

**M9/M9CV/M9T/M8 Elite/M10/M10CV/Crius
M10/M11/M11CV/Crius M11/Operus M11/
M9 Premium**

Diagnostic Ultrasound System

Operator's Manual

[Basic Volume]

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- the product is used in accordance with the instructions for use.

NOTE:

This equipment must be operated by skilled/trained clinical professionals.

WARNING

It is important for the hospital or organization that employs this equipment to carry out a reasonable service/maintenance plan. Neglect of this may result in machine breakdown or personal injury.

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- Others not caused by instrument or part itself.

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Important Information




- It is the customer's responsibility to maintain and manage the system after delivery.
- The warranty does not cover the following items, even during the warranty period:




- Damage or loss due to misuse or abuse.
- Damage or loss caused by Acts of God such as fires, earthquakes, floods, lightning, etc.
- Damage or loss caused by failure to meet the specified conditions for this system, such as inadequate power supply, improper installation or environmental conditions.
- Damage or loss due to use of the system outside the region where the system was originally sold.
- Damage or loss involving the system purchased from a source other than Mindray or its authorized agents.
- This system shall not be used by persons other than fully qualified and certified medical personnel.
- DO NOT make changes or modifications to the software or hardware of this system.
- In no event shall Mindray be liable for problems, damage, or loss caused by relocation, modification, or repair performed by personnel other than those designated by Mindray.
- The purpose of this system is to provide physicians with data for clinical diagnosis. The physician is responsible for the results of diagnostic procedures. Mindray shall not be liable for the results of diagnostic procedures.
- Important data must be backed up on external memory media.
- Mindray shall not be liable for loss of data stored in the memory of this system caused by operator error or accidents.
- This manual contains warnings regarding foreseeable potential dangers, but you shall also be continuously alert to dangers other than those indicated. Mindray shall not be liable for damage or loss resulting from negligence or ignorance of the precautions and operating instructions described in this operator's manual.
- If a new manager takes over this system, be sure to hand over this operator's manual to the new manager.

About This Manual

This operator's manual describes the operating procedures for this diagnostic ultrasound system and the compatible probes. To ensure safe and correct operation, carefully read and understand the manual before operating the system.

Meaning of Signal Words

In this manual, the signal words  **DANGER**,  **WARNING**,  **CAUTION**, **NOTE** and **TIP** are used regarding safety and other important instructions. The signal words and their meanings are defined as follows. Please understand their meanings clearly before reading this manual.

Signal word	Meaning
 DANGER	Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.
 WARNING	Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.
 CAUTION	Indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury.
NOTE	Indicates a potentially hazardous situation that, if not avoided, may result in property damage.

Signal word	Meaning
TIP	Important information that helps you to use the system more effectively.

Hardcopy Manuals

- Operator's Manual [Basic Volume]
Describes the basic functions and operations of the system, safety precautions, exam modes, imaging modes, preset, maintenance and acoustic output, etc.
- Operator's Manual [Advanced Volume]
- Operator's Manual [Acoustic Power Data and Surface Temperature Data]
Contains data tables of acoustic output for transducers.
- Quick Reference Guide
Contains a quick reference guide for basic system operations.

NOTE:

- Manuals on CD are the manuals translated into languages other than English, according to the English manuals.
 - If you find that the contents of the manuals on CD are NOT consistent with the system or the English manuals, refer ONLY to the corresponding English manuals.
 - The accompanying manuals may vary depending on the specific system you purchased. Please refer to the packing list.
-

Software Interfaces in this Manual

Depending on the software version, preset settings and optional configuration, the actual interfaces may be different from those in this manual.

Conventions

In this manual, the following conventions are used to describe the buttons on the control panel, items in the menus, buttons in the dialog boxes and some basic operations:

- <Buttons>: angular brackets indicate buttons, knobs and other controls on the control panel or on the keyboard.
- [Items in menu or buttons in dialog box]: square brackets indicate items in menus, on the soft menu or buttons in dialog boxes.
- [Items in menu] > [Items in submenu]: select a submenu item following the path.

Notification of Adverse Events

As a health care provider, you may report the occurrence of certain events to SHENZHEN MINDRAY BIO-MEDICAL ELECTRONICS CO., LTD., and possibly to the competent authority of the Member state in which the user and / or patient is established.

These events, include device-related death and serious injury or illness. In addition, as part of our Quality Assurance Program, SHENZHEN MINDRAY BIO-MEDICAL ELECTRONICS CO., LTD. requests to be notified of device failures or malfunctions. This information is required to ensure that SHENZHEN MINDRAY BIO-MEDICAL ELECTRONICS CO., LTD. provides only the highest quality products.

Operator's Manuals

You may receive multi-language manuals on compact disc or paper. Please refer to the English manual for the latest information and registration information.

The content of the operator manual, such as screens, menus or descriptions, may be different from what you see in your system. The content varies depending on the software version, options and configuration of the system.

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1 Important Information

1.1 Safety Precautions

Please observe the following precautions to ensure patient and operator's safety when using this system.

CAUTION

U.S.A. Federal Law restricts this device to sale by or on the order of a physician.

DANGER

Do not operate this system and probes in an atmosphere containing flammable gases or liquids such as anesthetic gases, hydrogen, and ethanol, because there is danger of explosion.

WARNING

- Do not connect the three-wire cable of the system with a two-wire plug without protective grounding; otherwise, electric shock may result.
- Do connect the power plug of this system to wall receptacles that meet the ratings indicated on the rating nameplate. If adapters or multi-functional receptacles are used, it may cause the leakage current to exceed the safety requirement.
- In the environment that patient is 1.5 meters around, connect peripherals to the auxiliary power outlet, or power the peripherals by auxiliary output cable or isolation transformer complied with IEC60601-1 or the power input of the same safety level.
- DO NOT use power supply of different phases to power peripherals, like power supply of air-conditioning.
- When using peripherals not powered by the auxiliary output of the ultrasound system, or using peripherals other than permitted by Mindray, make sure the overall leakage current of peripherals and the ultrasound system meets the requirement of the local medical device electrical regulation (like enclosure leakage current should be no more than 500 uA of IEC60601-1), and the responsibility is held by the user.
- Connect the grounding conductor before turning ON the system. Disconnect the grounding cable after turning OFF the system. Otherwise, electric shock may result.

- For the connection of power and grounding, follow the appropriate procedures described in this operator's manual. Otherwise, there is risk of electric shock. Do not connect the grounding cable to a gas pipe or water pipe; otherwise, improper grounding may result or a gas explosion may occur.
- Before cleaning the system, disconnect the power cord from the outlet. System failure and electric shock may result.
- This system is not water-proof designed. Do Not use this system in any place where water or any liquid leakage may occur. If any water is sprayed on or into the system, electric shock may result or the system may be damaged. If water is accidentally sprayed on or into the system, contact Mindray Customer Service Department or sales representative.
- DO NOT use a probe that has a damaged, scratched surface, or exposed wiring of any kind. Immediately stop using the probe and contact Mindray Customer Service Department or sales representative. There is risk of electric shock if using a damaged or scratched transducer.
- Do not allow the patient to contact the live parts of the ultrasound system or other devices, e.g. signal I/O ports. Electric shock may occur.
- The operator SHOULD NOT touch Signal Input Ports/Signal Output Ports and the patient at the same time.
- Do not use an aftermarket probe other than those specified by Mindray. The probes may damage the system causing a profound failure, e.g. a fire in the worst case.
- Do not subject the transducers to knocks or drops. Use of a defective transducer may cause an electric shock.
- Do not open the covers and front panel of the system. Short circuit or electric shock may result when the system hardware is exposed and powered on.
- Do not use the system with the patient when the system is being serviced or maintained.
- Do not use this system when any digital device such as a high-frequency electrotome, high-frequency therapeutic device or defibrillator is applied already. Otherwise, there is a risk of electric shock to the patient.
- Only use the ECG leads provided with the physiology module; otherwise, electric shock may be resulted.
- When moving the system, you should first fold the LCD display, disconnect the system from other devices (including probes) and disconnect the system from the power supply.
- When moving the system, disconnect the system from other devices (including probes) and disconnect the system from the power supply.
- The auxiliary power output outlet in the system is used to supply power for the recommended peripheral devices. Do not connect other devices to the outlet, otherwise, the rated output power may be exceeded and failure may be resulted.

- Accessory equipment (analog or digital) connected to the ultrasound system must comply with the relevant IEC standards (e.g., IEC 60950 information technology equipment safety standard and IEC 60601-1 medical equipment standard). Furthermore, all configurations must comply with the standard IEC60601-1. It is the responsibility of the person, who connects additional equipment to the signal input or output ports and configures a medical system, to verify that the system complies with the requirements of IEC60601-1. If you have any questions regarding these requirements, consult your vendor.
 - Prolonged and repeated use of keyboards may result in hand or arm nerve disorders for some individuals. Observe the local safety or health regulations concerning the use of keyboards.
 - It is not allowed for the operator to have contact with other patients and the electronic parts (such as the input/output terminal of the signal) of other devices that are connected to the system. Otherwise, it may produce the electrical shock to the patient.
 - DO NOT block the cooling vent of the system.
 - Do not expose the device to a magnetic resonance (MR) environment.
 - DO NOT make changes or modifications to the software or hardware of this system.
 - To avoid the risk of electric shock, this equipment must only be connected to a supply mains with protective earth.
-

CAUTION

- Precautions concerning clinical examination techniques:
 - This system must be used only by qualified medical professionals.
 - This operator's manual does not describe clinical examination techniques. The clinician should select the proper examination techniques based on specialized training and clinical experience.
- Malfunctions due to radio wave:
 - If a radio wave emitting device is used in the proximity of this system, it may interfere with operations. Do not use or take any devices transmitting RF signals (such as cellular phones, transceivers and radio controlled products) in the room placing the system.
 - If a person brings a device that generates radio waves near the system, ask him/her to immediately turn OFF the device.
- Precautions concerning movement of the system:
 - When you place the system on the mobile trolley and move them together, you must secure all objects on the mobile trolley to prevent them from falling. Otherwise you should separate the system from the mobile trolley and move them individually.

When you have to move the system with the mobile trolley upward or downward the stairs, you must separate them first and then move them individually.

- Object placed on the monitor may fall and injure an individual when moving.
- Confirm that there is no peripheral device connected to the system before moving the system. Otherwise, peripheral device may fall and injure an individual.
- If the circuit protector is tripped, it indicates that the system or a peripheral device was improperly shut down and the system is unstable. You cannot repair the system under this circumstance and must call the Mindray Customer Service Department or sales representative.
- There is no risk of high-temperature burns during normal ultrasound examinations. It is possible for the surface temperature of the transducer to exceed the body temperature of a patient due to environmental temperature and exam type combinations. Do not apply the transducer to the same region on the patient for a long time. Apply the transducer only for a period of time required for the purpose of diagnosis.
- Do not use the system to examine a fetus for a long period of time.
- Except accessories that have been stated as sterile, the system and its accessories are not disinfected or sterilized prior to delivery. The operator is responsible for the cleaning and disinfection of probes and sterilization of biopsy brackets according to the manuals, prior to the use. All items must be thoroughly processed to completely remove harmful residual chemicals, which will not only harmful to the human body, but also damage the accessory.
- It is necessary to end the current scan that is in progress and clear the current Patient Information field. Otherwise, new patient data may be combined with the previous patient data.
- Do not connect or disconnect the system's power cord or its accessories (e.g., a printer or a recorder) without turning OFF the system power first. This may damage the system and its accessories or cause electric shock.
- If the system is powered off improperly during operation, it may result in data damage of the system's hard disk or system failure.
- Do not use a USB memory device (e.g., a USB flash drive, removable hard disk) which has unsafe data. Otherwise, system damage may result.
- It is recommended to only use the video devices specified in this manual.
- Do not use gel, disinfectant, probes, probe sheath or needle-guided brackets that are not compatible with the system.
- The applied contrast agent should be compliant with the relevant local regulations.
- Read the Acoustic Output Principle in the operation manual carefully before operating this system on clinical examination.

- The cover contains natural rubber that can cause allergic reactions in some individuals.
 - Please use the ultrasound gel compliant with the relevant local regulations.
 - DO NOT expose the system to excessive vibration through transportation. Mechanical damage may result.
 - Always keep the system dry. Avoid transporting this system quickly from a cold place to a warm place; otherwise condensation or water droplets may form allowing a short circuit and possible electric shock.
-

NOTE:

- DO NOT use the system in the vicinity of strong electromagnetic field (such as a transformer), which may affect the performance of the system.
- Do not use the system in the vicinity of high-frequency radiation source (e.g. cellular phones), which may affect the performance of the system or even lead to failure.
- When using or placing the system, keep the system horizontal to avoid imbalance.
- To avoid damaging the system, do not use it in following environment:
 - Locations exposed to direct sunlight.
 - Locations subject to sudden changes in environmental temperature.
 - Dusty locations.
 - Locations subject to vibration.
 - Locations near heat generators.
 - Locations with high humidity.
- Turn ON the system only after the power has been turned OFF for a while. If the system is turned ON immediately after being turned OFF, the system may not be rebooted properly and could malfunction.
- Select the Freeze to freeze an image or turn off the power of the system before connecting or disconnecting a probe.
- Remove the ultrasound gel from the face of the transducer when the examination is completed. Water in the gel may enter the acoustic lens and adversely affect the performance and safety of the transducer.
- You should properly back up the system to a secure external storage media, including system configuration, settings and patient data. Data stored to the system's hard drive may be lost due to system failure, improper operation or accident.
- Do not apply external force to the control panel. Otherwise, the system may be damaged.
- If the system is used in a small room, the room temperature may rise. Please provide proper ventilation and free air exchange.
- To dispose of the system or any part, contact Mindray Customer Service Department or sales representative. Mindray is not responsible for any system content or accessories that have been discarded improperly.
- Electrical and mechanical performance may be degraded due to long usage (such as current leakage or distortion and abrasion); the image sensitivity and precision may become worse too. To ensure optimal system operations, it is recommended that you maintain the system under a Mindray service agreement.
- Refer replacing job to Mindray service engineers or engineers authorized by Mindray only.

- Do not turn OFF the power supply of the system during printing, file storage or invoking other system operations. An interrupted process may not be completed, and can become lost or corrupted.
 - Ensure that the current exam date and time are the same as the system date and time.
 - Use detachable power supply cord as mains power breaking device. DO NOT set equipment in place where difficult for disconnection of detachable power supply cord.
-

Please read the following precautions carefully to ensure the safety of the patient and the operator when using the probes.

WARNING

- The ultrasound probe is only for use with the specified ultrasound diagnostic system.
 - The ultrasound probe must be used only by qualified professionals.
 - Confirm that the transducer and probe cable are normal before and after each examination. A defective probe may cause electric shock to the patient.
 - Do not subject the probe to shock. A defective probe may cause electric shock to the patient.
 - Do not disassemble the probe to avoid the possibility of electric shock.
 - Never immerse the probe connector into liquids such as water or disinfectant because the connector is not waterproof. Immersion may cause electric shock or malfunction.
 - A transducer sheath must be installed over the transducer before performing examination.
 - When using a probe, pay attention to the status of the ultrasound image. Do not use the probe to perform image acquisition when the image is frozen.
-

CAUTION

- When using the probe, wear sterile gloves to prevent infection.
 - Please use the ultrasound gel compliant with the relevant local regulations. And manage the ultrasound gel properly to ensure that it does not become a source of infection.
 - In normal diagnostic ultrasound mode, there is no danger of a normal-temperature burn; however, do not keep the probe on the same region of the patient for more than 10 minutes to avoid risk of burn.
 - Do not use the carrying case for storing the transducer. If the carrying case is used for storage, it may become a source of infection.
 - It is required to practice ALARA when operating ultrasound system. Minimize the acoustic power without compromising the quality of images.
 - The probe and accessories supplied with it are not delivered disinfected or sterilized. Sterilization (or high-level disinfect) before use is required.
-

- Disposable components should be packaged sterile and for single-use only. Do not use if integrity of packaging violated or if expiration date has passed. Please use the disposable components compliant with the relevant local regulations.
 - Please use the disinfection or sterilization solution recommended in this operator's manual; otherwise Mindray will not be liable for damage caused by other solutions. If you have any questions, please contact Mindray Customer Service Department or sales representative.
 - Do not use pre-lubricated condoms as a sheath. Lubricant may not be compatible with the probe material and damage may result.
 - The damage of the transducer may be caused by the contact of improper gel or cleaner:
 - DO NOT dip the transducer in the strong polar solution of ethanol, chloride of lime, ammonium chloride, acetone and formaldehyde.
 - DO NOT contact the transducer with solution or ultrasound gel containing oily medium such as mineral oil or lanoline.
-

NOTE:

- Read the following precautions to prevent the probe from malfunction:
 - Before connecting or disconnecting the probe, freeze or turn off the system.
 - Clean and disinfect the probe before and after each examination.
 - After the examination, wipe off the ultrasound gel thoroughly. Otherwise, the ultrasound gel may solidify and the image quality would be degraded.
 - Repeated disinfection will eventually damage the probe, please check the probe performance periodically.
-

1.2 Latex Alert

When choosing a probe sheath, it is recommended that you directly contact CIVCO for obtaining information regarding probe sheaths, pricing, samples and local distribution.

For CIVCO information, please contact the following:

CIVCO Medical Instruments

Tel: 1-800-445-6741

www.civco.com

WARNING

Allergic reactions in patients sensitive to latex (natural rubber) may range from mild skin reactions (irritation) to fatal anaphylactic shock, and may include difficulty breathing (wheezing), dizziness, shock, swelling of the face, hives, sneezing, or itching of the eyes (FDA Medical Alert on latex products, "Allergic Reactions to Latex-containing Medical Devices", issued on March 29, 1991).

1.3 Parts that can be used within patient environment

- The ultrasound system
- Video Printers

2 System Overview

2.1 Intended Use

Diagnostic Ultrasound System is applicable for adults, pregnant women, pediatric patients and neonates. It is intended for use in fetal, abdominal, Intra-operative, Laparoscopic, pediatric, small organ(breast, thyroid, testes), neonatal and adult cephalic, trans-rectal, trans-vaginal, musculo-skeletal(conventional, superficial), adult and pediatric cardiac, trans-esoph.(Cardiac), peripheral vessel and urology exams.

This device is a general purpose diagnostic ultrasound system intended for use by qualified and trained healthcare professionals for ultrasound imaging, measurement, display and analysis of the human body and fluid, which is intended to be used in a hospital or medical clinic.

Modes of operation include: B, M, PWD, CWD, Color Doppler, Amplitude Doppler, Combined mode(B+M, PW+B, Color+B, Power+B, PW+Color+B, Power+PW+B), Tissue Harmonic Imaging, iScape, TDI, Color M, Elastography, Contrast imaging (Contrast agent for LVO), Smart 3D, 4D(Real-time 3D), Contrast imaging (Contrast agent for Liver).

NOTE:

The system is not intended for central cardiovascular or central nervous system use.

2.2 Contraindication

The diagnostic ultrasound system is not intended for ophthalmic use.

2.3 Safety Classifications

- According to the type of protection against electric shock:
Class I equipment + internally powered equipment
- According to the degree of protection against electric shock:
Type-BF applied part
- According to the degree of protection against harmful ingress of water:
 - The main unit is rated as IPX0
 - The probes are rated as IPX7
 - The 1-pedal type is rated as IPX8, and 2-pedal and 3-pedal types are rated as IP68
 - The power adapter is rated as IPX1
- According to the disinfection and sterilization method(s) recommended by manufacturer:
Equipment with disinfection and sterilization method(s) recommended by manufacturer.
- According to the degree of safety of application in the presence of a FLAMMABLE ANESTHETIC MIXTURE WITH AIR or WITH OXYGEN OR NITROUS OXIDE
EQUIPMENT not suitable for use in the presence of a FLAMMABLE ANESTHETIC MIXTURE WITH AIR or WITH OXYGEN OR NITROUS OXIDE

- According to the mode of operation:
Continuous operation
- According to the installation and use:
Portable equipment
Mobile equipment (when the system is installed on the mobile trolley)
- Does the equipment has any defibrillation-proof applied parts:
Non-defibrillation-proof applied part
- Permanently installed equipment or non-permanently installed equipment:
Non-permanently installed equipment

2.4 Product Specifications

NOTE:

The functions described in the operator's manual may vary depending on the specific system purchased.

2.4.1 Power supply

- Voltage: 100 V - 240 V AC
- Frequency: 50/60 Hz
- Power input: 2.0 A
- Battery voltage: 14.8 V

2.4.2 Environmental Conditions

- Operating conditions
 - Ambient temperature: 0 °C ~ 40 °C
 - Relative humidity: 30% ~ 85% (no condensation)
 - Atmospheric pressure: 700 hPa ~ 1060 hPa
- Storage and transportation conditions
 - Ambient temperature: -20 °C ~ 55 °C
 - Relative humidity: 20% ~ 95% (no condensation)
 - Atmospheric pressure: 700 hPa ~ 1060 hPa



WARNING

Do not use this system in conditions other than those specified.

2.4.3 Dimensions and Weight

- Dimensions (D×W×H, unit: mm): $(362\pm5) \times (390\pm5) \times (59\pm3)$ mm
- Weight (including batteries): <6.5 kg

2.5 Product Differences

Model	B-Profile	B-Histogram	Double-Dist	Color Vel	Spline Length
M9	√	√	√	×	√
M9CV	×	√	√	×	√
M9T	√	×	√	×	√
M8 Elite	×	×	√	√	√
M10	√	√	√	√	×
M10CV	×	√	√	√	×
Crius M10	×	√	√	×	×
M11	√	√	√	√	√
M11CV	×	√	√	√	√
Crius M11	√	√	×	×	√
Operus M11	×	×	×	√	√
M9 Premium	×	×	×	×	×

NOTE:

- B-Profile: measures the gray distribution of ultrasonic echo signals on a line.
- B-Histogram: measures and counts the gray distribution of ultrasonic echo signals within a closed region.
- Double-Dist: measures the lengths of line segments A and B perpendicular to each other.
- Color Vel: measures the velocity of blood flow on the Color Mode image.
- Spline Length: measures the length of a curve on the image.

2.6 System Configuration

2.6.1 Standard Configuration

- Main unit
- System software
- Keyboard
- Power adapter
- Built-in batteries
- Wi-Fi
- Physio module
- Travelling case
- Ultrasound gel
- Optical disk with multi-language manual
- u-Link

- Accessories
 - Operator’s manuals
 - User-defined label
 - Cables
 - Alphanumeric keyboard dust proof cover
 - Multilingual controls overlay
 - Probe container (LAP13-4Cs should be configured)

2.6.2 Probes and Needle-guided Brackets Available

Please see “13 Probes and Biopsy”.

2.6.3 Options

Item	Remarks
Mobile Trolley	See Trolley chapter for details.
Footswitch	Types: 2-pedal/3-pedal/1-pedal
Audio/Video Extend Module	iDock51
Probe Extend Module	PEM-51
Clamp-type three-cable ECG lead (electrode cable)	ECG function should be configured.
12-pin, 3-lead defibrillation-proof, ECG cable (Neonate, IEC/AHA, Datascope)	Physio function should be configured
DC-IN cable	ECG function should be configured.
USB to LAN Adapter	/
Power cable	/
Travelling pack	/
External DVD R/W drive	/
Barcode Reader	/
iVocal microphone	iVocal function should be configured.
IMT	Vascular Package should be configured.
iScape View	/
Free Xros M	/
Free Xros CM	/
CW	/
Tissue Doppler Imaging	/
TDI QA	Tissue Doppler Imaging should be configured.
Contrast Imaging	/
LVO	Cardiology Package should be configured.
Contrast Imaging QA	Contrast Imaging should be configured.

Item	Remarks
Elastography	/
Stress Echo	Cardiology Package should be configured.
Tissue Tracking QA	Cardiology Package should be configured.
TTQA-RV	Cardiology Package and Tissue Tracking QA should be configured.
iWorks	/
iNeedle	/
Abdomen/General Package	/
Obstetrics Package	/
Smart OB	Obstetrics Package should be configured.
Smart NT	Obstetrics Package should be configured.
Gynecology Package	/
Cardiology Package	/
Small Parts Package	/
Urology Package	/
Vascular Package	/
Pediatrics Package	/
Nerve Package	/
Emergency & Critical Package	/
AutoEF	Cardiology package should be configured.
DICOM Basic	/
DICOM Worklist	DICOM Basic should be configured.
DICOM MPPS	
DICOM OB/GYN SR	
DICOM Vascular SR	
DICOM Cardiac SR	
DICOM Query/Retrieve	
DICOM Breast SR	
Physio	Clamp-type three-cable ECG lead and DC IN cable should be configured.
Smart 3D	/
4D Function	/
iPage	4D Function should be configured.
Smart Volume	4D Function should be configured.
Smart Hip	Pediatrics Package should be configured.
McAfee	/
iVocal	iVocal microphone should be configured.

Item	Remarks
Smart VTI	Cardiology Package should be configured.
Smart IVC	/
Smart B-line	/
Auto GA	/
Auto DFR	/

2.6.4 Peripherals Supported

Item	Model
Digital graph/text printer	HP OFFICEJET PRO 8100 (the printer driver requires manually installed)
Black/ white video printer (digital)	MITSUBISHI P95DW-N
Black/ white video printer (analog)	SONY UP-X898MD
Digital color video printer	SONY UP-D25MD
Barcode reader	SYMBOL DS4308 SYMBOL LS2208 JADAK HS-1M JADAK HS-1R Honeywell HH1800
Footswitch	971-SWNOM (2-pedals) 971-SWNOM (3-pedals) FS-81-SP-2 (1-pedal)
External DVD R/W drive	DVDRW HP GP60NB60/DVDRW HP GP70
DVR	/
Microphone	SAMSON XPD2

2.7 CIVCO Probe Sheath and Brackets

To order Civco brackets or probe sheaths, contact:

Multi-Modality Imaging and Corporate Office:

Toll-free within the U.S. & Canada: 800.445.6741,

Toll-free Fax: 877.329.2482

Direct Dial: 319.248.6757 (International)

Fax: 319.248.6660

E-mail: order@civco.com

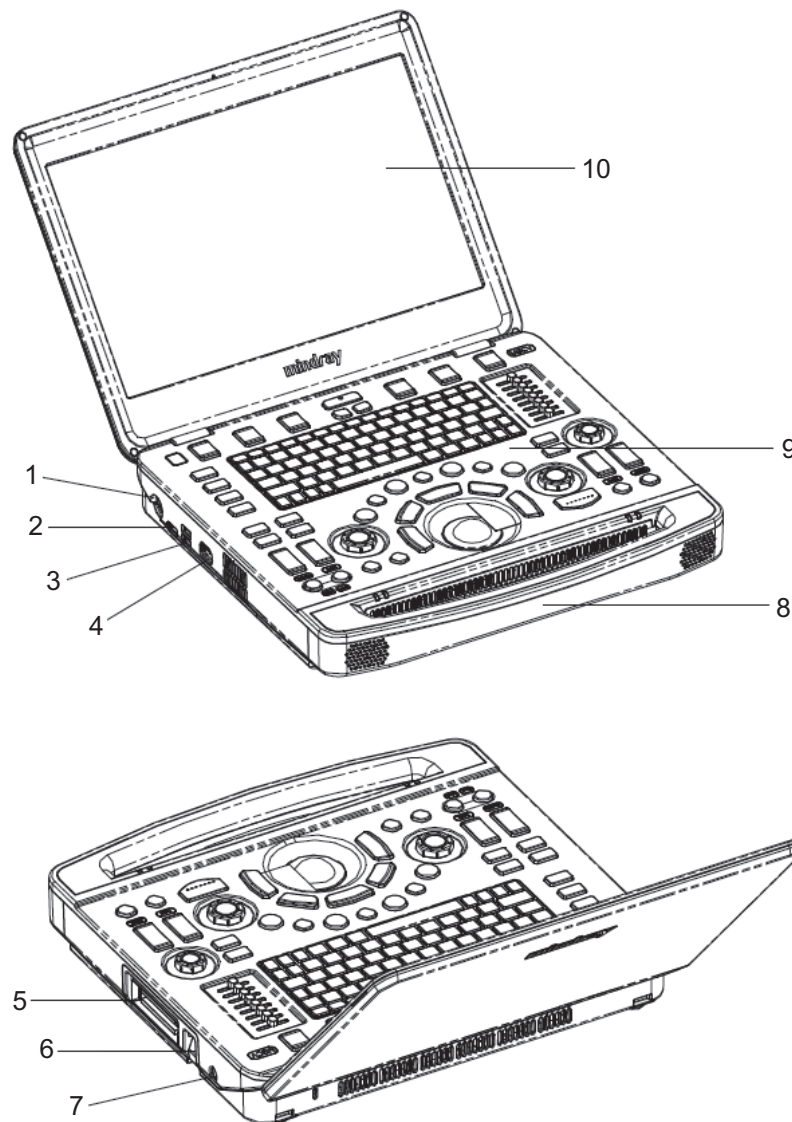
Internet: www.civco.com



CIVCO Bracket:

Probe model	Needle-guided Bracket Model
L14-6Ns/ L12-4s	CIVCO 658-001 Infiniti-Plus Bracket Starter Kit
V11-3Ws	CIVCO 610-543 Disposable Sterile Endocavity Needle Guide / Cover Kit
	CIVCO 610-1274 Disposable, Sterile Endocavity Guide / Cover Kit

2.8 Introduction of Each Unit

Figure 2-1 Overview



No.	Name	Function
1	Power input port	Connects the power adapter.
2	HDMI port	High definition multimedia interface. Used for connecting TV, projector, ultrasound workstation video capture card, etc.
3	USB port	Used for connecting storage devices such as USB disk, barcode reader, printer, footswitch, DVD recorder, etc.
4	ECG port	Connects ECG lead or DC-IN cables.
5	Probe port	Connects a probe to the main unit; or connects a probe extend module.
6	Probe locking lever	Locks or unlocks the probe connected with the main unit. <ul style="list-style-type: none"> • : locked symbol. • : unlocked symbol.
7	Pencil probe port	Connects a pencil probe.
8	Handle	Used for carrying the system.
9	Control Panel	Operator-system interface or control.
10	Display	Displays the images and parameters during scanning.

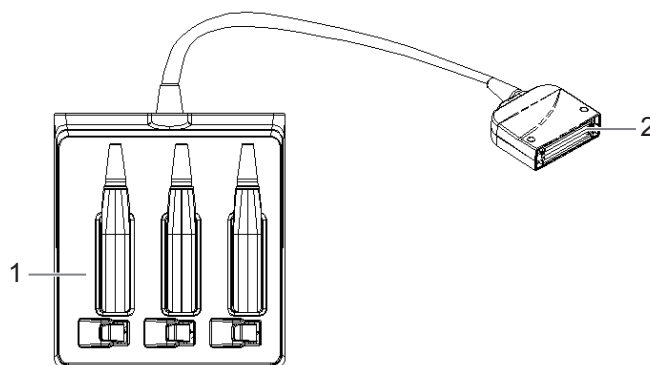
2.9 Extend Module

Extension modules to the system are: probe extend module and audio/video extend module.

2.9.1 Probe Extend Module

Overview

Figure 2-2 Probe Extend Module



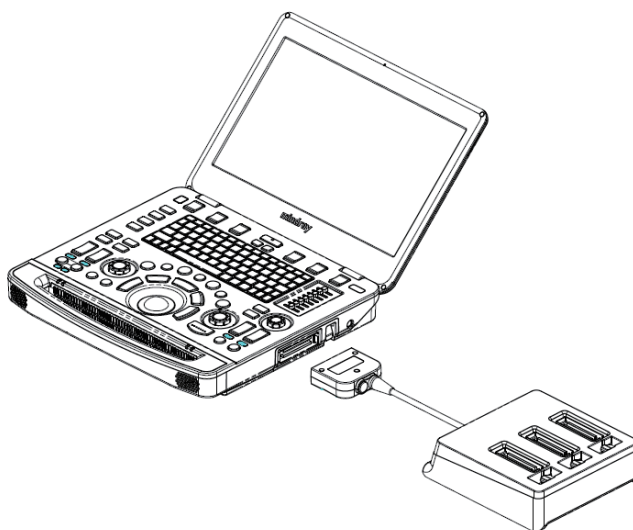
No.	Name	Description
1	Probe port	To extend ports for connecting probes, the middle one is a docking port

No.	Name	Description
2	Connector	Connects to the probe port of the main unit, and extends the probe port to three.

Connection

NOTE:

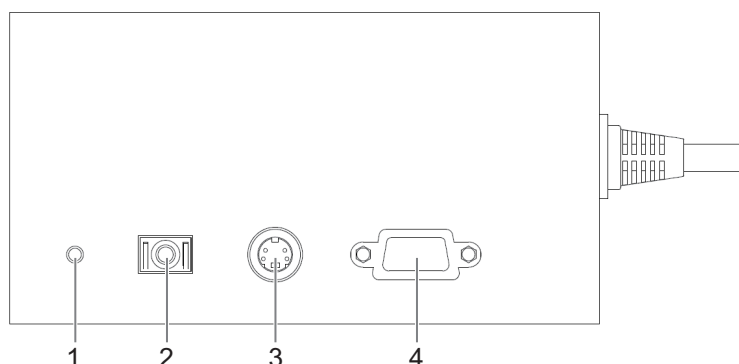
- Perform the plug and unplug of this module. To reduce the wastage of probe module, the operation should be conducted under frozen status of the system.
- If you use this module to connect a probe, the image quality may be degraded.



2.9.2 Audio/Video Extend Module

Overview

Figure 2-3 Audio/Video Extend Module



No.	Name	Description
1	Indicator	It illuminates in green when the module is connected to the main unit.
2	Audio output port	Used for audio signal output.

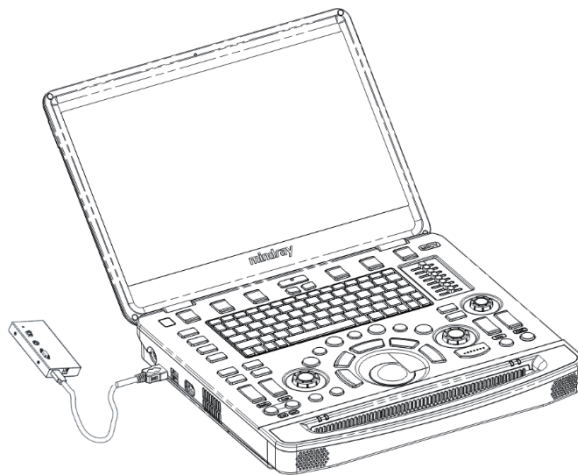
No.	Name	Description
3	S-Video output port	Used for connecting projector, ultrasound workstation video capture card, video printer, or LCD, etc.
4	VGA output port	VGA signal output. Used for connecting TV, projector, ultrasound workstation video capture card, etc.

Connection

NOTE:

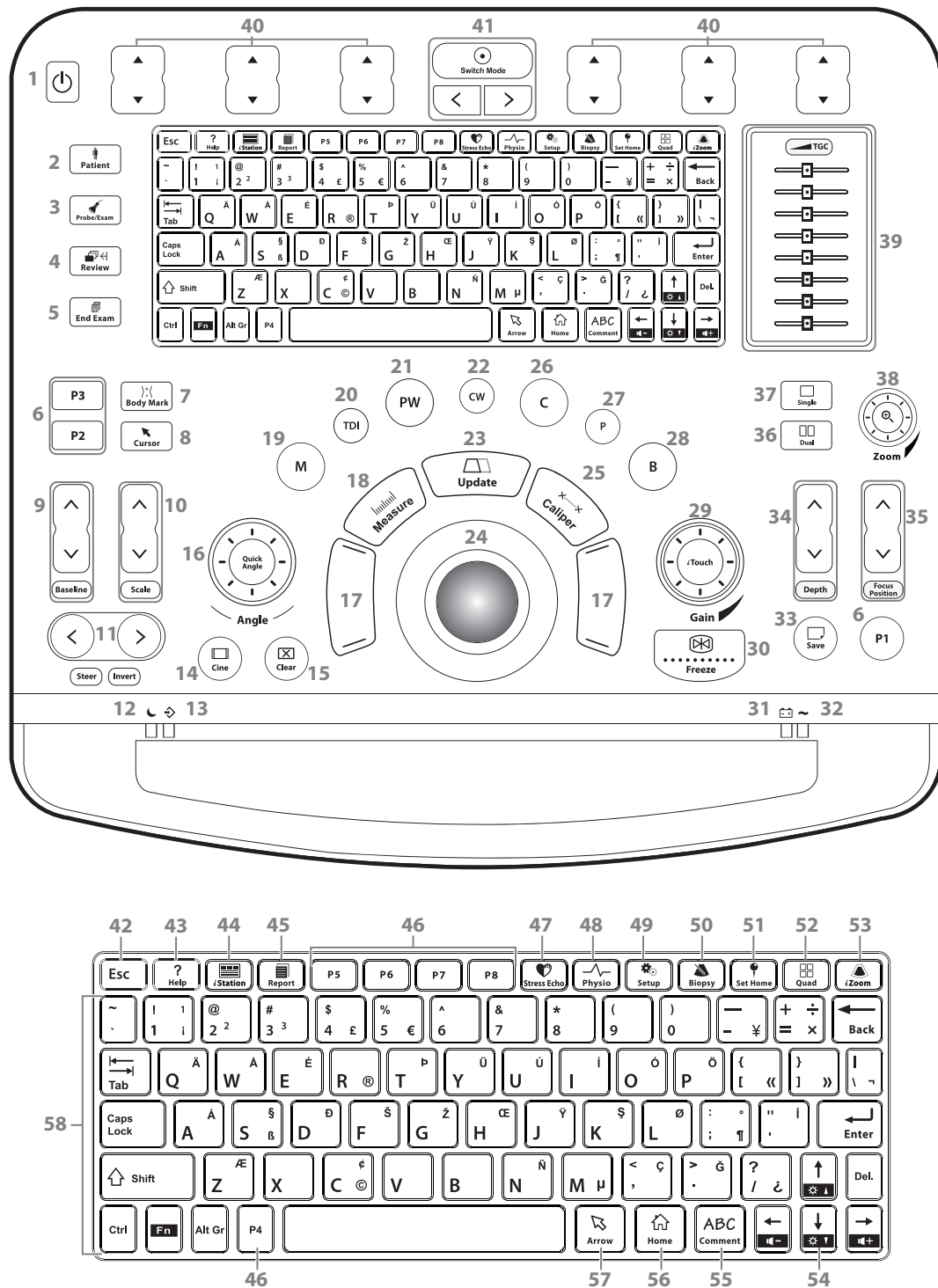
- When connecting an external video device (HDMI/VGA), make sure the display resolution setting is 1920x1080, otherwise the image quality may be degraded.
 - For a better audio/video signal performance, please connect the iDock51 to the ultrasound system before the system is powered on.
-

Connect the Audio/Video extend module to the main unit via a HDMI port. As shown in the following figure.



2.10 Control Panel

Figure 2-4 Control Panel Overview



No.	Name	English Name	Description
1.	Power button	/	Power the power supply on/off.

No.	Name	English Name	Description
2.	Patient	Patient	Press to enter the Patient information screen.
3.	Probe/exam mode switch button	Probe/Exam	Press to switch probe and exam mode.
4.	Image review button	Review	Press to review the stored images.
5.	End exam button	End Exam	Press to end an exam.
6.	User-defined keys	P3/P2/P1	Undefined button, set by the user in preset.
7.	Body mark button	Body Mark	Press to enter/ exit the body mark mode.
8.	Cursor button	Cursor	Press to show/hide the cursor.
9.	Baseline position adjustment button and auxiliary interface	Baseline	Adjust the baseline parameter when the indicator is on.
10.	Scale adjustment button and auxiliary interface	Scale	Press to adjust the scale parameter when the indicator is on.
11.	Steer/Invert adjustment button	Steer/Invert	Adjust the steer/invert parameter when the indicator is on.
12.	Standby status indicator	/	<ul style="list-style-type: none"> Standby indicator. Standby: blinking in orange. Other status: light off.
13.	Hard disk read indicator	/	<p>Hard disk status indicator.</p> <p>The indicator blinks in green when hard disk is running.</p> <p>The indicator is off on the other status.</p> <p>NOTE:</p> <p>DO NOT move the machine when the indicator blinking in green. Otherwise the hard disk may be damaged by sudden shake.</p>
14.	Save static image button	Save	Save images in a preset way.
15.	Clear button	Clear	Press to clear off the comments or measurement calipers on the screen.
16.	Angle adjustment and quick angle knob	Quick Angle	<ul style="list-style-type: none"> Press to activate quick angle or auto correct under PW mode. Rotate to adjust probe marker orientation of body mark. Press to switch the X-/Y-/Z- axis; rotate to get 3D/4D image rotation in 3D/4D mode.
17.	Confirm key (left <Set> key)	/	Press to confirm the operation.

No.	Name	English Name	Description
18.	Measure button	Measure	Press to enter/exit application measurement.
19.	M mode button	M	Press to enter the M mode.
20.	TDI Functional button	TDI	Press to enter TDI mode
21.	PW mode button	PW	Press to enter PW mode.
22.	CW mode button	CW	Press to enter CW mode.
23.	Update button	Update	<ul style="list-style-type: none"> Switching key: Press to change the currently active window. Start or end capturing the image in iScape.
24.	Trackball	/	To move the cursor.
25.	Caliper button	Caliper	Press to enter/exit general measurement.
26.	Color mode button	C	Press to enter Color mode.
27.	P mode button	P	Press to enter Power mode.
28.	B mode button	B	Press to enter B mode.
29.	Gain and iTouch knob	Gain/iTouch	<ul style="list-style-type: none"> Adjust the gain of the image in various modes. Press to enter iTouch mode.
30.	Freeze button	Freeze	Press to freeze or unfreeze the image.
31.	Battery indicator	/	<p>Battery status indicator.</p> <ul style="list-style-type: none"> Charging status: It illuminates in orange when batteries are charging; It illuminates in green when batteries are charged fully. Discharging status: It illuminates in green color when the power of the batteries is sufficient; It illuminates in orange color for low battery power.
32.	AC power indicator	/	<p>AC indicator</p> <p>The indicator is green at AC supply.</p> <p>The indicator is off when batteries are supplied without AC supply.</p>
33.	Save static image button	Save	Save images in a preset way.
34.	Depth adjustment button and functional interface	Depth	Adjust the depth parameter when the indicator is on.
35.	Focus position adjustment button and functional interface	Focus Position	Adjust the focus position when the indicator is on.





No.	Name	English Name	Description
36.	Dual-split window button	Dual	Press to enter the Dual mode from another mode; Press to switch between the two windows in the Dual mode.
37.	Single-window button	Single	Press to enter active window in Dual or Quad mode.
38.	Image zoom and spot/pan zoom switch knob	Zoom	Press to enter or exit zoom status.
39.	TGC and functional interface	/	Move to adjust depth gain compensation.
40.	Soft menu adjustment buttons	/	Press to select the soft menu items displayed on the bottom of the screen. Refer to the subsequent contents for specific functions.
41.	Soft menu display mode switch button	/	Press to switch the mode for the soft menu.
	Soft menu page up/down button	/	Press to turn the soft menu page backwards/forwards.
42.	Esc	Esc	Cancel the operation or exit the operation.
43.	On-line help	Help	Press to open or close the accompanying help documents.
44.	Patient data management system	iStation	Enter or exit patient information system.
45.	Report	Report	Open/ close the exam report.
46.	User-defined keys	P4~P8	Undefined button, set by the user in preset.
47.	Stress echo	Stress Echo	Press to enter Stress Echo mode.
48.	Physiological signal	Physio	Press to enter or exit ECG or respiratory curve.
49.	Setup	Setup	Press to enter/ exit Setup.
50.	Biopsy	Biopsy	Press to enter biopsy.
51.	Set home	Set home	Set home of comments.
52.	Quad-window display	Quad	<ul style="list-style-type: none"> Enter Quad mode in Non-Quad mode. Press to switch among interfaces in Quad mode.
53.	iZoom (Full-screen Zooming)	iZoom	<ul style="list-style-type: none"> Enter/exit full-screen zoom status. Under iZoom status, switch zooming way.
54.	Direction-control keys	/	Moves the cursor one letter each time; or, select the ambient one in a selectable area.
55.	Comments	Comment	Enter/exit the textual comment status.

No.	Name	English Name	Description
56.	Home	Home	Activate the Home function: return to start position of comment.
57.	Arrow	Arrow	Enter/exit the arrow comment status.
58.	Alphanumeric keys	/	Enter characters.

Functions of key combinations

The system supports multi-language input using key combinations. Key combinations include [Shift], [Alt Gr], [Ctrl] and some alphabet keys.

- <Shift> key
 <Shift> + key: enter the top left letter on the key.
 For the alphabet keys (<A>~<Z>), press <Shift> + key to enter the current letter in a different case.
- [Alt Gr] key
 Combined with other letter keys, [Alt Gr] can be used for entering other languages.
 Press [Alt Gr] and a letter key simultaneously. The letter in the top-right corner of the key is entered.
- [Ctrl] key combined keys
 On the iStation or Review screen, use <Ctrl> and <Set> to select more than one patient.
- [Fn] key
 For these combination keys, press <Fn> + key to use the functions indicated with a frame on the key.

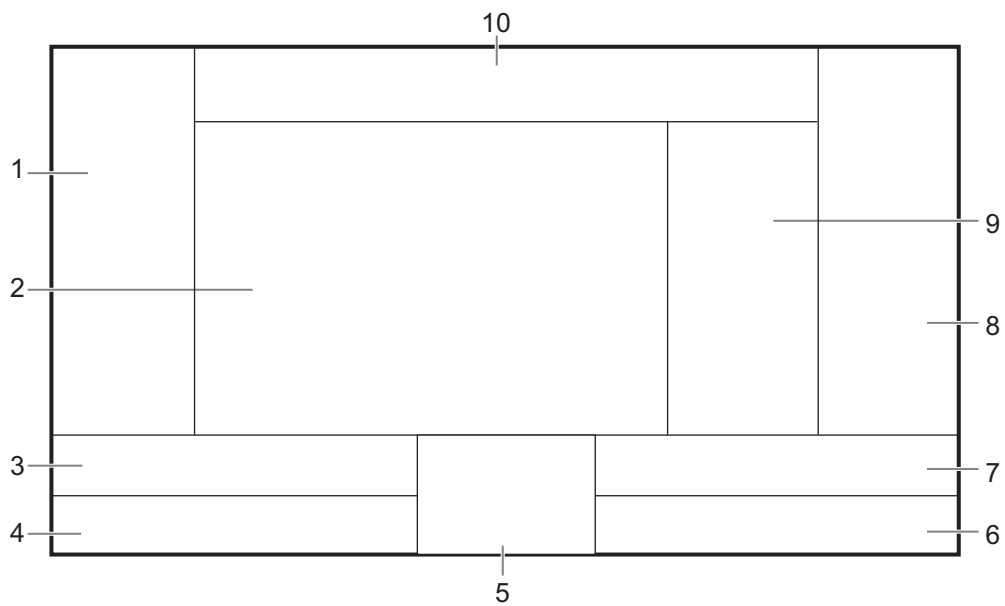
Key	Function
Fn+ 	Increase the audio volume.
Fn+ 	Decrease the audio volume.
Fn+ 	Increase the brightness of the screen.
Fn+ 	Decrease the brightness of the screen.

2.11 Screen Display

The screen displays ultrasound images, parameters, menus and measurement results windows.

The following diagram maps out the different areas, such as patient information, image parameter & menu, image area, thumbnail of images saved, help information & cursor icon, soft menu, system status icon, etc.

Figure 2-5 Monitor Display



1	Menu area
2	Image area
3	Soft menu area
4	Help information area
5	Trackball function hint area
6	System status area
7	Soft menu area
8	Clip board/Thumbnails area
9	Parameter area
10	Patient/Exam information area

Menu area

Includes the image menu, measurement menu, comment menu, body mark menu, and so on.

Image area

The image area displays the ultrasound images, ECG waveforms, probe mark (or activating window mark “M”), coordinate axis (including depth, time, velocity/frequency), acoustic output index (including the acoustic power, MI and TI index) and focal position (located on the depth axis in the form of ◀). Annotations, body marks, measurement calipers, color bar/grayscale bar are also displayed here.

Soft menu area

The soft menu items displayed are corresponding to functions of soft menu controls (soft key) in the control panel.

Help information area

The help information area displays various help information items or the progress bar in the current status.

TIP:

In terms of help information, “TB” refers to “Trackball”.

Press <Help> to open the Help Info manual.

Trackball function hint area





Displays the current functions of trackball and keys.

System status area

This area displays the relevant system icons, such as USB memory device, printer, network, and current system time, etc.

Clip board/Thumbnails area

Displays the thumbnail images stored under the current patient.

- Page-turning: when there are more than one page images have been stored, you can turn to the next or preview page by  or  respectively.
- Delete: select a thumbnail image, and click  to delete it.
- Send to: select a thumbnail image, and click to  send it to other devices.

Parameter area

Displays the image parameters for the active window. If there are more than one imaging modes, the parameters are displayed by each mode.

The actual display of parameters is depending on the current imaging mode. General image parameters are as follows:

Parameter	Meaning
F	Frequency
D	Depth
G	Gain
FR	Frame Rate
DR	Dynamic Range
iClear	Display when the function is turned on
iBeam	
iTouch	
Z (Zoom)	
V	Speed
PRF	Pulse Repetition Frequency
WF	Color Wall Filter
SVD	SV Position
SV	SV Size

Parameter	Meaning
Angle	Angle value
FC H	Contrast frequency

Patient/Exam information area

The Information area consists of the manufacturer's logo, the hospital name, the exam time, patient information, the probe model, the exam mode, etc. To preset which kind of patient information is displayed, enter the path: <Setup> button > [System Preset] > [General].

2.12 Basic Operations

2.12.1 Dialog Box


Take the patient information screen as an example.

User Interface Controls

A dialog box screen consists of title, tab pages, contents and buttons, etc.

- Title bar
The title bar is used to give a description of the content and function of the screen.
- Tab page
For some screens, the contents are distributed across several pages. Use the <Set> key to open/close the available pages.
- Content
 - Radio box: click to select the item.
 - Check box: click to check or uncheck the item.
 - Text box: enter characters manually via the keyboard.
 - Drop-down list box: click [▼] to show the list and select an item.
- Standard buttons
When the operation of a screen is completed, click the [OK] or [Cancel] button to save or cancel the operation, and close the screen.

To reposition a dialog box

1. Use the trackball to move the cursor onto the title bar of the dialog box.
At this time the cursor becomes a , then press <Set> button.
2. Position the rectangular graphic to the new desired location.
3. Release <Set> button, and the dialog box is moved to the desired position.

2.12.2 Select Exam Mode and Probe



CAUTION

If the exam mode is changed during a measurement, all measurement calipers on the image will be cleared. The data of general measurements will be lost, but the data of application measurements will be stored in the reports.

Perform the following procedure:

1. Connect suitable probes to the system and press <Probe> on the control panel. The screen displays the Probe and Exam dialog box.
2. Select the probe type and exam mode.
The system exits the dialog box and enters the selected exam mode and probe.
Click [Exit] or press <Probe> again to cancel the selection and exit the screen.

2.12.3 Select the Imaging Mode

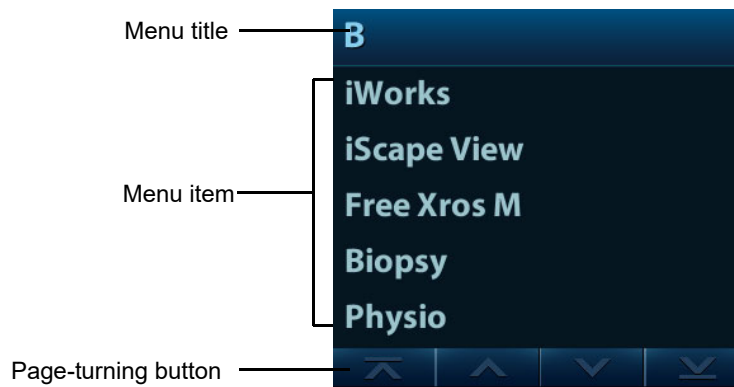
Switch between imaging modes according to the actual situation using the corresponding imaging button.

Pencil probes only support CW mode.

2.12.4 Image Adjustment

Adjust using the image menu

The menu area consists of menu title, menu items and page-turning button. As shown in figure below.

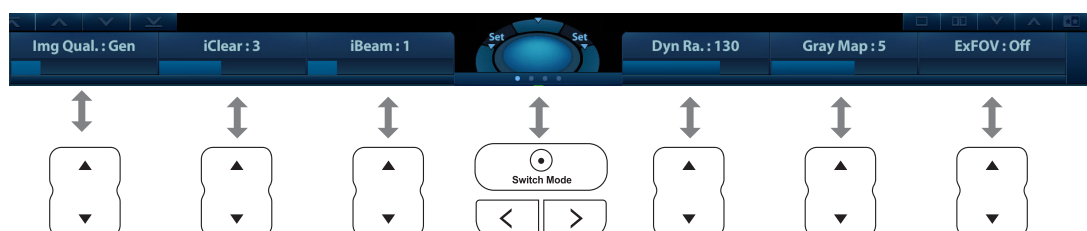


- Menu title
Displays the menu name.
- Page-turning button
When there are too many items in a menu, the items will be divided into more than one page. You can turn pages by page-turning buttons.
- Menu item
Refers to the items on a menu. Items of measurement can be preset.

Adjust using the parameter menu (soft key)

The parameter menu items displayed are corresponding to functions of soft menu controls (soft key) in the control panel.

The parameter menu controls are located at the top of the control panel, shown in the following figure.



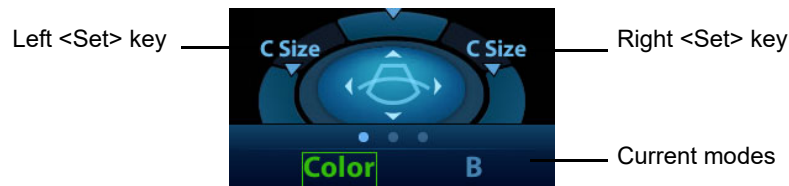
- Page-turning: Use the </> buttons on the control panel to turn pages.
- Mode switching: Use <Switch Mode> to switch between the modes. The parameter menu items vary depending on the mode. The mode navigation will cause the change of the menu.
- The soft menu items are operated respectively through the groups of soft menu controls.

Control Panel

Adjust using the trackball, control panel key, knob or slider.

Trackball function keys

In some modes, you need to use both the trackball and the trackball function keys to make adjustments.



For instance, in Color mode, use the trackball and the trackball function keys to adjust the ROI size/position.

1. Press the left/right <Set> key to switch between ROI size and ROI position.
2. Use the trackball to adjust the ROI.

2.12.5 Quickly Saving Image Settings

Press user-defined key for QSave to access the image data saving dialog box. For details about user-defined key setting, see the Key Configuration section of the Setup chapter.)

Save the image parameter adjustment

Click [Save] to save the current image values for the current exam mode of the particular probe.

Create new exam data (using the current image parameter settings)

Enter the name in the box after “Save As” to assign a name for a user-defined exam mode, and click [Create] to save the current image parameters, measurements, comments and body mark settings to the exam mode.

Restore the factory settings

The settings of the current exam mode and the probe can be restored to factory data by clicking [Restore].

Check image parameter level and other settings

- Click [Image Params] to check levels of different image parameters. Click [Save Image Parameter] to save the current image values for the current exam mode of the particular probe.
- Select “Advanced” tab to set TIC/TIB/TIS parameter.
- Select “Advanced” and set “Sampling Line Displaying” to “On”, then PW/M/TVM mode can be entered by pressing the imaging mode key only one time.

2.12.6 Splitting Display

The system supports dual-split and quad-split display format. However, only one window is active. The multi-window display can complete the image and multi-frame image comparison.

Dual-split

Select the <Dual> button to enter the dual-split mode, and use the <Dual> button or <Update> button to switch between the two images; select the B mode button or the <Single> button to exit.

Quad-split

Select the <Quad> button to enter the quad-split mode, and use the <Quad> button to switch among four images; select the B mode button or the <Single> button to exit.

2.12.7 Image Magnification

NOTE:

Zooming an image changes the frame rate which tends to change thermal indices. The position of the focal zones may also change which may cause the peak intensity to occur at a different location in the acoustic field. As a result, the MI may change.

Spot Zoom

Perform the following procedure:

1. Select the <Zoom> button to enter the sample volume definition status.
2. Change the box size and position. Select the <Set> button to toggle between setting the size and position.
3. After the sample volume is set, select the <Zoom> button again or <Update> button to enter spot zoom status.
4. Rotate the <Zoom> knob to change the magnification factor.

The image magnification factor value will display in real time in the image parameter area.

5. The size and position of sample volume box change along with scan depth and area.
6. Select the <Zoom> button again to exit spot zoom.

Pan Zoom

Perform the following procedure:

1. Rotate the <Zoom> knob to enter the pan zoom status and adjust the Zoom value,.

Image-in-image is displayed. The image magnification factor value will display in real time in the image parameter area. For example, "Z 1.40" indicates that the magnification factor is 1.4.

2. Change the ROI position in the Image-in-image to shifting the image.
3. Adjust the magnification factor to 1.00 to exit pan zoom.

iZoom (Full-screen Zooming)

Perform the following procedure:

1. Select the <iZoom> button to zoom in the image.

The zooming area includes image area, parameter area, image banner, and so on.

2. Select the <iZoom> button again to zoom in the image area only.

The image goes to full-screen.

3. Select the <iZoom> button again to exit.

2.12.8 Freeze/Unfreeze the Image

Select the Freeze button to freeze a scanning image. In freezing mode, the probe stops transmitting acoustic power, and all images as well as the parameters are kept still.

After freezing an image, the system may enter cine review, measure, comment adding, or body mark mode, which is dependent upon preset.

Select the Freeze button in frozen mode to unfreeze the image, and the system continues image scanning.

2.12.9 Imaging Mode Switching When Frozen

Imaging mode switching in frozen mode follows the following principles:

- In splitting display B mode, select the Dual button or the Quad button to switch among the windows; select the B Mode button or the Single button to exit splitting display mode and enter the image of the currently activated window in full screen.
- In frozen mode, the system supports imaging mode switching between the sub-modes (only for the activated window). For example, if the frozen image is of B+C+PW mode, then the system supports imaging mode switching between B+C+PW, B+C, B+PW and B by selecting the Color Mode button or the PW Mode button.
- The imaging mode and parameters of an unfrozen image is the same as the corresponding one that before frozen; but the display format is the same as the one before unfrozen.

2.12.10 Soft Menu Display in Comments

Comments can be added to an ultrasound image to bring attention, notate or communicate information observed during the examination. You can add comments to: zoomed images, cine review images, real-time images, frozen images. You can type comments as characters, insert pre-defined comments from the comments library or insert arrow markers.

The system can be configured with comment text libraries. Press <Comment> to enter comments status, you can enter the comment text using the screen menu.

Set the comment home location

Move the cursor to the desired comment location and press <Set Home> on the keyboard area on the control panel.

Return the cursor to the set home location

Press <Home> on the keyboard area on the control panel to return the cursor to the set home location.

Navigate through the comment libraries

To select the comment library, click [Library] on the soft menu to select the library.

NOTE:

Available libraries are linked to the exam modes configured for the current probe.

Add/modify comment positions

Click [RT/LT] or [Sag/XS] to directly mark the position. Move the cursor onto the comment item to be modified, click [RT/LT] or [Sag/XS] to change the already-added comment position.

Change Font Size/Arrow Size

To change the font size of next input comment text, use [Font Size] button on the soft menu to select from Small, Medium and Large.

To change the arrow size, use [Arrow Size] button on the soft menu to select from Small, Medium and Large.

Comment display/hide

Select [Hide]/[Display] on the soft menu to display or hide the comments.

Trace

Select [Trace] on the soft menu to enter trace commenting status.

2.12.11 Soft Menu Display in Body Mark

The Body Mark (Pictogram) feature is used to indicate the patient's position during the exam as well as the transducer position and orientation.

The system supports body marks for Abdomen, Cardiology, GYN, OB, Urology, Small Parts and Vascular applications. In addition, the system supports importing user-defined body marks.

The body mark soft menu displays the settings for the current mode.

Library

Use [Library] on the soft menu to switch the body mark library. Corresponding body marks are shown on the left (available libraries are linked to the exam modes configured for the current probe).

User-defined body mark

Select [Custom] to enter the dialog. You can import body mark graphs here.

You can import a user-defined body mark in BMP/PNG format of 140*140 (unit: pixel) in size.

Save Probe

If the probe mark direction and position is determined for the current body mark being added, select [Save Probe] to save the current probe mark direction and position for the body mark.

2.13 Cine Review

The system allows you to review and edit the images prior to the image frozen. This function is called as cine review. The magnified images can also be reviewed, and the operating method is the same. You can perform zoom, measurements, add comments and body marks on the images being reviewed.

The system supports manual review as well as automatic review. The default setup is Manual Cine, but you can switch between Auto Cine and Manual Cine.

In addition, the system supports the images reviewed along with physiological unit waveforms, if the detection of physiological unit waveforms is performed.

CAUTION

- The cine memory must be cleared at the end of the current patient and the onset of the next new patient by selecting the End Exam button.
 - Cine files stored in the system's hard drive shall contain patient information, to avoid the selection of an incorrect image file and potential misdiagnosis.
-

2.13.1 Entering/Exiting Cine Review

To Enter Cine Review

- The system enters the manual cine review status once select the Freeze button to freeze the image.
- Open cine files in thumbnail, iStation or Review. The system enters automatic cine review status.

To Exit Cine Review

Select the Freeze button or the B Mode button, the system will return to image scanning and exit cine review.

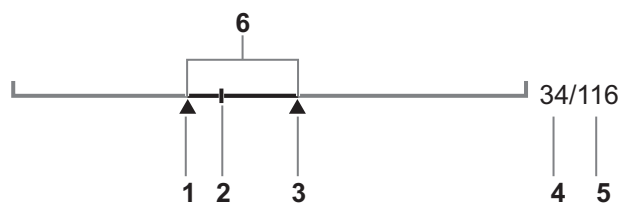
2.13.2 2D Cine Review

Manual Cine Review

Enter the cine mode in 2D imaging mode. Use the trackball to view the cine.

If you move the playback mark to the left by using the trackball, the review sequence is reversed to the image-storing sequence, thus the images are displayed in descending order. Whereas, if you move the playback mark to the right by using the trackball, the review sequence is the same as the image-storing sequence, thus the images are displayed in ascending order. When you review images until the first or the last frame, further using the trackball will display the last or first frame.

The cine progress bar at the bottom of the screen (as shown in the figure below):



1	Start mark
2	Playback mark
3	End mark
4	Current frame
5	Total frames
6	Auto Review Region

Reviewing all of Auto Review

Perform the following procedure:

1. In the manual cine review status, use the [Auto Play] to set the review speed to activate auto cine review.
2. Exit:

Select [Auto Play] on the parameter menu, or use the trackball, the auto review state becomes manual cine review.

Setting scope of Auto Review

You can set a segment of cine loop which can be reviewed automatically. After the auto review scope is set, the auto cine review can only be performed within this scope; but the manual cine

review can be performed beyond this scope. When the cine file is saved, only the images within this scope are saved.

TIP:

You can perform cine review on each image window in the dual/quad splitting mode, and set auto review region for each window.

Perform the following procedure:

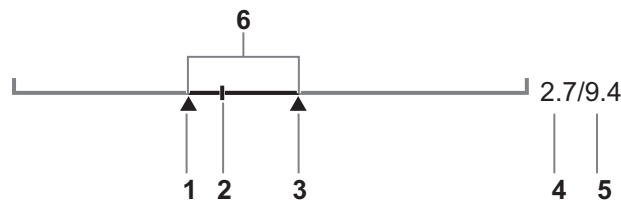
1. Set the start frame:
Manually review the cine file by trackball, and use [Set Begin] to set current frame to be the start point.
2. Set the end frame:
Manually review the cine file by trackball, and use [Set End] to set current frame to be end.
3. Use [Auto Play] to set the review speed.
The system plays the auto review region automatically.
4. Use [Jump to First]/ [Jump to Last] to review the first or last image.

2.13.3 Cine Review in M/PW/CW/TVD Mode

Enter cine review in M mode, PW mode, CW mode TVD mode, and then use the trackball the cine images are displayed on the screen one by one.

Move the playback mark to the left by using the trackball. The review progress slider moves to the left, the images moves to the right, and the earlier stored images are invoked. Whereas move the playback mark to the right by using the trackball, the review progress slider moves to the right, and the images move to the left, the recently stored images are invoked. When the image goes to the first/last frame, the cine is played in loop with the trackball moving left or right.

The cine progress bar at the bottom of the screen (as shown in the figure below):



1	Start mark
2	Playback mark
3	End mark
4	Time played
5	Total time
6	Auto Review Region

Cine review operations are the same as these of 2D mode.

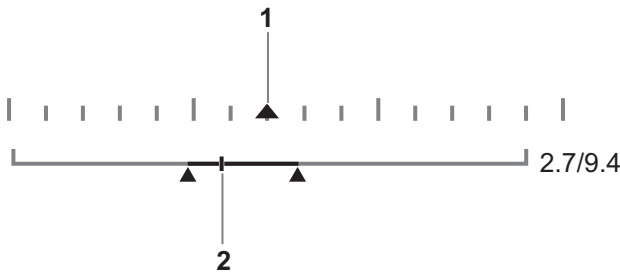
TIP:

There is no audio when the spectrum is reviewed in manual status but audio synchronization can be realized in auto review status with speed of $\times 1$.

2.13.4 Linked Cine Review

The linked cine review refers to review of the images captured at the same moment.

- B/Color/Power/TVI/TEI dual live
- B/B dual live
- B+M synchronization mode
- Duplex mode
- Triplex mode



1	Frame synchronization mark
2	Playback progress bar

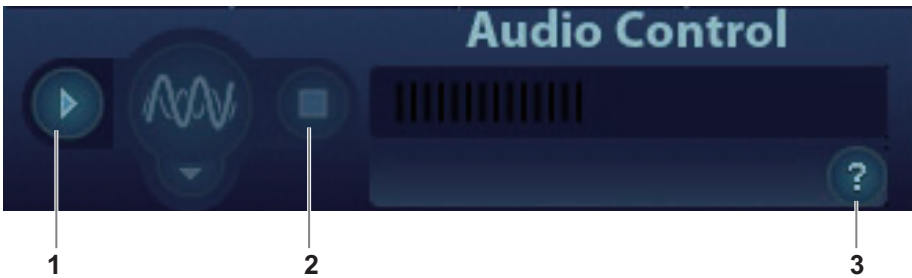
The frame synchronization mark on the time mark of M/PW image indicates the corresponding 2D image and M/PW image. In statuses other than dual live status, you can only review images in the currently active window.

2.13.5 Voice Recognition

TIP:

Currently, only wireless microphone devices can be inserted to the system for inputting vocal commands.

Figure 2-6 Audio Control Panel



No.	Name	Description
1.	Start button	Click to speak to the microphone (the system recognizes the vocal order). The system conducts the operations after recognizing the voice.
2.	Stop button	Click to stop the voice Recognition.

No.	Name	Description
3.	Setup button	Click to check the system recognizable commands and enter the iVocal Setup menu.

Inputting vocal command






Perform the following procedure:

1. Click the Start button in the Audio Control panel to start the vocal command recognition.
2. Input a vocal command using the microphone, and after the command is recognized, the system automatically performs the corresponding operation.
3. Click the Stop button in the Audio Control panel to pause the vocal command recognition.

Setup

Click the Setup button in the Audio Command panel to check the system recognizable commands and enter the iVocal Setup menu.




- Add: click [Add] to enter the Adding New Command menu, click [Function Description] to select the desired function, enter the user-defined command in the [Command] text box, and then select OK.
- Test: click [Test] and input a vocal command to the microphone device. After the vocal command is recognized, the Success Rate is displayed in fraction. Click [Test] again to close the vocal command test.
- Clear: Click [Clear] to clear all the Success Rate test records.
- Recover: Click [Recover] to enter the Confirm menu. You can select Yes to restore to the default settings.

Icon	Function
	Audition the vocal command
	Delete the vocal command
	Rename the vocal command
	Add the failure time by 1
	Clear the Success Rate test record of the selected vocal command




2.14 Warning Labels

This system uses the symbols and warning labels listed in the following table to describe the important information and potential hazards.

The warning labels use the same signal words as those used in the operator's manual. Read operator's manual carefully before using the system.




















Symbol	Description
 <p>The following labels are available when the system works with the mobile trolley.</p> 	<p>Read this information carefully before using the system.</p> <ol style="list-style-type: none"> 1. Do not place the system with the mobile trolley on a sloped surface. Otherwise the system may slide, resulting in personal injury or the system malfunction. Two persons are required to move the system over a sloped surface. 2. DO NOT sit on the trolley. 3. When the casters are locked, DO NOT push the trolley.
	Non-ionizing radiation














The general meaning assigned to geometric shapes, safety colors and contrast colors for safety signs are as follows:

Geometric shape	Meaning	Safety color	Contrast color	Graphical symbol color
	Prohibition	Red	White	Black
	Mandatory action	Blue	White	White
	Warning	Yellow	Black	Black

2.15 Symbols

The name, pattern and meaning of each symbol and warning label are described as follows:

Symbol	Description
	Type-BF applied part The ultrasound probes connected to this system are type-BF applied parts. The ECG leads within this system is type-BF applied part.
	Caution!
	Standby
	No user serviceable parts (applied to the power adapter)
	Indoor, dry location use only (applied to the power adapter)
	Transducer sockets
	Pencil probe port
	AC (Alternating current)
	Protective earth (ground)
	Foot switch
	USB port
VGA 	Used for VGA output
	Used for separate video output
ECG 	Used for ECG function
	Used for audio output
HDMI 	High definition multimedia interface
	Unlock position
	Lock position
	Network port

Symbol	Description
	Standby indicator
	Harddisk indicator
	Battery indicator
	Equipotentiality
	Product serial number
	Manufacture date
	Manufacturer
	Temperature limit
	Humidity limitation
	Atmospheric pressure limitation
Rx Only	Federal law restricts this device to sale by or on the order of a licensed healthcare practitioner (USA).
	General warning sign
	MR Unsafe – the system is not intended to be used within magnetic resonance (MR) environment.
ETL CLASSIFIED  Intertek 3179617	CONFORMS TO AAMI STD ES60601-1, IEC STD 60601-2-37, IEC STD 60601-1-6; CERTIFIED TO CSA STD C22.2 NO. 60601-1, 60601-2-37, 60601-1-6

3 System Preparation

3.1 Move/Position the System

Read and understand the safety precautions before positioning the system to ensure the safety of both the operator and the devices.

1. Switch off the power, and pull out the power plug.
2. Disconnect all cables from off-board peripheral devices.
3. Place the system in a desired location.

Leave at least 20 cm at the back and both sides of the system.

CAUTION

Maintain a generous, free air flowing space around the back and both sides of the system. Not doing so may result in failure due to the increased rise in the system's operating temperature.

3.2 Connecting the Power Cord

This system can work normally only when it is connected to the external power supply or the battery capacity is sufficient.

3.2.1 Connecting Power

1. Connect the connector of the power adapter to the adapter port in the system.
2. Use a three-wire cable to connect the adapter with the external power supply.

If you have any question about the power adapter, please contact your sales representative.

NOTE:

- You must use the specified power adapter.
 - Do not use this power adapter in the conditions other than those specified.
-

3.2.2 Powered by Batteries

When connected to the external power supply, the system is powered by the external power. The batteries inside it are in the charging status, the indicator turns off when the capacity is full.

When disconnected from the external power supply, the system is powered by the batteries.

WARNING

- The battery is inside the machine. Only Mindray technical professionals or engineers authorized by Mindray following training can perform battery installation and uninstallation.

- If you need to change the battery or buy a new one, contact your sales representative.
 - The replacement of batteries by inadequately trained personnel could result in a HAZARD (such as excessive temperatures, fire or explosion).
 - The lithium-ion battery has a service life of five years. Replace your battery when it reaches the end of its service life.
-

Battery Performance

Under power off or standby status, charging time of the battery from capacity 0 to 100% takes less than 4 hours.

NOTE:

Power off the system if it will not be used for a long period of time (including storage/transportation condition). Do not leave the system in standby status, otherwise the batteries will be discharged and permanently damaged.

Battery specification

- Voltage: 14.8 V
- Capacity: 5800 mAh (single battery)

Battery Status Indicator

The battery status indicator is located in the system status area of the screen, indicating the battery capacity.

- : Indicates the battery capacity is nearly empty.
- : Indicates the battery capacity is full.

3.3 Power ON/OFF

CAUTION

To ensure safe and effective system operation, you must perform daily maintenance and checks. If the system begins to function improperly, immediately stop scanning. If the system continues to function improperly, fully shut down the system and contact the Mindray Customer Service Department or a sales representative. If you use the system in a persistent improperly functioning state, you may harm the patient or damage the equipment.

3.3.1 Check before Powering ON

Check before the system is powered on:

- The temperature, relative humidity and atmospheric pressure meet the requirements of the operating conditions, for details see environmental conditions in System Overview chapter.
- There is no condensation.
- There is no distortion, damage or dirt on the system and peripheral devices.
If any dirt is found, cleaning shall be performed, see System Maintenance chapter.
- There are no loose screws on the monitor, control panel or the trolley.

- There is no cable damage (e.g., power cord). Maintain secure connections to the system at all times.
- The probes and probe cables are free from damage or stains.
For details of probe cleaning and disinfection, see “13 Probes and Biopsy”.
- No miscellaneous odds and ends are attached or affixed to the control panel.
- Ensure that all connections are free from damage and remain clear of foreign object blockages.
There are no obstacles around the system and its air vent.
- Probe cleaning and disinfection.
- The entire scanning environment and field must be clean.
- The locking mechanism of the casters (if there is a trolley) works normally.

3.3.2 Power the System ON

Press the power button to power the system on.


If access control has been set by the system administrator, you can access data in the system only after logging onto the system.

You must log in again after system restart or dormancy.

To login onto the system


Perform the following procedure:

1. Select the login type, and user name in the drop-down list.
2. Enter the password and click [Login].

When the user has logged onto the system,  is visible in the bottom-right corner of the screen.

To change users


Perform the following procedure:

1. To log out the current user and change to another user, click  in the system status area of the screen to bring up the Session Manage dialog box
2. Select [Change User] to bring up the Login dialog box.
3. Select the login type, and user name in the drop-down list.
4. Enter the password and click [Login].

To modify password


General operators and administrators can modify the password.

Perform the following procedure:

1. Click  in the system status area of the screen to bring up the Session Manage dialog box where you can see the current user's information.
2. If you want to modify the current password, click [Change Password] to bring up the Change Password dialog box.
3. Enter both the previous and new passwords, and confirm the new password in the dialog box.
4. Click [OK] to exit.

To lock the system

Perform the following procedure:

1. Click the  in the system status area of the screen to bring up the dialog box.
2. Select [Lock Machine] and the system is locked.

You must log on before using the system.

3.3.3 Check the system after it is powered on

Check after the system is powered on:

- There are no unusual sounds or smells indicating possible overheating.
- There are no persistently displayed system error messages.
- There is no evident excessive noise, or discontinuous, absent or black items in the B mode image.
- Check whether there is abnormal heat on the surface of the probe during an ultrasound procedure. If you use a probe which is giving off excessive heat, it may burn the patient.
- The control panel keys and knobs are fully functional.
- The date and time are displayed correctly.

WARNING

- If you use a probe giving off excessive heat, it may burn the patient.
 - If you find anything not functioning properly, this may indicate that the system is defective. In this case, shut down the system immediately and contact Mindray Customer Service Department or sales representative.
-

NOTE:

When you start the system or switch between transducers, you will hear clicking sounds – this is expected behavior.

3.3.4 Power the System Off

You must follow the correct procedures to power the system off. Also, after you upgrade the software or when the system is down, you need to power off and restart it.

If you will not use the system for a long period of time, you shall:

1. Disconnect the power adapter.
2. Disconnect the mains power.
3. Turn off powers of all peripherals connected to the system.

To power the system off normally

Perform the following procedure:

1. Press the power button to see the option:
 - Shutdown: to power the system off normally.
 - Standby: to enter standby status.
 - Cancel: to cancel the operation.
2. Select [Shutdown] to power the system off.

To shut down the system directly if it cannot be done normally

Press and hold the power button for a long time and the system will power off without displaying the “Shutdown Confirm” screen. However, shutting down the system this way may destroy the data.

NOTE:

- DO NOT rush direct shutdown of the system. It may damage the data.
 - After the system is upgraded, use [Shutdown] to power the system off to make the upgraded data effective.
-

3.3.5 Standby

NOTE:

- Power off the system if you will not use the system for a long period of time (including storage/ transportation condition), and you should not allow the system in standby status, otherwise the batteries will be out of power and permanently damaged.
 - If the system will not be used for a long period of time, you should disconnect the power adapter, disconnect the mains power, and turn off the power to all peripherals connected to the system.
-

To enter standby

- Fully fold the LCD display and wait for 30 seconds, then the system enters the standby status.
- Set the time for screen saver and standby, see Setup chapter. If the system is not carrying out an operation, the screensaver appears after the screensaver delay period. If there is still no operation, the system enters standby after the standby delay period.
- Press the power button and select “Standby”.

To exit standby

- Unfold the LCD display.
- Press the power button.

3.4 Monitor Brightness/Contrast Adjustment

Monitoring the brightness and contrast adjustment is one of the most important factors for proper image qualities. If set incorrectly, the gain, TGC, dynamic range or even acoustic output have to be changed more often than necessary to compensate.

NOTE:

On the monitor, the brightness adjustment comes before contrast. After readjusting the monitor's contrast and brightness, adjust all preset and peripheral settings.

3.5 Connecting/Disconnecting a Probe

 CAUTION

- Freeze an image or turn off the power of the system before connecting/ disconnecting the probe. Otherwise, system or probe failure may occur.
- When connecting or disconnecting a probe, place it in the proper position to prevent the probe from falling off or becoming damaged.

- Hang the probe cable to the hanger located under the control panel to avoid excessively bending and damaging the cable.
 - Only use probes provided by Mindray. Aftermarket probes may result in damage or cause a fire.
-

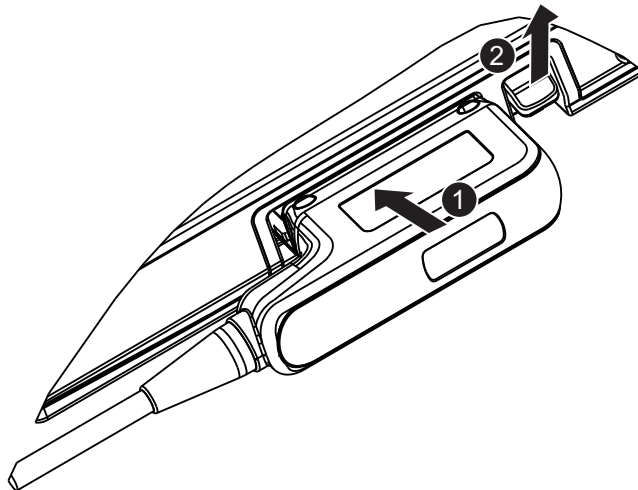
3.5.1 Connecting a Probe

⚠ WARNING

The probes, cables and connectors should be in proper operating order and free from surface defects, cracks and peeling. Otherwise, this may lead to electrical shock.

NOTE:

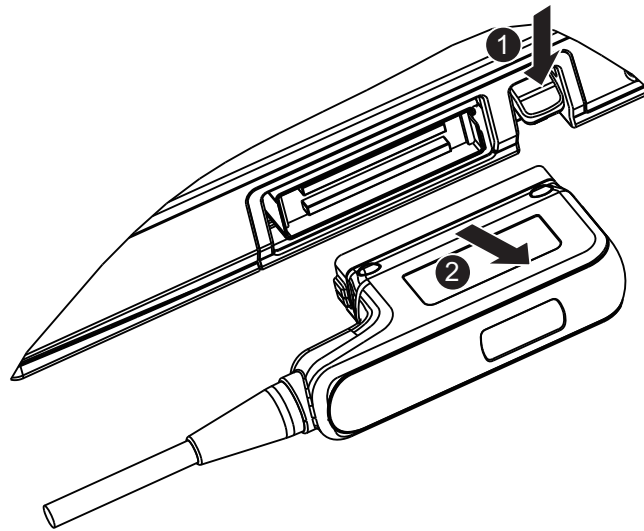
Before inserting the connector into the probe port, inspect the connector pin. If the pin is bent, do not use the probe until it has been inspected/repaired/replaced.



Perform the following procedure:

1. Keep the cable end of the transducer to the front side of the system, insert the connector into the system port, then press in fully.
2. Toggle the locking lever to the lock position.
3. Position the probe properly to avoid it being treaded on or becoming wrapped around other devices. DO NOT allow the probe head to hang free.

3.5.2 Disconnecting a probe



Perform the following procedure:

1. Toggle the locking lever to the unlock position.
2. Pull the transducer connector straight out vertically.

3.6 Connecting USB Devices

WARNING

DO NOT directly remove a USB memory device, as the USB device and/or the system may become damaged.

- When connecting a USB memory device to the ultrasound system via a USB port, a sound is heard if it is connected successfully and the USB symbol appears in the system status area of the screen.
- To remove the USB device: select the USB symbol to open the [Remove USB Device] screen. Select the device to be removed and select [OK]. A sound is heard when removing the USB memory device.
- The system supports option of external DVD R/W drive. The DVD R/W drive is connected to the ultrasound system via USB port.

NOTE:

- When connecting an external DVD R/W drive, connect the two cables of the drive to the ultrasound system if the drive provides 2 USB power cables. In this way, the DVD R/W drive can work more normally.
- If the USB disk cannot be recognized by the system, please try disconnecting and then connecting again several times, or try another USB disk. If the problem still exists, please contact Mindray service engineer.

3.7 Connecting the Footswitch

The system supports USB port-type foot switches.

The function of the foot switch can be preset. For details, see Setup chapter.

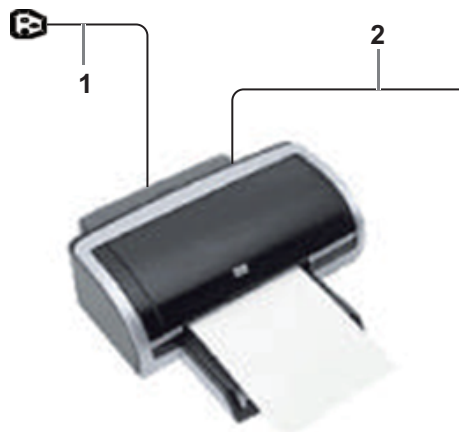
3.8 Installing a Printer

TIP:

- Printers listed in System Overview chapter have drivers installed already.
- If the printer driver is required, please contact Mindray Customer Service Department or sales representative.
- Please refer to the accompanying manuals of the printers for more details.

3.8.1 Connecting a Graph/Text Printer

As shown in the figure below, a graph/text printer has a power cord and data cable. The power cord shall be directly connected to a wall receptacle as required.



1	Power supply cable	Connect to power supply.
2	Data cable	Connect to the USB port of this system.

Perform the following procedure:

1. Connect the data cable to USB port of the ultrasound device.
2. Power on the system and the printer.
3. Preset the default report printer and its attribute:
 - a. Select <Setup> button to enter setup screen, than select print preset.
 - b. Select the “Report Print” column in the Service Type list.
 - c. In the “Property” frame, select printer from the driver list next to “Printer” and set the items.
 - d. Click [Save] after you have finished setting.

3.8.2 Connecting a Video Printer

The digital video printers that system supports consist of the B/W printers and color printers.

Perform the following procedure:

1. Place the printer appropriately.
2. Connect the power cord of the printer to a receptacle. Connect the USB port of the system to the USB port of the printer with USB cable.
3. Load a paper roll and turn on the system and printer.
4. Add a print service:
 - a. Select <Setup> button to enter setup screen, than select print preset.
 - b. Click [Add Service] to enter the Print Service page.
 - c. Select the service type and enter the service name manually.
 - d. Click [OK] to return to the page.
 - e. Select the target printer from the drop-down list in the “Property” box and set other printing properties.
 - f. Click [OK] to complete.

3.9 Wired Network Connection

Connect the USB plug of the USB to LAN Adapter to the USB port on the machine, and insert the network cable into the LAN port of the adapter to get a wired network connection.

WARNING

The LAN port of the adapter CAN ONLY be used to connect to wired network. Device interconnection using the adapter through LAN port is forbidden; otherwise, electric shock may result. If you intend to connect an external device, please make sure it meets the requirement of IEC60601-1:2005 chapter 16.

In case of interfering the network communication, only one USB2LAN device should be connected to the system each time.

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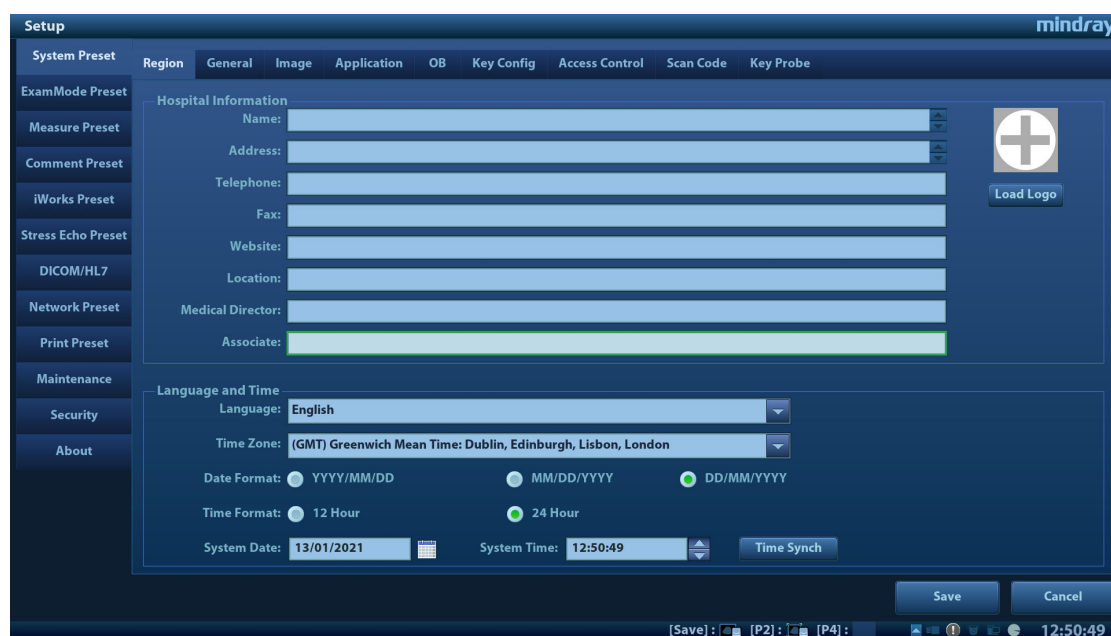
4 Setup

The Setup function is designed to set the configuration parameters of operating the system and maintaining user workflow setup data. The setup data of the user and system are stored to the hard drive, and should be backed up to CD/DVD or USB memory device.

CAUTION

When the preset data is changed, be sure to save the preset data according to the methods described in this chapter. Mindray is not responsible for the loss of preset data.

- To enter Setup:
Press <Setup> button.



- To exit Setup:
 - Select [Save] in the Setup menu. The parameter settings are saved.
 - Select [Cancel] in the Setup menu or press <ESC> button to close the Setup menu to close the Setup menu.

When you change the system language and click [Save] in the Setup menu, the system automatically shuts down to make the modification effective.

- Basic operations

The commonly-used setting types are:

- Text box: position the cursor over the corresponding field box. Enter the desired value using the soft keyboard on the soft menu.
- Radio button: click the button to select an item.

- Check box: click the checkbox to select one or more options.
- Drop-down list: click the arrow beside the list to select an item.

4.1 System Preset

4.1.1 Region

Set the hospital name, language, time zone, time format and system date/time.

Item	Description
Hospital Information	To set the hospital-relevant information such as name, address, telephone, and so on.
Language	To select a language (input) for the system.
Load Logo	Import image for logo loading. NOTE: For a better display effect, please try to use an BMP image with 400*400 pixels and 8/24/32 bitdepth.
Time Zone	To select the time zone.
Time Format	To select the time format.
Date Format	To set the date format.
System Date	To set the date for the system.
System Time	Move the cursor over the corresponding field and enter the time manually using the keyboard, or, move the cursor over the time segment and press <Set>, then increase or decrease the required value by clicking the icons on the right side.
Time Synch	To assign a time server and make the time of the ultrasound machine consistent with the server.

4.1.2 General

Set patient information, exam setup, patient management, storage, system dormancy, auxiliary output setting and so on.

Type	Item	Description
Patient Info	Info displays in an image banner	To select whether to display the available patient information items on the screen.
	H&W Unit	To set the unit for calculating patient height and weight.
	Surface Formula	To set the surface formula.
Exam Setup	Status after exam ends	To set the system status when an exam ends.
	Sending/printing after End Exam	Select whether to automatically archive the exam data to the DICOM server for storage/print.
	Disable Recycle	Select whether to disable recycle bin. The deleted patient data, exam data and images will not be stored in the recycle bin.

Type	Item	Description
Storage	Image size	To set the size for a stored image or text/digital printer printing.
	Digital Output	To set the size for digital signal (VGA and HDMI) output.
	Analog Output Mode	To select the format for analog signal (S-Video) output: NTSC or PAL.
	Clip Length	To set the cine length and heart cycle.
	Prospective Cine Length	To set the cine length for prospective live capture.
AVI Encode	Export file format Setting	To set cine format in the [Send To] dialogue box. MP4 file is acquired if Mac OS is selected. You can also select encode quality.
Display	Brightness auto adjustment	To set whether to use auto brightness auto control.
	Contrast	Click [-] or [+] to decrease/increase the contrast value.
Screen Saver	Screen Saver	To select a system dormancy type. After the screen saver function is enabled, click [Browse] to select the figure used for the screen saver and click [Preview] to see the effect. To set the delay before the system enters dormancy/standby status in the drop-down list beside "Wait."
iVocal	Enable Voice Response	After it is ticked, the system will repeat recorded voice commands automatically.
	Automatically shut down waiting time	To set the delay before voice recording stops automatically.

4.1.3 Image Preset

Controls are as follows:

Type	Item	Description
Reset Config.	Probe	To set the default probe model for the system.
Freeze Config.	Status after Freeze	To set the system status after the image is frozen.

Type	Item	Description
Image	Steer	To set the steer mode in B + Color + PW imaging mode. <ul style="list-style-type: none"> C&PW: select to adjust the sample volume in color mode and sample line in PW mode together. C/PW: select to adjust the sample volume in color mode and sample line in PW mode separately.
	Auto Invert	The spectrum can automatically invert when the color flow is steered to a certain angle, thus accommodating the operator's wish to distinguish the flow direction.
	iScape Ruler Display	To set whether to display the iScape ruler in iScape imaging mode.
	B+Color Refresh with PW/CW Sampling Line Movement	To set whether to turn on the function that when moving PW/CW sampling line, B image is activated under B+Color+PW/CW mode.
	Color And PW/CW Synchronize Invert	To set whether to invert Color Map and PW/CW spectrum synchronously.
	B+Color+PW Unfreeze keeping PW	To set whether to retain PW images when unfrozen under B+Color+PW mode.
Tissue Tracking QA	Segment model	Select the segment model: 16 segments or 17 segments.

4.1.4 Application

Set the measurement ruler, measurement setting, follicle method, left ventricular setting, comment setting and so on.

Measure Ruler

Controls are as follows:

Item	Description
Cursor Type	Type of cursor displayed on the measurement caliper and results window. Value options: <ul style="list-style-type: none"> Number: the cursor always displays as “+” while different measurements are marked with numbers. Symbol: the cursor displays sequentially in 8 symbols to identify different measurements.
Cursor Size	The size of the cursor.
Heart Beat	The number of cardiac cycles in the heart rate calculation. (In heart rate measurement, the number of cardiac cycles should match the preset number.)
Cursor Line Display	If unselected, the connecting line between the measuring ends will be hidden after measurement.
Ellipse Cross Line Display	If unselected, the measuring axis within the ellipse area will be hidden after measurement.
Clear results while deleting caliper	If unselected, when the caliper is deleted due to image change, the result in the result window will not be deleted until the result window is cleared manually.

LV Cube/Teichholz/Gibson

Set the tools used in the Cube/Teichholz/Gibson study.

Follicle

Set the method for calculating the follicle.

PW Measurement

PW measure velocity displays absolute value.

All measurement results in PW mode are absolute values based on the unit of velocity after checking this item.

Comment

Set whether to clear comments and bodymark:

Item	Description
Clear comments while unfreezing image or changing probe/exam	To set whether to clear comments while unfreezing image or changing probe/exam.
Clear Bodymark upon unfreeze	To set whether to clear bodymark whiling unfreezing image.

Cardiac Value Range Display

Set whether to display the EMINCA/ASE study.

4.1.5 Obstetric Preset

Set the relevant information regarding the fetal gestational age, fetal growth formula and fetal weight.

To set the default formula

Perform the following procedure:

1. On the [Fetal Gestational Age], [Fetal Growth] or [Fetal Weight] page, select an OB Item in the left column.
2. Select a formula in the right column.
3. Click [Default].

The default formula is marked with a √.

To set the fetal weight display

Perform the following procedure:

1. Enter the [Fetal Calc] page.
2. Select the [Fetal Weight Unit].
Select Metric, English or English & Metric from the drop-down list.
3. Select the formula for calculating the weight percentile.
Select the formula from the drop-down list of [EFW-GP].

To import/export an OB Table or Formula

TIP:

Only imported user-defined tables can be exported.

Perform the following procedure:

1. Select [Import] or [Export] on the Fetal Gestational Age or Fetal Growth page.
2. Select the drive and file path where the data is located.
3. Select the data file to load or export, click [OK] to confirm.

The imported user-defined table for FG and GA must be a *.csv file. The format of the *.csv file is described as follows:

– FG table

Table Type	Author Name	SD Type	Meas Value Unit	SD Unit
FG	The author name	Value of standard deviation	Unit of the measurement value	Unit of the standard deviation
Row Num	Row number (N) of the table			
No.	GA	Min	Meas Value	Max
1	GA value	Minimum value	Measurement value	Maximum value
2	...	...	...	...
...
N	...	...	...	...

NOTE:

- Fill in the table according to the actual clinical values, except for those cells with bold text.
- Value of standard deviation. Select from one of the following: None, $\pm 1SD$, $\pm 2SD$, 3%~97%, 5%~95%, 10%~90%.
- Unit of the measurement value: according to the table to import, select from mm, cm, g, kg, cm² or mm².
- Row number (N) of the table: the maximum row number N in the column “No.”
- The third row is empty.
- GA value, Minimum value, Measurement value, Maximum value: enter the number of days without the unit.

– GA table

Table Type	Author Name	SD Type	Meas Value Unit	
GA	The author name	Value of standard deviation	Unit of the standard deviation	

Row Num	Row number (N) of the table			
No.	Meas Value	SD(-)	GA	SD(+)
1	Measurement value	Standard deviation (-)	GA value	Standard deviation (+)
2	...	...	...	...
...
N	...	...	...	...

NOTE:

- Fill in the table according to the actual clinical values, except for those cells with bold text.
- Value of standard deviation. Select from one of the following: None, $\pm 1SD$, $\pm 2SD$, 3%~97%, 5%~95%, 10%~90%.
- Unit of the measurement value: according to the table to import, select from mm, cm, g, kg, cm^2 or mm^2 .
- Row number (N) of the table: the maximum row number N in the column “No.”
- The third row is empty.
- Measurement value, Standard deviation (-), GA value, Standard deviation (+): enter the number of days without the unit.

User-defined OB Items**NOTE:**

The calculation results of the user-defined OB formulae are used for reference rather than clinical diagnosis.

You can add user-defined formulae for items (obstetric tools) that are not included in the GA and FG table.

1. Select [More OB Items] on the Fetal Gestational Age or Fetal Growth page.
2. Select an item and click [OK].

The new item appears in the left column and the system asks if to add a formula.

3. Click [OK] to select the *.csv file (formula file) for the item. Or add a formula for the new item by clicking [Import].

Measure Result

EDD display: the EDD is displayed in the result window after checking.

Display EFW GA in report

Estimate GA according to EFW data after checking.

4.1.6 Key Configuration

Assign functions to the foot switch and user-defined keys.

Key function setting

You can set the functions for <Save> and user-defined keys.

To assign a function to a key:

1. Click to select the desired key in the Key Function column on the left side of the page.
2. Click to select a function in the Function area. You can see the available functions selected on the right side.
3. Click [Save] to complete the function setting.

Footswitch Function Setting

You can assign a function to the left/middle/right key of the foot switch. The method is similar to setting key functions. See the steps above.

Trackball Speed

Set the speed of the trackball when using the trackball.

Control Panel Brightness

To set overall brightness of control panel elements (including trackball and key backlights).

Key Volume

Set the key volume level.

Auxiliary Output Function

For the following three functions, the system provides auxiliary output function setting: “Save Image”, “Save Cine (Retrospective)” and “Save Cine (Prospective)”. When the corresponding user-defined key is pressed, the system can perform multiple operations one by one as per the preset.

- Save the single-frame image:
 - Send image to DICOM storage
 - Send image to DICOM print
 - Send image to USB disk
 - Send image to iStorage
 - Send image to local printer
- Retrospective/prospective saving cine:
 - Send cine to DICOM storage
 - Send cine to USB disk
 - Send cine to iStorage

Setting method (taking “Save Image” as an example, add the auxiliary functions “Send Image to DICOM Storage” and “Send Image to USB disk”):

1. Select a key in the Key Function field on the left side and select “Save Image” in the Output page of Function field on the right side.
2. Click [Add] in the middle part of the screen, then there will be “Function 2: NULL” under the key function in the Key Function Field on the left side, and at the same time, “Output” column on the right side will show the available auxiliary functions for current key. Select “Send Image to DICOM Storage” in the “Output” column on the right side. Then the Function 2 on the left side turns into “Send Image to DICOM Storage”.
3. Click [Add] again, then there will be “Function 3: NULL” under the key function in the Key Function Field on the left side. Select “Send Image to USB disk” in the “Output” column on the right side. Then the Function 3 on the left side turns into “Send Image to USB disk”.
4. Click [Save] to confirm.

5. Scan and freeze the image
6. Press the user-defined key, then the system will perform three steps:
 - a. Save the image to the local hard disk.
 - b. Send image to DICOM Storage server.
 - c. Send the image to USB disk.

TIP:

Repeat step 3 will continue adding auxiliary functions; you can add 6 functions at most.

4.1.7 Output Preset

SendTo Frame Rate

To set if the frame rate can be compressed.

4.1.8 Access Control

The system supports two types of users: administrator and operator.

- Administrator
The system administrator can access all function modules, and view all patient data, such as patient information, images and reports, etc. Only one administrator is configured by default. The administrator can add or delete operators.
- Operator
The operator can only access the function modules with assigned privileges. The operator can only view exam information saved in the system and operated by him or herself, such as patient information, images and reports, etc.

Enabling Access Control

The system administrator can preset the access controls, that is, whether an operator has the right to access data in the system.

Access control only can be set by the system administrator.

Open the “Access Control” page:

- If “Enable User Account Control” is selected, you must be authorized before accessing the data, and you can configure password policy and LDAP, and change password. If unselected, you can access all the data without authorization, and you cannot configure password policy and LDAP, and change password.
- If “Enable Emergency User” is selected, the administrator can edit privileges for emergency users. If unselected, the administrator cannot edit privileges for emergency users.

Adding a User/Assigning privilege

Turn on the access control function and log in to the system as Administrator before you add the user.

1. Click [Add] to bring up the dialog box.
2. Enter the user name and password, confirm password.
3. Select or deselect the check box from the privilege list.

Users can only access the function module with assigned privilege.

4. Click [OK] to confirm the setting and exit the dialog box.

The new user and the privilege will appear in the User List.

Deleting a User

Turn on the access control function and log in to the system as Administrator before you delete the user.

Select the user to be deleted in the User List. Click [Delete] to delete the selected user.

Editing Privilege

Turn on the access control function and log in to the system as Administrator before you edit privileges.

1. Select a user, click [Edit Privilege] to enter the “Edit user privilege” dialog box.
2. Select or deselect the check box from the privilege list.
3. Click [OK] to confirm the editing and exit the dialog box.

The edited privileges will appear in the User List.

Modify Passwords

The system administrator can modify all user passwords. The administrator password is empty by factory default. You can set this password.

An operator can only modify his/her own password.

1. Select the user name to be modified in User List.
2. Click [Change Password] to open the dialog box.
3. Enter current password, new password and confirm new password, then click [OK].

Configure Password Policy

Turn on the access control function and log in to the system as Administrator before you configure the password policy.

Click [Password Policy Config]:

Item	Description	Remark
Lockout Threshold	Set the maximum time that a user can input the wrong password. If you exceed the maximum times, your account will be locked.	For example, assume that the “Lockout Threshold” is set to 5, the “Reset Account Lockout Threshold after” is set to 60, and the “Lockout Duration” is set to 60. That is, a user inputs the wrong password for 5 times within 60 minutes, the account is locked, and the user can log in to the system only after 60 minutes. Other users with unlocked accounts can still log in to the system normally.
Reset Account Lockout Threshold after	Set the duration allowed for a user to continuously input the wrong password.	
Lockout Duration	Set the duration after an account is locked.	
Reset all lockout	Reset all locked accounts.	/

Item	Description	Remark
Enable strong password	<p>Enable strong password to improve security.</p> <ul style="list-style-type: none"> If the strong password is enabled and you log in to the system with the account that is added before the strong password is enabled, the system prompts a warning message to inform you whether your password conforms to the password policy. The administrator can change password for administrator or operator. If the strong password is enabled and you add a new user account, the system prompt an error message to inform you that the password is too weak, please modify the password according to the error message. 	/

LDAP Privilege Management

Turn on the access control function and log in to the system as Administrator before you edit privileges for the LDAP (Lightweight Directory Access Protocol) users.

Click [LDAP Config]:

Item	Description
Service Address	Enter the server address in the field box after accessing the network
Test LDAP Server	To test whether the LDAP server is accessible. If the LDAP is accessible, the system prompts the following message "Server test succeeded."
Root DN	It is automatically displayed after the server is successfully tested.
Default Domain	The default domain is the DC name in the Root DN. For example, if DC=security1, then input "security1" in the field box of the "Default Domain"
Days to keep cached password	<p>Set days to keep the cached passwords in the local system.</p> <p>Users can log in to the server even without accessing the network within the setting days.</p> <ul style="list-style-type: none"> Empty: the passwords are kept in the local system permanently. 0: no passwords are kept in the local system. ≥1: for example, if it is set to 5, the passwords are kept in the local system for 5 days.
Member of filter/Privilege	<ul style="list-style-type: none"> Enter the member name, and select or deselect privileges from the drop-down list of "Privilege". Click [Add], and the new members and privileges will appear in the Member of filter list. Select a member to be deleted, and click [Delete]. Select a member to be modified, modify the member name, and select or deselect privileges from the drop-down list of "Privilege". Click [Modify], and the modified member name and privileges will appear in the Member of filter list.

Item	Description
Logon Test	<ol style="list-style-type: none"> 1. Enter the User name and password in the field boxes of the Authentication test area. 2. Click [Logon Test] to test whether the user is authenticated.
User field name	<p>Select [Use user field name] to customize the user field name. After that, the members and privileges cannot be edited.</p> <p>Enter the user field name in the field box of the “User field name” (the user field names are configured in the LDAP server. For details, please refer to the LDAP server manual).</p> <p>The user field name corresponding to privileges are as follows:</p> <ul style="list-style-type: none"> • iStation Access: 1 • Save Exam: 2 • Export Exam: 4 • Network Settings: 8 • Maintenance Menus: 16 • System Settings: 32 • Workflow Settings: 64 • Worklist Access: 128 <p>NOTE:</p> <p>The privilege items can be combined randomly. For example, if user A is assigned with all the above 8 privileges, the user field name for user A is $1+2+4+8+16+32+64+128=255$.</p>



Auto Lock Machine

To set the waiting time before the system enters locked status in the drop-down list beside “Wait”.
The system will be locked automatically if the system waiting time exceeds the duration already set.

Scene Preset Management

The system can manage preset data under different scene applications. When the feature is turned on, you can use different preset data for print, DICOM and iStorage services.

To enable the function:

1. Check the checkbox next to “Enable Preset Scene Mangement”.
2. Click [OK] to confirm.
3. Switch different scenarios:
 - a. In non-preset screen, press <Cursor> to show the cursor and move the cursor to the system status area of the screen. Click  icon to see the scene management list.
 - b. Position the cursor on the target scene and press <Set> to switch.
4. Configure scenes:
 - a. In non-preset screen, press <Cursor> to show the cursor and move the cursor to the system status area of the screen. Click  icon to see the scene management list.
 - b. Click [Configure] to enter scene configuration dialog box.
 - c. Add scenes: click [Add] and enter the scene name in the Add Scene dialog box and then click [OK].
 - d. Click to select the target scene name in the Scene Name list on the left side.
 - e. Click to select a desired preset service on the right to open the screen.

- f. Set necessary parameters and click [Save] to exit.
- g. Click [Exit] to exit configuration.

4.1.9 Scan Code Preset

Set the code parameters for barcode reader.

1-dimension barcode reader (1D)

Item	Description
Scan Item	<p>After scanning 1D bar code, the regular expression is matched in the priority order: "Patient ID > Other ID > First name > Last name > Middle name > Accession# > Operator > Diagnostician". If the regular expression is matched successfully, the data of 1D bar code will be displayed in this item in Patient page automatically.</p> <p>Example: The data of the bar code is 123 after scanning 1D bar code. The regular expression is matched in the priority order: "Patient ID > Other ID > First name > Last name > Middle name > Accession# > Operator > Diagnostician". If the regular expression of "Other ID" is matched successfully, "123" will be displayed in "Other ID" item in Patient page automatically.</p>
Regular Expression	Set the regular expression according to the bar code format.
Append Options	<p>The information of operator or diagnostician can be appended after selecting the check box.</p> <p>For example, after scanning a 1D barcode of an operator or diagnostician, the obtained data is A, and A will be displayed in "Operator" or "Diagnostician" item in Patient page automatically.</p> <p>After scanning a 1D barcode of an operator or diagnostician for a second time, the obtained data is B, and A will be appended by B in "Operator" or "Diagnostician" item in Patient page automatically.</p>
Default Item	<p>If the default item is set to "No", and both the 2D and 1D barcodes fail to be matched, the obtained data of the barcode is input as a string of characters. After selecting a default item from the drop down list of "Default Item", the obtained data of the scanned barcode will be displayed in the corresponding selected default item.</p> <p>For example, if the default item is set to "Patient ID", and both the 2D and 1D barcodes fail to be matched, the obtained data is displayed in the "Patient ID" item in Patient page automatically.</p>
Move Up/Down	Move up or Move down a selected item.
Add/Delete	Add or delete a selected item. (Only the default item can be added or deleted.)
Load default	Restore the parameter value to the default value.
Worklist Options	<ul style="list-style-type: none"> Select "Worklist server" from the drop-down list, and the system searches the Worklist server according to the scanned data. Select "No" from the drop-down list, and the system creates a new exam in the Patient page according to the scanned data.

Item	Description
Worklist Default	<ul style="list-style-type: none"> Select a default item for searching the Worklist server. For example, users select “Patient ID” from the drop down list of “Worklist Default”, and the system searches Patient ID in the Worklist server. Select “No”, and the system searches the Worklist server in the priority order: “Patient ID” > “Last name” > “Accession #”. <p>NOTE:</p> <p>The matching priority order is 2D item, 1D item, and Default Item, after the 1D/2D and default items are configured.</p>
Import/Export	Import and export configuration files to preset the barcode. For details, please contact the Mindray service engineer.

2-dimension barcode reader (2D)

- General Analysis Mode

Select “General” from “Analysis Mode” drop-down list: The scan codes consist of Patient ID, Other ID, Patient Name, Birth, etc.

Item	Description
Scan Barcode Example	Input a barcode example, barcode example is separated by separators (the separator is used to set the start and end position of each item), and the barcode data is displayed in the following items in turn.
Parameters	<ul style="list-style-type: none"> Input a barcode example, and you can change the information of Patient ID, Other ID, First Name, Last Name, Middle Name, Birth (Day), Birth (Month), Birth (Year), Age, Gender and etc. in the “Content” list. <p>Note: Ignore item is used to add one line below the selected item to hide unimportant patient information.</p> <ul style="list-style-type: none"> Set the start and end position of each item via separators. After inputting a barcode example, you can select item separators from the drop-down list of the Separator. (Only separators that are input in the field box of the Scan Barcode Example can be displayed in the drop-down list of the Separator.) <p>Note: You can customize the age unit of Birth (Day), Birth (Month), Birth (Year) in the Content column. If the DOB provided by the patient contains only digit, the system displayed an auto-generated age.</p>
Age Unit	Select an age unit from the drop-down list of the “Age Unit”: Year, Month, or Day.
Male/Female	Input the customized gender symbol besides the Male and Female field box, such as Male (M) or Female (F).

- Advanced Analysis Mode

Select “Advanced” from “Analysis Mode” drop-down list: user enters scan barcode example and regular expression and click [Match], the system will match scan barcode example with regular expression automatically, and if which is matched successfully, the scan item will display the barcode by separators.

4.1.10 Key Probe

Assign functions to the key probe buttons.

Item	Description
Probe	Select the probe to be set.
Probe Key Customer Function Settings	Set the key function for the selected probe.

4.2 Exam Mode Preset

You can assign available exam modes for probes.

Perform the following procedure:

1. To select a probe, move the cursor over the Probe column and select the probe model using the drop-down list.
2. Select/delete exam modes:

On the left side, you can view all the available exam modes in the exam library for the probe.

On the right side of the screen, you can view the current exam modes assigned to the probe.


- Click [>]: add a selected exam mode in the [Exam mode Library] to the [Probe and Exam mode] list.
- Click [<]: add a selected exam mode in the [Probe and Exam Mode] to the [Exam Mode Library] list.
- Click [>>]: add all exam modes in the library to the [Probe and Exam Mode] list.
- Click [<<]: add all probe and exam modes in the library to the [Exam Mode Library] list.
- Click [Delete] to delete a user-defined exam in the Exam Mode Library area.
- Click [Default] to set a selected exam mode as the default exam mode. The default exam mode is marked by a “√”.

4.3 Measurement Preset

“Exam Mode XXX” on the upper left side refers to the currently configured exam mode. The configured general/application menus are only related to the current exam mode.

There are three kinds of measurement items.


Measurement

Results of measurements are directly obtained via the measurement tools, which are indicated by “” in the preset screen.

For example, “Distance” in the 2D general measurement or “HC” in the OB measurement.

On the touch screen, measurement tools are displayed using square button.

Calculation


Results of calculations are automatically derived by the system using other measured or calculated values as parameters, they are indicated by “” in the preset screen.

For example, EFW (Estimated Fetal Weight) in the OB measurement.

If all measurements related to a calculation tool are completed, the system will automatically calculate the result. If some measurement tools are performed again, the system will automatically update the calculation result using the latest measurement results.

On the touch screen, calculation tools are displayed using square button.

Study

A group of measurements and/or calculations for a specific clinical application, which are indicated by “” in the preset screen.

For example, AFI in the OB measurement.

Fold/unfold the study to hide/show the measurement or calculation items included.

On the touch screen, study items are displayed with an arrow indicating the tools to be selected.

4.3.1 General Measurement Preset

You can preset the General Measurement packages for 2D (B/Color/Power Mode), M Mode, or Doppler (PW/CW) Mode respectively.

Perform the following procedure:

1. Select the [Caliper] on the [Measure Preset] page.
2. Select the [2D], [M] or [Doppler] tab to go to the corresponding preset menu.
 - [Available Items]: general measurement tools configured by the system in the current scanning mode which are available but not assigned yet.
 - [Selected Items]: displays the tools to be added to the menu.
3. Add/Remove the general measurement item using the following buttons:
 - [>]: To add the selected tool from the [Available Items] to the [Selected Items].
 - [>>]: To add all tools in the [Available Items] to the [Selected Items].
 - [<]: To remove the selected tool from the [Selected Items] to the [Available Items].
 - [<<]: To remove all tools from the [Selected Items] to the [Available Items]. You do not need to select any items before removing.
4. Set the default item.

Select an item from the [Selected Items], then click [Default]. The item is marked with a ✓.

The default item is activated automatically when entering this general measurement menu.
5. Adjust the item position.

Select an item from the right column and click [Up]/[Down] to adjust the sequence in which the items are arranged in the corresponding general measurement menu (touch screen display).
6. Modify the properties of a measurement item.

The following takes D trace as an example to show how to set the properties of a measurement tool.

 - a. Select the [Doppler] tab to go to the corresponding preset menu.
 - b. Select [D Trace] from the [Selected Items] and click [Property] to bring up the property dialog box.

Descriptions of the attributes are shown in the following table:

Item	Description
Item Name & Result	<p>Results obtained from D trace are listed. The selected items will be displayed in the results window after measurement.</p> <ul style="list-style-type: none"> • If PV is selected, other results become deselected (except the temporary result “velocity”). • Some results, such as PS and ED, can be derived via a simple method (e.g., Velocity), but others, such as TAMAX, can only be derived via complicated methods such as Manual, Spline, Auto, etc. • Only Vel. is available in [Method] if only PS or ED is selected. • Methods for obtaining PS and TAMAX simultaneously (trace, spline and auto) should be chosen if both PS and TAMAX are selected (TAMEAN should use auto method).
Unit	<p>Select the measurement unit.</p> <p>Click “Unit” column of each item to select.</p>
CalcMethod	<p>Select the measurement method for the tool.</p> <p>Click “CalcMethod” column of each item to select.</p>

c. Click [OK] to confirm the setting.

7. Select the measurement sequence.

- [Repeat]: after the current measurement is completed, the system automatically activates the current tool again.
- [Next]: after the current measurement is completed, the system automatically activates the next tool in the menu.
- [None]: after the current measurement is completed, the cursor can be moved over the whole screen. And the cursor will automatically return to the menu of the corresponding measurement.

8. Click [Save] to confirm.

4.3.2 Application Measurement Preset

Measurement Package Preset

During measurement, the preset package displays on the touch screen. Items in the package can be preset and may belong to different application regions.

You may configure more than one measurement package for current exam mode. Under actual measurement status, switch the measurement library if necessary.

Click [Advanced] on the [Measure Preset] page to enter the “Add New Package” page.

- [Available Items]: shows application packages configured in the system but not yet assigned to the current mode.
- [Selected Items]: shows application packages assigned to the current exam mode. If more than one package is assigned to the current exam mode.

Package editing includes Creating Packages, Add/Remove Items, Deleting Measurement Packages, Setting Default Packages, Adjusting Package Positions.

- Creating Packages: Click [New] and enter a name for the new package in the dialog box pop-up. Click [OK] to confirm, the new package displays in the [Available Items] list.
- Adding/Removing Packages: Add/remove the package by clicking [>], [>>], [<] and [<<].

- **Deleting Packages:** Select a package from the [Available Items] list, click [Delete]. To delete an item from [Selected Items], you need to move it to the [Available Items] first.
- **Setting Default Packages:** Select a package from the [Selected Items] list, then click [Default]. The default package is marked with a \checkmark .
The default package displays when entering the [Measure] page.
The measurement menu of the default package (corresponding to the exam mode) displays when entering the measuring status.
- **Adjusting Package Positions:** Select a package from the [Selected Items] and click [Move Up]/[Move Down] to adjust the sequence that the packages in the menu are arranged in.

Measurement Menu Preset

The following operations are available.

- **Adding/Removing Items:** Add/Remove the general measurement item using the [>], [>>], [<] and [<<].
- **Setting Default Items:** Select an item from the [Selected Items] list, click [Default]. The defaulted item is marked with a \checkmark .
To deselect the default tool, select it and click [Default] or set another item as the default.
If a particular item is set as the default item, it automatically displays the submenu of the study when entering this measurement menu.
- **Adjusting Item Positions:** Select an item from the [Selected Items], click [Move Up]/[Move Down].
The order in the list is also the item position in the menu.

User-defined Measurement/Calculation/Study

NOTE:

- Please ensure the correctness and validity of the defined formula, otherwise Mindray will not be liable for damage caused by improper definition of the formula.
 - Trigonometric functions are in degrees, not radians.
 - PI is accurate to 7 digits.
 - Adding B-Hist or B-Profile to the study is not supported.
 - Click [Export Custom] in the measurement preset window to export the user-defined measurement.
-

User-defined calculations are derived from arithmetic operations in which the parameters are measurement, calculation or study results obtained in measurement items which exist in the system or are user-defined.

Perform the following procedure:

1. Select the [Measure] tab page.
2. Click [New], the “Measurement Custom Wizard” dialog box appears.
3. Enter the Name in the “Measurement Custom Wizard” dialog box, then click [Next].
4. Set the user-defined attributes in the dialog box.
5. Click [Complete] to finish setting. The user-defined item is listed in the “Selected Items” menu and in the “User-defined” category of “Available Items.” An asterisk appears after the user-defined item for identification.

In the meantime, the user-defined item will be added automatically to the “Selected Items” in the Report template. If the item is completed in an exam, the results will be displayed in the report.

Add a Study

You can add or remove user-defined study items in the [Selected Items] column.

Perform the following procedure:

1. Select the [Measure] tab page.
2. Click [Add Study] on the right.
3. Enter the study name in the dialog box that appears.
4. Click [OK] and the item will be added to the “Selected Items.”
5. Select a measurement/calculation item from the “Available Items” and click [>] to add the item to the user-defined study.
6. Repeat the step 5 to add more items if necessary.
7. Move the cursor to click on the study and click [Property] on the right to edit the measure sequence.

Edit User-defined Items

Select the target defined item in the “Available Items”, and click [Edit].

Remove User-defined Items

- Remove Measurement/Calculation
 - a. Select “User Defined” in the “Available Items”, and select the desired item.
 - b. Click [Delete].
- Remove Study

Select a user-defined study, click [<].

4.3.3 Report Preset

NOTE:

- Deleting is not supported in IVF, IMT and EM reports.
- Watch the layout when setting the patient information layout of the report template. Do not set too many characters in one line; otherwise it may affect the display of the report.

Creating Report Templates

Perform the following procedure:

1. Select the [Report] on the [Measure Preset] page.
2. Click [New] to bring up the Report Template dialog box.
3. Select template: click the drop-down list under “Application Region” to select the template and click [OK] to confirm the template layout and exit the dialog box.
4. Enter the name for the user-defined report template in the box after “Report Template Name”.
5. Click [Measurement] to select measurement results to be displayed in the report:
 - a. Select an application category from the drop-down list beside “Available Items”.
 - b. Select Measurement, Calculate, Study or All from the drop-down list beside “Available Items”. The corresponding items appear in the list.
 - c. Use the [>] or [>>] buttons to add items to the “Selected” list.

Only tools which appear in the right column and are completed in the ultrasound exam can be displayed in the report.

In cardiac mode, if result items of only one formula are selected, only results of that one formula will be displayed after measurement. (For e.g., if only items suffixed with Teicholz are selected, not with Gibson or Cube, then only results suffixed with Teicholz after measurement are displayed.)

- d. Add the study.
Click [Add Study] and enter the study name in the dialog box which appears, then click [OK].
The new added study appears in the “Selected” list.
 - e. Adjust the item position.
Select an item from the “Selected” list, click [Up]/[Down] to adjust the position of the item in the list, as well as in the report template.
 - f. Click [OK] to save the settings and exit the dialog box.
6. Set the module display in the report: click [Setting] to make a selection;
 - Tick the check box in front of the module name to display the module in the report;
 - Click [OK] to save the setting and exit.
 7. Change the patient information layout in the report template:
 - Change the template used in the report layout: click [New Layout] to select another template.
 - Double click the information lines to be edited in “Report body”. The dialog box of font setting appears. Set the font size, font weight or hidden key words.
 - Double click the blank of a module in “Report Body”. The dialog box of editing the content appears. Select the content to be displayed at current position.
 - Press left <Set> key on the blank of a module in “Report Body”. Choose to add or delete the line, or add the table, etc.
 8. Click [Save] to save the setting.
 9. Click [Close] to quit the template.

Deleting Report Templates

Perform the following procedure:

1. Select the [Report] on the [Measure] page.
2. Select the template to be deleted from the list.
3. Click [Delete] > [Yes] to delete the selected template.
4. Click [Save] to confirm the settings.

Editing Report Templates

Perform the following procedure:

1. Select the [Report] on the [Measure] page.
2. Select the template to be modified from the list.
3. Select [Edit] to enter the [Measurement Report Preset] dialog box.
4. Click [Save] to confirm the settings.

Setting Default Templates

Perform the following procedure:

1. Select the [Report] on the [Measure] page.
2. Select a report template from the list.
3. Click [Default].
4. Click [Save] to confirm.

4.4 Comment Preset

You can preset the custom comments library for current exam mode. The comments in the library are provided by the system or user-defined ones.

Add a user-defined item

Directly enter user-defined comment texts: posit the cursor in the field box above [Add Comment], enter the text comment through the soft keyboard, and then click [Add Comment]. Then the directly-entered comment will be added to the Selected Items.

Select available items

Perform the following procedure:

1. Select available items:
 - a. Select a comment library in the drop-down list below “Application”.
 - b. Select a comment type in the drop-down list below “Type”.

All items will be displayed below “Available Items”.

2. Click [>], [>>], [<] and [<<] to add the item in Available Items on the left into Selected Items on the right.

TIP:

You can only delete the user-defined items rather than the items in the system library. After a user-defined item is deleted, it will not be available.

Change position of the selected items

Select an item on the right side box and click [Up], [Down], [Left] or [Right] button to change the position of the item.

4.5 iWorks Preset

You can customize the protocols and views in the iWorks preset screen.

4.5.1 Protocol Management

- Click to select the protocol in the list. The protocol type can be checked on the right. Select the exam mode in Use This Protocol Under, and click [Save]. The protocol can be used in the selected exam mode.
- Click [Add Protocol] to create a new protocol. It can be customized.
- Click to select a protocol in the list on the left and click [Copy]. A protocol named “XXX_Copy1” is created with the copied views, which can be customized.
- Select a view with “Left”, “Lt”, “Right” or “Rt” in its name in the list on the left, and click [Copy L⇌R]. The selected view is copied onto a new view in which bodymarks, annotations and measurement items are reversed to the opposite side.

- Click [Delete] to delete a user-defined protocol.
- Click [Up] or [Down] to move the selected protocol.
- Click [Move to Top]/[Move to Bottom] to move the selected protocol to the top or bottom of the list.

4.5.2 View Management

- Click to select the views in the list. The image, annotation, body mark and measurement settings can be checked on the right.
- Click to select a user-defined protocol in the list. Click [Add View] to add a view template to the protocol.

4.5.3 Create a New Protocol

You can create user-defined protocols and customize the automated procedure.

Perform the following procedure:

1. In the iWorks preset screen, click [Add Protocol] to create a new protocol.
Or, select an existing protocol and click [Copy] to customize the protocol based on the previous template.
2. Enter the protocol name, type and select the application region.
3. Click [Add View] to enter the view name and perform image settings.
 - In the measurement setting, if “Measurement on next section” is selected, the system will save two section images after finishing the section operation. One of the two sections will include the measurement result.
 - Select the checkbox of “Disable Protocol Body Marks” for body mark display settings.

4.6 Stress Echo Preset

4.6.1 Protocol Edit

You can create, edit, delete, copy, export and load the Stress Echo protocols using the Protocol Editor dialog box.

Item	Description
Protocol Name	Enter the protocol name.
Trigger	Set the trigger type.
WMS model	Set the chamber segment division method.
Loop usage	Displays the acquired loop number as well as the total usable loop number.
View	Set the views for each stage.
Standard Views	Set the standard view.
Load	Import a protocol.
Export	Export a protocol.
New Protocol	Create a new protocol.
Copy Protocol	Create a new protocol with an existing one.

Item	Description
Delete Protocol	Delete the protocol.
New stage	Create a stage for the current protocol.

Creating a Stress Echo Protocol

Perform the following procedure:

1. Click the [New Protocol] to the right of the Protocol Editor dialog box.
2. Enter the protocol name in the Protocol Name box at the top.
3. For each view (all views display for each phase):
 - a. Select “New View” in the View list.
 - b. Select a standard view from the Standard View list. Or you can customize the view name.
4. For each phase in the protocol:
 - a. Select “New Stage” in the Stage list.
 - b. Enter a phase name.
 - Select “Auto Select”, the system jumps to Select Mode after retrospective acquisition.
 - Select the required option from the Clip Capture drop-down list.
 - Select the number of loops to acquire (per view in the selected phase) in the Loops list (for non-continuous stages).
 - Select the type: exercise or drug.
5. Click [Save] to save changes and quit.

Editing a Stress Echo Protocol

Perform the following procedure:

1. Click a user-defined protocol on the Select Protocol screen.
2. Edit the protocol as described in the create protocol.

Deleting a Stress Echo Protocol

Click an user-defined protocol on the Select Protocol screen, click [Delete Protocol].

4.6.2 Maintenance

Item	Description
Acquire mode	Set the type of ROI: manual ROI or full-screen.
Overlay	Select the items to be labeled on each loop.
WMS score type	Set the chamber segment division method.
QT-Time table	To customize the length of systolic duration acquired for a specific heart rate, it will store the clip duration. You can add and remove entries in this table. You can also load the factory defaults.
Heart rate	Enter the heart rate.
Syst. duration	Enter the systolic duration.
Load factory	To reset the QT time table.

Item	Description
Acquire Timer	Set to automatically turn on the timer when starting storing post exercise.

4.7 DICOM/HL7

4.7.1 DICOM Local Preset

TIP:

- AE Title should be the same with the SCU AE Title preset in the server (PACS/RIS/HIS), for example, if the AE Title of the server preset in the storage server is Storage, and the AE Title of the accepted SCU is preset as Machine, then in the figure above, the AE Title of Local should be Machine, and the AE Title of storage server should be Storage.
- The device name is random. If the server name is same with that in the DICOM server list, the information “the server added already exists”, click [OK] to retype the name.
- IP address should be the address of the remote server.

DICOM local preset items are described as follows:

	Item	Description
Local Host DICOM service property	AE Title	Application Entity title.
	Port	Communication port, DICOM communication port.
	PDU	Maximum PDU data package size (not need to change), ranging from 16384 to 65536; if the value is less than 16384 or greater than 65536, the system automatically sets it to the value 32768.
	DICOM output charasets	Select an character set for DICOM output according to the local PACS workstation.
	Transcoding elements	Set what DICOM element(s) will be transcoded.
	TLS Port	Set the TLS port.
	TLS Server Setting	Import the encryption key/certificate.
	TLS Client Setting	<ul style="list-style-type: none"> • After importing TLS certificates, and selecting Verify Certificate check box, the system verifies the effectiveness of the TLS function in the DICOM storage, print, and worklist services. • Import trusted certificates, or delete certificates.

Item		Description
Server Setting	Device	Name of the device supporting DICOM services.
	IP Address	IP address of the server.
	Ping	You can ping the other machines after you entered the correct IP address. Besides, you can select a server in the Device list to ping it.
	Device List	Displays the added device.
	Set DICOM Service	Provides server settings of DICOM service, for details, please refer to the following chapters.
	Set DICOM Strategy	Click to enter the configure the strategy screen.
	Log Level	For engineer use only.
	Capture	

Add a Server

Perform the following procedure:

1. Enter the server device name and IP address.
2. Click [Ping] to check the connection.
3. Click [Add] to add the server to the device list, and its name and address are displayed in the list.

Delete a Server

Select a server in the device list, and then click [Delete].

Set DICOM Strategy

TIP:

- The DICOM strategy must be configured by qualified personnel with good knowledge of DICOM standards.
- The qualified personnel must ensure the validity of the DICOM strategy.

Perform the following procedure:

1. Click [Set DICOM Strategy].
2. Edit the DICOM strategy:
 - Add: Enter strategy name and description, and click [Add] to add a new strategy. Then the added strategy will be added to the Strategy List.
 - Delete: Select a strategy from the Strategy List, and click [Delete].
 - Update: Select a strategy from the Strategy List, re-enter strategy name or description, and click [Update].
3. Configure the item:

Select a strategy name from the Strategy List, and assign strategy items to the selected strategy.

 - Add: Set the function from the drop-list box, enter the parameter 1 and parameter 2, and click [Add]. Then the added strategy item will be added to the Strategy Items List.
 - Delete: Select a strategy item from the Strategy Items List, and click [Delete].

- Update: Select a strategy from the Strategy Items List, reselect the function or re-enter the parameter 1/2, and click [Update].
4. Import/Export strategy:
- Import: Click [Import], browse the desired strategy file and operate according to the screen prompts to import.
The imported file for DICOM strategy must be a *.xml file.
 - Export: Select a strategy from the Strategy List, click [Export] and then select the export path and type the file name.
E drive is default, and the file type is .xml.

4.7.2 DICOM Service Preset

The DICOM Service screen is used to set attributes for DICOM service.

When the system is configured with DICOM basic function module, and installed with DICOM modules, the corresponding preset can be found in DICOM Service screen.

TIP:

Not all SCPs can support verification. See the SCP properties to confirm whether the SCP can support this service. If not, the verification will not be successful.

Perform the following procedure:

1. Click [Set DICOM Service] on the DICOM/HL7 screen.
2. Select the DICOM service tab to enter the corresponding settings screen.
3. Enter the correct AE Title, port, etc.
 - Click [Add] to add the service to the Service List.
 - Select an item in the service list, change the parameters in the above area, and click [Update] to update the item in the service list.
 - Click to delete the selected service in the service list.
 - Select an item in the service list, click [Default] and you can see “Y” in the Default column.
4. Click [Verify] to verify that the two DICOM application entities are properly connected.
If the verification is successful, the system displays “xxx Verify Succeed.” Otherwise, it displays “xxx Verify Failed.”

If verification failed, possible causes may be: wrong IP address, not able to access IP address, remote DICOM server is not running, wrong port, incorrect application name.

Storage Service Preset

DICOM storage preset items are described as follows:

Item	Description
Device	After you set the server (s) in DICOM Preset screen, the name (s) will appear in the drop-down list, select the name of the storage server.
Service Name	Default is xxx-Storage, user-changeable.
AE Title	Application Entity title, here, it should be consistent with that of the storage server.

Item	Description
Port	DICOM communication port, 104 is default. Here, the port should be consistent with that of the storage server port.
Maximum Retries	Set the maximum retries (0-9). The default value is 3. If the DICOM task sending to the server fails, the retry times should be 3.
Interval Time(s)	Interval time.
Timeout	Refers to the amount of time after which the system will stop trying to establish a connection to the service.
TLS	Transport Layer Security. Select whether to encrypt the data during network transportation.
Cine Zoom Mode	Select the cine zoom mode during image file storage.
Compression Mode	Select the compression mode: original data (uncompressed), RLE (the image not compressed), JPEG, and JPEG2000.
Compression Ratio	Select the JPEG compression ratio: lossless, low, medium, and high. The compression ratio is inversely proportional to the image quality (reserved function).
Color Mode	Select the color mode. If you choose the mix or the grey, RLE/JPEG is unavailable. The image uses 24 bit when sending the image from the ultrasound device to the server; it depends on the image when choosing the mix. The image uses 8 bit if the image is captured in color mode or the image has the tint. All images use 8 bit when choosing the grey.
Allow Multiframe	If SCP supports this function, then select it.
Max Frame Rate	Set the frame range of transferring cin file into DCM multi-frame file. It is editable to the user.
3D/4D	Set the 3D/4D image transfer mode. Set the transfer mode for the 3D/4D cine sending. <ul style="list-style-type: none"> • Normal: use the way that 2D image adopts to send; • Volume: use Enhanced US Volume Storage IOD to send; • Data source: used to obtain 3D/4D image for 4D Viewer.
SR Storage Option	To enable or disable structured reporting sending.
Encapsulated PDF	Select if to encapsulate PDF format report in DICOM standard. It becomes available if SCP supports the function.
Doppler audio	Set to save the audio of PW mode.
Storage mode	Set the storage mode for image and cine file: <ul style="list-style-type: none"> • Parallel file: save the current file, and is ready for the storage of the next file. • Parallel frame: send the current frame, and is ready for sending the next frame.
TransducerTracking	Files of images that are saved in DCM format through DICOM or DICOMDIR contain transducer serial number information.
Strategy Name	Set the DICOM strategy.

TIP:

- If the server software supports the compression algorithm, select JPEG, RLE, JPEG2000. Otherwise, original data should be used (RLE is the default method).
- RLE, JPEG and JPEG2000 are not supported by all SCPs. Refer to the SCP's DICOM CONFORMANCE STATEMENT electronic file to check whether SCP supports it or not. Do not select these compression modes if the storage server does not support them.
- Images of PW/M/TVM/TVD mode (B image is not frozen) and images other than PW/M/TVM/TVD mode: if "Max Frame rate" is not "Full" and the actual frame rate is larger than the set value, the system will save the image files in a frame rate of the set value, and transfer in a frame rate of B mode.
- Images of PW/M/TVM/TVD mode (B image is frozen), the system will save/transfer the images files in frame rate of 6.

Print Service Preset

DICOM print preset items are described as follows:

Item	Description
Device	After you set the server (s) in DICOM Preset screen, the name (s) will appear in the drop-down list, select the name of the print server.
Service Name	Default is xxx-Print, user-changeable.
AE Title	Application Entity title, here, it should be consistent with that of the print server.
Port	DICOM communication port, 104 is default. Here, the port should be consistent with that of the print server port.
Maximum Retries	It starts retrying if it fails to send DICOM task to the server. The retry entry times should be this value.
Interval Time (s)	Reserved time.
Timeout	Refers to the amount of time after which the system will stop trying to establish a connection to the service.
TLS	Transport Layer Security. Select whether to encrypt the data during network transportation.
Copies	Refer to copies of printed files. You can select among 1 through 5, or directly enter the numeral.
Settings	The system supports RGB (color printing) and MONOCHROME2 (black and white printing). Please select the type the printer supports.
Film Orientation	Select between LANDSCAPE and PORTRAIT.
Priority	Specify printing task priority among HIGH, MED and LOW.
Film Size	Select film size among the selections listed in the drop-down list.
Display Format	Specify quantity of printed files, e.g. STANDARD2, 3 indicates 6 images are printed for each page.
Medium Type	Specify print medium: Paper, Clear Film, Blue Film; select Blue Film or Clear Film for black and white printing; select Paper for color printing.

Item	Description
Trim	Specify whether you want a trim box to be printed around each image on the film: Yes or No.
Configuration Info	Enter configuration information in the field.
Min Density	Enter the minimum density of the film.
Max Density	Enter the maximum density of the film.
Destination	Specify where the file is exposed: MAGAZINE (stored in the magazine), or, PROCESSOR (exposed in the processor).
Magnification Type	Select how the printer magnifies an image to fit the film. <ul style="list-style-type: none"> • Replicate: interpolated pixels belong to duplicate of adjacent pixels); • Bilinear: interpolated pixels are generated from bilinear interpolations between adjacent pixels; • Cubic: interpolated pixels are generated from cubic interpolations between adjacent pixels; • None: without interpolation.
Strategy Name	Set the DICOM strategy.

Worklist Setting

DICOM service setting for Worklist is described as follows:

Item	Description
Device Name	After you set the server (s) in DICOM Server Setting screen, the name (s) will appear in the drop-down list, select the name of the Worklist server.
Service Name	Default is server-Worklist, and it can be modified.
AE Title	Application Entity title. It is consistent with that of the Worklist server.
Port	DICOM communication port, 104 by default. The port should be consistent with that of the Worklist server port.
Maximum Retries	Reserved feature.
Interval Time(s)	Reserved feature.
Timeout	Refers to time after which the system will stop trying to establish a connection to the service.
TLS	Transport Layer Security. Select whether to encrypt the data during network transportation.
Strategy Name	Set the DICOM strategy.
Remove Attributes(0)	Set what DICOM element(s) that will not be used in worklist query.

MPPS Preset

MPPS setting items are described as follows:

Item	Description
Device Name	After you set the server (s) in DICOM Server Setting, the name (s) will appear in the drop-down list, select the name of the MPPS server.
Service Name	Default is server-MPPS, and it can be modified.

Item	Description
AE Title	Application Entity title. It should be consistent with that of the MPPS server.
Port	DICOM communication port, 104 by default. The port should be consistent with that of the MPPS server.
Maximum Retries	It starts retrying if it fails to send DICOM task to the server. The retry entry times should be this value.
Interval Time(s)	Reserved feature.
Timeout	Refers to the amount of time after which the system will stop trying to establish a connection to the service.
TLS	Transport Layer Security. Select whether to encrypt the data during network transportation.

TIP:

Set the MPPS service as the default when using the MPPS.

Storage Commitment Setting

DICOM storage commitment setting items are described as follows:

Name	NOTE
Device Name	After you set the server (s) in DICOM Server Setting, the name (s) will appear in the drop-down list, select the name of the storage commitment server.
DICOM Service Name	Default is server-SC, and it can be modified.
AE Title	Application Entity title. Here, it should be consistent with that of the storage commitment server.
Port	DICOM communication port, 104 by default. Here, the port should be consistent with that of the storage commitment server port.
Maximum Retries	Reserved feature.
Interval Time(s)	Reserved feature.
Timeout	Refers to the amount of time after which the system will stop trying to establish a connection to the service.
Associated Storage Service	The associated storage server is preset before storage commitment, only after the exam is sent out, can storage commitment be created.
TLS	Transport Layer Security. Select whether to encrypt the data during network transportation.

Query/Retrieve

DICOM query/retrieve setting items are described as follows:

Item	Description
Device Name	Select the name of a device that can be added (including the local).
Service Name	Default is server-queryRetrieve, and it can be modified.

Item	Description
AE Title	Application Entity title. Here, it should be consistent with that of the storage commitment server.
Port	DICOM communication port, 104 by default. Here, the port should be consistent with that of the storage commitment server port.
Maximum Retries	Reserved feature.
Interval Time(s)	Reserved feature.
Timeout	Refers to the amount of time after which the system will stop trying to establish a connection to the service.
TLS	Transport Layer Security. Select whether to encrypt the data during network transportation.

HL7 Query Service Preset

The protocol version that the ultrasound system supports: V2.3, V2.4, V2.5, V2.6.

HL7 service setting for Worklist is described as follows:

Item	Description
Device Name	After you set the server (s) in DICOM Server Setting screen, the name (s) will appear in the drop-down list, select the name of the Worklist server.
Service Name	Default is server-HL7Query, and it can be modified.
AE Title	Application Entity title. here, it should be consistent with that of the HL7 server.
Port	DICOM communication port, 104 by default. Here, the port should be consistent with that of the HL7 server port.
Maximum Retries	Reserved feature.
Interval Time(s)	Reserved feature.
Timeout	Refers to the amount of time after which the system will stop trying to establish a connection to the service.
Listen mode	This function enables the ultrasound system to use the listen port for data receiving.
Listen port	Port for ultrasound system to receive data after the listen mode function is activated. Here, the port should be consistent with that of the HL7 server port. For details of listen port setting, refer to settings in the server.

4.8 Network Preset

4.8.1 iStorage Preset

You can send exam data or images to the iStorage server and perform analysis using UltraAssist. For details about this feature, see the UltraAssist manual.

Item	Description
Service Name	The name of the iStorage service.
IP Address	IP address of the iStorage service device.
Port	Port for transmitting.
Charset	Set the character set.

Add an iStorage service

Perform the following procedure:

1. Set the iStorage server properties as described above.
2. Click [Connect] to verify connection.
3. Click [Add] to add the service to the Service list.

Edit a network service

Perform the following procedure:

1. Select the service to be updated in the service list.
2. You can see properties in the Configure Service area.
3. Do one of the following to edit the network service:
 - Modify the properties and click [Update] to update the setting.
 - Click [Default] to set as the default service.
 - Click [Delete] to delete it from the service list.

4.8.2 MedTouch/MedSight Preset

You can set environment for MedTouch/MedSight here and then use the MedTouch/MedSight function by mobile phone or tablet computers. See MedTouch/MedSight manual for details.

4.8.3 Q-Path Preset

You can use the ultrasound system to check data on browser directly. After you have ordered storage service of a network website service, you can check data using the website, authorized account and password (provided by the service vendor). You can open the browser (Q-View) to review previously sent DICOM data.

Q-path is a network server provided by Telexy Healthcare Inc. for digital image storage. Q-View is a client viewing tool for the server. Telexy Healthcare developed technology and a command structure that allows any Q-view enabled ultrasound system to access Q-path directly from the ultrasound system using a single control. The primary purpose for Q-view is to provide remote access to Q-path from the ultrasound system to complete the exam report on the ultrasound system and submit for QA.

To access Q-Path on the system, the user just opens the Q-View first and then enters the URL, user account and password provided by Telexy Healthcare, and the system software system will call Q-View tool then for user Q-Path application.

For details, please contact Q-Path service provider.

Q-Path Basic Preset

Item	Description
Advanced	Sets the sub URLs of “QView full” and “QView lite”. The sub URL is set by default. Users can modify the sub URL and click [Apply] to exit the “QView sub URL setting” window.
Enable Direct Report	Sets whether to open the Q-Path server through the <Report> button.
Worksheet Only	Sets whether to directly enter the Worksheet interface after opening the Q-Path server.
Password On Worksheet	Sets whether to display the Signature field box in a worksheet. Select <Report> button > [WorkSheet] or select <Review> button > [Report] > [WorkSheet], enter the worksheet password in the field box, and click [OK]. Users can query the corresponding worksheet by searching the worksheet password in the Q-Path server.
Password On End Exam	Sets whether to input the worksheet password after ending an exam.
Password Visible	Sets whether the password is visible.
Import	Imports a user-defined worksheet template from the USB storage (downloaded from the Q-Path server).
Backup	Backs up worksheets to the USB storage.
Restore	Restores the backup worksheet template from the USB storage to the ultrasound system.
Delete	Deletes a worksheet template.
Restore Factory	Restores the worksheet template to the default state.

Perform the following procedure:

1. Select “Enable Q-Path”.
2. Enter the website, account and password of the target service.
3. Select user type: Personal User or Default User.
 - Personal User: the personal user needs to enter the user name and password in every-time login.
 - Default User: after the default user enters the user name and password in the field box of the “User Name” and “Password”, and click [OK], no login is required to access the Q-Path server later.
4. Select an appropriate item from the drop-down list of “Available Items”.
5. Select an exam mode in the left “Exam Mode” column.
6. Select a worksheet in the right “Worksheets” column.
7. Click [Save] to exit, and the system will shut down.

4.8.4 Wireless Network Connection

Enable/Disable on Wi-Fi function

Select [Wireless Network Connection] page in Network Preset screen.

Confirm the Wi-Fi is enabled: [Disable Wifi] appears on the screen.

Hosted Network

Reserved.

4.8.5 Network Storage

Before adding a network service, you should firstly set a shared directory in your PC server. In order to make network storage function normally, setting of the sharing folder of the PC server in advance is a must, e.g. destination, user name and password should be confirmed at first.

Item	Description
Service Name	The name of the network service, which cannot be empty.
Destination Device	Name of the device, which cannot be empty
IP Address	IP address of the network service device, which cannot be empty
Ping	Press Ping to confirm that a device is connected
User Name	User name for entering the shared PC server, which is decided by the server
Password	Password for entering the shared PC server, which is decided by the server
Shared Dir	Shared folder directory, which cannot be empty
Browse	To enter the Net Disk Browse screen to set the shared folder directory. And if the user name or the password is incorrect, the server cannot be entered.
Add	Click it to add the Network service to the service list.
Cancel	Click to cancel parameter setting
Update	To save the changed parameters.
Default	To set as the default server for network storage
Delete	Click to delete the selected service in the service list.

Add a network service

Perform the following procedure:

1. Set the network server properties as described above.
2. Click [Add] to add the service to the Service list.
3. Select the added service in the service list, you can set it as default or delete it.

Modify a network service

Perform the following procedure:

1. Select the service to be updated in the service list.
2. You can see properties in the Configure Service area.
3. Modify the parameters and click [Update] to update setting.

Setting U-View Server

Type	Item	Description
U-View Server Setup	Device	Tap to input the ID of device.
	IP Address	Tap to input IP address of U-VIEW server.
	Port	Tap to input port of U-VIEW server.
	Connect	Select to connect the server.

Setting Physio-View Server

Type	Item	Description
Physio-View Server Setup	IP Address	Tap to input IP address of Physio-View server.
	Port	Tap to input port of Physio-View server.
	Connect	Select to connect the server.
	Encrypted Connection Type	Select to enable SSL Encryption Priority.

4.8.6 MIOT Preset

After the MIOT (Mindray Internet of Things) service is enabled and configured, the Ultrasound device information such as Usage, Operating duration, can be transmitted to MIOT.

Item	Description
IP Address	IP address of the MIOT service device.
Port	Port for transmitting.
MIOT Service Switch On	Click to enable MIOT service.

4.9 Print Preset

This screen is used to set up the printer and image printing.

4.9.1 Print Setting

Item	Description
Add Service	Click to begin adding print services.
Remove Service	Click to delete the selected print service.
Rename Service	Click to rename the selected print service.
Default print service	Click to set the selected print service as the default one.

Item	Description
Property	Preset print service properties.

4.9.2 Image Settings

Click [Image Setting] to enter the page, you can set the brightness, contrast and saturation of image printing, or you can use the default values.

4.10 Maintenance

In the Setup menu, select [Maintenance] to enter the screen.

The [Maintenance] function is designed for you to import or export user data, restore factory setting and export log. You may also execute self-test and option installation/trial through the maintenance menu. Furthermore, you can set the factory preset, export the register data, and etc.

If you require other maintenance functions, please contact Mindray Customer Service Department or sales representative.

4.10.1 Exporting Setup Data

This function is used to write all setup data of the system into a disk for backup.

Perform the following procedure:

1. Select the target module.
2. Click [Export] to open the [Export Data] screen.
3. Select the path to save the data.
4. Select the exported file and type as PDP and click [OK].

4.10.2 Importing Setup Data

This function is used to import the existing setup data to the setup data memory of the system. The system will reset and operate according to the setup preferences that were imported.

Perform the following procedure:

1. Click [Import] to open the Load Data screen.
2. Select the imported file.
3. Click [OK], a progress bar will appear and the setup data is imported to the specified path.
4. To restore the factory setup data, click [Load Factory] on the right side of the screen.

4.10.3 Probe Check

This function is used to check the condition of transducer elements to evaluate the probe performance.

Before performing the probe check, ensure the probe head must be clean and the probe is in non-scanning state.

Click [Setup] > [Probe Check] to enter the Probe Check screen:

- If a transducer element is in malfunction, it is displayed as a red spot.
- If a transducer element functions well, it is displayed as a green spot.

You can export the result image to the external device.

4.10.4 Other Settings

Other preset settings are described as follows:

Item		Description
Load Factory		Local factory default settings.
Option		You can trial each option for 3 months at most. Each option can only be trialed once.
Setup	Export Log	Export the log.
	Self Test	Perform system self-test and restart the machine.
	Recover	To recover the system.
	Enter Windows	For password, please contact your service engineer.
	Show Metrics Logs	Show the metrics logs, such as login count, total usage time, user metrics details, exam mode metrics details or probes.

If you have any questions, please contact the service engineer or your sales representative.

4.11 Security

4.11.1 Drive Encryption/Secure Data Wipe

Encrypt the patient data stored in the hard disk. The system provides two encryption methods: Factory Default and User Define.

- Factory Default: the system is in factory state by default.
- User Define: add a user-defined password.

Perform the following procedure:

1. Select [User Define].
2. If no patient data are stored in the hard disk, click [Confirm], input the password and click [Confirm] to finish the password setting

If the patient data are already stored in the hard disk, the system will pop-up prompts, follow the steps below:

- a. Click [OK].
- b. Click [Wipe] and operate according to the screen prompts to clear patient data.
- c. Select [User Define] again, and click [Confirm].
- d. Input the password and click [Confirm] to finish the password setting.

NOTE:

- If you want to switch to Factory Default, perform steps above again. The password is the same as that of the User Define.
- When you set password, multi-language and Chinese characters are not supported.

4.11.2 Anti-Virus

The system provides two anti-virus software: Windows Defender and McAfee. They can effectively prevent the ultrasound system from being attacked by virus, spyware, or other malware.

- Windows Defender is already installed on the system.

- The McAfee software is an option. If you want to buy McAfee, contact the service engineer or your sales representative.

NOTE:

McAfee cannot be uninstalled after successful installation.

4.11.3 Transmission Encryption

After accessing the network, click [VPN Config] to enter the “VPN Config” interface.

Item	Description
Status	<ul style="list-style-type: none"> • No driver: click [SetupDriver] to enter the “TAP-Windows 9.21.2 Setup” interface, and do as instructed. • Ready: the VPN is ready for use. • Advance: VPN Advance Configuration • Connected: VPN is successfully connected. • Disconnected: VPN is disconnected. • Error: error connection.
Server IP	/
Group	/
User Name	/
Password	/
Hide characters	The password is displayed as *.
Connect/ Disconnect	Connect or disconnect VPN.
Advance	<p>Enters the “VPN Advance Config” interface.</p> <ul style="list-style-type: none"> • Reset: if the system does not respond after you click [Config], click [Reset]. • Config: enters the “OpenConnect-GUI VPN client” interface. For details about the settings, please refer to the TAP manual. <p>NOTE:</p> <p>After exiting the “VPN Advance Config” interface, you need to reboot the system; otherwise, you cannot connect VPN normally.</p>
Close	Close the “VPN Advance Config” interface.

4.12 System Information

Click [About] on the Setup menu to enter the system information screen.

This screen displays the system software version and other versions of devices. You cannot edit the information, only view them. The information varies depending on the system configurations and version.

5

Exam Preparation

You can start a patient exam in the following situations:

- New patient information: to start a new patient exam, patient information must first be entered.
- New exam: to start a new exam for patient who is already registered, the recorded information can be obtained through either iStation or Worklist.
- Activate exam: to select an exam that has been completed within 24 hours, continue the exam with imported patient information and exam data.
- Continue an exam: to select an exam that has been paused within 24 hours, continue the exam with imported patient information and exam data.

General procedure for an exam:

1. Acquire the patient information.

The system supports image scanning and measurement without patient information.

2. Select an exam mode and probe.
3. Choose an imaging mode.
4. Perform the exam.

5.1 Acquire Patient Information

5.1.1 New Patient Information

CAUTION

Before examining a new patient, use the End Exam button to end the exam of the previous patient, update the patient ID and information, to avoid mixing data of the next new patient.

To start a new patient exam, it is better to type the detailed patient information. The system will set up a unique information database for each patient based on the patient information entered, so that the information of one patient will not be confused with that of another patient.

1. Select the patient button on the control panel to enter the patient information page.

Place the cursor onto the targeted box. The field box is highlighted and a flashing cursor appears. Information can be entered or selected from the options.

NOTE:

- Patient ID is generated automatically by the system after starting a new patient, and can be modified manually. The characters “\”, “\”, “*”, “?” are not permitted.
- You can either enter the patient’s date of birth manually, or use the calendar to select the date.
- The age unit can be “Years”, “Months” or “Days.” If the age is less than one year, the system will automatically calculate the age in months or days.

2. Exam Type
 - Select the exam type tab to enter exam-specific information.
 - Input general information/operating information
3. Functional keys
 - [New Patient]: select to clear the current patient information in the patient information screen in order to input new patient information.
 - [New Exam]: select to clear the current exam information in order to create a new exam for the current patient.
 - [Pause Exam]: select to pause the current exam due to some special causes or system power off.
 - [Cancel Exam]: select to cancel the current exam.
The cancelled exam can't be restored.
 - [Quick Register]: select to save the patient information quickly and return to the main screen.
 - [OK]: select to save the patient data entered and exit the screen.
 - [Cancel]: select to cancel the patient data entered and exits the screen.

5.1.2 Retrieve Patient Information

Retrieve from iStation

The patient data can be obtained in iStation from the system hardware or USB memory device. You can enter the searching conditions for the patient.

1. Do one of the following to enter iStation screen:
 - Select the iStation button.
 - Select [iStation] in the patient information screen.
 - Select [iStation] in the review screen.
2. Select the data source.

Select the data source in the drop-down list of “Data Source”.
3. Input the searching condition.

The default condition is name. Select a searching condition from the drop-down list, enter a keyword or select the period in accordance with the condition selected.

Select “Find in results”, the system will search the keyword based on the existed searched results.
4. Select the desired patient information in the list, and the system pops up the shortcut menu.

Review Image	Click to enter the Review screen.
Patient Infor	Click to enter the Patient Info screen.
Review Report	Enter diagnostic report screen.
Delete Exam	Delete the selected record.
Backup Exam	Click to back up the selected patient record to media sup-ported.
Restore Exam	Click to import the patient data from an external media.
Send Exam	Click to send the selected patient data to external device, storage server or printer.

Activate Exam	Click to continue an exam that has been finished within 24 hours.
Continue Exam	Click to continue an exam that has been paused within 24 hours.
Annotation Exam	Click to add annotations to the selected exam, or view the history annotations of the selected exam.

- Click [New Exam] to enter the patient information screen.

The corresponding patient information is also imported to the new exam simultaneously. After editing the patient information in the patient information screen, select [OK] to start a new exam.

WorkList/HL7 Enquiry

TIP:

Worklist is an optional function. Configure DICOM Basic and DICOM WorkList first.

When the DICOM basic package is configured and the Worklist server has been set, click [Worklist] in the “Patient Info” screen to query or import the patient data. For details, see “12.3 Worklist”.

5.2 Activate and Continue an Exam

5.2.1 Activate an Exam

In the iStation screen, select the exam record finished within 24 hours, and click [Activate Exam]; or, click [Active Exam] in the review screen to activate the exam.

NOTE:

- The system can automatically load the patient information and exam data to continue the exam.
- If you want to continue an exam which data lies in an external memory database, you have to first allow the system to load the patient data to the system’s patient database.
- For an only one re-activated exam, you can modify patient ID.

5.2.2 Continue an Exam

In the iStation screen, select an exam record paused within 24 hours, click [Resume Exam] to continue the exam.

If you want to select a patient data in an external memory database, you have to first allow the system to load the patient data to the system’s patient database.

The patient ID can be modified for the exam only with one exam record and being activated again.

5.3 Pause and End an Exam

5.3.1 Pause an Exam

Sometimes, you have to stop an uncompleted exam due to some special causes. When the exam is paused, the system can begin other exams.

- Select the patient button on the control panel to enter the patient information page.

2. Select [Pause Exam].

If the system is powered off during scanning, the exam status turns “paused” after the system restart.

When an exam is paused, the system will:

- Save the exam-related images, reports and measurement data, modify the status as “Paused”.
- Save the exam information, including report, imaging mode, exam mode, image parameters, operation mode, and imaging/measurement data and so on.

5.3.2 End an Exam

Before examining a new patient, select the end exam button to end the exam of the previous patient, update the patient ID and information, to avoid mixing data of the next new patient.

To end an exam, do one of the following:

- Select the end exam button to finish the current exam.
- Select [New Patient] in the patient information screen to end the last patient exam and clear the patient information.
- Select [New Exam] in the patient information screen (or iStation screen, or review screen) to end the last exam and clear the exam data.

6 Image Acquisition

WARNING

- The images displayed in this system are only reference for diagnosis. Mindray is not responsible for the correctness of diagnostic results.
 - In Dual-B imaging mode, the measurement results of the merged image may be inaccurate. Therefore, the results are provided for reference only, not for confirming a diagnosis.
-

TIP:

Operations for switching between different image modes and optimizing images, see System Overview chapter.

6.1 B Mode

B mode is the basic imaging mode that displays real-time views of anatomical tissues and organs.

6.1.1 B-mode Image Scanning

Select the B Mode button on the control panel to enter B mode.

If the system is in other imaging mode, select the B mode button to return B mode.

Adjust parameters to optimize the image.

6.1.2 B-mode Image Parameters

Image Quality

Used for switching B/THI and adjusting the frequency. The real-time value of frequency is displayed in the image parameter area, and if harmonic frequency is used, “F H” is displayed as harmonic frequency value.

The system provides a THI function using harmonics of echoes to optimize the image. Harmonic imaging enhances near field resolution and reduces low-frequency and large amplitude noise, so as to improve small parts imaging.

Please select the frequency according to the detection depth and current tissue features.

Gain

To adjust the gain of the whole receiving information in B mode. The real-time gain value is displayed in the image parameter area.

Depth

This function is used to adjust the display depth of sampling, the real-time value of which is displayed in the image parameter area.

Depth increase will cause a decrease in the frame rate.

TGC

The system compensates the signals from deeper tissue by segments to optimize the image.

There are 8-segment TGC sliders corresponding to the areas in the image.

Adjust the signal gain for the certain image area to get a balanced image.

Acoustic power

Refers to the power of ultrasonic wave transmitted by the probe, the real-time value of which is displayed on the screen.

TIP:

You should perform exams according to actual situation and follow the ALARA Principle.

Scan range and FOV position

More information can be obtained without moving the probe or changing the sampling position.

TIP:

- The FOV position/range is available only for the convex and phased probes.
 - When the scan range is adjusted to the widest, the FOV position cannot be changed.
-

Steer

To steer the beam the probe transmits.

TIP:

Steer is available only for linear probes.

Line Density

The function determines the quality and information of the image.

The higher the line density is, the higher the resolution becomes.

Dynamic Range

Adjusts contrast resolution of an image, compresses or expands gray display range.

The real-time dynamic range value is displayed on the image parameter area.

The more the dynamic range, the more specified the information, and the lower the contrast with more noise.

iClear

The function is used to enhance the image profile so as to distinguish the image boundary for optimization.

Persistence

Used to superimpose and average adjacent B images, so as to optimize the image and remove noises.

Rotation/Flip

This function provides a better observation for image display.

The “M” mark indicates the orientation of the image; the M mark is located on the top of the imaging area by default.

iBeam (Spatial Compound Imaging)

This function is used to superimpose and average images of different steer angles to obtain image optimization.

TIP:

The phased probe does not support iBeam. iBeam is unavailable when ExFov is enabled.

Image Merge

In the Dual-split mode, when the images of the two windows have the same probe type, depth, invert status, rotation status and magnification factor, the system will merge the two images so as to extend the field of vision.

TIP:

Only for linear probes.

Gray Map

Adjusting grayscale contrast to optimize the image.

Tint Map

This function provides an imaging process based on color difference rather than gray distinction.

TSI (Tissue Specific Imaging)

The TSI function is used to optimize the image by selecting acoustic speed according to tissue characteristics.

iTouch (Auto Image Optimization)

To optimize image parameters as per the current tissue characteristics for a better image effect. It is available for all real-time imaging in B mode.

H Scale

Display or hide the width scale (horizontal scale).

The scale of the horizontal scale is the same as that of vertical scale (depth), they change together in zoom mode, or when the number of the image window changes. The H Scale will be inverted when image is turned upwards/downwards.

Dual Live

Display different image effects of one probe for a better observation.

Two pages of adjustable parameters are displayed on the touch screen as well; where, shared parameters and left window parameters are displayed in the B (L) page, while right window parameters are displayed in the B(R) page.

In the image parameter area, parameters of the both windows are displayed.

It supports the magnification of the image.

LGC

Adjust the gain along the scan line to improve the lateral resolution of the image.

TIP:

The system provides several preset parameters for imaging.

Echo Boost

The contrast is increased and the noise is decreased with the clear boundary after generating the function.

TIP:

Use phased probe to activate the function in cardiac mode.

Patient Temperature

If the current active probe is TEE transducer, the parameter will display under the B mode menu. You can enter the patient temperature by this function.

⚠ WARNING

If the patient temperature is above 37 °C (98.6 °F) and the [Patient Temperature] setting is below the actual reading, the system could overestimate the temperature of TEE transducer's distal tip. This could trigger the Auto-Cool feature. If the patient temperature reaches or is near 37 °C (98.6 °F) and the [Patient Temperature] setting is above the actual reading, the system could underestimate the temperature of the TEE transducer's distal tip. The patient is exposed to excessive temperatures.

6.2 Color Mode

The Color mode is used to detect color flow, and the color is designed to judge the direction and speed of blood flow.

Generally, the color above the color bar indicates the flow towards the probe, while the color below the color bar indicates the flow away from the probe; the brighter the color is, the faster the flow speed becomes; while the darker the color is, the slower the flow speed becomes.

TIP:

In Color Mode, acoustic power is synchronous with that of B Mode. Adjustment of the depth or zoom to the B Mode image will lead to corresponding changes in Color Mode image.

6.2.1 Color Mode Image Scanning

Perform the following procedure:

1. Select a premium image during B mode scan, and adjust to place the area of interest in the center of the image.
2. Select the Color Mode button to enter B+Color mode.
3. Change position and size of the Region of Interest (ROI).
4. Adjust the image parameters during scan to obtain optimized images.

6.2.2 Color Mode Image Parameters

Color Gain

Refers to the overall sensitivity to flow signals. The real-time gain value is displayed in the image parameter area.

Increasing the gain will increase the flow signal presented as well as noise, while the signals may be missing when the gain is adjusted too low.

Image Quality

Refers to the transmitting frequency in Doppler mode of the probe, the real-time value of which is displayed in the image parameter area.

B/C Align

To set and constrain the maximum width of the B mode image to that of the Color ROI.

Dual Live

This function is used to display B image and Color image synchronously.

Steer

The feature is used to adjust the ROI of color flow with different angles with immobility of the probe.

This function is used to adjust the scan angle of linear probes, so as to change the angle between the transmitting beam and flow direction.

TIP:

Steer is available only for linear probes.

Line Density

The function determines the quality and information of the image.

The higher the line density is, the higher the resolution becomes.

Packet Size

This function is an indication of the ability to detect flow, which is used to adjust the accuracy of color flow.

The higher the sensitivity is, the more sensitive indication for low-velocity flow becomes.

Flow State

Refers to optimizing the various flow states.

Persistence

This function is to adjust the temporal smooth to optimize the image.

Smooth

This feature is used to reject the noise and smooth the image.

Scale

This function is used to adjust the speed range of color flow, which is adjusted through PRF in the system. The real-time PRF value is displayed in the image parameter area.

Aliasing may occur if low velocity scale is used and high velocities are encountered.

Low velocities may not be identified when a high velocity scale is used.

Baseline

Refers to the area where the velocity is zero in the scale. Adjust according to the actual situation so as to get an optimum flow display.

Invert

To set the display mode of the color flow, the color scale will be inverted when the function is activated.

TIP:

It is available only for linear probes.

Color Map

This function is a combination of several image parameters, which indicates the display effect of color image.

WF (Wall Filter)

It filters out low-velocity signals to provide effective information, and this function is used to adjust the filtered frequency. The real-time value (WF) is displayed in the image parameter area.

Smart Track

To optimize image parameters as per the current tissue characteristics for a better image effect. The angle and the position of the ROI are adjusted after the function is enabled. The area is tracked without being affected by the dynamic moves.

TIP:

The linear probes support the smart track.

Priority

This function is used to set levels of the flow display, to display the grayscale signal or color signal. The color image is preferred with higher value; while grayscale signals are displayed with the lower value.

Velocity Tag

This function is used to mark the specified velocity range in flow to check the flow function or specific flow velocity value.

Enable this function, the green mark appears on the color scale. Use trackball and <Set> to set the marking range and marking position.

iTouch (Auto Image Optimization)

To optimize image parameters as per the current tissue characteristics for a better image effect.

HR Flow (High Resolution Flow)

This function enhances the micro vessel imaging effect, and can be used to analyze the tissue blood supply condition.

Flash Control

This function suppresses low-speed flashing in red or blue.

TIP:

The SP5-1s adult cardiac, P8-2Ts, P7-3Ts probe supports Flash Control.

Artifact Control

This function suppresses high-speed bar artifacts caused by reverberation.

TIP:

The SP5-1s adult cardiac, P8-2Ts, P7-3Ts probe supports Artifact Control.

Smooth Style

This function can suppress image noise and eliminate speckle in the blood flow.

TIP:

The SP5-1s adult cardiac, P8-2Ts, P7-3Ts probe supports Artifact Control.

Filter Mode

This function can adjust the filter mode.

TIP:

The SP5-1s adult cardiac, P8-2Ts, P7-3Ts probe supports Artifact Control.

6.3 Power Mode

Power mode provides a non-directionally display of blood flow in the form of intensity as opposed to flow velocity.

DirPower (Directional Power Mode) provides the additional information of flow direction towards or away from the probe.

TIP:

In Power mode, the acoustic power is synchronous with that of B mode. Adjustment of the depth to the B mode image will lead to corresponding changes in Power mode image.

6.3.1 Power Mode Image Scanning

Perform the following procedure:

1. Select a premium image during B mode or B+ Color scan, and adjust to place the area of interest in the center of the image.
2. Select the Power Mode button to enter B+Power mode.
3. Change position and size of the Region of Interest (ROI).
4. Adjust the image parameters during scan to obtain optimized images.

6.3.2 Power Mode Image Parameters

Because both are based on Doppler color imaging, the adjustments of Power mode are same with these of Color mode's. Hence, only the adjustments of Power mode are introduced.

Power Gain

Refers to the overall sensitivity to flow signals, and this function is used to adjust the gain in Power mode. The real-time gain value is displayed in the image parameter area.

Map

This feature indicates the display effect of power image. The maps in Power mode image are grouped into two categories: Power maps and Directional Power maps.

- The Power maps provide information of blood flow, which are highly sensitive to the low-velocity flows.
- The Directional Power maps provide information of flow direction.

Dynamic Range

This function is to adjust the transformation of echo intensity into color signal.

Increasing dynamic range will lead to higher sensitivity to low-power signals, thus enhances the range of signals to display.

6.4 M Mode

6.4.1 M Mode Image Scanning

Perform the following procedure:

1. Select a premium image during B mode or B+ Color scan, and adjust to place the area of interest in the center of the image.
2. Select the M Mode button on the control panel, and adjust the sampling line as needed.
3. Select the M Mode button again or the Update button to enter M mode, and then you can observe the tissue motion along with anatomical images of B mode. During the scanning process, you can also adjust the sampling line accordingly when necessary.
4. Adjust the image parameters to obtain optimized images.

6.4.2 M Mode Image Parameters

Gain

To adjust the gain of M mode image, the real-time gain value is displayed in the image parameter area.

Increasing the gain will brighten the image and you can see more received signals. However, noise may also be increased.

Display Format

To set the display format of B mode image and M mode image.

Adjust according to the actual situation and obtain a desired analysis through comparison.

Speed

This function is used to set the scan speed of M mode imaging, and the real-time speed value is displayed in the image parameter area.

Tint Map

This function provides an imaging process based on color difference rather than gray distinction.

Gray Map

Adjusting grayscale contrast to optimize the image.

Edge Enhance

This function is used to increase image profile, so as to distinguish the image boundary.

Larger edge enhance may lead to noise increase.

Dynamic Range

Adjusts contrast resolution of an image, compresses or expands gray display range. The real-time dynamic range value will be displayed on the image parameter area on the top of the screen.

M Soften

This feature is used to process the scan lines of M images to reject noise, making the image details to be clearer.

6.5 Color M Mode (CM)

To know the cardiac motion state, CM is overlaid with flow based on M mode, which is more sensitive to the instantaneous signal changes. Then, it shows the diagnosis information in detail.

TIP:

Linear probe does not support Color M mode.

6.5.1 CM Image Scanning

Perform the following procedure:

1. To enter CM mode:
 - In B+M mode, select the Color Mode button.
 - In B+Color, select the M Mode button.
2. Select the M Mode button again to enter Color Flow M mode.
3. Adjust the image parameters to obtain optimized images.

6.5.2 CM Image Parameters

In CM mode, parameters that can be adjusted are in accordance with those in B, M and Color modes; please refer to relevant sections of B, Color and M mode for details.

The ROI size and position determine the size and position of the color flow displayed in the color M mode image.

6.6 Anatomical M Mode

For an image in the traditional M mode, the M-mark line goes along the beams transmitted from the probe. Thus it is difficult to obtain a good plane for difficult-to-image patients who cannot be moved easily. However, in the Anatomical M mode, you can manipulate the M-mark line and move it to any position at desired angles. The system supports anatomical M scanning in 2D imaging modes.

CAUTION

Anatomical M Mode and Color Anatomical M mode images are provided for reference only, not for confirming diagnoses. Compare the image with those of other machines, or make diagnoses using non-ultrasound methods.

6.6.1 Linear Anatomical M (Free Xros M)

Free Xros M imaging is supported on frozen B image, B+M image and B+Power/Color/TVI image.

Perform the following procedure:

1. Adjust the probe and image to obtain the desired plane in real-time B mode or M mode.
Or select the B mode cine file to be observed.
2. Select the Free Xros M on the menu area to enter Free Xros M mode.
3. Adjust the M-mark sampling line to obtain optimized images and necessary information.
 - Select and adjust the sampling line, the corresponding sampling line and the Free Xros M image appear on the screen.
 - Select whether to display the image of the current M-mark line or all.
You can choose to display the sampling line on the current image or all.
 - Switch among the sampling lines and press <Cursor> to show the cursor.
 - When the M-mark line is activated, move the trackball left and right to adjust the position.
The direction is recognized by the arrow at the end of the line.
 - When the M-mark line is activated, move the trackball to adjust the fulcrum of the line,
and adjust using the [Angle] deflector rod on the control panel.
 - When the M-mark line is activated, click <Update > to edit mark. Move the trackball and
press the left <Set > key to set the start point of the M-mark line. Press the right <Set >
key to set the end point of the M-mark line. Click <Update > again to exit.
4. Adjust the image parameters to obtain optimized images.
5. Select the B Mode button to return to real-time B mode.

6.6.2 Free Xros CM (Curved Anatomical M-Mode)

In Free Xros CM mode, the distance/time curve is generated from the sample line manually depicted anywhere on the image. Free Xros CM is used for TVI and TEI modes.

CAUTION

Curved anatomical M image in this manual that it is provided for reference, not for confirming a diagnosis. Generally it should be compared with other device or make a diagnosis by non-ultrasonic methods.

TIP:

Only phased probe supports Free Xros CM.

Perform the following procedure:

1. In real-time 2D mode, adjust the probe and image to obtain the desired plane.
2. Select the TDI mode button to obtain the image.
3. Select the Free Xros CM on the menu area to enter the Free Xros CM mode.
4. Move the cursor to define the start point of the sampling line on the 2D image.
The cursor displays as +, and can be moved within the B image only.
5. Press <Set> to fix the start point, and the digital number “1” is marked beside the point.
6. Move the cursor to define the next point and press <Set> key to confirm.

The system updates the time-motion curve in real time, and each point is marked with a number in sequence.

Select [Undo] to cancel the current point and activate the preview point.

7. Repeat Step 6 to finish the sampling line.
8. Double press <Set> to finish the editing.
9. You can edit the curve if needed:
 - a. After finishing the sampling line, select [Edit].
 - b. Move the cursor over the curve, press <Set> to activate the spot.
 - c. Move the cursor to change the shape of the curve.
 - d. Double press <Set> to finish the editing.

NOTE:

Select [Delete] to remove the curve, and select [Edit] to re-edit the curve.

10. Adjust the parameters to obtain the desired tissue of Free Xros CM image. Then, save the image.
11. Select the B mode button to exit.

6.6.3 Anatomical M Mode Parameters

In anatomical M mode, adjustable parameters are similar with these in M mode.

6.7 PW/CW Mode

PW (Pulsed Wave Doppler) mode or CW (Continuous Wave Doppler) mode is used to provide blood flow velocity and direction utilizing a real-time spectral display. The horizontal axis represents time, while the vertical axis represents Doppler frequency shift.

PW mode provides a function to examine flow at one specific site for its velocity, direction and features; while CW mode proves to be much more sensitive to high velocity flow display. Thus, a combination of both modes will contribute to a much more accurate analysis.

6.7.1 PW/CW Mode Image Scanning

Perform the following procedure:

1. Select a premium image during B mode or B+ Color (Power) scan, and adjust to place the area of interest in the center of the image.
2. Select the PW/CW Mode button to adjust the sampling line.

The sampling status will be displayed in the image parameter area.

3. Set the position of the sample line and the SVD by using the trackball, and adjust the angle and SV size according to the actual situation.
4. Select the PW/CW Mode button again or select the <Update> button to enter PW/CW mode and perform the examination.

Observe and calculate the data based on B mode or Color mode image. You can also adjust the SV size, angle and depth in the real-time scan.

5. Adjust the image parameters to obtain optimized images.

6.7.2 PW/CW Mode Image Parameters

Gain

This function is intended to adjust the gain of spectrum map. The real-time gain value is displayed in the image parameter area.

PW Sampling Gate

Adjusts the SV position and size of sampling in PW mode, the real-time value of SV and SVD are displayed in the image parameter area, in which SV represents the size of the sampling gate, and SVD represents the sampling depth.

CW Focus Position

To adjust the focus position of CW mode. The real-time focus position value is displayed on the image parameter area in SVD.

Image Quality

Refers to the transmitting frequency in Doppler mode of the probe, the real-time value of which is displayed in the image parameter area.

Scale

This function is used to adjust the speed range of color flow, which is adjusted through PRF in the system. The real-time PRF value is displayed in the image parameter area.

To provide a much clearer color flow image.

Use low PRF to observe low-velocity flows, and use high PRF to observe high-velocity flows.

iTouch

To optimize image parameters as per the current tissue characteristics for a better image effect.

Auto Calculation

This function is used to trace the spectrum and calculate the PW/CW mode image parameters. The results are displayed in the results window.

In real-time scanning, the results displayed are derived from the calculation of the latest cardiac cycle.

In the freeze and cine status, the results displayed are calculated from the current selected area.

- Auto Calculation Parameter: To set the calculation results to display.
- Auto Calculation Cycle: To set the heart cycle number for auto-calculation.
- Trace Area: To set the trace area of the Doppler wave in the spectrum map, applicable for auto calculation, V Max and V Mean display.
- Trace Smooth: To set the smooth level when tracing.
- Trace Sensitivity: This function is used to set the sensitivity of tracing in the spectrum.

Invert

This function is used to set the display manner of spectrum.

TIP:

It is available only for linear probes.

Speed

This function is used to set the scan speed of PW mode imaging.

T/F Res

Adjusts for a balance between time resolution and spatial resolution.

WF (Wall Filter)

To display the image accurately, it adjusts the cut-off used in the wall filter, and filters out the flow noise which is produced by vessel wall vibration. The real-time value is displayed in the image parameter area.

Tint Map

This function provides an imaging process based on color difference rather than gray distinction.

Gray Map

Selects among post processing map curves to optimize grayscale images.

Display Format

Sets the display proportion of PW mode image and B mode image.

Duplex/Triplex

This function is used to set if B image or B+Color image (Power) is scanned synchronously.

HPRF

HPRF mode is used when detected velocities exceed the processing capabilities of the currently selected PW Doppler scale or when the selected anatomical site is too deep for the selective PW Doppler scale.

Baseline

Refers to the area where the velocity is zero in the spectrum. The map changes after being edited.

Angle

This function is used to adjust the angle between Doppler vector and flow to make the velocity more accurate.

The real-time adjusting angle value is displayed in the image parameter area.

Quick Angle

Adjusts the angle faster in increments of 60°, and the real-time value of which is displayed in the image parameter area.

Dynamic Range

The dynamic range conveys the information that being transformed from echo intensity to gray scale.

Audio

Adjusts the output audio in spectrum Doppler.

PW Steer

Adjusts the scan angle in PW mode, so as to change the angle between the transmitting beam and flow direction.

Obtain more information with immobility of the probe.

Values of steer angles vary with the probe.

TIP:

PW Steer is available only for linear probes.

6.8 TDI

TDI mode is intended to provide information of low-velocity and high-amplitude tissue motion, specifically for cardiac movement.

There are 4 types of TDI mode available:

- Tissue Velocity Imaging (TVI): This imaging mode is used to detect tissue movement with direction and speed information. Generally the warm color indicates the movement towards the transducer, while the cool color indicates the movement away from the transducer.
- Tissue Energy Imaging (TEI): This imaging mode reflects the status of cardiac movement by providing the energy information, the larger the energy is, the brighter the color becomes.
- Tissue Velocity Doppler Mode (TVD): This imaging mode provides direction and speed information of the tissue.
- Tissue Velocity M Mode (TVM): This function assists to observe the cardiac motion through a direct angle.

6.8.1 TDI Mode Image Scanning

Perform the following procedure:

1. Select the TDI mode button to enter the TDI mode.
 - In B or B+Color mode: to enter TVI Mode, parameters of TVI mode will be displayed.
 - In Power mode: to enter TEI Mode, parameters of TEI mode will be displayed.
 - PW mode: select the TDI mode button and then select the PW mode button or <Update> button to enter TVD. The parameters of TCD are displayed.
 - M mode: select the TDI mode button and then select the M mode button or <Update> button to enter TVM. The parameters of TVM are displayed.
 2. Adjust the image parameters to obtain optimized images.
 3. Select the TDI mode button to exit from TDI mode and enter general imaging modes.
- Or, select the B mode button to return to B mode.

6.8.2 TDI Mode Image Parameters

In each TDI mode, the parameters that can be adjusted are similar to those in the color flow modes (Color, PW, and Power). See the relevant sections for details. The following introduces the specific items in TDI mode.

Tissue State

This function is used for fast image optimization.

6.8.3 TDI Quantitative Analysis

CAUTION

TDI is provided for reference, not for confirming a diagnosis.

NOTE:

To perform the strain and strain curve, the ECG curve is in need in case of the deviation in curve.

TIP:

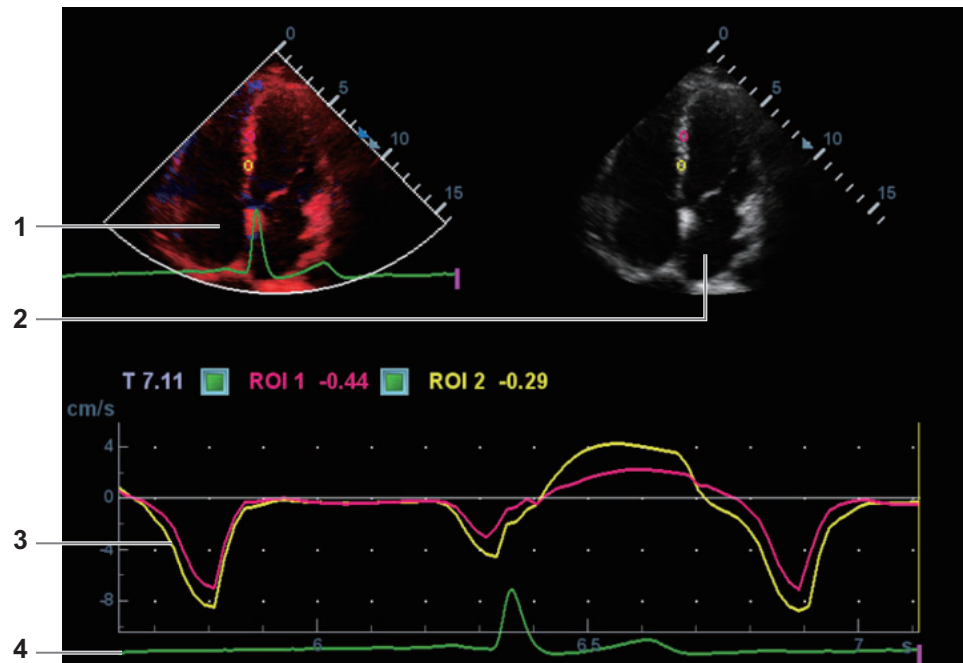
- The current image (in frozen state) and the saved image can be used in the quantitative analysis.
- Only after the user chooses the image review, the quantitative analysis is available. If the user chooses the static image (only one frame), the quantitative analysis is not available.

It is about analyzing the data of TVI imaging and measuring the velocity of the myocardium with the cardiac cycle.

Here are three types of curves to perform the quantitative analysis:

- Velocity-time curve
- Strain-time curve
- Strain rate-time curve
 - Strain: Deformation and displacement of the tissue within the specified time.
 - Strain rate: speed of the deformation, as myocardial variability will result in velocity gradient, strain rate is used commonly to evaluate how fast the tissue is deforming.

Figure 6-1 Quantitative analysis display (taking velocity-time curve as the example)



1	TDI review	Sampling area: indicates the sampling position of the curve. The sampling lines are marked with color numbers. It can mark 8 ROIs at most.
2	2D grey image review	<ul style="list-style-type: none"> • Use the trackball; the images in TDI review window and 2D review window are reviewed synchronously, since the two images are frozen at the same time. • ROI movement is linked between the TDI (Tissue Doppler Imaging) review window and the 2D imaging reviewing window.

3	Display analysis curve	<ul style="list-style-type: none"> Y-axis represents the velocity (unit: cm/s) [in strain-time curve, Y-axis represents the strain (%); in strain-time curve, Y-axis represents the strain (unit: 1/s)]. X-axis represents time (s); Frame mark: a white straight line perpendicular to the X-axis, and can be moved left and right by using the trackball. Click the check box in front of the ROI to display or hide the analysis curve. You can get the current X/Y axis value by moving the cursor onto one point on the curve; and if you press <Set> at this time, the frame marker will move to the spot.
4	ECG display area	/

Perform the following procedure:

1. Scan the image with the moves of myocardium on, freeze the image and select the scan scope, or open the image which includes the myocardium moves already.

NOTE:

- The current image (in frozen state) and the saved image can be used in the quantitative analysis.
- Only after the user chooses the image review, the quantitative analysis is available. If the user chooses the static image (only one frame), the quantitative analysis is not available.

2. Select the [TDI QA] button to enable the function.
3. Mark the interested myocardium area.

One image can save 8 ROIs at most, and draw the corresponding curve in image area. Each ROI has different color; the corresponding curve is painted with each color.

ROI settings:

- Select [Standard ROI]/[Ellipse ROI] to set a ROI method.
The cursor moves into the review area (TDI review window or 2D grey review window).
- Review to the desired frame.
- Move the cursor to one cine review window.
- Add a ROI.

When selecting "Standard ROI"	When selecting "Ellipse ROI"
Add ROI automatically after capturing the area. ROI size is decided by "Standard Height/Width/Angle".	<ol style="list-style-type: none"> 1. Press <Set> to confirm the start point. 2. Use the trackball and press <Set> to confirm the next point. 3. Press <Set> to complete the drawing.

You can press <Clear> to remove the last ROI.

4. Select the curve: [Speed], [Strain] or [Strain Rate].

For [Strain] or [Strain Rate], select [Strain Dist.] to select the corresponding value for Strain – Time curve or Strain Rate – Time curve.

If needed, select [ROI Tracking] to enable the function. This function provides a motion compensated ROI as precise time-intensity information can be acquired using active tracking. It can enhance the calculation accuracy as reducing the impact of probe or patient respiratory movement.

NOTE:

Elliptical ROIs can be positioned in any manner that keeps their center within the image boundaries. In the case that part of the ROI is outside the image boundary, only data from within the image boundary is used for calculating the mean intensity value.

5. Adjust the curve display:
 - X Scale: Choose different value, so that the X scale display manner will be changed. This function can be used to track detailed tissue information.
 - Smooth: Adjust the smooth feature of the curves.
6. Save the curves, and export the curve data, parameter data.
 - a. Select [Export].
 - b. Select the storage path and type the file name.
E drive is default; and the file type is .CSV.
 - c. Select [OK] to complete the export.

After being exported successfully, a BMP. file shows on the thumbnail area.

The exported data include:

- Current image;
 - Analysis curve data;
 - Analysis parameter.
7. Select [Exit] to exit the quantitative analysis.

6.9 iScape View (Real-time Panoramic Imaging)

The iScape panoramic imaging feature extends your field of view by piecing together multiple B images into a single, extended B image. Use this feature, for example, to view a complete hand or thyroid.

When scanning, move the probe linearly and acquire a series of B images. The system pieces these images together into a single, extended B image in real time. The system also supports out-and-back image piecing.

After obtaining the extended image, you can rotate it, move it linearly, magnify it, add comments or body marks, or perform measurements on the extended image.

The system provides a color iScape function, so you can get more information from extended images.

CAUTION

- It is provided for reference, not for confirming a diagnosis.
 - iScape panoramic imaging constructs an extended image from individual image frames. The quality of the resulting image is user-dependent and requires operator skill and additional practice to become fully proficient. Therefore, the measurement results can be inaccurate. Exercise caution when you perform measurements in iScape mode. A smooth and even speed will help produce optimal image results.
-

NOTE:

- Guidance and precautions for even movement:

- Make sure there is enough coupling gel along the scan path.
- Always move the probe slowly and steadily.
- Continuous contact is required throughout the length of the extended image. Do not lift the probe from the skin's surface.
- Always keep the probe perpendicular to the skin's surface. Do not rock, rotate or tilt the probe during the scan.
- The system accommodates a reasonable range of motion velocity. Do not make abrupt changes in motion speed.
- Deeper scans generally require reduced acquisition speed.

NOTE:

Needle mark cannot be displayed in iScape imaging mode.

6.9.1 Basic Procedures for iScape Imaging

Perform the following procedure:

1. Connect an appropriate iScape compatible probe. Make sure there is enough coupling gel along the scan path.
2. Select [iScape] to enter iScape.
3. Optimize the B mode image:
In the capture preparation status, press <Switch Mode> to switch to the B (Power) mode page tab to select B (Power) mode image optimization. Do measurement or add comment/bodymark to the image if needed.
4. Switch to [iScape] page to enter the iScape acquisition preparation status.
5. Select [Start Capture] or press <Update> button to begin the capture.
The system enters into image review status when the acquisition is completed. You can perform operations such as parameter adjusting.
6. Scan slowly to obtain a single extended field of view image. You can also erase and retrace if the image is not satisfactory.
 - During image acquisition, none of the parameters are adjustable, and functions such as measurement, comments and body marks are not available.
 - A green box on the image indicating the boundary between the merged images and the unfinished images.
 - During image slicing, the system gives feedback on the probe's moving speed in the form of colors and words. The meanings are as follows:

Status	ROI Color	Tip
Speed too low	Blue	Moving speed of the probe is too low.
Appropriate	Green	/
Speed too high	Red	Moving speed of the probe is too high.

7. Do one of following to end image capture:
 - Select [Stop Capture].
 - Press <Update>.

- Wait until the acquisition completes automatically.

After the acquisition is completed, the panoramic image will be displayed and the system enters iScape viewing mode.

6.9.2 Image Review

After the acquisition is completed, the panoramic image will be displayed and the system enters iScape viewing mode.

6.9.3 Evaluate image quality

Many variables may affect the overall image quality. It is important to evaluate the image content and quality before an image is used for diagnosis or measurements.

NOTE:

- iScape panoramic imaging is intended for use by well-trained ultrasound operators or physicians. The operator must recognize image items that will produce a sub-optimal or unreliable image.
 - If the image quality cannot satisfy the following criteria, you shall remove the image and capture it again.
 - The Image must be continuous (no part of an image moves suddenly or disappears.)
 - No shadow or absent signal along the scan plane.
 - Clear profile of anatomy through the entire scan plane without distortion.
 - Skin line is continuous.
 - The images are captured from the same plane.
 - There are no large black areas in the image.
-

6.9.4 Cine Review

Select [Review Cine] in panoramic image viewing status to enter cine reviewing mode. In cine reviewing mode, a frame marker indicates the sequence of the currently reviewed images in the panoramic image on the left-hand side of screen.

In cine review status:

- Use the trackball to review the captured images frame by frame.
- Select [Auto Play] to start or end auto play.
- In auto play mode, select [Auto Play] to change the play speed. When the speed is 0, the system exits auto play mode.
- Review to a certain image. Select [Set Begin] to set the start point. Review to another image. Select [Set End] to set the end point. In auto play mode, the review region is confined to the set start point and end point.
- Select [Return] to exit cine review mode. The panoramic image displays.
- In cine review mode, press the Freeze button to return to the acquisition preparation status.

6.10 Smart B-line

The lung acoustic impedance difference increases with the increase of lung liquids. The ultrasound waves produce strong reverberations in the lung at different depth. After multiple reflections, the comet tail sign is formed, which is perpendicular to the pleura plane. Starting from the pleura line,

the comet tail sign moves along with the lung and extends to the far field. The reverberation line perpendicular to the pleura plane is called Smart B-line.

Smart B-line is used to detect the B line of the lung in B mode. It supports B-line detecting in both real-time and freeze modes.

TIP:

- Smart B-line is only available in Single B imaging mode.
 - It supports single-frame and multi-frame image file detection in B mode.
-

6.10.1 Basic Procedures for Smart B-line

Perform the following procedure:

1. Select an appropriate probe and exam mode. The system enters the B mode by default.
2. Adjust the image parameters to obtain optimized images.
3. Select [Smart B-line] to enter Smart B-line mode.

Select the Scanning Areas to set different zone combinations for examination.

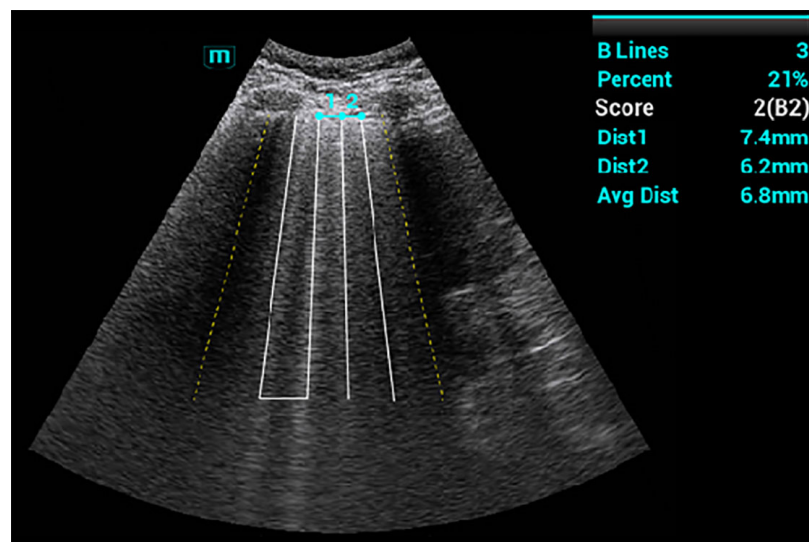
4. Select a desired zone, and select the Auto Calculate button.

The system automatically starts tracing the B line sampling area, and automatically recognizes and traces the B line in frame.

If necessary, use the trackball and <Set> buttons to adjust the B line sampling area.

5. Press the Freeze button to freeze the image.

The system automatically calculates the quantitative index, and the calculation results are displayed on the screen.



- B Lines: indicates the number of B lines of the current frame. The number can be 1, 2, 3, 4, or ≥ 5 . When the number is equal to or greater than 5, the system does not display a specific number.
- Percent: indicates the percent of the B lines area against the total sampling area.
- Score: the score is among 0 to 3.

Normal: when there are a lung sliding sign and A line, or isolated B lines (<3), it is marked as N in the brackets and the score is 0.

Moderate: when there are multiple clearly-distributed B lines, it is marked as B1 in the brackets and the score is 1.

Severe: when there are intensively fused B lines, it is marked as B2 in the brackets and the score is 2.

Lung consolidation: when the lung has a symptom that is similar to the liver lesion structure and air bronchogram, it is marked as C in the brackets and the score is 3. When the lung consolidation and pleural effusion occur at the same time, it is marked as C/P in the brackets and the score is 3.

- Dist n (B Line distance): indicates the distance between the 2 neighboring lines and is measured in the pleura line area, among which, n corresponds to the number between the 2 B lines.
- Avg Dist (B Line average distance): indicates the average distance of all B lines.

According to the quantitative index calculated by the system, you can add image and diagnosis information. Click the check box under the [Diagnosis] screen to select items:

6. Press the Save button to save the single-frame image and B line calculation results.

If necessary, press the Freeze button again to unfreeze the image. Repeat steps 4-6 to finish calculating other points.

6.10.2 Overview

After capturing images, select [Overview] to enter the Overview screen. The Smart B-line supports displaying two types of lung overviews in the main screen. You can switch the two lung overviews using the corresponding buttons on the touch screen.

- Image Map: Displays the ultrasound images of all zones, so as to check the overall lung condition. Every lung zone displays the ultrasound image with the highest percent of the B line area by default.
If a zone saves multiple ultrasound images, select the point corresponds to this zone, and select [Prev Item] and [Next Item] to switch the image.
- Color Map: Displays the color map of the lung and ultrasound image of a zone. The color map uses different colors to mark the ultrasound image analysis result of every lung zone. This analysis result is calculated from the ultrasound image with the highest percent of B line area. Select a point to check the calculation result of the zone related to this point.

6.11 Smart VTI

Smart VTI (Velocity-Time Integral) is used to calculate the CO (cardiac output) of the LVOT (left ventricular output tract), so as to quickly evaluate the cardiac function.

TIP:

Smart VTI supports B mode image calculation in real time.

Perform the following procedure:

1. Select a phased probe and Adult Cardiac exam mode.
2. Move the probe to capture an appropriate image of the long axis view of the left ventricular near the sternum.
3. Press the Measure button to enter the application measurement. Select the “LVOT Diam” item and the measurement cursor is displayed.

- a. Move the cursor to the starting point and press <Set> to confirm.
- b. Move the cursor to the end point.
Select the Clear button to cancel setting the starting point for measurement and <Update> to switch the active end and fixed end of the caliper.
- c. Press <Set> to set the end point.
4. Press the Freeze button to unfreeze the image. Move the probe to capture an appropriate image of the apical five chamber view.
5. Select [Smart VTI] to enter the Smart VTI mode.

The system will:

- Automatically trace the color VOI, and PW sampling line and sampling volume.
 - Automatically recognize the cardiac cycle: when there are ECG inputs, the ECG signals are preferred; when there are no ECG signals, the system automatically starts calculation.
 - Trace the LVOT spectrum in a cardiac cycle in real time to gain the VTI, HR, and CO results of the LVOT.
6. If necessary, adjust the color VOI, and PW sampling line and sampling volume:
 - Adjust the color VOI position and size, and the PW sampling line position.
 - Switch to PW image page and adjust the PW sampling volume.

After adjustment, the LVOT spectrum tracing and calculation results display in real time.

7. Press the Freeze button to freeze the image, and check the Smart VTI calculation results.

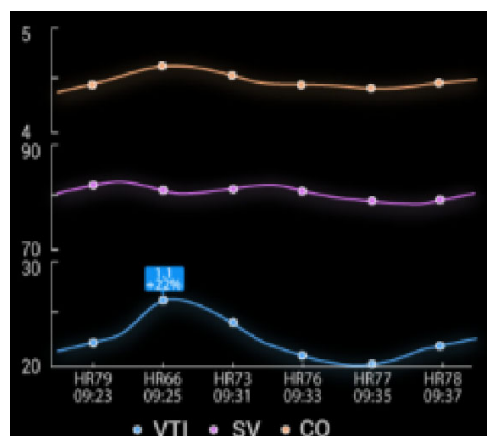
If necessary, you can edit the LOVT spectrum manually:

- a. Select [Edit VTI].
- b. Activate the cursor.
- c. Move the cursor to the spectrum tracing line and press <Set>.
- d. Move he cursor to trace a line.

After tracing, the calculation results display in real time.

8. Select [Save VTI] to save the Smart VTI calculation results of the current cardiac cycle to the report.
9. Select [Graph] to check the quantitative index trend curve.

VTI, SV, and CO have different trend curves and are differentiated by colors. A maximum of 6 sets of Smart VTI results can be saved and displayed.



6.12 Smart IVC

Smart IVC is used to automatically measure the IVC inner diameter and calculate the change rate in the B mode image. Measure the IVC (Inferior Vena Cava) in real time, and the system automatically tracks and measures the changes of IVC inner diameter. It can be used to assist in treatments, such as volume estimation and fluid infusion.

TIP:

Smart IVC supports calculation in both real time and freeze modes:

- Enable Smart IVC in real time. The calculation starts from the current frame and ends after the image is frozen.
 - Enable Smart IVC in freeze mode or from the cine file. The calculation starts from the current frame and ends at the last frame. If the cine length is no longer than 10 seconds, it is allowed to calculate in retrospective from the current frame after the cine length reaches 10 seconds.
-

Perform the following procedure:

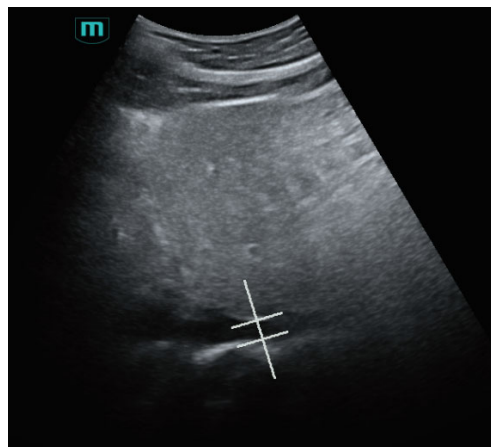
1. Select an appropriate probe and exam mode.
2. Move the probe to gain an appropriate IVC long axis image.
3. Select [Smart IVC] to enter Smart IVC mode and start calculation.
 - a. Select a breath type: Spontaneous Breath or Mechanical Ventilation.
 - b. Select [Change Resp time] > [Resp Time] to set a respiratory time.

The system measures the IVC inner diameter of the image in every frame, calculates the maximum and minimum IVC diameters, and draws a quantitative index change curve in real time.

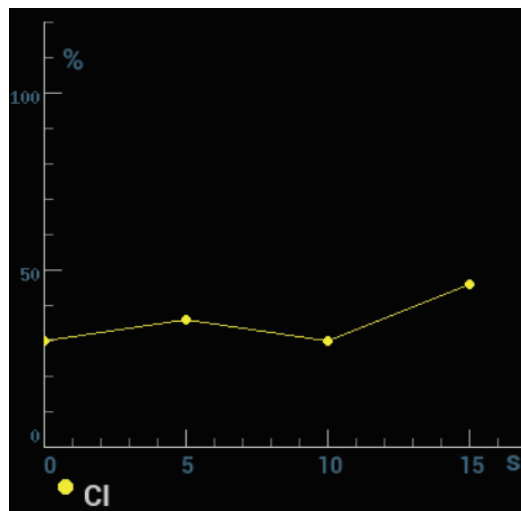
4. If necessary, you can adjust the IVC sampling line manually:
 - a. Select [Edit Line].
 - b. Select [Angle] to adjust the sampling line angle, and use the trackball to adjust the sampling line position.
 - c. Press <Update> to start calculating IVC again.
5. Press the Freeze button to freeze the image and finish calculating IVC.

The calculation results and quantitative trend curve are displayed on the screen. Select the diagnostic Information item to add diagnostic information to the image.

- B Mode Image and IVC Sampling Line:



- IVC CI (Collapsibility Index), DI (Distensibility Index), IVCV trend curve:



Corresponds to the selected breath type:

Spontaneous Breath: displays the IVC CI curve.

Mechanical Vent: displays the IVC DI curve and IVCV curve.

- Diagnostic Information

Displays the added diagnostic information.

- Calculation Results Window

The horizontal axis represents the time, which is displayed in the below Free Xros M image, and is traced along the IVC vessel wall.

Displays the calculation results within the current calculation range.

Dmax: indicates the maximum IVC inner diameter within a respiratory cycle.

Dmin: indicates the minimum IVC inner diameter within a respiratory cycle.

$$\text{IVC CI} = (\text{Dmax} - \text{Dmin}) / \text{Dmax}$$

$$\text{IVC DI} = (\text{Dmax} - \text{Dmin}) / \text{Dmin}$$

$$\text{IVCV} = (\text{Dmax} - \text{Dmin}) / [(\text{Dmax} + \text{Dmin}) / 2]$$

6. Select [Save Data] to save the calculating IVC results to the report.

6.13 Tissue Tracking Quantitative Analysis

⚠ CAUTION

Tissue Tracking Quantitative Analysis images are provided for reference only, not for confirming diagnoses.

Apart from TDI imaging function, the system also provides tissue tracking QA function for myocardial movement evaluation.

By tissue tracking QA function, the ultrasound system will scan each pixel position by frame within the cardiac cycle, and then use region matching method and auto-correlation searching method to trace each spot and calculate the movement, so as to determine myocardial motion in a more quantitative way.

NOTE:

Only use the probes that support stress echo function under the cardiac mode to start Tissue Tracking QA function.

6.13.1 Basic Procedures for Tissue Tracking QA

Perform the following procedure:

1. Open a saved B mode cardiac cine file.
A cin. format file which contains more than 1 cardiac cycle (with 2 R waves).
2. Select [Tissue Tracking QA] to activate the function:
 - Select [TTQA-LV] when opening the cine image of left ventricular heart, or [TTQA-RV] when opening the cine image of right ventricular heart.
 - You can determine the image of interest by previewing the image.
 - Select and find the image of interest.
 - When opening a cardiac cine file without ECG signal, cardiac cycle can be set by trackball or [Free Xros M].
3. Select the corresponding section name and locate one frame image with good image effect by cine play. Use the cursor to set the reference point:
 - Long axis section: use the “3-point” method or “Manual” method to set.
 - Short axis section: enter multiple points (at least 6 points) using the cursor manually to set.
4. After reference points are set, the system will display the boundary of the endocardium and epicardium. Adjust the thickness if necessary.
If the traced result is poor, select [Reload] to re-trace the reference points, or make fine adjustments to the points using the cursor.
If the cycles are not adequate to provide the information, switch to another cycle to trace.
5. Select [Start Tracking] to start the tracking function. Adjust the parameters if necessary.
Select [Edit] to display the cursor. Use the trackball and press <Set> to re-select the trace reference points (inner dots of the curve). Move the cursor to the exact boundary position and press <Set> again to set the right place. Select [Start Tracking] to start tracking again.
6. Select [Accept & Compute] to calculate and display the curve.
Adjust the parameters if necessary.
7. Select [Bull’s Eye] to see the result.

NOTE:

Bull’s Eye is unavailable in TTAQ-RV.

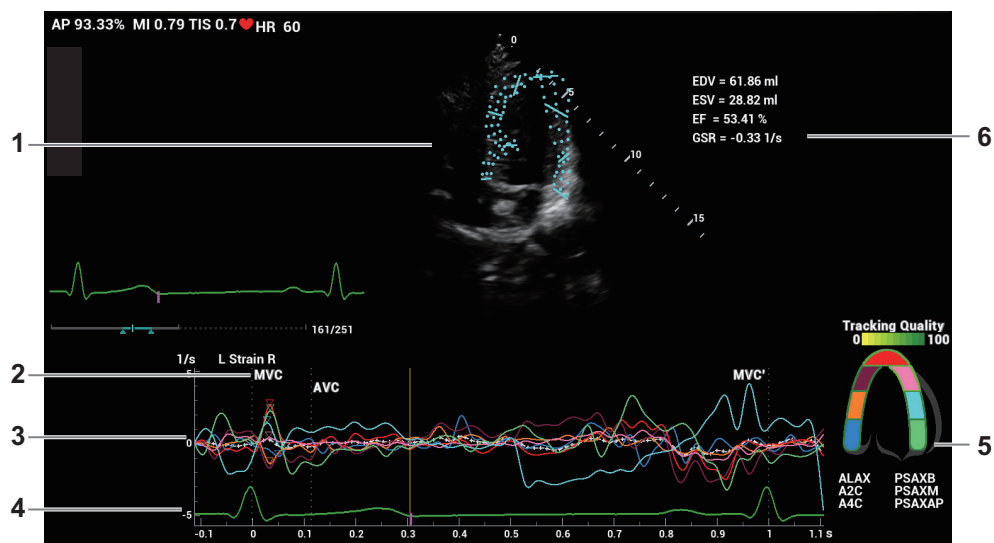
8. If necessary, press <Save> key to save the result.
9. If necessary, repeat steps 3-8 to track the next section.

NOTE:

The screen displays the result of the current section, and the bull’s eye graph shows the average value of all the tracked sections.

10. Select [Data Export] to export analyzed data.
11. Select [Exit] to exit.

6.13.2 Screen Display of Tissue Tracking QA



1	Displays image used to generate trace curve	/
2	Displays corresponding time of AVO (aortic valve open)/ AVC (aortic valve close)/ MVO (mitral valve open)/ MVC (mitral valve close).	/
3	Display curve: Velocity/ Displacement/Strain/Strain Rate.	<p>Each curve on the image is matched with a certain segment in the cardiac segmentation model (6), identified by different colors.</p> <ul style="list-style-type: none"> • Velocity curve: X-axis represents time (s); Y-axis represents velocity (cm/s). • Displacement curve: X-axis represents time (s); Y-axis represents displacement (mm). • Strain curve: X-axis represents time (s); Y-axis represents deformation of the tissue (%). • Strain-rate curve: X-axis represents time (s); Y-axis represents strain by time (s^{-1}).
4	Displays ECG trace	/
5	Displays cardiac segmentation model, and each segment name is illustrated beneath the model.	<ul style="list-style-type: none"> • In the figure, ∇ marks the peak position of the curve. • Under tracking status, click on a segment in the cardiac segmentation model. The segment has "X" mark and its corresponding calculating is eliminated. • Select certain segment in the cardiac segmentation model, the segment will turns grey and its corresponding curve no longer displays. • You can get the current X/Y axis value by moving the cursor onto one point on the curve; and if you press <Set> at this time, the frame marker will move to the spot. <p>The segment boundary color indicates the tracking quality.</p>

6	Displays measurement and calculation results	<ul style="list-style-type: none"> • EDV: Maximum value of the end diastolic volume during the trace. • EDA: Maximum value of the end diastolic area (Left Ventricular) during the trace. • ESV: Maximum value of the end systolic volume (Left Ventricular) during the trace. • ESA: Maximum value of the end systolic area (Left Ventricular) during the trace. • FAC (for short axis section): Fractional Area Change= (EDA — ESA)/EDA • EF (for long axis section): Ejection fraction • HR: Heart rate • Global strain of all segments. • Displays when strain rate curve is acquired. • Global strain rate of all segments. • Displays when strain rate curve rate is acquired. <p>Also on Bull's Eye figure, the system displays TPSD value: Time to Peak Standard Deviation (TPSD): Where, standardized value of time to peak data: $\{TP_i i \in [1, N]\}$. (N is the number of time to peak data) Average value of standardized value of time to peak data: \overline{TP}, and the standard deviation is</p> $TPSD = \sqrt{\frac{\sum_{i=1}^N (TP_i - \overline{TP})^2}{N}}$
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6.13.3 Select Image and Cardiac Cycle

You can select images with a better image quality so as to guarantee the analysis result.

Switch the cine file

1. Select the Review button to enter the review state.
2. Double-click the target file.
3. The system closes current displayed file and switch to the newly selected file.

Switch cardiac cycle within the cine file

Select [Circle] to select when opening a cine which includes multiple cardiac cycles.

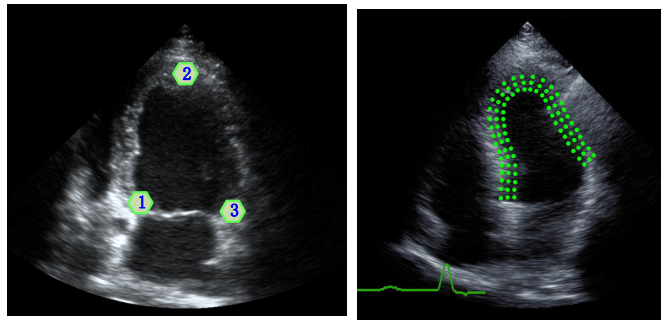
6.13.4 Myocardial Boundary Tracing

Tracing

The system provides 2 kinds of tracing method for 2 kind of sections. Long axis section (A4C, A2C, ALAX): 3-point method and manual tracing method are both available. Short axis section (PSAX B, PSAX M, PSAX AP): only manual tracing is available.

- 3-point method

As shown in the following figure, after operation by pressing <Set> to place 3 points on the image, the system generates the trace automatically.



- Manual trace method
Press <Set> and move the cursor by using the trackball along the boundary to add the trace points gradually, after trace is finished, press <Set> twice to finish tracing.

NOTE:

At least 6 points should be determined by you before the system generates automated trace.
Press <Set> to make the traces on the image clockwise or anticlockwise.

Retracing

If current trace is not satisfactory, select [Reload] to clear the trace and to start another tracing.
During the tracing drawing, select the Clear button to clear already traced drawing.

Make fine adjustment to the trace

You can make fine adjustments to the trace after it is completed.

Perform the following procedure:

1. Under tracing curve adjusting status, the cursor turns into \square .
2. Move the cursor to the editable point, press <Set>.
3. Use the trackball to drag the curve to desired position, press <Set> again to set the point to the new position.
4. Repeat step 2~3 above to finish all points that need adjustment.

TIP:

Under tracking status, select [Edit] to enter the status.

6.13.5 Basic Operations of TTQA

Switch among the operation controls

- [Start Tracking]: select to start tracking.
- [Accept & Compute]: select to start calculation and display the curve.
- [Exit]: select to exit tissue tracking.
- [Parameter]: rotate to select the curve type.
- [Bull's Eye]: select to turn on/off bull's eye and peak data table.
- [Auto Play]: change the speed of the play.

View Selection

Before tracing, touch the corresponding keys to select for the view.

- [A4C]: apical four chamber.
- [A2C]: apical two chamber.

- [ALAX]: apical long-axis view, also called 3-chamber view.
- [PSAX B]: short axis view of base section, short axis view of mitral valve.
- [PSAX M]: short axis view of base section, short axis view of papillary muscle.
- [PSAX AP]: short axis view of apex.

Parameter Adjustment

- [Thickness]: adjusts the tracing thickness, i.e., the distance between the endocardium wall and the tracking points on the epicardium.
- [Tracking Points]: adjusts the number of points within the segment.
- [Cycle]: select the next cycle.
- [Display Effect]: turns on/off the arrow vector graphical display of the myocardial movement.
- [Velocity Scale]: adjust the scale length of the velocity.
- [Display Style]: display the endometrial, the epicardium, the myocardial or all.
- [Tracking Cycles]: select the cycles to be tracked.
- [Average Cycles]: obtain the average parameter curves of the tissue.
- [Cycle Select]: select among different cycles.

Manual Input

Function: Manually set the position of MVC/MVO/AVO/AVC displayed in the curve.

Steps: In [TTQA-LV], open a saved B mode cardiac cine file, and select [Manual Input] to enter the mitral valve opening and closing time and aortic valve opening and closing time.

- [R to MVO]: set aortic valve open time.
- [R to MVC]: set aortic valve closure time.
- [R to AVO]: set mitral valve open time.
- [R to AVC]: set mitral valve closure time.
- [Data entered manually is preferred]: If selected, the timing is applicable to all cardiac view.

Time Mark

According to the status of the current section, select the corresponding key on the touch screen to check the matching time.

- [AVO]: displays aortic valve open time.
- [AVC]: displays aortic valve closure time.
- [MVO]: displays mitral valve open time.
- [MVC]: displays mitral valve closure time.
- [PVO]: displays pulmonary valve open time.
- [PVC]: displays pulmonary valve closure time.
- [TVO]: displays tricuspid valve open time.
- [TVC]: displays tricuspid valve closure time.

Curve Display

Select [Parameter], the system provides different curves of different segments for observation.

Select [Peak], mark the systolic, diastolic or global peak points of the curve.

- General
 - Speed curve: The X-axis represents time (s); the Y-axis represents velocity (cm/s).
 - Displacement curve: The X-axis represents time (s); the Y-axis represents displacement (cm).

- Long axis section
 - Volume: The X-axis represents time(s); the Y-axis represents volume (ml).
 - Strain curve (Longitudinal, Transversal): The X-axis represents time (s); the Y-axis represents strain deformation of the tissue (%).
 - Strain-rate curve (Longitudinal, Transversal): The X-axis represents time (s); the Y-axis represents strain by time (s^{-1}).
- Short axis section
 - Area curve: The X-axis represents time(s); the Y-axis represents area (cm²).
 - Strain curve (Radial, Circumferential): The X-axis represents time (s); the Y-axis represents strain deformation of the tissue (%).
 - Strain-rate curve (Radial, Circumferential): The X-axis represents time (s); the Y-axis represents strain by time (s^{-1}).
 - Circumferential Rotation curve: The X-axis represents time (s); the Y-axis represents rotation of the tissue (Deg).
 - Circumferential Rotation Rate curve: The X-axis represents time (s); the Y-axis represents rotation by time (Deg/s).

Twist & Twist Rate Curve

The system provides left ventricular twist data based on short axis sections of PSAX AP and PSAX B. Twist is acquired by calculating difference of apex and base of the heart.

$$\text{Twist} = \text{PSAX AP Rot.} - \text{PSA XB Rot.}$$

- The X-axis represents time (s).
- The Y-axis represents twist by time (Deg/s).

6.13.6 Bulleye

After tracking, the system can display Bull's Eye graph, so as to judge reverse movement or scope of myocardium.

1. Select [Bull's Eye] to turn on the function:

You can acquire:

- Time to peak value and peak value of the 17 segments (similar to 16 segments);
 - Display measurement result EDV/ESV/EF/TPSD/PeakSD.
2. Use [Parameter] to see different parameter bull's eye graph.
- “-” will display in the table to indicate those segments that are not well tracked.

6.13.7 Measurement/Comment

Under tissue tracking QA mode, only Time measurement is available. For details, please refer to Operator's Manual *Advanced Volume*.

Comments and Body Mark operations are the same as in other modes.

6.13.8 Data Export

The system provides data exporting function, so that you can export calculation result for analysis (for instance, SPSS analysis).

Select [Data Export] to export analyzed data of each segment.

6.14 Stress Echo

Only the phased probes support stress echo function under the cardiac mode.

CAUTION

Stress echo data are provided for reference only, not for confirming diagnoses.

The Stress Echo feature allows you to capture and review cardiac loops for multiple-phase (multiple-stage) Stress Echo protocols.

Stress Echo data consists of Stress Echo loops, wall motion scores, and all other information pertaining to the Stress Echo portion of a patient examination.

A loop is a clip that displays the motion of an entire heart cycle, or from the beginning systole to the end systole, as indicated by the R-wave of the ECG trace and determined by the QT – Time Table.

The loops in a given protocol are acquired by stages (phases), according to stage configuration (continuous (prospective) or retrospective (non-continuous)).

- Loops in non-continuous stages are limited to a specified loop-per-view maximum (such as four). View labels can only be selected in the configured order. Acquisition is retrospective - when you press <Save> on the control panel, the system saves the previously acquired images.
- Loops in continuous stages are limited by time rather than a maximum number of loops - the system stops acquisition after two minutes. Acquisition is prospective - when you select the stage label and then press <Save> on the control panel, the system starts saving newly acquired images. In some protocols, the system will jump to Select Mode after retrospective saving.

When images are saved, the system places a checkmark to the right of the view or continuous stage and then shifts the red mark to the next view or next stage.

6.14.1 Stress Echo Acquisition Procedure

To acquire Stress Echo loops, you must enable the ECG function.

Perform the following procedure:

1. Use the proper probe and cardiac-related exam mode, select [Stress Echo] to enter stress echo imaging.

The system displays the “Select Protocol” window with the protocol selections.

2. Select the desired protocol and then select [OK].

The system displays the real-time imaging screen.

- If the Stress Echo manual ROI option is selected in the Maintenance dialog box, the system also displays a region of interest (ROI).
 - If Acquire Mode is set as Full-screen in Maintenance, then no ROI box is displayed.
3. According to the help information in the bottom of the screen, if an ROI is displayed, adjust the ROI size and position. Press <Update> on the control panel to confirm the ROI.

When you confirm the ROI size by pressing <Update>, you cannot adjust the ROI size during acquisition. You can only adjust the ROI position.

4. Press <Save> on the control panel to start acquisition.

The system displays the Protocol window on the screen, listing the phases for the selected protocol along with the first phase views (phases are stages). The system selects the first view for acquisition by default.

5. Proceed through each view in each stage according to the following instructions:

Non-continuous stages:

- To save acquired images for the selected view, press <Save> on the control panel. The system goes to the next view for acquisition by default, saved views are marked with a “√.”
- Use [Stages: XXX] or [Views: XXX] to select the stage and view for image acquisition (or reacquisition). Press <Save> to start acquisition.

Views can be re-acquired until you select [End Acquisition].

If the protocol contains continuous stages (for alternative workflows), then proceed through each continuous stage according to the following instructions:

- To begin saving acquired images for the selected stage, press <Save> on the control panel.
- The system displays a percentage marker below the selected stage indicating the progress of the continuous capture.
- To halt saving acquired images for the selected stage, select [Pause] or press the Freeze button directly. The percentage stops increasing.
- Select [Continue] or press the Freeze button again to continue.
- To end the current acquisition, press <Save> on the control panel.
- To select another continuous stage, use [Stages XXX] on the touch screen.
- Suspending is not allowed under continuous exam.

When acquisition is complete for each stage, the system advances to the next stage. If the stage is non-continuous, the system displays the stage views. When image acquisition is completed for all views and continuous stages, the system switch to Select Mode.

6. To start or restart the timer, select [Stage Timer]/[Exam Timer] to turn it on.

The Stage time is displayed to the right side of each stage in the protocol list, while the Exam time is displayed in the left side of the screen.

Each saved image will be marked with two times T1 and T2. T1 refers to the total time of the whole acquisition, while T2 indicates the time the acquisition lasted for a certain stage.

7. To review loops before ending acquisition, select [Review/WMS]. You can redisplay the real-time imaging screen to continue acquisition by selecting [Acquire].
8. To end the acquisition and review the acquired images, select [End Acquisition].

When the acquisition is ended, no stress echo image acquisition can be performed for the same exam.

6.14.2 Selecting Preferred Stress Echo Loops (Select Mode)

The selected clips are used for analysis in the review mode and wall motion scoring mode. Select Mode is used to select the best loops of the examination.

When the acquisition is ended, select mode is enabled automatically.

In Select Mode, you can select the representative loop (“preferred” loop) for each view.

To select “preferred” loops:

1. Use <Switch Mode> and <Update> key according to tips in the trackball hint area or select [Select] to enter the Select Mode, or the system enters the Select Mode directly after the acquisition is finished.
2. Select the loop. Use the buttons displayed during Select Mode to designate another loop or another view for display.
 - Use [Stages: XXX] or [Views: XXX] to select the target stage/view.

- Single-click a clip to select the clip for current stage/view and zoom in the clip to the full-screen.
 - Double-click a clip. The clip will be magnified.
 - Select [First/Last] or [Previous/Next] to display another loop in the current view.
3. Select the stage and view to display all loops for the view and then continue designating the “preferred” loop for each displayed view until all views are completed.

Description of select mode controls:

Selection	Description
Stages XXX	To select a stage.
Views XXX	To select a view.
Acquire/Select/ Review/ WMS	To switch the mode status.
1. Clip/2. Clip/3. Clip/4. Clip	For selecting views in the selected stage.
Next	Next four Clips.
Previous	Previous four Clips.
First	Go to “first” Clips.
Last	Go to “last” Clips.
Play	Click to play/stop cine play.
Prev frame	See previous frame of the cine file.
Next frame	See next frame of the cine file.
First frame	See first frame of the cine file.
Last frame	See last frame of the cine file.
Speed decrease/Speed increase	Decreases or increases playback speed.
Text	Function that turns the screen graphic text “On” or “Off”. Information includes: name of level, name of view, heart rate, time stamp acquisition, timers, frame slider, loop ID, clip control. For the cine without distributed view, the name of level and name of view are displayed in “--”.
Apply edit all	Clip edit applied to all clips taken.
Clip Length	Specify the clip segments: systole, diastole, full cycle or customized.
Bookmark	For continuous acquisition, when the bookmark is set to “On”, only the selected loops for the current view can be displayed.
Delete Unselected	Delete clips that are not selected. If selected, the system will delete all clips that are not selected after the exam is ended.
Suspend exam	Pauses the stress echo exam but does not end the stress echo exam. When a stress echo exam is suspended, the user can perform image acquisition of all other imaging modes, or perform operations such as measurement.
End SE exam	End the stress echo exam.
Tissue Tracking QA	Access the tissue tracking quantitative analysis.

6.14.3 Review/WMS Mode

Review/WMS mode is used by cardiologists to evaluate clips for cardiac wall motion abnormalities. Different views from different stages are selected for comparison across a wide variety of combinations. The most common workflow is to compare “same views” but at “different stages” of the exam (e.g., PSLA view, Rest stage compared to PSLA view, Post-exercise stage).

Enter review mode

Select [Review/WMS] to enter review mode, and then select the label of the phase or view (for example, Rest or Long Axis), the system displays all loops that represent the selected phase or view.

To display phases for the selected view(s)

Perform the following procedure:

1. To include a phase or view for display, select the leftmost, gray box to the left of each required phase and/or view.

The system inserts a checkmark into each selected gray box.

2. To exclude a phase or view from display, select the blue box to the left of each required phase and/or view.

The system inserts a X into each selected box, like ☒.

3. Select [Display Selected] on the touch screen.

The system displays the selected phases for each selected view side by side.

To display all views for a specific phase

Select the phase label (for example, Rest).

To display all phases for a specific view

Select the view label (for example, PLAX).

The system displays all phases for the selected view.

To display a loop in full-screen format

1. Double-click the loop to display in full-screen format.
2. Double-click the loop again to display the loop in its initial size, select the loop again.

Description of review/WMS mode keys (keys with the same function as in select mode are not described below):

Item	Description
Review/WMS	<p>Perform side-by-side comparison of the same views at different stages (PLAX, PSAX, A4C, A2C at “Rest” compared to PLAX, PSAX, A4C, A2C “Post-Exercise”). Clips are synchronized.</p> <ul style="list-style-type: none"> Under [Text] “Off” status, when you select one stage, all view loops are displayed on the screen; when you select one view, all loops of the same view in different stages will be displayed on the screen. Set [Text] to “On”, the system will select loops of first two views of the first two stages to display automatically. If you choose [Previous], then loops of the next two views of the first stages will be displayed. If you choose [Next], loops of the first two views in the 3rd and 4th stage will be displayed. <p>In the meantime, if you choose one stage, loops of all views under this stage will be displayed on the screen (4 at most), and choosing one view will lead to loops of this view in different stages be displayed (4 at most).</p>
Display Selected	Displays loops of all the stages and views selected.

Wall Motion Scoring

The WMS-Report lists user-assigned wall motion scores and associated data.

The Wall Motion Score (WMS) measurement is an application prepared for assisting in stress echo semi-quantitative evaluations of abnormalities with left ventricular wall motion or changes in wall thickness. The left ventricle is divided into segments for scoring to evaluate the degree of abnormality from the sum of the scores in each segment using the motion of the walls of the entire left ventricle.

You can assign wall motion scores to specific portions within each view (representative loop). You can also assign a normal wall motion score (WMS) to the currently selected view or to all displayed views.

Two methods of chamber segment division, ASE 16 and ASE 17, are supported. In addition, each segment has 3 kinds of scoring method: 4, 5 and 7 points. Select through the [Scoring] control on the touch screen.

To assign a wall motion score (WMS):

1. Select a colored number.

The meanings and colors used in segments are listed in the table below.

Score	Meaning	Color
1	Normal	Green
2	Hypokinesis	Yellow
2.5	Severe Hypokinesis	Khaki
3	Akinesis	Blue
4	Dyskinesis	Red
5	Aneurysm	Purple

2. Use the trackball to select the value and then click the target segments, then the segment is assigned with a value.

3. Repeat step 2 to perform value assign for all segments.
 - To assign a normal wall motion score (WMS) to all currently displayed views:
Select [Set All Normal] on the touch screen.
 - To assign a normal wall motion score (WMS) to the currently selected view:
Select [Set Current Normal] on the touch screen.

6.14.4 Saving Stress Echo Data

Stress Echo data consists of Stress Echo loops, wall motion scores, and all other information pertaining to the Stress Echo portion of a patient examination.

When the exam is ended, the system will save all images within the exam.

6.14.5 Exiting the Stress Echo Feature

To exit the Stress Echo feature:

Select [End SE exam] on the touch screen.

6.14.6 Measurement and Report

Suspend the stress echo exam by selecting [Suspend Exam]. Press the measurement related keys or buttons to enter cardiology measurement.

Reports contain the entered indication, if any, and also any entered comments that are specific to the report. You can include or exclude data from specific phase(s). You can preview and print the report for the currently selected mode. You can also enable colored report printing in Maintenance.

You can enter indications or comments for display in Stress Echo reports.

To enter an indication:

1. Select the Report button to open the report.
2. Use the keyboard to enter text in the Indication dialog box and then select [OK].

6.15 Strain Elastography

CAUTION

It is provided for reference, not for confirming a diagnosis.

TIP:

Select an appropriate probe before performing elastography imaging scan, see System Overview chapter.

It is produced based on the slight manual-pressure or human respiration in 2D real-time mode. The tissue hardness of the mass can be determined by the image color and brightness. Besides, the relative tissue hardness is displayed in quantitative manners.

6.15.1 Basic Procedure for Strain Elastography

Perform the following procedure:

1. Perform 2D scan to locate the region.
2. Select [Elasto] to enter the elastography mode.

The system displays two dual B+E windows in real time. The left one is 2D image, and the right one is elasto image.

3. Adjust ROI size and position according to the actual situation.
4. Press the probe according to the experiences and actual situation.

The screen displays the pressure curve in real-time:



Where, the X-axis represents time and Y-axis represents pressure.

5. Adjust the image parameters to obtain optimized image and necessary information.
6. Select the B mode button to exit, and then return to B mode.

6.15.2 Image Parameters

Smooth

Adjust the smooth feature of the Elasto image.

Opacity

Adjust the opacity feature of the Elasto image.

Invert

Invert the E color bar and therefore invert the colors of benign and malignant tissue.

Single E

To switch between the B+E dual window and the single E window.

E represents the Elastography image.

Map

Select different maps for observation.

6.16 Contrast Imaging

The contrast imaging is used in conjunction with ultrasound contrast agents to enhance imaging of blood flow and microcirculation. Injected contrast agents re-emit incident acoustic energy at a harmonic frequency much more efficient than the surrounding tissue. Blood containing the contrast agent stands out brightly against a dark background of normal tissue.

CAUTION

- Set MI index by instructions in the contrast agent accompanied manual.
- Read contrast agent accompanied manual carefully before using contrast function.

NOTE:

- Make sure to finish parameter setting before injecting the agent into the patient to avoid affecting image consistency. This is because the acting time of the agent is limited.

- The applied contrast agent should be compliant with the relevant local regulations.
-

TIP:

Select an appropriate probe for Contrast Imaging, see System Overview chapter.

6.16.1 Basic Procedures for Contrast Imaging

Perform the following procedure:

1. Select an appropriate probe, and perform 2D imaging to obtain the target image, and then fix the probe.
2. Select [Contrast] to enter the contrast imaging mode.
3. Adjust the acoustic power experientially to obtain a good image.
Set [Dual Live] to be “On” to activate the dual live function. Observe the tissue image to find the target view.
4. Inject the contrast agent, and set [Timer 1] at “ON” to start the contrast timing. When the timer begins to work, the time will be displayed on the screen.
5. Observe the image, use [Pro Capture] and [Retro Capture] button to save the images.

Press the Freeze button to end the live capture.

Perform several live captures if there are more than one interested sections.

6. At the end of a contrast imaging, set [Timer 1] at “OFF” to exit the timing function.

Perform steps 3-6 if necessary.

For every single contrast imaging procedure, use [Timer 2] for timing.

If necessary, activate destruction function by setting [Destruct] at “ON” to destruct the micro-bubbles left by the last contrast imaging; or to observe the reinfusion effect in a continuous agent injecting process.

7. Exit contrast imaging.

Press the B mode button to return to B mode.

6.16.2 Left Ventricular Opacification

Perform the following procedure:

1. Acquire ECG signal.
2. Select an appropriate probe and LVO exam mode.
3. Adjust the acoustic power experientially to obtain a good image.
Set [Dual Live] to be “On” to activate the dual live function. Observe the tissue image to find the target view.
4. Inject the contrast agent, and set [Timer 1] at “ON” to start the contrast timing. When the timer begins to work, the time will be displayed on the screen.
5. Observe the image, use [Pro Capture] and [Retro Capture] button to save the images.

Press the Freeze button to end the live capture.

Perform several live captures if there are more than one interested sections.

6. At the end of a contrast imaging, set [Timer 1] at “OFF” to exit the timing function.

Perform steps 3-6 if necessary.

For every single contrast imaging procedure, use [Timer 2] for timing.

If necessary, activate destruction function by setting [Destruct] at “ON” to destruct the micro-bubbles left by the last contrast imaging; or to observe the reinfusion effect in a continuous agent injecting process.

7. Exit contrast imaging.

Press the B mode button to return to B mode.

6.16.3 Low MI Contrast Imaging

This feature enhances echo reflection by using contrast agent to perform myocardial analysis based on echocardiography technique.

Perform the following procedure:

1. Acquire ECG signal.
2. Select an appropriate probe and cardiac exam mode.
3. Adjust the acoustic power experientially to obtain a good image.

Set [Dual Live] to be “On” to activate the dual live function. Observe the tissue image to find the target view.

4. Inject the contrast agent, and set [Timer 1] at “ON” to start the contrast timing. When the timer begins to work, the time will be displayed on the screen.
5. Observe the image, use [Pro Capture] and [Retro Capture] button to save the images.

Press the Freeze button to end the live capture.

Perform several live captures if there are more than one interested sections.

6. At the end of a contrast imaging, set [Timer 1] at “OFF” to exit the timing function.

Perform steps 3-6 if necessary.

For every single contrast imaging procedure, use [Timer 2] for timing.

If necessary, activate destruction function by setting [Destruct] at “ON” to destruct the micro-bubbles left by the last contrast imaging; or to observe the reinfusion effect in a continuous agent injecting process.

7. Exit contrast imaging.

Press the B mode button to return to B mode.

6.16.4 Image Parameters

When entering contrast imaging mode, the screen displays the contrast image, and if [Dual Live] item on the touch screen is “ON”, both the contrast image (marked with “C”) and tissue image (marked with “T”) are displayed (the two window position can be changed).

Parameters in Contrast mode are similar to those in B mode; please refer to B chapter for details, special Contrast imaging parameters are introduced in the following.

Timer

NOTE:

The starting time displayed may be inconsistent with the actual one due to system error or some other man-made mistakes; please check the agent-injecting time.

The two timers are used to record total time of contrast imaging and single time of one contrast exam.

After the image is frozen, Timer 1 is still timing, and after unfreezing the image, the corresponding time can be seen.

Timer 2 stops timing when one contrast exam is frozen, and after unfreezing the image, the Timer 2 is off.

Set [Timer 1] as “ON” to start the timing at the moment you inject the contrast agent. Here, the screen displays the times at the lower corner.

Micro-bubble Destruction

CAUTION

Use the contrast imaging according to the residual level of the micro-bubbles, using contrast imaging continuously may result in human harm.

Destruct the micro-bubbles left by the last contrast imaging; or to observe the reinfusion effect in a continuous agent injecting process.

Select [Destruct] to enable the micro-bubble destruction function:

- DestructAP: Adjust the destruct acoustic power.
- Destruct Time: Adjust the destruct time.

Dual Live

In live mode or freeze mode, set [Dual Live] as “ON” to enable dual live function. Both the contrast mode and tissue mode are displayed. The THI and B image are displayed on the screen if the [Dual Live] is enabled.

TIP:

- In dual live mode, the screen displays the contrast image and tissue image
 - In freeze mode, there displays only one cine review progress bar as the contrast image and tissue image are reviewed synchronously.
-

Mix Map

This function is to mix the contrast image with the tissue image, so that interested contrast regions can be located.

Use [Mix] to select different mixing mode.

- When dual live function is on, you can see the mixed effect on the contrast image.
- When dual live function is off, you can see the mixed effect on the full screen image.

Select the map through the [Mix Map] item.

iTouch

On contrast status, you can also get a better image effect by using iTouch function.

1. Select the iTouch button to turn on the function.

The symbol of iTouch will be displayed in the image parameter area once.

2. Select different levels of iTouch effect through [iTouch] parameter.
3. Select and hold the iTouch button to exit the function.

6.16.5 Image Saving

- Live capture

In live mode, you can save the interested images by selecting [Pro Capture] and [Retro Capture].

- Cine saving

In live mode, select the Freeze button to enter cine review status.

6.16.6 Micro Flow Enhancement

MFE superimposes and processes multiple frames of contrast image during the cycle; it indicates tiny vessel structures in detail by recording and imaging microbubbles.

TIP:

- MFE imaging is available only for real-time imaging or cine file of auto review mode. If a MFE cine is reviewed manually, MFE effect cannot be displayed.
 - In MFE status, patient should lie down and hold breath, and transducer should be kept still.
-

Perform the following procedure:

1. During real-time scanning, select [MFE] to start MFE imaging.
2. Use [MFE Period] to select different imaging period suitable for current flow. Where, MAX is the maximum superimposing effect.

6.16.7 Contrast Imaging QA

 **CAUTION**

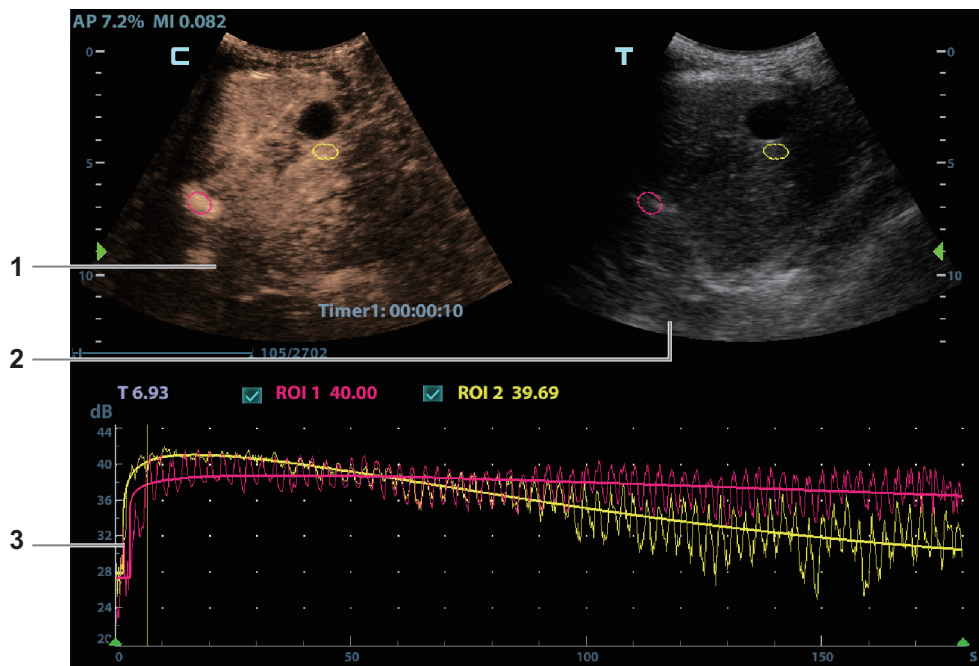
Contrast Imaging QA images are provided for reference only, not for confirming a diagnosis.

TIP:

- In case of inaccuracy of the data, do not adjust the depth and the pan-zoom when saving the cine.
 - If the contrast signal inside the selected ROI does not meet the requirements of gamma fitting condition, that is the bulleting injection, curve fitting may not be available.
-

Contrast Imaging QA adopts time-intensity analysis to obtain perfusion quantification information of velocity flow. This is usually performed on both suspected tissue and normal tissue to get specific information of the suspected tissue.

Figure 6-2 Contrast QA Screen



1	Contrast cineloop window	Sample area: indicates sampling position of the analysis curve. The sample area is color-coded, 8 (maximum) sample areas can be indicated.
2	B cineloop window	Sample areas are linked in the contrast cineloop window and B cineloop window.
3	Time-intensity curve	<ul style="list-style-type: none">• Y axis represents the intensity (unit: dB), while X axis represents the time (unit: s).• Frame marker: a white line that is perpendicular to the X axis, can be moved horizontally left to right (right to left) by using the trackball.• Click the check box beside the ROI to set if to hide or to display the QA curve.• You can get the current X/Y axis value by moving the cursor onto one point on the curve; and if you press <Set> at this time, the frame marker will move to the spot.

Perform the following procedure:

1. Perform image scanning, freeze the image and select a range of images for analysis; or select a desired cine loop from the stored images.

The system set the starting time and ending time of the cine to be first frame and last frame of QA analysis range.
2. Review the image to a desired frame.
3. Select [Contrast QA] to activate the function.
4. Mark out the interested part (ROI).

Up to 8 ROIs can be saved on the reference image, with the corresponding eight traces plotted simultaneously on the graph. Each ROI display has a different color, and its corresponding trace data is plotted using that same color.

- a. Use [ROI Type] to select the method for determining the shapes of the sample area: Trace ROI and Ellipse ROI.

The cursor is evolved in the image review area.

- b. Move the cursor to position the caliper on the reference image at the start point. Press <Set> to fix the start point.

Trace ROI	<p>Follow the steps below:</p> <ol style="list-style-type: none"> 1. Press <Set> key to fix the starting point. 2. Press <Set> key, and move the cursor to depict the ROI. Press <Clear> to cancel the last point. The system automatically links the start point to the end point by drawing a straight line between them. 3. When a suitable ROI has been drawn, confirm the ROI by double pressing <Set>.
Ellipse ROI	<p>Follow the steps below:</p> <ol style="list-style-type: none"> 1. Move the cursor to position the caliper on the reference image at the start point. Press <Set> to fix the start point. 2. Trace the outline of the desired ROI by moving the cursor. 3. Press <Set> to fix the end point, and move the cursor to depict the ROI. When a suitable ROI has been drawn, confirm the ROI by pressing <Set> key.

- Press <Clear> key to clear out the last ROI.
- Select [Delete All] to clear out all ROIs.
The corresponding traces for the deleted ROIs are erased from the plot.
- Select [Copy ROI] to create a new ROI similar to the current or latest added ROI.

5. Select [Motion Tracking] to enable the Motion Tracking function.

This function provides a motion compensated ROI as precise time-intensity information can be acquired using active tracking. It can enhance the calculation accuracy as reducing the impact of probe or patient respiratory movement.

6. If necessary, select [Fit Curve] to perform curve fitting on the time-intensity curve, where color of the fitted curve is consistent with color of the current ROI curve.

The system can calculate characteristic parameters according to curve fitting formula and data, display fit curve for time-intensity curve, and perform data analysis on time-intensity curve for data table.

- Select [Raw Curve] to hide/display raw curve.
- Select [Table Display] to check parameters:

Item	Description
GOF (Goodness of Fit)	Calculate the fit degree of the curve; range: 0-1, where 1 means the fit curve fits the raw curve perfectly.
BI (Base Intensity)	Basic intensity of no contrast agent perfusion status.
AT (Arrival Time)	Time point where contrast intensity appears, generally, the actual time value is 110% higher than the base intensity.
TTP (Time To Peak)	Time when the contrast intensity reaches peak value.

Item	Description
PI (Peak Intensity)	Contrast peak intensity.
AS (Ascending Slope)	Ascending slope of contrast, the slope between the start point of lesion perfusion to the peak.
DT/2	Time when the intensity is half the value of the peak intensity.
DS (Descending Slope)	Descending slope of the curve.
AUC (Area Under Curve)	To calculate the area under the time-intensity curves during contrast.
MTT (Mean Transition Time)	The mean time which a red blood cell (microbubble) needs to flow through the tissue mass.

You can set range for the fit curve. After the range is set, the system displays fit curve within the range only. Use the trackball to the time-intensity curve to move the frame marker position.

- a. Set starting point of the fit curve: Use the trackball to select the starting time and select [Set Fit Start].
- b. Set end of the fit curve: Use the trackball to select the end time and select [Set Fit End].
7. Use [X Scale] on the touch screen to choose different value, so that the X scale display manner will be changed.

This function can be used to track detailed tissue information.

8. Save the curved image, export the data and do parameter analysis.
 - a. Select [Export].
 - b. Select the drive and enter the file name in the displayed window.
 - c. Select [OK] to save the data and return to the QA Analysis screen.

All displayed ROI traces are saved in the exported file.

The parameters are included in the trace file if the user has fixed a ROI.

After the exporting is succeeded, a .BMP format image is displayed in the thumbnail area of the screen.

Only data from the user selected image range is included in the exported trace file.

9. Select [Exit] to exit Contrast QA.

6.17 Auto GA

NOTE:

Auto GA must be used with convex probe.

After acquired image(s) of gastric antrum, by freezing image and tapping the Auto GA button, the feature shows boundary of gastric antrum and calculates the area of gastric antrum.

Perform the following procedure:

1. Scan and obtain the gastric antrum image and freeze the image.
2. Select [Auto GA].
3. Move the cursor along the target to trace the outline of the target.
4. To modify the line, move the cursor along the target.
5. Press <Set> button to confirm.

6.18 Auto DFR

The Auto DFR is used to estimate the diastolic function of left ventricular. E/A and E/ E' are the indexes of diastolic function and can be automatically measured.

Perform the following procedure:

1. Select a phased probe (except TEE probes) and cardiac exam.
2. Acquire an Apical four-chamber image.
3. Select [Auto DFR].

If necessary, adjust the PW Doppler sample volume.

4. Select the desired calculation item (MV E/A, MV E/E' Septal, MV E/E' Lateral) to acquire the results by auto calculation.
5. Press the Freeze button to freeze the image.
6. Select an appropriate heart cycle by using the trackball, and select [Accept Result] to accept the calculation result.

If necessary, adjust the position of E or A peak point to fine tune the calculation result, and then select [Accept Result].

Measurement results include Peak E-wave velocity, Peak A-wave velocity, MV E/A ratio, Pulsed-wave TDI E' velocity and Mitral E/E' ratio.

6.19 iWorks (Auto Workflow Protocol)

6.19.1 Overview

The main objective of ultrasound workflow automation (iWorks) is to speed up exam times and reduce the excessive number of user interface manual key strokes that can lead to repetitive strain injuries over time. It automates a clinical workflow in common exam protocols in a logical “step by step” manner. It also prevents missing important parts of examinations as well as decreasing exam times.

A Protocol Event contains series workflow events (annotation comments, body marks and measurements) and image modal commands to assist the user in routine ultrasound examinations.

The system provides different protocol events based on the different application regions.

6.19.2 Normal iWorks Basic Procedure

Perform the following procedure:

1. Enter the patient information.
2. Press <Cursor> to show the cursor, select [iWorks] to enter the protocol selection screen, and select the corresponding protocol to enter the status.
3. After the system enters the iWorks screen, the available protocol is displayed. Perform the scanning and saving according to the screen prompt.

Perform measurements or add comments/body marks to the image according to the screen prompt.

4. After a view scanning is complete, press the Save key to switch to the next view according to the screen prompt.
5. Repeat step 3 and step 4 to acquire all the necessary images.
 - If a pathology is discovered, select [Insert] to select a protocol outside of the normal routine to start scanning.

- [Repeat]: add a copy of the selected view to work on if necessary.
 - [Next] or [Previous]: skip to a particular view you are interested in.
 - [Replace]: to delete images and operations for the selected view and restart operations on that view.
 - [Delete]: delete the currently activated view.
 - [Suspend]: start a manual scan when an unusual or atypical workflow is required, and select [Resume iWorks] to restart the iWorks procedure.
6. After all views are finished, the system will prompt you to exit iWorks. Select [Yes] to exit. Or select [Stop] to exit iWorks in advance.

6.19.3 iWorks OB Procedure

iWorks OB is a variation on the “iWorks” feature. iWorks is based on protocol events occurring in a linear “step by step” succession. iWorks OB accommodates protocol events that occur in a “random” or non-linear manner.

Perform the following procedure:

1. Enter the patient information.
2. Press <Cursor> to show the cursor, select [iWorks] to enter the protocol selection screen, and use the trackball and <Set> to select the corresponding protocol to enter the status.
3. After the system enters the iWorks screen, four categories of available views are displayed on the left part of the screen.
4. Use the trackball and <Set> key to select a view.
5. Scan and save according to the screen prompt.
6. Perform measurements or add comments/body marks to the image according to the screen prompt.
7. Repeat step 4 and step 5 to acquire all the necessary images.
 - If a pathology is discovered, select [Insert] to select a protocol outside of the normal routine to start scanning.
 - [Repeat]: add a copy of the selected view to work on if necessary.
 - [Next] or [Previous]: skip to a particular view you are interested in.
 - [Replace]: delete images and operations for the selected view and restart operations on that view.
 - [Delete]: delete the currently activated view.
 - [Suspend]: start a manual scan when an unusual or atypical workflow is required, and select [Resume iWorks] to restart the iWorks procedure.
8. After all views are finished, the system will prompt you to exit iWorks. Select [Yes] to exit. Or select [Stop] to exit iWorks in advance.

6.19.4 View Operation

In iWorks status, you can perform view selection, repeat, replacement and delete operations using the touch screen.

For some views, the system switches to the relevant imaging modes if necessary.

The comment for the current view has been automatically added to the image, ready for you to scan the specified anatomy.

View Selection

Select [Previous]/[Next] to select the view to be scanned. The current view is surrounded by a solid frame.

View Operation

In the current active view, you can perform image scanning, measurements, and adding comments and body marks, etc. Operations are the same as those for manual operation. See the relevant chapters for details.

Repeat View

If necessary, select [Repeat] to insert another template of the current view. You can then perform an extra examination.

View Replacement

The previous image will be deleted and replaced by the new image.

Delete View

Select [Previous]/[Next] to select the view to be deleted. Select [Delete] to delete the selected view.

6.19.5 Manual Examination

Suspend - Exit the protocol so the user can run the system manually. This is used when an unusual or atypical workflow is required.

You can run the system manually if necessary.

- Start manual examination: select [Suspend] to pause the current iWorks protocol. The system enters manual examination status.
- Return to iWorks: select [Resume iWorks] to return to automated status. You can continue the previous iWorks scan.

6.19.6 Insert

Insert is a specialized protocol event within iWorks and iWorks OB. It assists with the workflow for documenting and measuring common pathological (disease) states (i.e. Mass, Cyst, Stenosis, Thrombus) that occurs outside a routine, normal examination.

1. Select [Insert] to enter the status.
2. Select the necessary protocol and the system adds the protocol events to the current protocol.
3. Perform measurements or add comments/body marks to the image if necessary.

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7 3D/4D

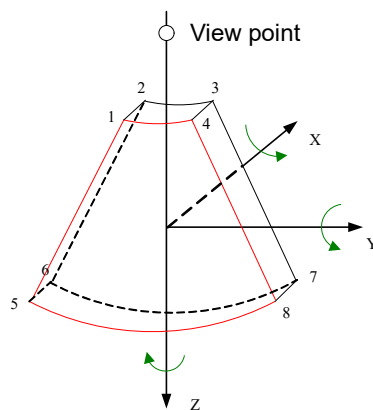
NOTE:

3D/4D imaging is largely environment-dependent, so the images obtained are provided for reference only, not for confirming a diagnosis.

7.1 Overview

Ultrasound data based on three-dimensional imaging methods can be used to image any structure where a view cannot be achieved with the standard 2D-mode and to improve the understanding of complex structures.

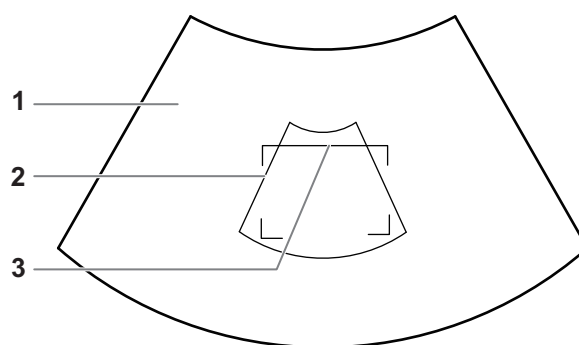
7.1.1 Terms



- Volume data: to obtain the data collection of three-dimensional object via the sequence reconstruction to two-dimensional object.
- 3D image Volume Rendering (VR): the 3D image on the screen.
- View point: the position for viewing volume data/3D image.
- MultiPlaner Rendering (MPR): a tangent plane of the 3D image that obtained by algorithm. Of which, XY-paralleled plane is C-plane, XZ-paralleled plane is B-plane, and YZ-paralleled plane is A-plane. YZ-paralleled plane is B-section. The probe is moved along the X-axis.
- ROI (Region of Interest): a volume box used to determine the height and width of scanning volume.
- VOI (Volume of Interest): a volume box used to display 3D image (VR) by adjusting interesting region in MPR.

7.1.2 ROI and VOI

After the system enters 3D/4D imaging, a B image with ROI displays on the screen. A line (shown in the following figure) that shows the upper edge position of VOI is inside ROI.



1	2D image
2	ROI
3	Cut plane

NOTE:

- To define a ROI, please remove the useless data as to reduce the volume data and shorten the time for image storing, processing and reconstruction.
- Set ROI on the 2D image with the largest section area of the fetal face.
- Set ROI a little larger than the fetal head.

Use both the trackball and the trackball function keys to adjust the ROI and Curved VOI.

Curved VOI changes the curved shape of the nearest VOI section and facilitates observation of the volume data of interest. When a triangle of control point is displayed on the curved VOI, it can be adjusted both in acquisition preparation status, and in the A, B and C sections of review/4D imaging status.

Depending on the view direction, the orientation and the shape (line or dot) of curved VOI vary:

View	Curved VOI
U/D	At the upper part of curved VOI
D/U	At the lower part of curved VOI
L/R	At the left part of curved VOI
R/L	At the right part of curved VOI
F/B	Displays as a dot
B/F	Displays as a dot

7.1.3 About the probes

A 2D imaging probe can be applied for Smart 3D imaging. However, to realize Static 3D imaging, 4D imaging, a volume probe should be selected.

7.1.4 3D Acquisition Preparation

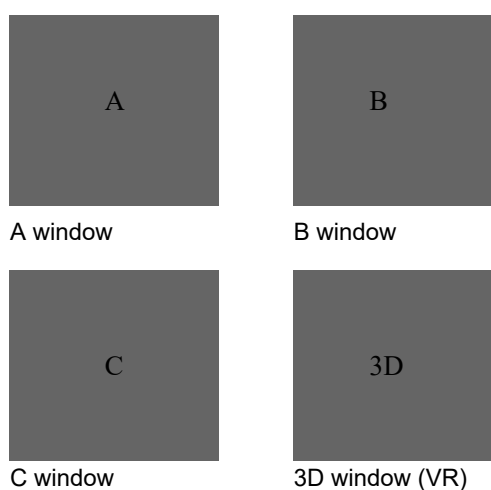
Description of parameters:

Type	Parameter	Description
Parameter adjusting	Angle	To set the range for imaging.
	Quality	To adjust the image quality by changing the line density. Image quality can affect the imaging speed: the better the image quality, the longer the time.
Render Mode	Surface	To set Surface as the 3D image rendering mode. This is useful for surface imaging, such as fetus face, hand or foot. NOTE: you may have to adjust the threshold to obtain a clear body boundary.
	Max.	To set Max. as the 3D image rendering mode. Displays the maximum echo intensity in the observation direction. This is useful for viewing bony structures.
	Min.	To set Min. as the 3D image rendering mode. Displays the minimum echo intensity in the observation direction. This is useful for viewing vessels and hollow structures.
	X-ray	To set X-ray as the 3D image rendering mode. Displays the average value of all gray values in the ROI. X Ray is used for imaging tissues with different internal structures or tissues with tumors.

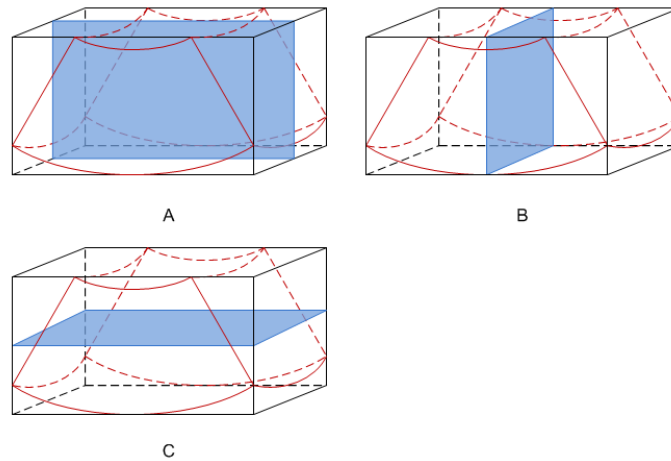
7.1.5 MPR

MPR represents three different views of 3D image.

In the quad display format view, the screen displays 3 MPRs (A, B and C) and the 3D image.



Select a target window to be the currently activated window. A, B, C sectional images are corresponding to the following sections of 3D image.



- Section A: corresponds to the 2D image in B mode. Section A is the sagittal section in fetal face up posture, as shown in the figure A above.
- Section B: it is the horizontal section in fetal face up posture, as shown in the figure B above.
- Section C: it is the coronal section in fetal face up posture, as shown in the figure C above.

The upper part of the 3D image in the 3D window is corresponding to the orientation mark on the probe, if the fetal posture is head down (orientating the mother's feet), and the orientation mark is orientating the mother's head, then the fetus posture is head down in the 3D image, you can make the fetus head up by rotating the 3D image using the Rotation parameter.

CAUTION

The ultrasound images are provided for reference only, not for confirming a diagnosis. Please use caution to avoid misdiagnosis.

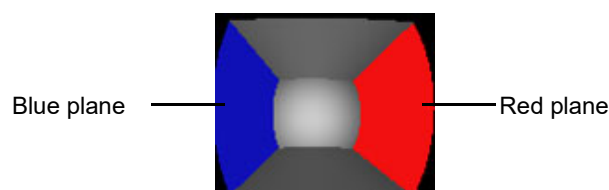
7.1.6 Free View (Free View Imaging)

With this function, the probe scanning direction can be controlled just by changing the probe scanning angle. The image of interest can be easily found without any actual probe position and direction change. This not only reduces the operations, but most importantly, it decreases patient discomfort resulting from moving the probe.

When the intra-cavity 4D probe is activated, the parameter [Free View] can be adjusted on the B image soft menu for adjusting the probe angle.

7.1.7 Wire cage

When you view a 3D/4D image on the display monitor, it's sometimes difficult to recognize the orientation. The system displays a three-dimensional drawing to illustrate the orientation for help. Of which, the blue plane presents the image acquisition where started, while the red plane presents the image acquisition where ended. Besides, a yellow plane in the wire cage presents the position of the MPR.



7.2 Note before Use

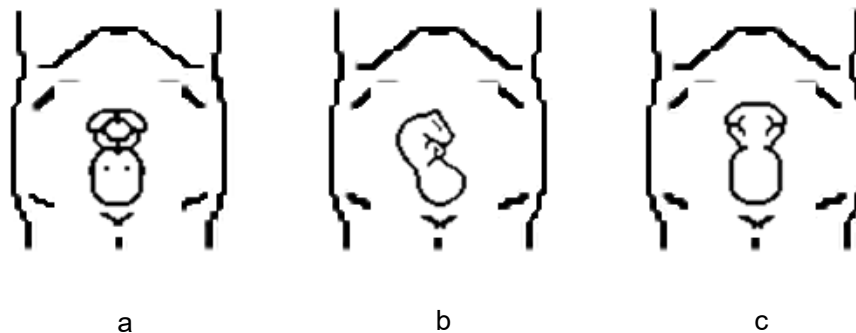
The quality of images reconstructed in 3D/4D mode is closely related to the fetal condition, angle of a B tangent plane and scanning technique (only for Smart 3D). The following description uses fetal face imaging as an example. Imaging of other parts is the same.

NOTE:

- In accordance with the ALARA (As Low As Reasonably Achievable) principle, please try to short the sweeping time after a good 3D imaging is obtained.
- A region with qualified image in B mode may not be optimal for 3D imaging. E.g. adequate AF isolation for one section plane of 2D image doesn't mean the whole desired region is isolated by AF for 3D imaging.
- More practices are needed for a high success of qualified 3D imaging.
- Even with good imaging condition, to acquire an approving 3D image may need more than one scanning.

Fetal Condition

- Gestational age
Fetuses of 24~30 weeks old are the most appropriate to 3D imaging.
- Fetal body posture
Recommended: Cephalic face up (figure a) or face aside (figure b); NOT recommended: Cephalic face down (figure c).



- Amniotic fluid (AF) isolation
 - The region desired is isolated by amniotic fluid adequately.
 - The region for imaging is not covered by limbs or umbilical cord.
- The fetus keeps still. If there is a fetal movement, you need a rescan when the fetus is still.

Angle of a B tangent plane

The optimum tangent plane to the fetal face 3D/4D imaging is the sagittal section of the face. To ensure high image quality, you'd better scan maximum face area and keep edge continuity.

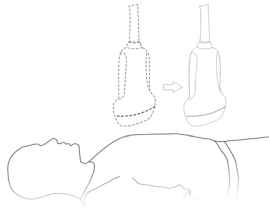
Image quality in B mode (2D image quality)

Before entering 3D/4D capture, optimize the B mode image to ensure:

- High contrast between the desired region and the amniotic fluid surrounded.
- Clear boundary of the desired region.
- Low noise of the amniotic fluid area.

Scanning technique (only for Smart 3D)

- Stability: body, arm and wrist must move smoothly, otherwise, the restructured 3D image distorts.
- Slowness: Move or rotate the transducer slowly. The speed of linear scan is about 2 cm/s and the rotation rate of the fan scan is about $10^{\circ}/s \sim 15^{\circ}/s$.
- Evenness: move or rotate the transducer at a steady speed or rate.
- Method: capture images using Linear scan or Rocked scan.
 - Linear scan
Move the probe across the surface. See the following figure.



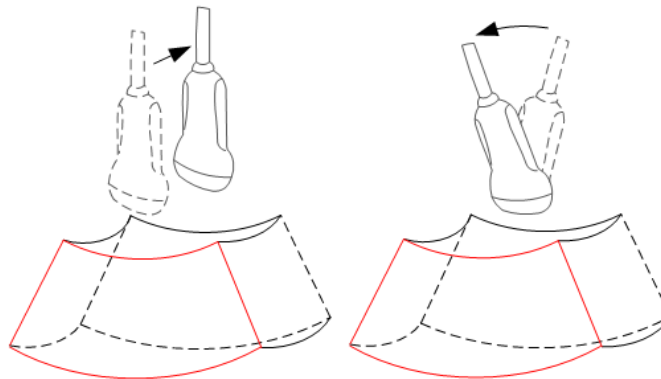
- Rocked scan
Rotate the probe once from the left to the right side (or from the right to the left) to include the entire desired region. See the following figure.

**Scanning plane and probe movement (only for Smart 3D)**

Move the probe across the body surface.

The arrow in the figure below indicates the movement of the probe.

You can move the probe in the opposite direction to the arrow.



7.3 Static 3D

Static 3D provides single frame image acquisition of 3D images. During scanning, the probe performs the scanning automatically.

Perform the following procedure:

1. Select the appropriate probe and exam mode. Make sure there is sufficient gel on the probe for scanning.
2. Obtain a 2D image.
Make sure there is:
 - High contrast between the desired region and the surrounding AF (amniotic fluid).
 - Clear boundary of the desired region.
 - Low noise of the AF area.
3. Enter Static 3D acquisition preparation mode, and define the ROI as well as the curved VOI.
4. Select the render mode, and set parameters of 3D acquisition preparation.
5. Press <Update> to start the 3D image acquisition.
6. The system enters 3D image viewing status when the acquisition is completed.
7. In image viewing status, you can perform VOI setting, image editing and other operations.
8. Exit Static 3D.

Select the B mode button to enter B mode.

7.4 4D

4D provides continuous, high-volume acquisition of 3D images. During scanning, the probe performs the scanning automatically.

4D image acquisition operations are similar to those of Static 3D. The only difference is that in static 3D mode, only a single frame 3D image is captured, while in 4D mode, continuous, high-volume acquisition of 3D images is provided.

7.4.1 Basic Procedures for 4D Imaging

Perform the following procedure:

1. Select the appropriate 4D-compatible probe and exam mode. Make sure there is sufficient gel on the probe for scanning.
2. Obtain a 2D image as described in the Static 3D imaging procedure.
3. Enter 4D imaging preparation status, and define the ROI as well as the curved VOI.
4. Select the render mode, and set parameters.
The parameters are the same as those for Static 3D
5. Press <Update> to enter the 4D image real-time display status.
6. Select the Freeze button to freeze the image.
Perform image cutting, rotation, annotation and image saving if necessary.
7. Exit 4D.

Press <Update> to return to 4D image acquisition preparation,
or, select the B mode button to enter B mode.

7.4.2 4D Real-time Editing

You can remove unnecessary information from the VR in real-time scanning by using a line tool.

1. In 4D real-time imaging, press <Switch Mode> to select [Edit] tab to enter the status.
2. Select the starting point in the VR and press <Set>.
3. Move the trackball to adjust the orientation, and press <Set> again to define the cutting boundary.
4. Move the cursor to the region you want to remove and press <Set> to remove it.
5. Select [Undo] or [Undo All] to restore the operations.

7.4.3 4D Image Saving

- In 3D viewing mode, press the single image Save button to save the current image to the patient information management system in the set format and image size.
- Save clip: in 3D viewing mode, press the Save Cine (Retrospective) button to save a CIN-format clip to the hard drive.

7.4.4 3D/4D Fast Switching

In 4D real-time imaging mode, select the 3D mode to quickly switch to VR viewing status, where you can obtain the same image of a better quality.

In 3D imaging viewing mode, select the 4D mode to quickly switch to 4D image real-time imaging status, where you can obtain the same image in dynamic mode.

7.5 Smart 3D

The operator manually moves the probe to change its position/angle when performing the scan. After scanning, the system carries out image rendering automatically, then displays a frame of the 3D image.

NOTE:

In Smart 3D image scanning, if the probe orientation mark is oriented to the operator's finger, perform the scan from right to left in linear scan, or rotate the probe from left to right in rocked scanning. Otherwise, the VR direction will be wrong.

Perform the following procedure:

1. Select the proper probe (non-4D probe) and exam mode; make sure there is sufficient gel on the probe for scanning.
2. Obtain a 2D image, and optimize the image if necessary.
3. Enter the Smart 3D imaging mode.
4. Adjust ROI size and position and the position of VOI.
5. Select the render mode.
6. Set the scan method and parameters.
 - Rocked mode: set the Angle parameter.
 - Linear mode: set the Distance parameter.
7. Press <Update> to start 3D imaging.

The system enters into 3D image review status when the acquisition is completed; or, you can finish the acquisition ahead by pressing <Freeze> or <Update>.

8. Exit Smart 3D
 - Press <Update> or <Freeze> to return to Smart 3D acquisition preparation status.
 - Or press the B mode button to exit the mode.

7.6 3D Image Viewing

Activate MPR

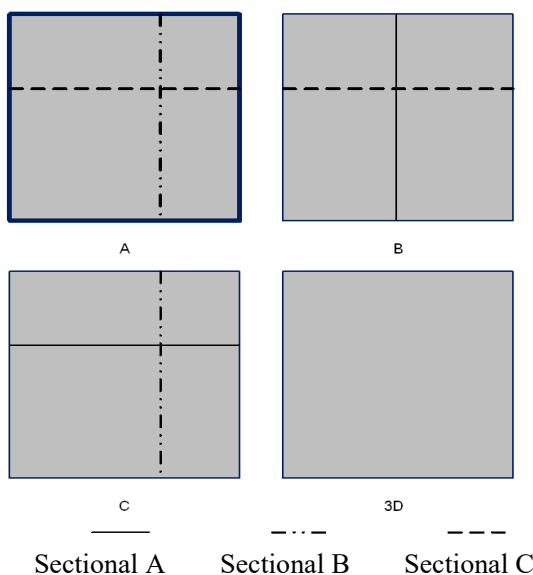
Select the corresponding reference image to activate sectional plane image (MPR) or 3D image (VR).

MPR Viewing

In actual display, different colors of the window box and the section line are used to identify the section A, B and C.

- The color of window A is blue, and the color of the lines (representing section A) displayed in the other two windows is blue as well.
- The color of window B is yellow, and the color of the lines (representing section B) displayed in the other two windows is yellow as well.
- The color of window C is orange, and the color of the lines (representing section C) displayed in the other two windows is orange as well.

Positions of the other two sectional planes are indicated in the selected plane. You can roll the track ball to change the position.



Window Display

Use <Single>/ <Dual>/ <Quad> button to switch window display.

Display Format

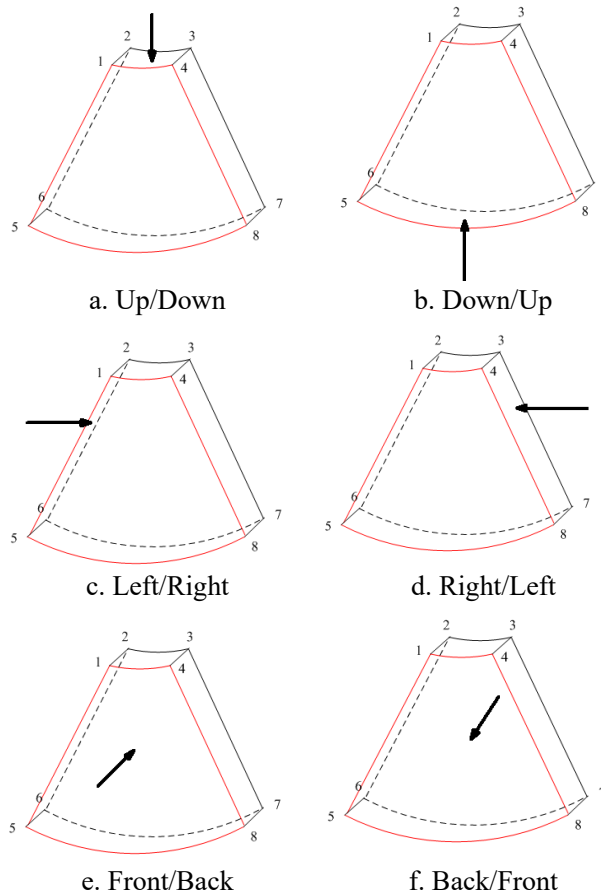
Select [MPR Only] from [Display Format] to display section images only. And the adjustable image parameters are changed into MPR parameters automatically.

Only A, B and C section images are displayed, and 3D image is not displayed.

View Direction

The Region of Interest (ROI) contains the section of the volume you want to render. You can adjust the view direction of the ROI.

The system supports the observation of 3D image from 6 directions.



Select the direction to be [Up/Down], [Left/Right] or [Front/Back] to select the direction of the above Figure a, c and e.

Select [Flip] to view in the opposite direction to the current direction, as shown in Figures b, d and f.

Adjust VOI

Adjusting the VOI box size and position is to select the volume data needed to restructure the 3D image and improve the reconstruction effect.

- VOI On

3D image (VR) image displays VOI information.

 - a. In image viewing status, set [VOI] to be “On”.
 - b. Select a desired section plane by selecting [A], [B] or [C] or [VR].
 - c. Adjust VOI position, size and curved VOI.
- VOI Off

3D image (VR) image displays ROI information.

Set [VOI] to be “Off”, then the ROI image is displayed on the screen, use the trackball to observe section images.

Accept VOI

This function is usually used for section image observation and to determine the relative position of the section image to the VR.

1. Select [Accept VOI].
2. Select a desired MPR image by selecting [A], [B] or [C].
3. View the current active section image, and the other section images change correspondingly

In Accept VOI status, when the 3D image is active or the section image which is perpendicular to the view direction is active, center point of the 3D image displays, and you can adjust the position by using the trackball.

The adjustment of Rendering Parameters

In image viewing status, you can render the image by adjusting the relevant parameters.

Select [VR] or [MPR] to select the VR parameters or MPR parameters.

- When [VR] is selected, adjust parameters of 3D image (VR).
- When [MPR] is selected, adjust parameters of sectional image.

You can adjust:

Item	Description
Threshold	Set the threshold for 3D image rendering. 3D image is rendered on the signal above thresholds by eliminating noise via the Threshold parameter. Lower threshold can eliminate lower range noises and echo, which will contribute to a clearer and smoother image. Available only in Surface rendering mode.
Opacity	Adjust the transparency value for 3D image rendering. It implies the transparency of the light. The higher the value is, the tougher the surface becomes. The lower the number is, the more transparent the gray scale information will be. Available only in Surface rendering mode.
Smooth	Set the smoothness of 3D image. NOTE: Insufficient smoothness can result in a fuzzy image; however, too much smoothness will lead to image distortion.
Brightness	Set the brightness of image. NOTE: The adjustment is for 3D (VR) and MPR.
Contrast	Set the contrast scale of the image. As long as the contrast becomes larger, the bright spot and dark spot on the image change as well. NOTE: The adjustment is for 3D (VR) and MPR.
Tint	Enable/disable tint map. The color of image change according the tint value.
Quick Rotation	Rotate the 3D image quickly.

Item	Description
iClear	Use the 3D self-adaptation filter to strengthen the space continuity of the tissue structure, and provide speckle suppression, and improve the image contrast effect, so as to optimize the image data. Adjust iClear to optimize MPR image.

Reset Curve

Do one of the following to reset the curve:

Item	Description
Ori	To reset the volume rotation, shifting and zooming of 3D image to original status.
All	To reset the parameters, rendering rotation, VOI and image effect.
Curve	To reset the curve to be the original beeline.

Render Mode

Set 3D image rendering mode.

The rendering manners can be applied to inversion mode.

Inversion

This function is to inverse the echo of the 3D image, so as to enhance observation for low-echo region, applicable for vessel, cyst and etc.

When the Inversion is turned on, the rendering mode parameters change into the corresponding inversion parameters.

Vessel shape is correct with the capture target. The vessel wall is smooth and clear.

Rotate the Image

NOTE:

You can view the back of the VR by rotating it 180°. The back view image may not be as vivid as the front. (Here we call the initial view of the VR the “front”). It is recommended to re-capture rather than rotate the VR if a certain desired region is obscured in the VR.

- Axial rotation
Axial rotation rotates the currently activated image around the X-, Y- or Z-axis.
Select the current image, and press <Quick Angle> knob or [Rotate: X] to switch the X/ Y/ Z – axis and rotate to make the image rotate:
- Auto Rotation
 - a. In 3D viewing mode, press <Switch Mode> to enter the Auto Rotation status. The system enters the auto rotation preparation state.
 - b. Select the Direction to be [Left/Right] or [Up/Down] to set the auto rotation direction.
 - c. Set the Start position and End position:
Start position: view the image at a certain position, and select the trackball function key according to the trackball hint area.
End position: view the image at a certain position, and select the trackball function key according to the trackball hint area.
 - d. Select [Step] to set the rotate step.

Image Zooming

To adjust the zoom factor of VR. The sectional images will be zoomed in/out accordingly.

Set the VR window as the current window.

Select the Zoom button to increase or decrease the magnification factor.

Under soft menu mapping mode, zoom the image by pinching the two fingers on the soft menu.

Sync

This function switches the view direction perpendicular to the current active plane, so as to get a better view of VR.

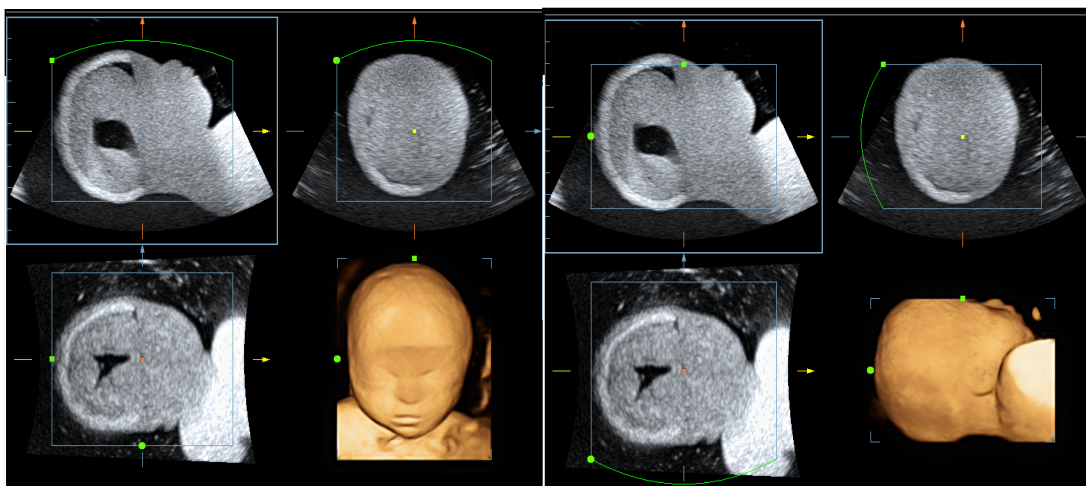


Image Editing

Image cutting is a more elaborate function than VOI adjusting to optimize the 3D by clipping (removing) the part blocked the region of interests.

TIP:

- In image cutting status, no image parameters can be changed. A cutting cursor is displayed + or an eraser cursor ○, and the system enters “Accept VOI” status.
- The editing function is only available on VR image.

Perform the following procedure:

1. Enter image editing status by pressing <Switch Mode> to select the [Edit] tab.
2. Select an edit/erase tool:

Item	Description	Operation
Polygon	Allows you to trace a polygon on the image you want to cut.	<p>Follow the steps below:</p> <ol style="list-style-type: none"> 1. Press <Set> to position the start point. 2. Move the cursor to set a region and press <Set> to trace the region. When the start point and the end point coincide, the region is selected or you can press <Set> twice to finish tracing. 3. Move the cursor to the region you want to edit and press <Set> again to edit.

Item	Description	Operation
Contour	Allows you to trace the portion of the image you want to cut.	Follow the steps below: 1. Press <Set> to position the start point. 2. Use the trackball to trace the region. When the start point and the end point coincide, the region is selected or you can press <Set> twice to finish tracing. 3. Move the cursor to the region you want to edit and press <Set> again to edit.
Rectangle	Displays a box which can be used to define the portion of the image you want to cut.	Follow the steps below: 1. Press <Set> to fix the rectangle position. 2. Use the trackball to change the size, and press <Set> again to finish rectangle drawing. 3. Move the cursor to the region you want to edit and press <Set> again to edit.
Line	Use a multi-point line to trace the boundary quickly.	Follow the steps below: 1. Press <Set> to position the start point and the system will display a reference line. 2. Use the trackball to set the line orientation and press <Set> to start drawing, press <Set> when ends are necessary; press <Set> twice to finish drawing. 3. Move the cursor to the region you want to edit and press <Set> again to edit.
Soft Eraser	Applies to softer or smoother boundary within a small range of the image.	Follow the steps below: 1. Press <Set> to position the start point. 2. Use [Eraser Size] to adjust the eraser size if needed. 3. Use the trackball to select the region, and press <Set> when ends are required. You can repeat the step to erase all parts blocking the interesting region.
Hard Eraser	Applies to a distinct boundary of within a wider range of the image.	
Eraser Diam.	As the eraser erases the image by means of sphere, you can adjust the size so as to adjust the erased area and depth. The eraser sphere center has a more distinct effect of clearing compared to other parts.	
Undo	To undo the last cut only.	/
Undo All	To undo all cuts since you entered image edit mode.	/

Image Saving

- Image saving

In the 3D Review mode, press <Save> key (with user-defined saving function) to save the current image and volume data to the patient information management system in the set format.

- Image review

Open an image file to enter the image review mode. In this mode, you can perform the same operations as what you can in review mode.

7.7 iPage (Multi-Slice Imaging)

iPage is a new “Visualization” mode for displaying sectional images. The data is presented as slices through the data set, which are parallel to each other.

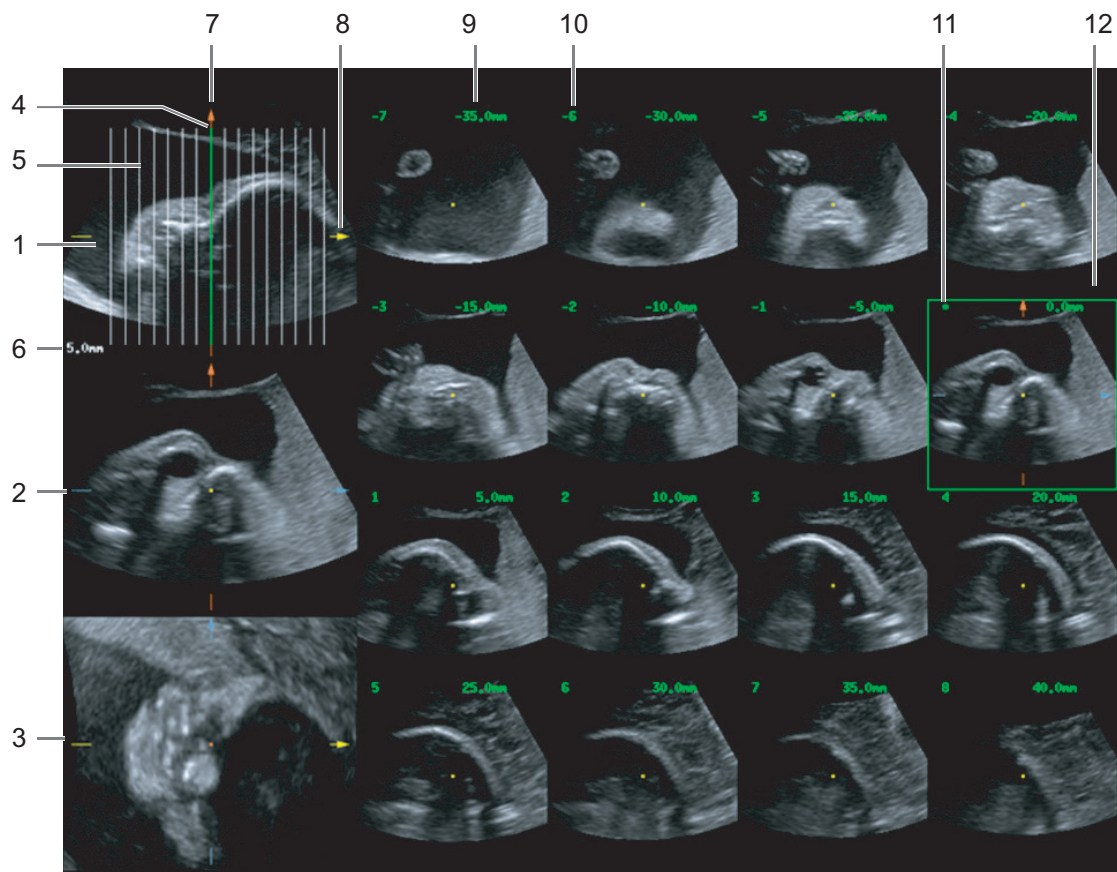
iPage is an option and is not available for Smart 3D images.

7.7.1 Basic Procedures for iPage

Perform the following procedure:

1. Acquire 3D/4D data.
 - Single-frame VR:
4D mode: freeze the system, then roll the trackball to select the image.
Static 3D: an image frame is acquired automatically after the acquisition is completed.
 - Multi-frame 3D images: acquire multiple 3D images in 4D imaging mode.
2. Perform operations such as rotation and VOI adjusting to the image to find the region of interest.
3. Switch to the [iPage] tab to enter iPage mode.
4. Select the A/B/C sectional planes and select the reference image.
5. Confirm whether the slices displayed are the target planes. If not, re-select the reference image again.
6. Observe the interested structure through multiple slices.
Select the proper image layout and space according to the size of the target structure.
To view the details or a tiny part of the region of interest, use image zooming.
7. Rotate the 3D image to observe the slices of other orientations. Repeat step 6 if necessary.
If the target orientation and region cannot be observed even after image rotation and shifting, select [Reset Ori.] to reset the 3D image.
8. Perform operations such as commenting on the region of interest.
9. Save the image as required.

7.7.2 iPage Basic Functions and Operations



1	A plane (the current reference image)	2	B plane	3	C plane
4	Central slice line (current active slice)	5	Slice line	6	Space between two slice lines
7	Y-axis	8	X-axis	<9	Slice position (to the central slice)
10	Slice order number	11	Central slice mark	12	Active slice is highlighted in green

Layout

The system supports several types of display layout: 2*2, 3*3, 4*4 and 5*5. Select the corresponding icon on the soft menu to select, and the selection [Slice Number] changes accordingly.

Reference image

Select [A], [B] or [C] to select the reference image.

Slice and slice line

- Central slice: the central plane which corresponds to the central slice line is the central slice, marked with a green “*” in the top-left corner of the image.
- Select [Line Direction] to be “V” to position the slice lines vertically, and “H” to position the slice lines horizontally.

- Active slice: the central plane which corresponds to the green slice line is the active slice, marked with a green box. The default active slice is the central slice.
- Slice order number: indicates the order of the slices. The position of the central slice is “0”, the slices before the central slice are marked with negative integral numbers, and the slices after the central slice are marked with positive integral numbers.
- Slice position (to the central slice): displayed in the top-left corner of each image, indicating the position of each image (such as -6 mm, -3 mm, 3 mm, 6 mm).
- Coordinate axis: indicated on the three A, B, C reference images. Correspond to the central slice line, and will move accordingly with the central slice line.

Slice shifting

Roll the trackball to shift the crossing point of the central axis up/down and left/right. The slice lines will shift accordingly with the crossing point.

Adjust through [Range Pos.] on the soft menu to fine-tune slice lines horizontally.

Slice position

Adjust through [Slice position] to move the active slice line (green) either forward or backward within the range. The corresponding slice will be highlighted in green.

Spacing

The value is displayed on the top-right side of the slice. Unit: mm. Adjust it using the soft menu selection [Spacing].

Slice numbers

Change slice numbers as necessary using [Slice Numbers] on the soft menu.

Image rotation

Rotate and press <Quick Angle> to perform axial rotation.

For details, see the descriptions in Static 3D.

Image zooming

Same as Static 3D image zooming.

Hide/show reference image

The system displays 3 standard sectional images (A plane, B plane, C plane) on the left side indicating the position of the slice lines. Select [Ref.Img] to be “Off” to hide the 3 reference images, then slices are displayed on the whole image area.

Quick switch to single display

Select a particular slice, double-click <Set> to see the slice in full screen, then double-click <Set> again to return to the original display format.

Reset Ori.

Select [Reset Ori.] to reset the orientation and zoom status of the image.

7.8 Smart Volume

The system provides a fast volume calculation method, using computer technology to define and enclose a boundary of the target within the VOI area (the computer technology allows the

ultrasound system to fit an ellipsoid that can be most approximate to the target) and then calculating this volume. It can be used to measure the volume of the mass, gestational sac or fetus.

Smart Volume is an option, and is not available for Smart 3D image.

CAUTION

The Smart Volume result is provided for reference only, not for confirming diagnoses.

7.8.1 Basic Procedure for Smart Volume

Perform the following procedure:

1. Acquire the necessary 3D/4D data.
2. Press <Switch Mode> to select the [Smart-V] tab on the soft menu to enter Smart Volume. The system is in “Edit VOI” status (the [Edit VOI] function is turned on).
3. Set the VOI position and size, and select [Accept VOI] (after selecting the button, the button is highlighted in green to indicate the status).
4. The system starts to calculate.
5. Auto-calculation is completed:
 - There are green solid curves enclosing the target region in each MPR image (A, B, C) window.
 - The 3D image (VR) displays the image of the target region in red.
 - The parameter area in the top right screen displays the calculation result.

NOTE:

To ensure the accuracy of the result, ensure that the VOI position and size setting has entirely enclosed the target and is approximate to the target before using the Smart Volume function.

7.8.2 Results Display

After calculating, the following result will be displayed in the top-right part of the screen.

3 diameter lengths of the fitting ellipsoid will be displayed.

V represents the calculated volume value.

7.8.3 Operation Controls

Edit the VOI (Volume of Interest)

Adjusting the VOI box size and position selects the volume data needed for calculation.

1. Select [Edit VOI] on the soft menu to turn it on (green highlighted status).
2. Select the desired MPR image by
3. selecting [A], [B] or [C].
4. Roll the trackball to adjust the VOI position and size, and press <Set> to switch between the adjusting statuses.

Accept VOI

The system starts calculating after selecting [Accept VOI].

Reset Curve

Parameter	Description
Reset Ori.	To reset the volume rotation, shifting and zooming to its original status.
Reset Curve	/
Reset All	/

Zoom

Same as for 3D/4D image zooming.

MPR measurement.

2D related measurements can be performed on MPRs.

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8 Physiological Unit Signal

The physiological unit signal waveform is used for checking ultrasound image in ultrasound exam (cardiac exam mainly).

WARNING

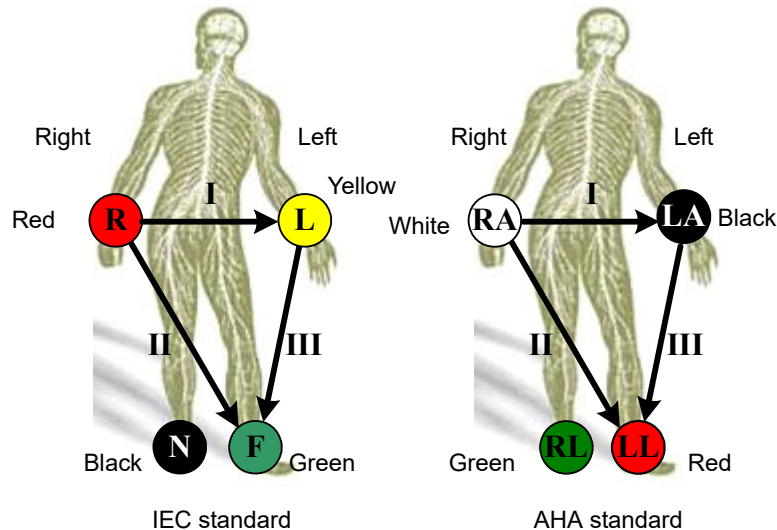
- Do not use the physiological traces for diagnosis and monitoring.
 - To avoid electric shock, the following checks shall be performed prior to an operation:
 - The ECG electrode cable must not be cracked, frayed or show any signs of damage or strain.
 - The ECG electrode cable must be correctly connected.
 - You must use the ECG leads provided with the physiological unit module. Failure to do so may result in electric shock.
 - The ECG electrode cable must be connected to the system first. Only after the cable is connected to the system, can the patient be connected to the ECG electrodes. Failure to follow these instructions may subject the patient to electric shock.
 - Do not place the ECG electrodes directly in contact the patient's heart; otherwise it may lead to stop of the patient's heartbeat.
 - Do not use this system when any digital device such as a high-frequency electrotome, high-frequency therapeutic device or defibrillator is applied already.
 - Conductive parts of electrodes and associated connectors for ECG should not contact other conductive parts including earth/grounding.
 - Frequent trampling or squeezing on the cables may result in cable breakdown or fracture.
 - Display effect of respiratory curve depends on the patient breathing status. While a very slow or smooth breathing may lead to an inapparent respiratory curve, breathing in a large amplitude may cause an incomplete display of the respiratory curve. Display effect is linked to the connected parts of the body. Generally, signals by connecting to limbs are stronger than by connecting to the chest.
-

8.1 ECG

Perform the following procedure:

1. Connect the device and place ECG electrodes.

- Turn off the power supply of the system, and connect the ECG cable to the ECG port of the system.
- Turn on the power supply of the system.
- Place the ECG electrodes on the patient's body (as shown in the following figure).



- Tap [Physio] to enter physio operation interface.
- Switch the imaging modes and display formats, adjusting the parameters to get an optimized image.
- Parameter adjusting:
In image menu, tap [ECG] to enable or disable ECG waveform curve. Adjust the [Speed], [ECG Gain], [Position] and [Invert].
- Trigger:
Select the trigger mode, or use [Real & Trig] to set the trigger time, triggering delay time and image display format.
- Freeze the triggering image and the curve, and then review them.
- Exit ECG mode, and remove ECG electrodes from the patient.

ECG Triggering

ECG triggering means that image scanning is activated at some time points of ECG signals, thus obtaining B images at these time points. The triggering image should be in 2D-mode.

When ECG triggering occurs, some marks (frame triggering mark) appear on the ECG waveform (relative R wave, the time for delay set), indicating the time points when the 2D images are captured.

TIP:

- The triggering mark is displayed in both freeze mode and live mode
- The marks in Dual trigger are in different colors.
- Triggering function is unavailable if the ECG trace is disappeared. Only the live 2D image can be triggered.
- No delay time or time interval shall be less than the time required to scan a single image.

- If the delay time is longer than a heart cycle, then the heart cycle in the delay time is omitted, that is to say no trigger is occurred when R waveform is detected in the duration.

Triggering Mode

There are three triggering modes available: Single, Dual, and Timer.

- Single Trigger: When an R waveform is detected, an image will be triggered after delay time T1. The time of T1 can be edited in single mode.
- Dual trigger: when an R waveform is detected, two images in two windows will be triggered respectively after delay time T1 and T2. The time of T1 and T2 can be edited in dual mode.
- Timer Trigger: an image will be triggered after a time interval. The time interval can be edited in triggering status.

The image triggering operation is described as follows (Take single trigger as an example):

1. Select exam mode.
2. Select [Trig Mode] on the touch screen to enable the trigger.
3. Select [Single].
4. Set the delay time (or use the T1 by default).

Real & Trigger

Select [Real & Trigger] to enable or disable the real trigger function.

After the [Real & Trigger] is enabled, two images are displayed respectively in two windows. One is triggered by ECG, and the other is non-triggered real time image.

8.2 Respiratory Wave

Perform the following procedure:

1. Connect the ECG lead and position the ECG electrodes.
2. Enter Physio screen.
3. Switch the imaging modes and display formats, adjusting the parameters to get an optimized image.
4. Parameter adjusting:
 - a. Select [RESP] in the physio menu.
 - b. Adjust [Speed], [RESP Gain], [Position] and [Invert].
5. Exit Respiratory display mode, and remove ECG electrodes from the patient.
6. Exit physio mode.

8.3 ECG Review

8.3.1 Review Principle

When an image is frozen, the ECG waveform where the image is triggered will be frozen at the same time. In the Dual triggering mode, the two window images are frozen at the same time. When images are reviewed with the ECG electrodes connected, the ECG trace is the reference for time.

After the images are frozen, all real time images are in the status of linked review.

8.3.2 Linked Review of Waveforms, M/D Images and 2D Images

If the physio unit signal, time curve and 2D image are frozen at the same time, the replay of them is displayed at the same time.

8.4 Parameter Description

The physio parameters are described as follows:

Parameter	Description
ECG Source	Select ECG source.
Gain	Set the amplitude of the trace.
Position	Set the vertical position of the both traces on the image display.
Speed	Change the speed of the physio trace.
RESP Gain	Set gain of the respiratory wave trace on the image display.
Resp Position	Set the vertical positioning of the respiratory wave trace on the image display.
T1	Set the delay time T1 in Single trigger or Dual trigger.
T2	Set the delay time T2.
Invert	Invert the display.

9 Measurement, Comments and Body Mark

9.1 Measurement

There are general measurements and application measurement. You can perform measurements on a zoomed image, cine reviewing image, real-time image, or frozen image. For measurement details, please refer to the *Advanced Volume*.

WARNING

- Be sure to measure areas of interest from the most optimal image plane to avoid misdiagnosis from inaccurate measurement values.
 - To obtain accurate Doppler flow measurement values, make sure the transmitting beam is not perpendicular to the flow, otherwise false readings and potential misdiagnosis may result.
-

CAUTION

- If an image is unfrozen or the mode is changed during a measurement, the calipers and measurement data will be cleared from the screen, but the measurement data will be stored in the report.
 - If the system is turned off or the End Exam button is selected during a measurement, the data not saved will be lost.
 - In Dual-B imaging mode, the measurement results of the merged image may be inaccurate. Therefore, the results are provided for reference only, not for confirming a diagnosis.
-

Measurement Accuracy

Table 9-1 Error of 2D Images

Parameter	Value Range	Error
Distance	Full screen	Within $\pm 3\%$
Area	Full screen	Within $\pm 7\%$
Circ	Full screen	Within $\pm 10\%$
Angle	Full screen	Within $\pm 3\%$
Volume	Full screen	Within $\pm 10\%$

Table 9-1 Error of 2D Images

Parameter	Value Range	Error
Distance (iScape)	Full screen	Within $\pm 5\%$ (for linear, wide-convex, and phased probes)
	Full screen	Within $\pm 10\%$ (for micro-convex probes)

Table 9-2 Time/Motion Measurements

Parameter	Value Range	Error
Distance	Full screen	Within $\pm 3\%$
Time	Timeline Display	Within $\pm 2\%$
Heart rate	Timeline Display	Within $\pm 4\%$
Velocity (PW mode)	10-300 cm/s (for non-transcranial application);	When angle $\leq 60^\circ$, $\leq 5\%$
	P4-2Ns, P7-3s, P10-4s, SP5-1s, P8-2s, C11-3s: 10-300 cm/s (for transcranial application); L14-6Ns, LM14-6s, L16-4Hs, L10-3s, L12-4s, L14-6Ws, L14-5sp: 20-100 cm/s (for transcranial application)	Within $\pm 5\%$
Velocity (CW mode)	10-300 cm/s (for non-transcranial application)	When angle $\leq 60^\circ$, $\leq 5\%$ (for probes except pencil probes); $\leq 5\%$ (for pencil probes)
	P4-2Ns, P7-3s, P10-4s, SP5-1s, P8-2s, CW2s, CW5s: 10-300 cm/s (for transcranial application)	Within $\pm 5\%$ (for probes except pencil probes); Within $\pm 10\%$ (for pencil probes)

Table 9-3

Function	Error
Smart Volume	Within $\pm 20\%$
Smart OB	Within $\pm 10\%$
Smart NT	Within $\pm 10\%$
Smart Hip	Within $\pm 5\%$
AutoEF	Within $\pm 10\%$
Smart IVC	Within $\pm 10\%$
Smart VTI	Within $\pm 10\%$
Smart B-line	Within $\pm 10\%$
Auto GA	Within $\pm 15\%$

Table 9-3

Function	Error
Auto DFR	Within $\pm 20\%$

NOTE:

Within the selected field range, the measurement accuracy is ensured within the range mentioned above. The accuracy specifications are performance in the worst conditions, or based on the real test for the system, regardless of acoustic speed error.

9.2 Comments

Comments can be added to an ultrasound image to bring attention, notate or communicate information observed during the examination. You can add comments to: zoomed image, cine review image, real-time image, frozen image. You can type the character as comments; insert the pre-defined comments from the comment library; insert arrow markers or add the trace.

WARNING

You must ensure that the entered comments are correct. Incorrect comments may lead to misdiagnosis.

9.2.1 Adding Comments

Adding an Comments Text

Perform the following procedure:

1. Select <ABC> button > [Comments] tab or press the user-defined key for “Annotation” to enter the comment status.
2. Use the trackball or press direction-control keys on the soft keyboard to move the cursor to the desired location for comments.
3. Do one of the following to add a comment:
 - Select the desired comment text on the touch screen, the system adds the selected comment text onto the screen where the cursor is anchored, you can edit the comment directly.
 - Type the alphanumeric characters through the soft keyboard.

In the edit status, select [Enter] to move the cursor to the new line, and the location of the cursor is aligned with that of the first line

4. In comments edit status, press <Set> or <Enter> key, or move the cursor to confirm the added comments text and exit the edit status.

Adding an Arrow

You can add an arrow to a location where you want to pay attention.

Perform the following procedure:

1. Select <ABC> button > [Comments] > Arrow button or press the user-defined key for “Arrow” to enter the arrow status.
2. Adjust the position and orientation of the arrow:

- Use the trackball to move the arrow to the desired position.
 - Rotate the <Angle> knob to change the arrow's orientation.
3. Press <Set> to anchor the arrow position.
Repeat steps above to add more arrows if necessary.
 4. Press <ABC> or the user-defined key for "Arrow" to exit the arrow comment status.

Trace

In comment status, select [Trace] to activate trace function, and the current image is also displayed on the touch screen.

1. Use the trackball to move the cursor to a desired position, and press <Set> to confirm the start point.
2. Use the trackball to move the cursor along the edge of the desired region and trace the outline of the region.
 - Rotate the <Angle> knob counter-clockwise to cancel 1 pixel of trace.
 - Rotate the <Angle> knob clockwise to restore 1 pixel of trace.
 - Short press <Clear> to clear last trace. Long press <Clear> to delete all tracing.
3. Press <Set> to finish the tracing.

9.2.2 Moving Comments

TIP:

If image size and position changed due to display format switching, then the position of the comment can be changed, too.

Perform the following procedure:

1. Select the comment to be moved.
2. Use the trackball to move the comment to the new position.
3. Press <Set> key to anchor the comment in the new position, and the comment-moving operation is complete.

9.2.3 Editing Comments

Modifying characters


Perform the following procedure:

1. In comment status, move the cursor onto the comments to be modified.
Press alphabetic keys to enter the character to the cursor position directly.
Or, double press <Set> to enter comment editing status, and use the direction-control keys to move the cursor to the desired location to insert/delete characters; you can either type characters by pressing the corresponding keys or select the new comment text from the menu.
2. Press to delete the comment character or text on the right side of the cursor; press <Back> to delete the comment character or text on the left side of the cursor.
3. Press <Set> key, or move the cursor to confirm the added comments text and exit the edit status.

If there are already comments on the screen, press the space bar to enter editing status.

Modifying Arrows

Perform the following procedure:

1. Move the cursor on the arrow that needs to be modified. After the cursor becomes , press <Set>. There is a frame around the arrow, indicating the arrow can be edited. Move the cursor to change the arrow position.
2. Rotate the <Angle> knob to modify the arrow's direction.
3. Press <Set> key to complete the operation.

9.2.4 Deleting Comments

Deleting Comments Characters, Texts or Arrows

Perform the following procedure:

1. Move the cursor to the comments to be deleted.
2. Press <Set> to select the comment.
3. Press <Clear> to complete the deletion.

Deleting a recently-added character, text or arrow

In comment status, press <Clear> to delete the latest added/modified comment unit.

Enter letters by pressing the alphanumeric key on the keyboard and use blank key to divide the letters. Select to delete latest added/modified comment unit and enter comment status.

Delete letters one by one

In comment editing status, select <Back> to delete letters before cursor “|”.

In comment editing status, select to delete letters after cursor “|”.

In comment status, enter letters by pressing the alphanumeric key on the keyboard. Select to delete letters before cursor “|”.

Erase All Text

NOTE:

- When no item is selected, press <Clear> will clear all comments and all measurements calipers.
 - After powering off, the system will clear all comments on the image.
-

Long press <Clear> key to delete all the comments.

9.2.5 Setting the Start Position

Perform the following procedure:

1. Select [Comments] to enter the comment status.
2. Move the cursor to the target position, then press <Set Home> to set the start position of the comment.

Select <Home> on the touch screen; the cursor returns to the start position.

9.3 Body Mark

NOTE:


After powering off, the system will clear all comments on the image.

The Body Mark feature is used for indicating the exam position of the patient and transducer position and orientation.

You can preset the system configured general body marks for each exam mode. The system supports the import of user-defined body marks.

9.3.1 Adding Body Mark

Perform the following procedure:

1. Press  to enter the Body Mark status.
2. Select the desired body mark on the touch screen directly.
3. To adjust the probe position and orientation marker:
 - Use the trackball to place the probe marker at the correct position.
 - Rotate <Angle> to adjust the mark's direction.
 - Select [Save Probe] to save the current direction and position for the probe mark of the current body mark.
4. Press <Set> to confirm the position and orientation of the probe marker and exit the body mark mode.


9.3.2 Moving Body Marks

You can move the body mark graphics to any desired position within the image area.

NOTE:

In Dual B Mode, a Body Mark cannot be moved between the separate image windows.

Perform the following procedure:


1. Press <Cursor> and move the cursor onto the body mark. The cursor then becomes , indicating you can move the Body Mark graphic to a new position.
2. Press <Set> key to select the body mark.
3. Move the Body Mark graphic to the desired position.
4. Press <Set> key to anchor and confirm the new graphic position.

9.3.3 Deleting Body Marks

TIP:

- Preset returning, switching the exam mode/patient/probe will clear the body marks.
 - Set if body mark is erased when the image is unfrozen, see the Application section of the Setup chapter.
-

Perform the following procedure:

1. Press <Cursor> and move the cursor onto the body mark. The cursor then becomes .
2. Press <Clear> to delete the body mark.

10 Patient Data Management

An exam record consists of all information and data of one exam.

An exam record consists of the following information:

- Patient basic information and exam data
- Image files
- Report

NOTE:

- DO NOT use the internal hard drive for long-term image storage. Daily backup is recommended. External storage media is recommended for archiving images.
 - The system patient database space is limited, please back up or clear patient data in time.
 - Mindray is not responsible for lost data if you DO NOT follow suggested backup procedures.
-

10.1 Storage Media

System supported memory media including:

- System hard disk
- USB memory devices: USB flash drive, removable USB hard disk
- Optical disk.

10.2 Image File Formats

The system supports file formats which belong to the system and file formats which are PC-compatible.

System-relevant formats

- Single-frame image file (FRM)
Refers to single-frame static image files not to be compressed; you can perform measurements and comments adding on this type of files.
- Cine file (CIN)
System-defined multi-frame file format; you can perform manual or auto cine review, and perform measurements or add comments for the reviewed images. After you open a stored CIN file, the system automatically enters cine review status.

PC-compatible formats

- Screen file (BMP)
Single-frame file format, used to save the current screen, non-compressed format;
- JPG: Single frame export format.
- TIFF: Single frame export format
- Multi-medium files

Multi-frame export format.

- DICOM files

DICOM standard files format, single-frame or multi-frame format, used to record patient information and images; you can only open DCM files to view rather than to edit.

10.3 Image Storage Setting

For detailed information about setting image size and user-defined buttons for saving image and cine, see the Setup chapter.

10.3.1 Setting Cine Length

NOTE:

The system ends up saving if the cine length goes beyond the maximum value.

Live Capture

- Prospective Cine Length

Prospective cine duration: for detailed information to set the time, see the Setup chapter.

- Retrospective Cine Length

Retrospective cine duration: set the time that user selects the “Retrospective Capture” button when playing the first frame of the image. It also refers to saving the cine or cycles retrospectively.

- With the ECG disabled: switch to [Cine] menu, and use [Time] item to adjust it.
- With the ECG enabled: switch to [Cine] menu. Select [Saving type (Retro)] to choose the type of the saving time and the cardiac cycles. Use [Time] or [Cycle] to adjust it.

Freeze storage setting

The first frame of the image starts when the user freezes the image at the first time. The system saves the cine in the auto review scope retrospectively.

Freeze the image. Use [Time] to set the cine time of retrospective saving in frozen status under Cine page, or mark the start frame in the auto review scope to set the cine time of retrospective saving in frozen status.

TIP:

It is only available to save the cine retrospectively in the frozen status.

10.4 Image File Management

You can store the image files either in the patient database in the system, or to external memory devices. For a saved image, you can perform operations like image reviewing, analyzing and demonstration.

10.4.1 Quickly Saving Images to the System

To save a single-frame image to the system quickly

Select the user-defined button for “Save Image or Frame” to save the image.

- The image format is FRM in the imaging interface.

- When a dialog box is displayed on the current screen, press the user-defined key to save the screen in the BMP format.

To save cine loop image to the system quickly

Select the user-defined button for “Save Cine (Retrospective/Prospective)” to save the cine file in the default file directory in the CIN format.

The thumbnail of this image will appear in the thumbnail area on the screen. When you move the cursor onto the thumbnail, its file name with suffix will be displayed.

Quickly Saving Full Screen Image to the System

Select the user-defined button for “Save Screen” to save the image.

The full screen image is saved to the default path with the default name. The thumbnail of this image will appear in the thumbnail area on the screen. When you move the cursor onto the thumbnail, its file name with suffix will be displayed.

10.4.2 Saving Images to USB Flash Drive

Select the user-defined button for “Send Image to USB Disk” to save the image to the USB flash drive.

10.4.3 Exporting Cine File to USB Flash Drive

Select the user-defined button for “Send Cine to USB Disk” to export the cine to the USB flash drive (not saved to the local path).

The file is stored in the directory: X (USB flash drive name): patient name+ ID\exam type + exam time \ image ID.

1. Perform the scan and freeze the image.
2. Select the user-defined button for “Send Cine to USB Disk” to save the images to the USB flash drive.

10.4.4 Auxiliary Output Function

For detailed information about setting the user-defined button for Auxiliary Output Function, see the Setup chapter.

For the following three functions, the system provides auxiliary output function setting: “Save Image”, “Save Cine (Retrospective)” and “Save Cine (Prospective)”. When the corresponding user-defined button is pressed, the system can perform multiple operations one by one as per the preset.

Taking “Save Image” as an example, add the auxiliary functions “Send Image to DICOM Storage” and “Send Image to USB disk”, press the user-defined key, then the system will perform three steps:

1. Save the image to the local hard disk.
2. Send image to DICOM Storage server.
3. Send the image to USB disk.

10.4.5 Thumbnails

The stored images or cine loops are displayed in the form of thumbnails on the screen:

- During image scanning, thumbnails of the current exam display in the Clip board/Thumbnails Area of the screen.
- In the iStation screen, the thumbnails of the current selected patient display at the bottom of the screen. When you move the cursor onto a thumbnail, its name and format will display.

- On the Review page, the thumbnails refer to the images stored in the same exam. When you move the cursor onto a thumbnail, its name and format will display.
- On the Review page, open images to enter the image analyzing status, all the thumbnails belong to the exam are displayed.

10.4.6 Image Review and Analysis

The system supports the image review and analysis to the saved patient image.

To review images

You can review all images stored in an exam, and send, delete or analyze the stored images.

- During image scan, saved image thumbnails will display on the right of the screen. Move the cursor onto a thumbnail, and press <Set> twice to open the image; if the stored image is a cine file, double-click the thumbnail to enter the auto cine review.
- To enter image review:
 - Select the Review button to enter review page. Images of the current exam and the current patient are displayed.
 - Select an exam of a patient in the iStation screen, and select <Review> or double-click the exam to enter the Review screen to review the images of the patient.

Analysis

In the image analysis status, you can view, zoom, perform post processing and measurements, add comments and perform cine review for a stored image (FRM or CIN format). The operation steps are the same as those for real-time scanning; please refer to relevant sections for details.

1. To enter image analysis:
 - In the image scanning or freeze status, double-click a thumbnail stored in this exam to enter the image analysis status; or
 - In the image review status, double-click the selected thumbnail to open the image.

You can perform cine review operations in image analysis status.

2. To exit the image analysis:
 - Press the Freeze button to exit and enter the real-time scan status.
 - Select the Return button to exit from the image analysis to the Review status. In image analysis status, the selected image is displayed on the screen, and the thumbnails of the same exam are displayed on the thumbnail area, you can turn pages using the buttons on the right side of the thumbnail.

10.4.7 Image Compare


Image Compare in Review Mode

TIP:

For B/B+COLOR/B+TVI/B+POWER/B+TEI mode image, you can select at most 4 images; for PW/M/CW/TVI mode image, you can select at most 2 images

Perform the following procedure:

1. Select [Compare] on iStation screen or Review screen.
2. Select the images for comparison.

Click to select the image, and the icon  appears on the image, which indicates the image is to be compared.

If select the wrong image, click the image again to cancel the selection.

- Select image size display on “Thumbnail Size” bar to display more images at a time.
- Image compare of different exams for the same patient: Select “all” in the drop-down list of “Exam History” to see all exam files, then you can select different images of different exams to compare.

3. Repeat the step 2 above to add the image to be compared.

There is “Display” column you can filter the images by selecting “All Items”, “Selected”, “Unselected”.

Click [Clear Selected] to clear all selected images.

4. Click [OK] to enter image comparison.
5. Switch the multi-frame cine among the windows to review (single-frame image cannot be reviewed).
 - Press <Dual> to toggle between the two images.
 - Press <Quad> to switch among 3-4 images.

The window with the highlighted “M” mark is the current activated window.

You can select the image to be reviewed at synchronous time when the multi-frame image is reviewed by using [Sync Play].

6. Save the image if necessary.
7. Click [Return] on the screen or press <Freeze> to exit image compare.

Frame Compare

TIP:

Cine compare can only be performed for B/C mode image only. The image on dual/quad window cannot be compared.

Perform the following procedure:

1. Freeze the image in B/C mode, select [Frame Compare] in “Cine” menu on the touch screen to enter frame comparison mode.
2. Review the images of different image windows (cine replaying can’t be performed for single-frame image file), press <Update> or <Dual> key to switch the active image window.
3. Save the image if it is necessary.

Measurements, adding comments and body marks are allowed.



- Select [Frame Compare] again to return to image frozen status; press <Freeze> to enter real-time imaging.

10.4.8 Sending Image File

NOTE:

Data saved this way can only be reviewed on the PC and cannot be restored to the ultrasound system.

Perform the following procedure:

1. Do one of the following to bring up the “Send To” screen:
 - In the main screen, select a stored image thumbnail and click  on the upper right corner of the image.
 - In the iStation screen, select a stored image thumbnail and click  on the upper right corner of the image.
 - In the Review screen, select a image and click [Send to].
2. Select the preferred destination from the Send To screen.

10.5 Report Management

10.5.1 Report storage

The exam reports are stored under the directory of the exam of the patient.

10.5.2 Importing, exporting and sending a report

Import/export report via Backup

In iStation screen, select patient data, then click [Restore Exam] or [Backup Exam] in the popped up menu to import or export patient information, images and reports from or to an external memory device.

Perform the following procedure:

1. Click to select patient data, and select [Restore Exam] or [Backup Exam].
2. Select the destination.
3. Select whether to remove from local HD after Backup:
 - If “Remove Exams” is selected, the patient information and images are removed.
 - If “Remove Images” is selected, only the patient images are removed.
4. Select whether to hide the patient information.
5. Select whether to encrypt backup exams for USB only: input the password and confirm password in the field box. Click [Backup], a “Patient.7z” compressed package is backed up to the USB device, and you need to input the password to open the package.

NOTE:

- If the password is forgotten, you cannot open the backup package.
- The password cannot be multi-language or Chinese characters.

Export report via Send To

In the iStation or Review screen, click [Send Exam] or [Send to] to send patient data to an external memory device (USB disk or disc) or network storage, you can choose if reports are exported.

Perform the following procedure:

1. Check “Export Report” on the screen.
2. Select report type to be exported.
3. Click [OK] to confirm.

10.6 Patient Data Management (iStation)

The patient data include basic patient information, exam information, image files and reports. You can search, view, backup, send, restore, delete or export patient data in iStation.

Do one of the following to enter iStation:

- Select the iStation button on the control panel.
- Click [iStation] in the Patient Info screen.
- Click [iStation] in the Review screen.

10.6.1 Searching a Patient

Perform the following procedure:

1. Select the data source.
Use [Data Source] to select the data source of patient data, the system patient database is default.
2. Set search conditions in the “Item” drop-down list.
3. Enter the key word. The matching patient information is displayed in the patient list.
4. When you select a patient in the patient list, the images of this patient will be displayed at the bottom of the screen.

10.6.2 Patient Data View & Management

Select the desired patient information in the list.

Item	Description
Review an image	Select an exam of a patient, click [Review Image] to enter Review screen.
Patient Information	Select an exam of a patient, click [Patient Info] to check the patient information of this exam.
Review Report	After you select an exam of a patient, click [Review Report] to view the report of this exam for this patient.
Delete Exam	<ul style="list-style-type: none"> • Select the patient record. Click [Delete Exam] to delete the exam. However, you cannot delete patient data being printed, exported or sent, or delete the current exam. • To delete an image, select the image and click the delete icon on the right side.
Backup Exam	<p>You can back up the selected patient data to the system-supported media in order to view it on PC, or restore the patient data to the system from an external media. The exam after being backed up can be restored to the system for another review. Click to back up the selected patient data to the system-supported media.</p> <ul style="list-style-type: none"> • Original format: to back up the data in original format. • DICOM format: you can change the cine compression mode, and JPEG compression mode. • You can select whether to remove images or the whole exam record from the system.
Restore Exam	Click to import the patient data from an external media.

Item	Description
Send Exam	<p>You can use this function to export the exam data to external devices (in PC data or DICOMDIR data format) and then import to PC or restore to the ultrasound system to review the data.</p> <ol style="list-style-type: none"> 1. Select the patient record, click [Send Exam] in the menu to send exam data or images of the selected record. 2. Select from the destination, and set related settings.
Activate an Exam	<p>After you select an exam, which has been performed within 24 hours, click [Activate Exam] to activate the exam and load the basic patient information and measurement data to continue the exam.</p> <p>If you want to select a patient data in an external memory database to start a new exam or recover the exam, you have to first allow the system to load the patient data to the system's patient database.</p>
Continue an Exam	<p>Select an exam that is paused within 24 hours, click [Continue Exam] to activate the exam and load the basic patient information and measurement data to continue the exam.</p> <p>If you want to select a patient data in an external memory database, you have to first allow the system to load the patient data to the system's patient database.</p>

10.7 Recycle bin

The recycle bin is used to store deleted patient data, exam data and images.

The system supports recovery of these data from the recycle bin.

Click the Recycle bin at the system status area (when the button is gray, the operation is unavailable) to enter the Patient Recycle Bin screen.

To recover the deleted patient data

NOTE:

If the capacity of the recycle bin exceeds 200. The system reminds the user to clean. Follow the procedures below to clean the recycle bin.

Perform the following procedure:

1. Select items to be recovered in the list.
2. Select operations:
 - [Restore Items]: restore the item back to iStation.
 - [Delete]: delete the item permanently, and the item can never be restored again.
 - [Restore All Items]: restore all the items back to iStation.
 - [Empty Recycle Bin]: empty the recycle bin and all items can never be restored again.
 - [Exit]: exit the recycle bin.

10.8 iStorage

TIP:

To use iStorage function, you need UltraAssist software in 2.0 version (with V1.0 network protocol); consult Mindray service engineer for details.

Network storage is used to save image files and measurement reports to the remote PC server.

For network storage setting, see the Setup chapter.

Perform the following procedure:

1. Enter iStation, select one (or more than one) patient data or image in the local data source.
2. Select [Send Exam].
3. Select [iStorage] in the Send To dialog box, and select the PC server of the right side.
4. Select PC transfer format and check whether to send report.
5. Click [OK] to start sending.

10.9 Network Storage

Network storage is used to save image files and measurement reports to the remote PC server.

For network storage setting, see the Setup chapter.

Perform the following procedure:

1. Enter iStation; select one (or more than one) patient data or image in the local data source.
2. Click [Send To].
3. Select [Network Storage] in the Send To dialogue box, and select the PC server on the right side.
4. Select PC transfer format and check if to send report.
5. Click [OK] to start sending.

TIP:

Send image/cine to Network storage by using the user-defined buttons for network storage. For detailed information about user-defined button setting, see the Setup chapter.

10.10Print


For printer connection, see “3.8 Installing a Printer”.

For detailed information about user-defined button setting, see the Setup chapter.

10.10.1Image Print

For DICOM image printing, refer to relevant chapters. Video printer is applied in image print service.

Perform the following procedure:

1. Select the desired image in iStation or Review screen.
2. Click  icon on the upper right side of the image, and select the printer in the popped up dialog box.

3. Click [OK] to start printing.

10.10.2 Report Printing


Both reports and images can be printed on a graph/text printer. For measurement details, please refer to the *Advanced Volume*.

10.11 Back up Files using the DVD Drive

CAUTION



During the backup process, if a CD/DVD is forcibly taken out or you perform other operations, the backup process will fail or the system may malfunction.

TIP:


- Writing data using “Send To” supports the PC format transfer function, while CD/DVD writing using “Back Up” supports only system-relevant formats.
 - The  symbol indicates that the input CD/DVD is damaged or contains data in an incorrect format.
-

The system supports writing data to CD/DVD using the DVD-RW/DVD+RW drive and reading data from CD/DVD on the PC.

Perform the following procedure:

1. Put a CD/DVD in the tray.
2. Select the data to be backed up. Select [Send Exam] or [Back up Exam] in the menu which appears. Select the target drive in the Send To or Back Up Patient Record dialog box.
3. Click [OK] or [Back up] to begin writing when the  symbol displays.
4. After the writing process is complete, click  to bring up the Disc Option dialog box, and select [Eject] to eject the CD/DVD.

10.12 Patient Task Management

Click  in the system status area of the screen to bring up the Task Management dialog box.

Storage Task

Displays the DICOM storage task.

DICOM Print Task

Displays the DICOM print task.

Media Storage Task

- DICOM media storage task (including disc and USB devices): In iStation screen, select the target exam and click [Send Exam], then click DICOMDIR in the menu which appears.
- Back up task (system-relevant format): Select the exam to be backed up in iStation and click [Back Up Exam].
- Send to external devices (including disc and USB devices): Select exam data or images in the iStation or Review screen. Click [Send Exam] for the image.

- iStorage task: In iStation screen, select the target exam and click [Send Exam], then click iStorage in the menu which appears.
- MedTouch/MedSight storage task:
 - In iStation screen, send exam to MedTouch/MedTouch devices.
 - In Review screen, iStation screen, thumbnail area, send the image(s) to MedTouch/MedSight devices.

Print Task


Displays image or report printing tasks.


In the Task Management dialog box, the patient ID, name, destination, progress, type, contents and task created time are displayed.

You can perform the following operations:

- Click [Delete] to delete the task.
- Click [Retry] to retry the failed task.
- Click [Select All] to select all the tasks.

Task Status

When there are tasks underway, the task management icon displays as . Click the icon to check the process.

When tasks have failed, the task management icon displays as . Click the icon to check the reason for the failure.

When the task management icon displays as , it means no task is underway or has failed.

DICOM Service Setting

On the Storage Task and DICOM Print Task page, click [Service Setting] to enter the DICOM service setting screen. For details, see the DICOM/HL7 section of the Setup chapter.

Troubleshooting

If a serious error occurs, such as network disconnection or operation timeout, the system can try to reconnect the network. The interval time and maximum retries can be set as desired. For details, see the DICOM Service Preset section of the Setup chapter.

10.13 V-Access

The ultrasound system can be used to log on to a remote server to check or modify patient data on the server.

Perform the following procedure:

1. Press the user-defined key for “V Access” to use the function.
The system brings up a dialog box for entering the IP address of the remote server.
2. Enter the IP address and click [OK].
3. Log on with the server account and password.
4. Check the data transferred and carry out operations as necessary.

After logging in to the remote server, you can switch from the Ultrasound System and the remote server as follows:

- a. Click [Minimize] to exit the remote server and enter the Doppler interface.
- b. Press the user-defined key for “V-Access” to enter the remote server again.

10.14 Q-Path

You can use the ultrasound system to check data on browser directly. After you have ordered storage service of a network website service, you can check data using the website, authorized account and password (provided by the service vendor). You can open the browser to review previously sent DICOM data. For Q-Path settings, see the Q-Path Preset section of the Setup chapter.

Perform the following procedure:

1. Send stored images or worksheet reports from iStation/Review/thumbnail area to the Q-Path server.
2. Press the user-defined key for “Q-Path” to enable the function.
3. Log in to the Q-Path server through the Q-View browser to check the stored images and worksheet reports.
4. Click [Esc] to exit the Q-View browser.

10.15 u-Link

u-Link is used to connect the software that supports u-Link protocol. For details, please refer to the accompanying software manual.

1. , and can match the data of the same patient through network connection

11 DVR Recording

NOTE:

- Strictly observe the procedures described here to perform the recording and replaying operations; otherwise it may result in data loss or system malfunction.
 - Set the PAL or NTSC in the setup and this shall be consistent with that in the DVR.
 - Accidental exposure to strong electromagnetic fields or mishandling of the video cassette may result in image and data loss, so check if the recording is successful as soon as possible. Mindray is not responsible for any data loss.
-

You can use the DVR device to record and replay videos and audios that can be stored in DVD disc or hard disc. For the detailed operation, please refer to the DVR accompanying operation manual.

Recording is to record videos/audios arises from the examination and store them into DVD or hard disc of the DVR device.

Recording procedures with DVR:

1. Connect the DVR recorder to the ultrasound system and insert an available DVD disc, make sure there is memory in the hard disc.
2. Do output setting, see the General section of the Setup chapter.
3. Start the ultrasound exam and acquire images.
 - To record: click begin recording related key on the DVR control panel to begin the recording.
 - To stop: click stop recording related key on the DVR control panel to stop the recording.

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12 DICOM/HL7

NOTE:

Before using DICOM, please read the electronic file DICOM CONFORMANCE STATEMENT along with the device.

TIP:

The DICOM package is optional, so the description here is only applicable for the system configured with the DICOM package.

This system supports the following DICOM functions:

- Verify Connectivity
- DICOM Storage
- DICOM Print
- DICOM Worklist
- MPPS (Modality Performed Procedure Step)
- Storage Commitment
- Query/Retrieve
- Structured Report
- DICOM Medium Storage (DICOMDIR Review)
- DICOM Task Management

If all the DICOM presets on the DICOM Service Preset screen are completed, you are ready for the Storage, Print, Worklist (HL7 Query), MPPS, Storage Commitment and Query/Retrieve applications. For detailed information about DICOM presets, see the DICOM/HL7 section of the Setup chapter.


12.1 DICOM Storage

DICOM Storage is used to send images (single-frame or multi-frame) or structured report to the DICOM storage server for storage.

12.1.1 Send images on iStation/Review/main screens

Perform the following procedure:

1. Do one of the following to select images:
 - Enter the iStation page. Click to select a patient or an exam record in the list. Thumbnails are displayed in the thumbnail area in the lower part of the screen, and then click to select a thumbnail or the cine. Or, select an exam or exams from the patient list (there should be images for this exam).
 - Enter the Review screen. Click to select a thumbnail or the cine.

- On the main screen, select a thumbnail or the cine from the clip board/thumbnails area of the screen.
2. Click  in the top-right part or [Send To] to bring up the Send To dialog box.
 3. Click to select “DICOM” in the Target box on the left side, then select the DICOM storage server in the Storage Server box on the right side, and click [OK].

12.1.2 To send images using a shortcut key

You can save single-frame images or multi-frame images to a DICOM server while saving to hard drive using a shortcut key.

TIP:

To define the shortcut key, for details see the Key Configuration section of the Setup chapter.

Start the ultrasound exam scan. Press the user-defined key to send the image or the cine to DICOM storage.

12.1.3 To send images to storage after an exam ends

TIP:

To preset Sending/printing after End Exam, for details see the General section of the Setup chapter.

Start the ultrasound exam scan. Select the End Exam button to send the image or the cine to DICOM storage automatically.

12.1.4 Encapsulate PDF

Encapsulate PDF refers to the PDF file is encapsulated in DICOM IOD.

Encapsulated PDF is sent by following the procedures below:


- Send in the unit of single exam.
- The exam with the state of End, Cancel or Stop cannot be sent as encapsulated PDF.
- Check “Encapsulate PDF” in the storage service preset.
- If there is an exam result in the report template, this type of exam should be performed.

Sending the exam or archiving the exam can send the encapsulated PDF file.

12.1.5 Unload DCM file

The image can be unloaded to DCM format and send to the storage media, iStorage.

Perform the following procedure:


1. Select the image, and click .
2. Select the iStorage server to export the image in DCM format.
3. Click [OK] to send DCM format file to the external media

12.2 DICOM Print

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

12.2.1 Print images on iStation/Review/Main screen

Perform the following procedure:

1. Do one of the following to select images:
 - Enter the iStation screen. Click to select a patient or an exam record in the list. Thumbnails are displayed in the thumbnail area in the lower part of the screen, and then click to select a thumbnail. Or, select an exam or exams from the patient list (there should be images for this exam).
 - Enter the Review screen. Click to select a thumbnail.
 - On the main screen, select a thumbnail or the cine.
2. Click  in the top-right part or [Send To].
3. Click to select “DICOM” in the Target box on the left side, then select the DICOM print server on the right side, and click [OK].

12.2.2 To send images to DICOM Print after an exam ends

TIP:

Preset Sending/printing after End Exam, for details see the General section of the Setup chapter.

Start the scan and obtain the image. Each time selecting the End Exam button, the system will send the image to the default DICOM print server for printing.

12.3 Worklist

When the DICOM basic package is configured and the Worklist server has been set, click [Worklist] in the “Patient Info” screen to query or import the patient data.

Perform the following procedure:

1. Enter the patient information page.
2. Select [Worklist] to enter the Worklist page.
3. Guarantee the data source: after select the service type, select the worklist server from the corresponding server.
4. Input the searching condition.
5. Click [Query]. The scheduled patients, which meet the criteria, are displayed in the lower part of the screen.
 - After the first query, you can perform the second query based on the preview results. The scheduled patients in the list will update in real time.
 - Enter patient ID, patient name, accession # and exam date, the system affords the result in real-time.
 - Select the [Search Key] type, enter the keywords and then click [Query] to search.
 - To reset the criteria, click [Clear] button.
 - After “Remember Patient ID/Name/AccessionNumber” is selected in [Setup], the latest query condition can be memorized.
6. Select the desired patient from the list.
 - Click [Start Exam], the patient information is imported into the system and then an exam is started.

- Click [Transfer], the patient information is imported into the Patient Information screen. After you edit the patient information in the Patient Information screen, click [OK] to start a new exam.
 - Click [Show Detail] to see details of patient data.
7. Click [Exit] to exit the Worklist.

12.4 MPPS


MPPS is used to send exam state information to the configured server. This facilitates the other systems in obtaining the exam progress in time.

After you preset the Worklist server and MPPS server, if the system obtains the patient information from Worklist server to begin the exam, it will send exam status information to MPPS server of when the exam is undergoing or ended. If the sending fails, the system resends automatically.

12.5 Storage Commitment

Storage commitment is used to confirm whether the images or structured reports are successfully stored on the DICOM storage server.

Before using storage commitment, set the associated storage service

If images are successfully sent to the storage server, the storage commitment server will return to the information about the successful image storage. In the iStation screen, you will see a tick “√” marked in the list below .

NOTE:

Multi-frame storage is not allowed if “Allow Multiframe” is not selected (About “Allow Multiframe” setting, see the Storage Service Preset section of the Setup chapter). Even if there is a multi-frame file in the exam to be sent, only single-frame image storage will be performed. After the storage is complete, there is no “√” marked in the list of the iStation screen.

12.5.1 Storage commitment after sending images on the iStation screen

Select the image, the cine or the data, and send it, see “12.1 DICOM Storage”.

The system will send all the images stored in the exam record to the storage server. Meanwhile, it will send storage commitment to the storage commitment server.

12.5.2 To send storage commitment automatically after an exam ends

TIP:

- Preset Sending/printing after End Exam, for details see the General section of the Setup chapter.
 - Set a default server in the Storage page and set the associated storage service in Storage Commitment page, see the DICOM Service Preset section of the Setup chapter.
-

Start the scan and obtain the image. Selecting the End Exam button each time, the system will send the image to the default DICOM storage server for storage and send storage commitment to the storage commitment server.

Storage commitment is confined to the whole exam. Not each image sending can be indicated.

12.6 Query/Retrieve

The query/retrieve function is used to query and retrieve patient exam records in a designated server.

After setting the DICOM query/retrieve server, you can perform the query/retrieve function in the iStation screen.

1. Enter iStation screen.
2. Click [Query/Retrieve] to open Query/Retrieve screen.
3. Select the server in the “Server and Service” area (both the source and the destination) and query level.
4. Enter the query information.
Click [Clear] to empty the entered query information.
5. Click [Query]. The system performs the query and lists the results in the patient (source) list.
You can perform further queries based on the results by entering new query information.
6. Select one or more patient records according to the actual situation.
 - Click [Select All] to select all the patient records in the list.
 - Click [Deselect All] to deselect all the patient records in the list.
7. Click [Retrieve] to retrieve the patient records in the DICOM query/retrieve server to the local machine.
8. Click [Exit]. The retrieved patient records are listed in the iStation screen.

12.7 DICOM Media Storage

Patient data in the ultrasound system can be saved on external media in DCM format, while DCM files can be accessed in the ultrasound system.

DICOM media storage and DICOMDUR review should meet the following conditions:

- There is a DVD disk in the ultrasound device, and it works well.
- File system format of CD/ DVD optical file should be ISO9660, and the optical disk should not be damaged.
- File system format of DVD optical file should be UDF, and the optical disk should not be damaged.
- Normally read/write data from the USB ports on the ultrasound system.
- File system format of removable device (USB flash drive) is FAT32 and the media should not be damaged.

12.7.1 Media Storage

Perform the following procedure:

1. Select patient records in the iStation screen.
2. Click [Send Exam] in the menu which appears to open the dialog box.
3. Select the destination to “DICOMDIR” and DICOM Format as well as compression mode.
You can select to delete the exam or the image after the backup, and select to hide patient information.

4. Click [OK]. The image from the current exam is sent to the external storage media in DICOM format.

If the backup is successful, a tick will appear in the Backup list in the iStation screen. If not, there will be no tick.

TIP:

There must be no DICOMDIR/DCMIMG/IHE_PDI files on the external storage media of the same name as the one being backed up. Otherwise, the backup cannot proceed. Ensure there is enough storage space, or the backup may fail due to shortage of space.

12.7.2 Media review

Perform the following procedure:

1. Connect the external media with DCM files to the system.
2. Select the data source in iStation screen, and the visible data will be shown.
3. If there are several types of data on the media, the system will ask you to select the format. Then, click [DICOMDIR].

12.7.3 Data Restore

NOTE:

Only system-accessible media can be selected.

After the DICOM format data are saved to external media, restore the data to the ultrasound system. Connect the external media containing DCM files to the system.


1. In iStation, review the data stored on the external media.
2. Select the data to be restored in iStation.
3. Click [Restore Exam] on the iStation screen.


12.8 Structured Report

The Structured Report (SR) can be sent with meeting the following procedures:

- DICOM structured report installed with the corresponding exam mode;
- The state of the SR should be “Cancel” or “Stop”.
- Set the storage option to “Attach SR When Store Images” or “Only Store SR”, see the DICOM Storage Service Preset section of the Setup chapter.

Perform the following procedure:

1. Click to select a patient or an exam record in the list on iStation page, and click [Send Exam] in the iStation page.
2. Select DICOM in the storage server list, select a server in the “Storage Server” list.
3. Click [OK], the status of sending task  viewed in task management.

After successful storage of both image and structured report; you can see the storage commitment mark “√” in the list below  on the iStation screen.

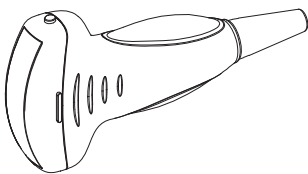
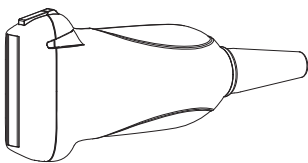

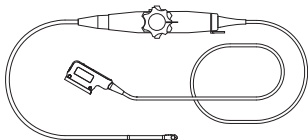
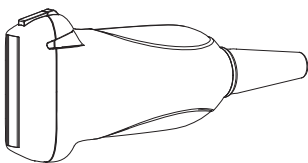
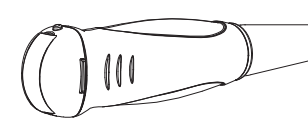
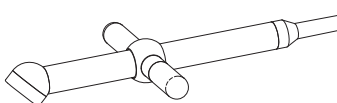
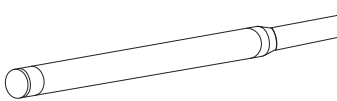
NOTE:


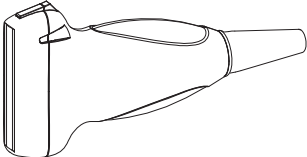
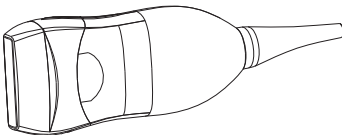
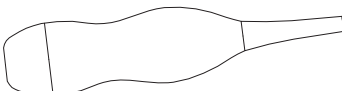
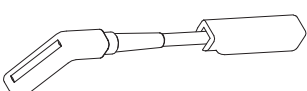
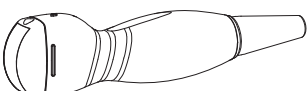
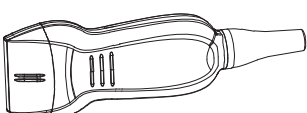
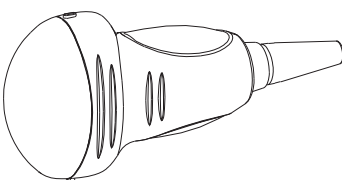
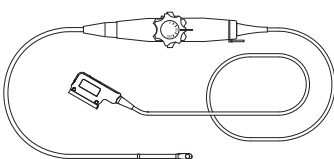
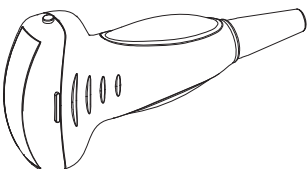
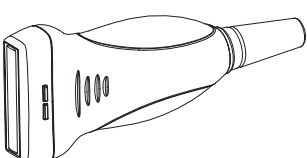
Only the PACS system from the Medstreaming company (<http://www.medstreaming.com/default.aspx>) supports sending self-defined measurements by DICOM SR.

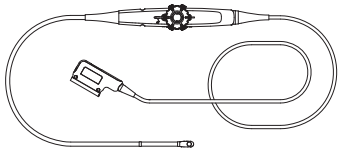
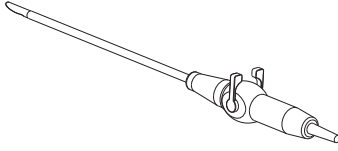
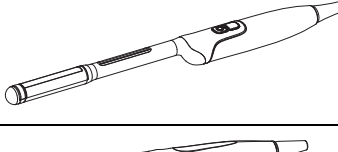
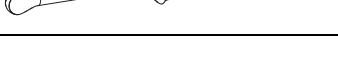

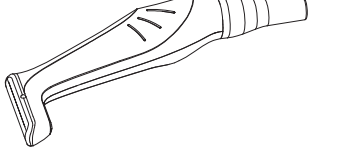
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13 Probes and Biopsy

13.1 Probes

Probe model	Probe Type	Probe Figure
C5-1s	Convex	
L12-4s	Linear	
P10-4s	Phased	
P7-3Ts	Phased	
L14-6Ns	Linear	
C11-3s	Convex	
CW2s	Pencil probe	
CW5s	Pencil probe	

Probe model	Probe Type	Probe Figure
SP5-1s	Phased	
L14-6Ws	Linear	
L10-3s	Linear	
P7-3s	Phased	
L16-4Hs	Linear	
C6-2Gs	Convex	
L20-5s	Linear	
D7-2s	Convex	
P8-3Ts	Phased	
SC6-1s	Convex	
L9-3s	Linear	

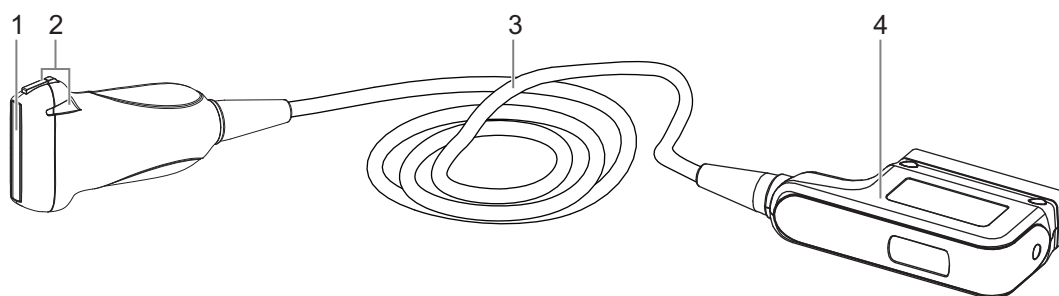
Probe model	Probe Type	Probe Figure
P8-2Ts	Phased	
LAP13-4Cs	Convex	
ELC13-4s	Intracavitary (Bi-Plane, convex & linear)	
V11-3Ws	Convex	
P8-2s	Phased	
L14-5sp	Linear	

TIP:

For details of TEE probe, see the relevant Operator's Manual.

13.1.1 Probe Functions by Part

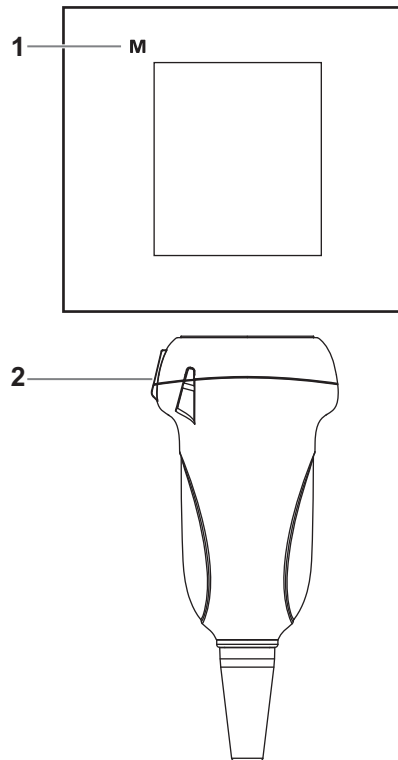
The basic structures and corresponding functions of probes are basically the same; take the following probe as an example.



No.	Item	Description
1.	Probe head	Converts the electrical signal into an ultrasonic signal, focusing the sound beams in a given direction; meanwhile, it receives the reflected ultrasonic signal and converts it into an electrical signal for transmission over the cable. The lens on the surface is the acoustic lens. Apply ultrasound gel on the acoustic lens for correct operation.
2.	Needle-guided bracket fix tabs and grooves	Provides mounting support of the needle-guided bracket. NOTE: This structure of probes in the figure above may vary with the matched needle-guided brackets.
3.	Probe cable	Transmits electrical signals between the probe body and connector.
4.	Probe connector	Connects the probe and cable to the ultrasonic diagnostic system.

13.1.2 Orientation of the Ultrasound Image and the Probe Head

The orientation of the ultrasound image and the probe are shown as below. The “M” side of the ultrasound image on the monitor corresponds to the mark side of the probe, for the laparoscopic probe, the probe orientation starting side is located on the end of the distal tip away from the handle. Check the orientation before the examination (Using a linear probe as an example).



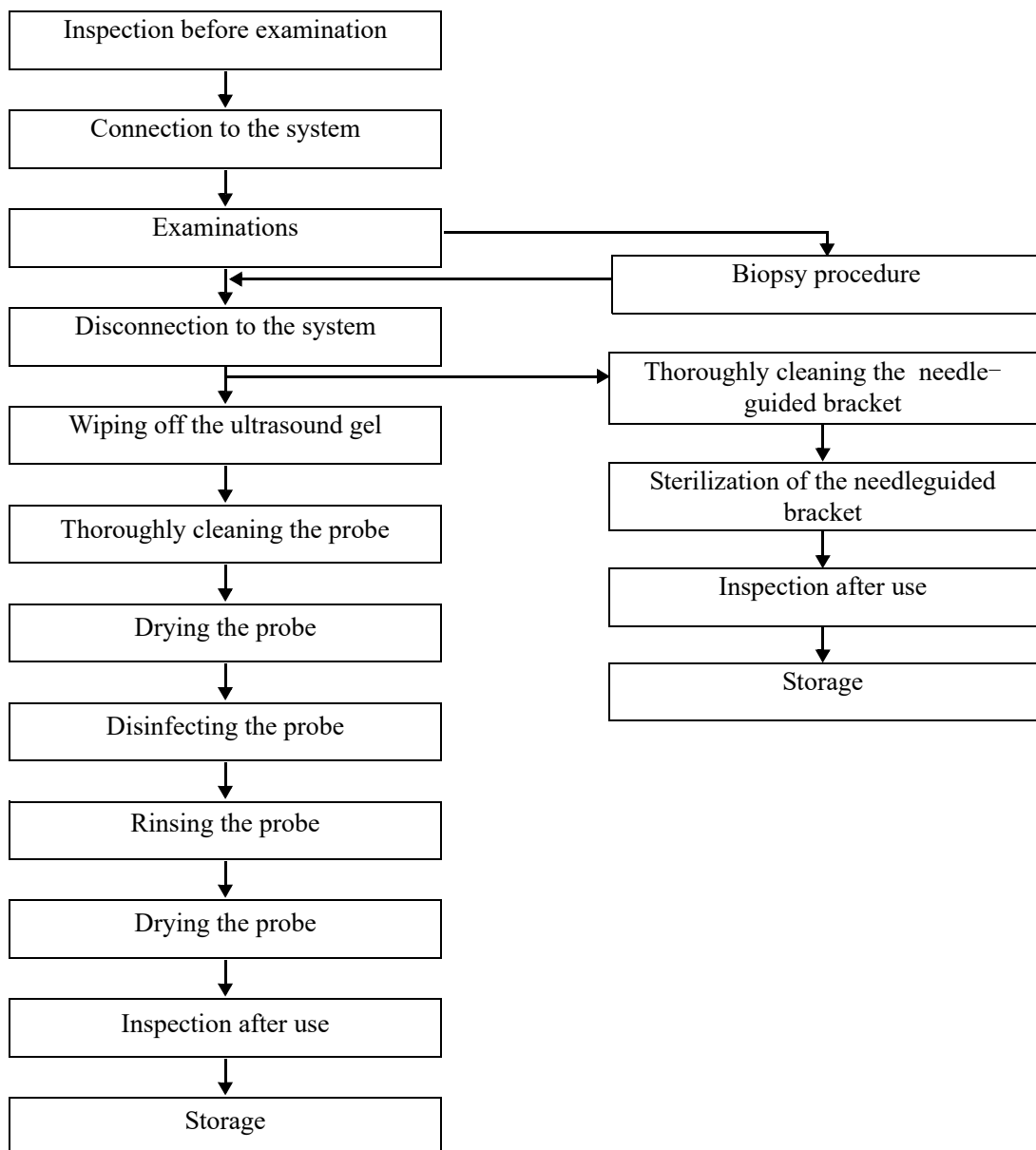
1	Orientation mark
2	Mark

13.1.3 Procedures for Operating

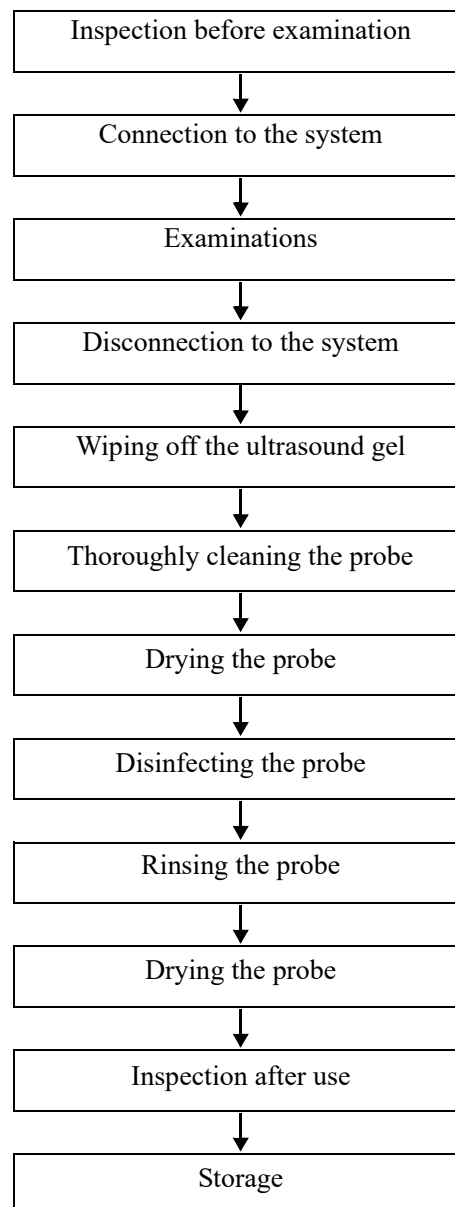
WARNING

Disinfect the probe and sterilize the needle-guided bracket before and after an ultrasound-guided biopsy procedure is performed. Failure to do so may cause the probe and the needle-guided bracket becomes a source of infection.

This section describes general procedures for operating the probe. The proper clinical technique to be used for operating the probe should be selected on the basis of specialized training and clinical experience.

Procedures for operating (with biopsy function)

Procedures for operating (with no biopsy function)



13.1.4 Wearing the Probe Sheath

CAUTION

- Be sure to cover the probe with a new (unused) probe sheath to prevent infection during examination. If the package of a probe sheath is open or broken, the sterilization of the probe sheath may not be sufficient. DO NOT use such a probe sheath.
- The cover contains natural rubber latex and talc that can cause allergic reactions in some individuals.
- DO NOT use an expired probe sheath. Before using a probe sheath, verify whether the term of validity has expired.

A legally marketed probe sheath must be installed over the probe before performing intra-cavitary and intra-operative examination. Protective barriers may be required to minimize disease transmission. Probe sheaths are available for use with all clinical situations where infection is a concern.

To order probe sheath, contact:

CIVCO Medical Instruments Co.

102 First Street South, Kalona, IA 52247-9589 USA

Tel: 1-319-656-4447

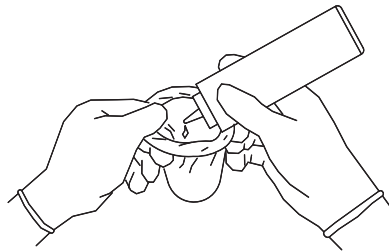
E-mail: info@civco.com

<http://www.civco.com>

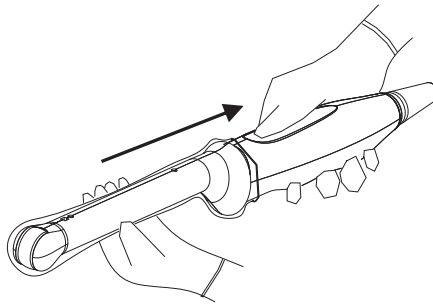
Refer to the probe dimensions listed the Probe Dimensions chapter to choose the necessary probe sheath type.

Perform the following procedure to install the probe sheath:

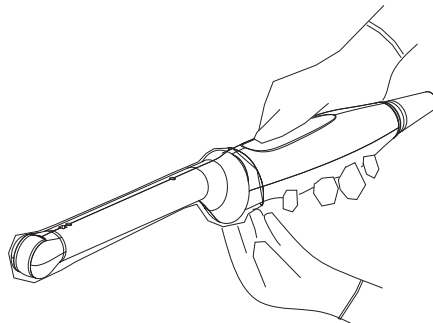
1. Place an appropriate amount of gel inside the sheath or on the probe acoustic lens. Poor imaging may result if no gel is used.



2. Insert the probe into the sheath; make sure to use proper sterile technique. Pull cover tightly over probe acoustic lens to remove wrinkles and air bubbles, and taking care to avoid puncturing the sheath.



3. Secure the sheath with the enclosed elastic bands.



4. Inspect the sheath to ensure there is no hole or tear.

13.1.5 Probes Cleaning and Disinfection/Sterilization

Before and after completing each examination, clean and disinfect (or sterilize) the probes as required. When biopsy procedures have been performed, be sure to sterilize the needle-guided bracket. Fail to do so may result in the probe and the needle-guided bracket to becoming sources of infection. Please follow the instructions in the manual for cleaning.

WARNING

Never immerse the probe connector into liquid such as water or disinfectant. Immersion may cause electrical shock or malfunction.

CAUTION

- No cleaning and disinfecting may result in the probe becoming a source of infection.
 - Please follow the disinfectant manufacturer's manual for performing cleaning and disinfection, including preparing sterile water and cleaning and disinfection time.
-

NOTE:

- After the examination, wipe off the ultrasound gel thoroughly. Otherwise, the ultrasound gel may solidify and degrade the image quality of the probe.
 - DO NOT make the probe to become overheated (more than 55 °C) during cleaning and disinfections. High temperature may cause the probe to become deformed or damaged.
 - Observe the graph here carefully to immerse the probe. Only soak parts of the probe below the strain relief.
 - Repeated disinfection will eventually damage the probe, please check the probe performance periodically.
-

Cleaning and Disinfection/Sterilization Overview

Cleaning and disinfection refer to two distinct processes. According to the Centers for Disease Control and Prevention (CDC) "Guideline for Disinfection and Sterilization in Healthcare Facilities" (2008):

- Cleaning is the removal of visible soil (e.g. organic and inorganic material) from objects and surfaces and normally is accomplished manually or mechanically using water with detergents or enzymatic products. Thorough cleaning is essential before high-level disinfection and sterilization because inorganic and organic material that remains on the surfaces of instruments interfere with the effectiveness of these processes.
- Disinfection describes a process that eliminates many or all pathogenic microorganisms, except bacterial spores.
 - Low-Level Disinfection—Destruction of most bacteria, some viruses, and some fungi. Low-level disinfection will not necessarily inactivate *Mycobacterium tuberculosis* or bacterial spores.
 - High-Level Disinfection (HLD)—Destruction/removal of all microorganisms except bacterial spores.

- Sterilization describes a process that destroys or eliminates all forms of microbial life and is carried out in healthcare facilities by physical or chemical methods.

Selecting a Microbicidal Method

Probes can be divided into three categories based on their intended use. Some probes may fall into more than one category (e.g. probes use for biopsy procedures). When selecting a disinfectant, determine the required level of disinfection based on intended use and possibility of cross-contamination.

- **Contacts intact skin:** Probes that only come into contact with clean, intact skin are considered noncritical devices and require cleaning after every use. Cleaning may be followed by a low-level disinfectant spray or wipe.
- **Contacts mucous membranes and non-intact skin:** This category includes all endocavity probes - intravaginal, transrectal, and transesophageal (TEE) and probes use for biopsy procedures. These semi-critical probes must be cleaned with an appropriate cleaner after use followed by high-level disinfection.
- **Contacts otherwise sterile tissue or body-space:** These probes are considered critical and include all intraoperative probes. These probes must be cleaned with an appropriate cleaner after each use, followed by a sterilization process.

Cleaning

Please refer to the instructions in the manual and follow your hospital policy and procedures for cleaning.

Perform the following procedure:

1. Wear a pair of gloves to prevent infection.
2. Disconnect the probe from the system. If the sheath is used, take off the sheath and discard it.
3. Wipe off the ultrasound gel or other visible dirt on the surface of the probe by using a damp piece of disposable lint-free soft cloth or tissue.
4. Choose an appropriate cleaning agent including mild detergents, enzymatic cleaners and specially designed enzymatic sponges.
5. Immerse the probe fully in the cleaning fluid for at least 1 minute or according to manufacturer's instructions. Lightly mechanical clean the probe with a piece of lint-free soft cloth or soft sponge until no dirt is visible. When necessary, clean the seams or biopsy guide features by using disposable cotton swabs. Avoid using a brush to wash the lens because it may damage the probe.
6. Rinse the probe thoroughly by using a large amount of clean water (about 7.5 L/2 gallons) at room temperature for about 30 s to remove the residual dirt and cleaning solvent. Repeat the rinsing operation twice.
7. Dry the probe by wiping with a piece of disposable lint-free soft cloth or tissue.
Do not dry the probe by heating.
8. Inspect the probe. If visible dirt still exists, repeat the preceding steps to wash the probe until it is all clean.
9. Check whether the probe has defects such as peeling, rifts, bumps, cracks, or liquid spill. If such defects exist, the probe has reached the end of its service life. In this case, stop using it and contact the Mindray service department.

Low-level disinfection of a non-critical probe

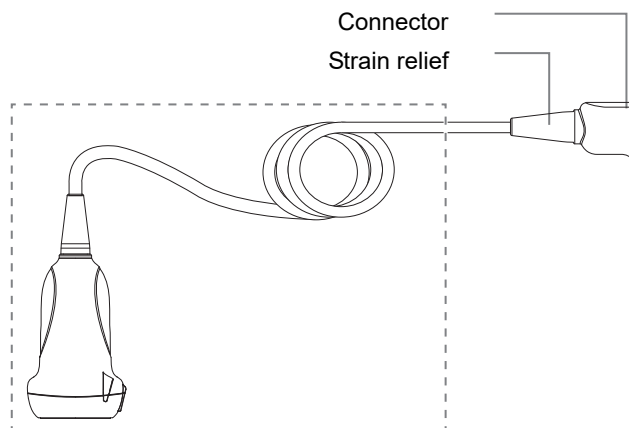
CAUTION

Use protective eyewear when disinfecting using sprays.

Perform the following procedure:

1. Wear a pair of gloves to prevent infection.
2. Clean the probe thoroughly in accordance with the cleaning procedure before disinfection.
3. Disinfect the probe by using an appropriate low-level disinfectant. Follow the disinfection agent manufacturer's instructions for preparation and use of the disinfectant.
 - Wipes: Wipe all the surface of the probe according to the wiping duration specified in the operator's manual provided by the manufacturer.
 - Spray: Spray the disinfectant directly on the surface of the probe or spray the disinfectant on a piece of disposable lint-free soft cloth and wipe the probe according to the wiping duration in the operator's manual provided by the manufacturer.

Observe the graph here carefully to perform disinfection. Do not spray the strain relief on the connector end or the connector.



4. Wipe away the residual disinfectant on the probe by using a piece of lint-free soft cloth soaked with clean water. Wipe three times. Or rinse the probe thoroughly by using a large amount of clean water (about 7.5 L/2 gallons) at room temperature.
5. Dry the probe by wiping with a piece of disposable lint-free soft cloth. Do not dry the probe by heating.
6. Check whether the probe has defects such as peeling, rifts, bumps, cracks, or liquid spill. If such defects exist, the probe has reached the end of its service life. In this case, stop using it and contact the Mindray service department.
7. Store the probe in a cool, clean and dry environment. And repeat the cleaning and disinfection process before the next use.

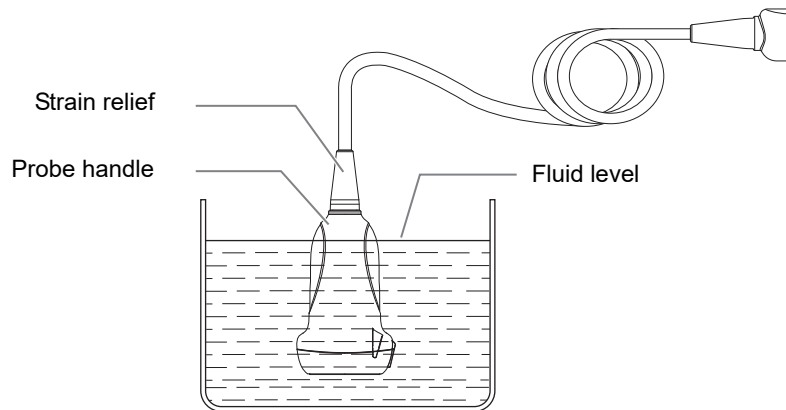
High-level disinfection of a semi-critical probe

Perform the following procedure:

1. Wear a pair of gloves to prevent infection.
2. Clean the probe thoroughly in accordance with the cleaning procedure before disinfection.

3. Disinfect the probe by using an appropriate high-level disinfectant or system. For how to use a high-level disinfectant or system, see the operator's manual provided by the manufacturer. Prepare a disinfectant by using sterile distilled or softened water when necessary.
 - Soaking: Immerse the probe head in the disinfectant and shake the probe appropriately to remove any bubbles on the probe surface. For details about the probe immersion duration, see the operator's manual provided by the manufacturer.

Observe the graph here carefully to immerse the probe. Only soak parts of the probe below the strain relief.



- Wiping: Use a market disinfection wipe product or sterile disposable lint-free soft cloth wetted with disinfection spray and wipe all surfaces of the probe for a duration according to the manufacturer instructions.
4. Rinse the probe thoroughly by using a large amount of clean water (about 7.5 L/2 gallons) at room temperature for about 30 s to remove the residual disinfectant. Repeat the operation twice. Or follow the disinfectant manufacturer's instructions regarding rinsing.
 5. Dry the probe by wiping with a piece of clean disposable lint-free soft cloth. Do not dry the probe by heating.
 6. Check whether the probe has defects such as peeling, rifts, bumps, cracks, or liquid spill. If such defects exist, the probe has reached the end of its service life. In this case, stop using it and contact the Mindray service department.
 7. Store the probe in a cool, clean and dry environment. And repeat the cleaning and disinfection process before the next use.

Sterilization of a critical probe

⚠ CAUTION

Repeated sterilization will eventually damage the probe, please check the probe's performance periodically.

For intra-operative probes, they have to be thoroughly cleaned and sterilized after completing each examination.

Perform the following procedure:

1. Wear a pair of gloves to prevent infection.
2. Clean the probe thoroughly in accordance with the cleaning procedure before sterilization.
3. Sterilize the probe by using an appropriate sterilant or system.

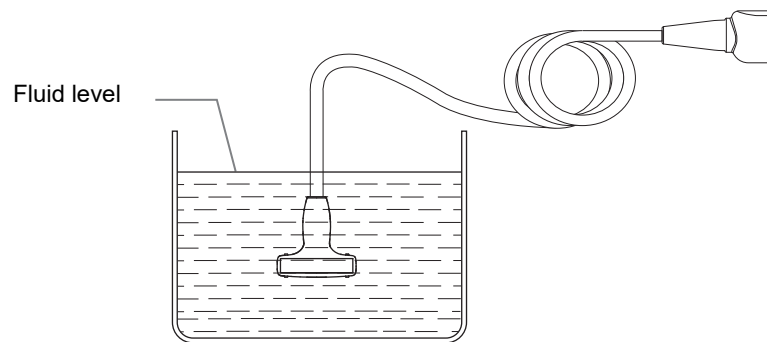
For how to use a system, see the operator's manual provided by the manufacturer.

When using a sterilant, follow the following steps:

- a. Prepare a sterilant by using sterile distilled or softened water when necessary.
- b. Immerse the probe head in the sterilant and shake the probe appropriately to remove any bubbles on the probe surface.

For details about the probe immersion duration, see the operator's manual provided by the manufacturer.

Figure 13-1 Immerse the intra-operative probe in the solution (for reference)



- c. Rinse the probe thoroughly by using a large amount of sterile distilled or softened water (about 2 gallons) at room temperature for about 30 s to remove the residual sterilant. Repeat the operation twice. Or follow the sterilant manufacturer's instructions regarding rinsing.
 - d. Dry the probe by wiping with a piece of sterile disposable lint-free soft cloth. Do not dry the probe by heating.
4. Check whether the probe has defects such as peeling, rifts, bumps, cracks, or liquid spill. If such defects exist, the probe has reached the end of its service life. In this case, stop using it and contact the Mindray service department.
 5. Store the probe in a cool, clean and dry environment. And repeat the cleaning and sterilization process before the next use.

Compatible Cleaner, Disinfectants/Sterilants

The transducer cleaners, disinfectants and sterilants guideline is provided separately. For details, please refer to the Mindray Transducer Disinfectant Recommendation that is accompanied with the transducer.

13.1.6 Probe Environmental Conditions

Table 13-2 Probe Environmental Conditions

Probe Model	Conditions	Ambient temperature	Relative humidity (no condensation)	Atmospheric pressure
C5-1s	Operating	0°C ~ 40°C	30% ~ 85%	700 hPa ~ 1060 hPa
	Storage and transportation	-20°C ~ 55°C	30% ~ 95%	700 hPa ~ 1060 hPa

Table 13-2 Probe Environmental Conditions

Probe Model	Conditions	Ambient temperature	Relative humidity (no condensation)	Atmospheric pressure
C6-2Gs	Operating	0°C ~ 40°C	20% ~ 85%	700 hPa ~ 1060 hPa
	Storage and transportation	-20°C ~ 55°C	20% ~ 95%	700 hPa ~ 1060 hPa
C11-3s	Operating	0°C ~ 40°C	30% ~ 85%	700 hPa ~ 1060 hPa
	Storage and transportation	-20°C ~ 55°C	30% ~ 95%	700 hPa ~ 1060 hPa
L9-3s	Operating	0°C ~ 40°C	20% ~ 85%	700 hPa ~ 1060 hPa
	Storage and transportation	-20°C ~ 55°C	20% ~ 95%	700 hPa ~ 1060 hPa
L14-6Ns	Operating	0°C ~ 40°C	30% ~ 85%	700 hPa ~ 1060 hPa
	Storage and transportation	-20°C ~ 55°C	30% ~ 95%	700 hPa ~ 1060 hPa
L14-6Ws	Operating	0°C ~ 40°C	30% ~ 85%	700 hPa ~ 1060 hPa
	Storage and transportation	-20°C ~ 55°C	30% ~ 95%	700 hPa ~ 1060 hPa
L16-4Hs	Operating	10°C ~ 40°C	30% ~ 85%	700 hPa ~ 1060 hPa
	Storage and transportation	0°C ~ 60°C	30% ~ 95%	700 hPa ~ 1060 hPa
L20-5s	Operating	0°C ~ 35°C	15% ~ 80%	700 hPa ~ 1060 hPa
	Storage and transportation	-20°C ~ 60°C	15% ~ 90%	500 hPa ~ 1060 hPa
P8-2s	Operating	0°C ~ 40°C	20% ~ 85%	700 hPa ~ 1060 hPa
	Storage and transportation	-20°C ~ 55°C	20% ~ 95%	700 hPa ~ 1060 hPa
P10-4s	Operating	0°C ~ 40°C	30% ~ 85%	700 hPa ~ 1060 hPa
	Storage and transportation	-20°C ~ 55°C	30% ~ 95%	700 hPa ~ 1060 hPa
L12-4s	Operating	0°C ~ 40°C	30% ~ 85%	700 hPa ~ 1060 hPa
	Storage and transportation	-20°C ~ 55°C	30% ~ 95%	700 hPa ~ 1060 hPa
CW2s	Operating	0°C ~ 40°C	30% ~ 85%	700 hPa ~ 1060 hPa
	Storage and transportation	-20°C ~ 55°C	30% ~ 95%	700 hPa ~ 1060 hPa
CW5s	Operating	0°C ~ 40°C	30% ~ 85%	700 hPa ~ 1060 hPa
	Storage and transportation	-20°C ~ 55°C	30% ~ 95%	700 hPa ~ 1060 hPa
SP5-1s	Operating	0°C ~ 40°C	20% ~ 85%	700 hPa ~ 1060 hPa
	Storage and transportation	-20°C ~ 55°C	20% ~ 95%	700 hPa ~ 1060 hPa

Table 13-2 Probe Environmental Conditions

Probe Model	Conditions	Ambient temperature	Relative humidity (no condensation)	Atmospheric pressure
P7-3s	Operating	10°C ~ 40°C	30% ~ 85%	700 hPa ~ 1060 hPa
	Storage and transportation	-20°C ~ 55°C	30% ~ 95%	700 hPa ~ 1060 hPa
L10-3s	Operating	10°C ~ 40°C	30% ~ 85%	700 hPa ~ 1060 hPa
	Storage and transportation	-34°C ~ 65°C	15% ~ 95%	700 hPa ~ 1060 hPa
P4-2Ns	Operating	0°C ~ 40°C	30% ~ 85%	700 hPa ~ 1060 hPa
	Storage and transportation	-20°C ~ 55°C	30% ~ 95%	700 hPa ~ 1060 hPa
D7-2s	Operating	10°C ~ 40°C	25% ~ 90%	700 hPa ~ 1060 hPa
	Storage and transportation	-10°C ~ 60°C	30% ~ 95%	700 hPa ~ 1060 hPa
SC6-1s	Operating	0°C ~ 40°C	20% ~ 85%	700 hPa ~ 1060 hPa
	Storage and transportation	-20°C ~ 55°C	20% ~ 95%	700 hPa ~ 1060 hPa
LAP13-4Cs	Operating	0°C ~ 40°C	20% ~ 85%	700 hPa ~ 1060 hPa
	Storage and transportation	-20°C ~ 55°C	20% ~ 95%	700 hPa ~ 1060 hPa
ELC13-4s	Operating	0°C ~ 40°C	20% ~ 85%	700 hPa ~ 1060 hPa
	Storage and transportation	-20°C ~ 55°C	20% ~ 95%	700 hPa ~ 1060 hPa
V11-3Ws	Operating	0°C ~ 40°C	30% ~ 85%	700 hPa ~ 1060 hPa
	Storage and transportation	-20°C ~ 55°C	30% ~ 95%	700 hPa ~ 1060 hPa
L14-5sp	Operating	10°C ~ 40°C	30% ~ 85%	700 hPa ~ 1060 hPa
	Storage and transportation	0°C ~ 60°C	30% ~ 95%	700 hPa ~ 1060 hPa

13.1.7 Storage and Transportation

When all examinations for the day have been completed, confirm that the probe is in good condition. After disinfecting the probe, confirm that the probe is in good condition and stored in a suitable place

- To prevent the probe from being damaged, DO NOT store it in locations where it may be exposed to:
 - Direct sunlight or X-rays
 - Sudden changes in temperature
 - Dust
 - Excessive vibration
 - Heat generators

- When the probe is sent to MINDRAY Customer Service Department or sales representative for repair, be sure to disinfect it and keep it in the carrying case to prevent infection.

13.2 Biopsy Guide

WARNING

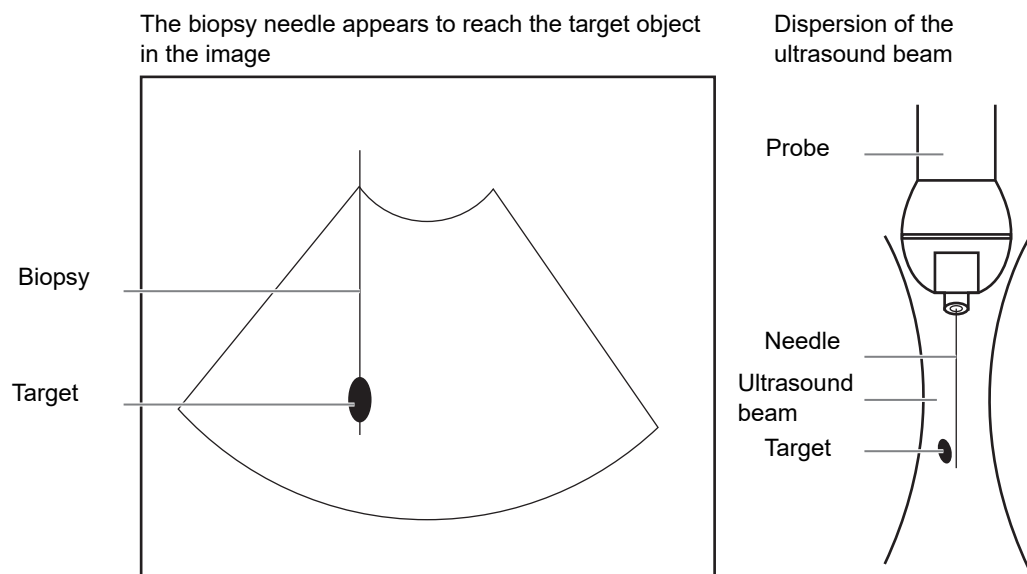
- The person performing biopsy procedures must understand diagnostic ultrasound thoroughly and have been trained adequately, otherwise, side effects may be caused to the patient.
- In situations listed below, the biopsy needle may fail to penetrate the target. The incorrect biopsy may cause various side effects in the patient.
 - Use a needle-guided bracket other than that provided.
 - Mount the needle-guided bracket incorrectly.
 - Use a biopsy needle that is unsuitable for the type of biopsy being performed.
 - Use a biopsy needle that is unsuitable for the needle guide.
- Before and after a biopsy procedure is performed, confirm that the needle-guided bracket is normal. Manually confirm that the parts of the needle-guided bracket do not slip off or move from their proper positions. If the needle-guided bracket is used when parts are not securely and correctly installed, the patient may be injured. If an abnormality is found on the needle-guided bracket, immediately stop using it and contact MINDRAY Customer Service Department or sales representative.
- Needle guided brackets are required to be verified before each biopsy. If the verification fails, it indicates that the needle-guided brackets are out of service life.
- Disposable brackets are packaged sterile and are single-use only, and the method of sterilization is irradiation. Do not use if the sterile packaging is open or broken, and do not reuse or resterilize the disposable brackets.
- DO NOT use a needle-guided bracket when scanning is performed. The needle may advance in an incorrect direction and possibly injure the patient.

Never perform a biopsy during image scanning.
- DO NOT freeze an image while performing biopsy procedure.
- During biopsy procedures, the needle may deviate from the desired course due to the tissue characteristics or the type of needle. In particular, needles of small diameters may deviate to a greater degree.
- Disinfect the probe and sterilize needle-guided bracket before and after each ultrasound-guided biopsy procedure is performed. Fail to do so may cause the probe and the needle-guided bracket become sources of infection.
- The needle mark displayed on the ultrasound image does not indicate the actual position of the biopsy needle. Therefore, it should only be used as a

reference. Always monitor the relative positions of the biopsy needle during the procedures.

- Adjust the needle mark before the biopsy procedure is performed.
- When performing biopsy procedures, use only sterile ultrasound gel that is certified to be safe. And manage the ultrasound gel properly to ensure that it does not become a source of infection.
- When performing the operation concerning biopsy, wear sterile gloves.
- Image of the biopsy target and the actual position of the biopsy needle:
Diagnostic ultrasound systems produce tomographic plane images with information of a certain thickness in the thickness direction of the probe. (That is to say, the information shown in the images consist all the information scanned in the thickness direction of the probe.) So, even though the biopsy needle appears to have penetrated the target object in the image, it may not actually have done so. When the target for biopsy is small, dispersion of the ultrasound beam may lead to image deviate from the actual position. Pay attention to this.

If the target object and the biopsy needle appear in the image as shown in the figures below (For reference only):



The biopsy needle may not have actually entered the target object even though it appears to have done so in the image. To avoid this, note the points below:

- Do not rely only on the needle tip in the image. Pay careful attention to the fact that when the biopsy needle enters the target object or comes into contact with it, the object should shift slightly.
- Before performing the biopsy, evaluate the size of the object and confirm whether the biopsy can be carried out.

13.2.1 Needle-guided Brackets Available

Table 13-3 Needle-guided Brackets Available

Needle-guided Bracket Model	Biopsy angle/depth ($\pm 1^\circ$)	Applicable Biopsy Needle
NGB-004 metal/needle non-detachable	/	16G, 17G, 18G
NGB-007 plastic/needle detachable metal/needle detachable	40°, 50°, 60°	Metal: 14G, 16G, 18G, 20G, 22G Plastic: 13G, 15G, 16G, 18G, 20G
NGB-011 metal/needle undetachable	11°, 23°	13G, 15G, 16G, 18G, 20G
NGB-018 metal/needle detachable	15°, 25°, 35°	14G, 16G, 18G, 20G, 22G
NGB-022 metal/needle detachable	25°, 35°, 45°	14G, 16G, 18G, 20G, 22G
NGB-024 metal/needle detachable	7°, 25°, 35°	14G, 16G, 18G, 20G, 22G
NGB-034 metal/needle detachable	40°, 50°, 60°	14G, 16G, 18G, 20G, 22G
NGB-051 metal/needle detachable	5mm, 10mm, 15mm, 20mm, 25mm, 30mm, 35mm, 40mm, 45mm, 50mm	14G, 16G, 18G, 20G

13.2.2 Needle-Guided Bracket Inspection and Installation

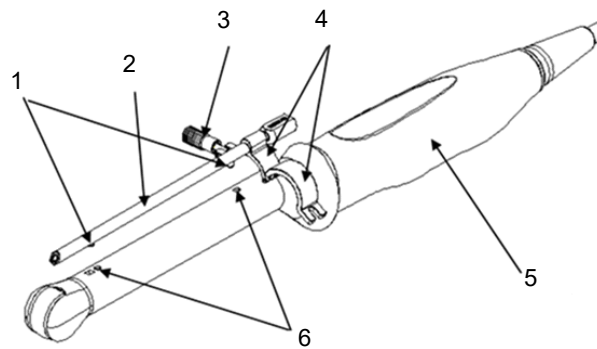
A needle-guided bracket is available for purchase as an optional accessory; it is used in combination with the probe. Some of the probes have matched needle-guided bracket and needles. To order needle-guided brackets, contact MINDRAY Customer Service Department or sales representative.

For biopsy or treatment, ultrasound-guided biopsy procedures can be performed using the probe in combination with a needle-guided bracket (optional accessory) and a biopsy needle (provided by the user).

Be sure to perform inspections before and after use of the needle-guided bracket. If an abnormality is found on the needle-guided bracket, immediately stop using it and contact MINDRAY Customer Service Department or sales representative.

- Sterilize the needle-guided bracket before and after use.
- Put on the sterile probe sheath before installing to the probe.
- Confirm that the needle-guided bracket is free of damage, deformation, stripping, malfunction, loose, or missing parts.
- Confirm that the needle-guided bracket is securely mounted in the correct position.
- Select the proper needle according to the specification above, and adjust the needle shift to the same specification of the selected needle.

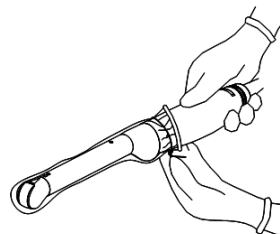
NGB-004 Metal-needle undetachable needle-guided bracket



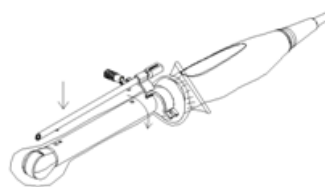
1	Locating bulge
2	Needle guide
3	Locking nut
4	Retaining clamp
5	Probe
6	Locating groove

Perform the following procedure:

1. Install the needle-guided bracket:
 - a. Put on the sterile probe sheath.



- b. Open the retaining clamp, align the needle-guided bracket with the probe to align the locating bulge on the needle guide with the locating grooves on the probe, then turn the retaining clamp to align it with the probe.



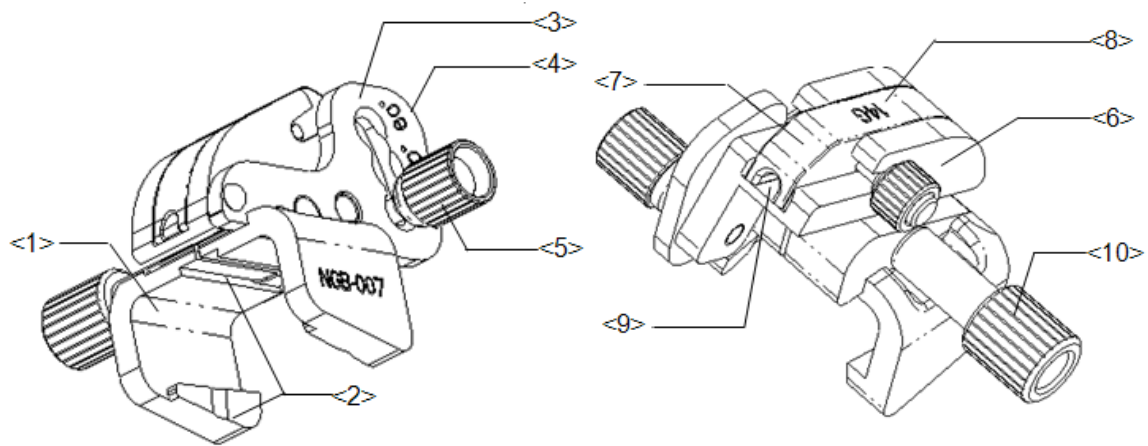
- c. When the retaining clamp is turned to the correct position, the locking nut will lock the retaining clamp and the needle-guided bracket is then mounted in the correct position.



2. Remove the needle-guided bracket:

Hold the probe in your left hand. Unscrew the locking nut with your right hand to open the retaining clamp, then raise the needle-guided bracket to separate the locating bulge from the locating grooves.

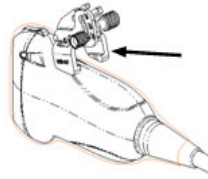
NGB-007 Metal/needle detachable needle-guided bracket



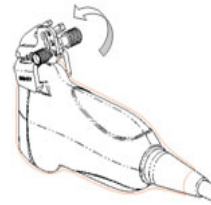
1	Support for needle-guided bracket
2	Tab and groove for the needle-guided bracket
3	Angle-adjusting base
4	Angle shift sign
5	Angle pinch nut
6	Angle block
7	Guiding block
8	Guiding block specification
9	Needle guide hole
10	Needle-guided bracket pinch nut

Perform the following procedure:

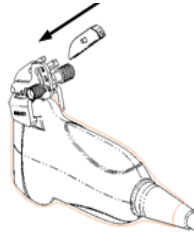
1. Install the needle-guided bracket:
 - a. Put on the sterile probe sheath.
 - b. Hold the probe in one hand, select the correct needle-guided bracket and hold it with the other hand. Match the groove and tab with the tab and groove of the probe respectively. Mount the bracket onto the probe.



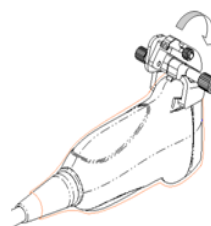
- c. Screw the pinch nut of the needle-guided bracket to ensure that the needle-guided bracket is properly installed on the probe.



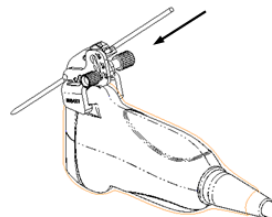
2. Adjust the needle angle to the proper shift as required:
 - a. Loosen the angle pinch nut.
 - b. Adjust the angle block to the desired level.
 - c. Tighten the angle pinch nut.
3. Install the guiding block
 - a. Select a suitable guiding block and push it into the groove above the angle block, then clamp it tightly



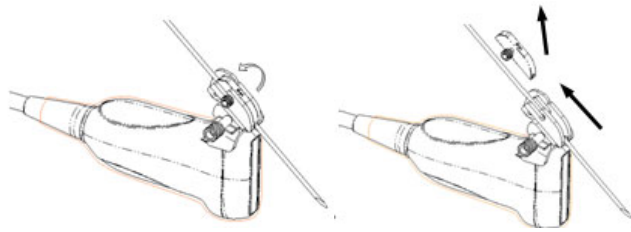
- b. Screw the block's nut to secure the block.



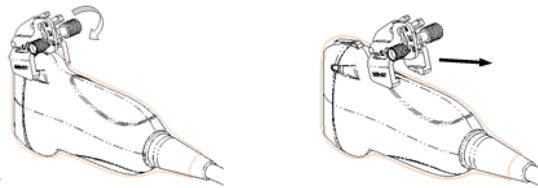
- c. Insert a biopsy needle with the same specification as that of the guiding block into the guiding block hole.



4. Release the needle from the bracket:

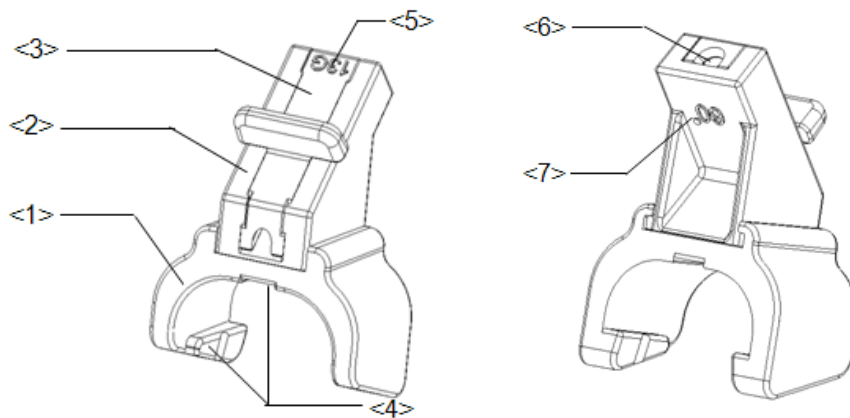


- a. Screw the nut of the guiding block and remove the guiding block slightly along the direction of the needle's tail.
 - b. Separate the residual part of the needle-guide bracket and the probe from the needle.
5. Remove the needle-guided bracket:



- a. Unscrew the Needle-guided bracket pinch nut, and remove the needle-guided bracket from the probe.
- b. Separate the probe and the needle-guided bracket.

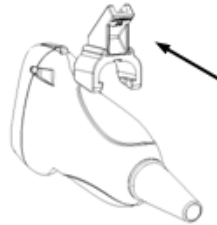
NGB-007 Plastic/needle detachable needle-guided bracket



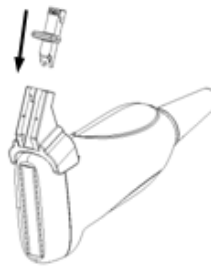
1	Support of needle-guided bracket
2	Angle block
3	Guiding block
4	Groove and tab of the needle-guided bracket
5	Specification of guiding block
6	Guiding hole of the biopsy needle
7	Specification of angle block

Perform the following procedure:

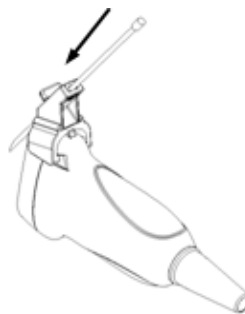
1. Install the needle-guided bracket:
 - a. Put on the sterile probe sheath.
 - b. Hold the probe by one hand, select the proper needle-guided bracket, and hold it with the other hand. Align the narrow end tab of the needle-guided bracket with the groove of the probe, then push the needle-guided bracket forward, making the tabs and the grooves of the needle-guided bracket to match with the grooves and tabs of the probe.



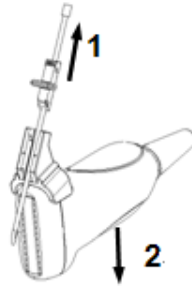
- c. Check manually to confirm that the needle-guided bracket is securely installed on the probe.
2. Install the guiding block:
 - a. Select a proper guiding block and push it into the groove above the angle block, and clamp it tightly.



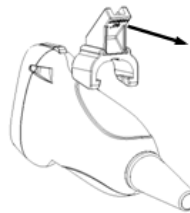
- b. Insert a biopsy needle with the same specification as that of the guiding block into the hole of the guiding block.



3. Release the needle from the bracket:

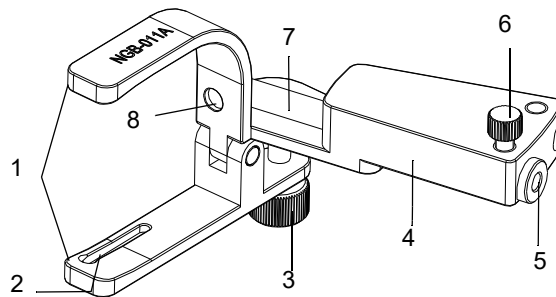


- a. Remove the guiding block slightly along the direction of the needle's tail.
 - b. Separate the residual part of the needle-guide bracket and the probe from the needle.
4. Remove the needle-guided bracket:



Remove the support of needle-guided bracket from the probe.

NGB-011 Metal-needle undetachable needle-guided bracket



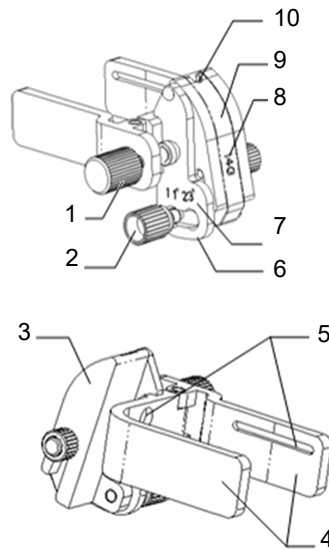
1	Clamp
2	Locating groove
3	Grip knob
4	Needle guide rack
5	Needle guide hole
6	Needle guide clamping knob
7	Needle guide
8	Locating pit

Perform the following procedure:

1. Install the needle-guided bracket:
 - a. Put on the sterile probe sheath.

- b. Connect the locating groove on the clamp with the two raised edges on the probe head and align the locating pit of the clamp with the convex point on the probe head.
 - c. Turn the grip knob at the tail of the needle-guided bracket tightly.
2. Remove the needle-guided bracket:
 Hold the probe and the needle-guided bracket, then open the grip knob of the needle-guided bracket.

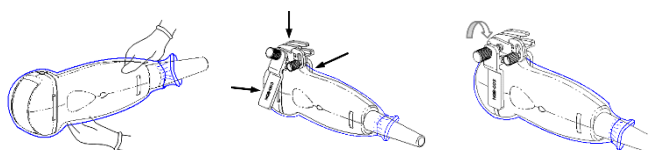
NGB-018 Metal-needle detachable needle-guided bracket



1	Pinch nut of bracket
2	Angle pinch nut
3	Angle block
4	Clamp
5	Groove
6	Angle-adjusting base
7	Angle shift sign
8	Guiding block specification
9	Guiding block
10	Needle guide hole

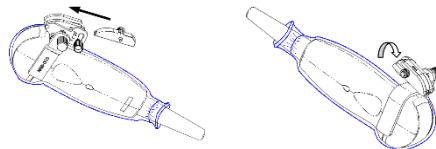
Perform the following procedure:

1. Install the needle-guided bracket:

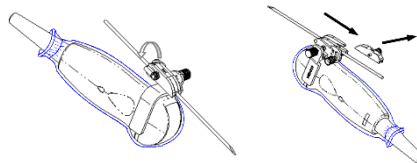


- a. Put on the sterile probe sheath.

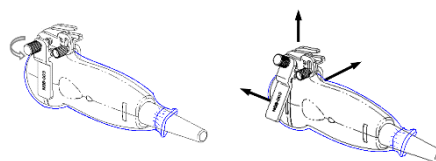
- b. Select a suitable needle-guided bracket and match the groove to the tab of the probe. Mount the bracket onto the probe.
 - c. Screw the pinch nut of the needle-guided bracket to ensure that the needle-guided bracket is properly installed on the probe.
2. Adjust the needle angle to the proper shift as required:
 - a. Loosen the angle pinch nut.
 - b. Adjust the angle block to the desired level.
 - c. Tighten the angle pinch nut.
3. Install the guiding block:



- a. Select a suitable guiding block and push it into the groove above the angle block
 - b. Screw the block's nut to secure the block.
 - c. Insert a biopsy needle with the same specification as that of the guiding block into the guiding block hole.
4. Release the needle from the bracket:

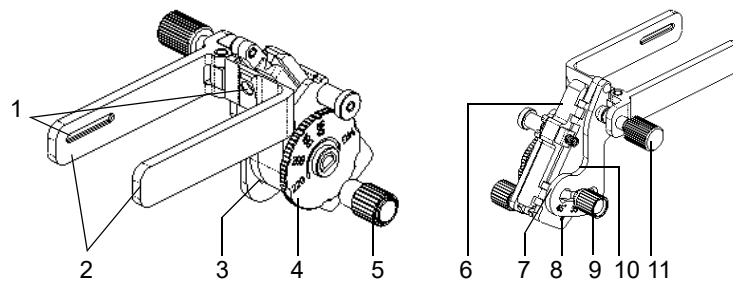


- a. Loosen the guiding block's nut and slightly move the guiding block in the direction of the needle's tail.
 - b. Separate the residual part of the needle-guide bracket and the probe from the needle.
5. Remove the needle-guided bracket:



- a. Screw the pinch nut to release the needle-guided bracket
 - b. Separate the bracket and the probe.

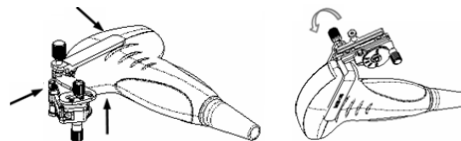
NGB-022 Metal-needle detachable needle-guided bracket



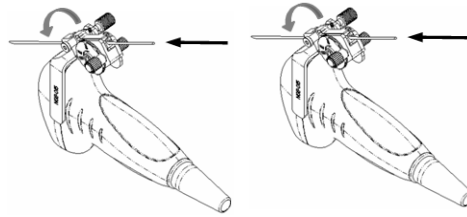
1	Groove
2	Clamp
3	Needle type adjusting base
4	Needle type dial scale
5	Needle fixing nut
6	V-shaped cover
7	Angle adjusting base
8	Angle shift sign
9	Angle pinch nut
10	Angle block
11	Pinch nut

Perform the following procedure:

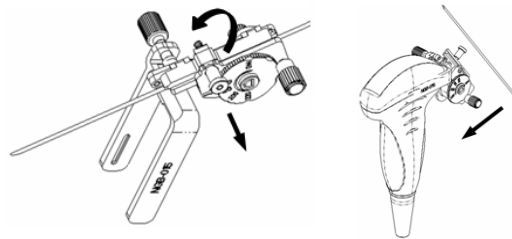
1. Install the needle-guided bracket:
 - a. Put on the sterile probe sheath.
 - b. Hold the probe by one hand, select the proper needle-guided bracket, and hold it with the other hand. Match the groove of the bracket with the tab of the probe. Amount the bracket onto the probe.



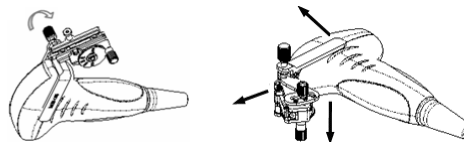
- c. Screw the pinch nut of the needle-guided bracket to confirm that the needle-guided bracket is properly installed on the probe.
2. Adjust the needle angle to the proper shift as required:
 - a. Loosen the angle pinch nut.
 - b. Adjust the angle block to the desired level.
 - c. Tighten the angle pinch nut.
3. Insert the biopsy needle:



- a. Adjust the dial scale to the required needle type shift, and then screw the needle fixing nut to lock the dial scale. (To adjust the dial scale you have to loosen the needle fixing nut first.)
 - b. Pull the lock pin and close the V-shaped cover to fix the lock pin in the groove of the needle type adjusting base, so as to install the needle into the guiding hole.
4. Release the needle from the bracket:

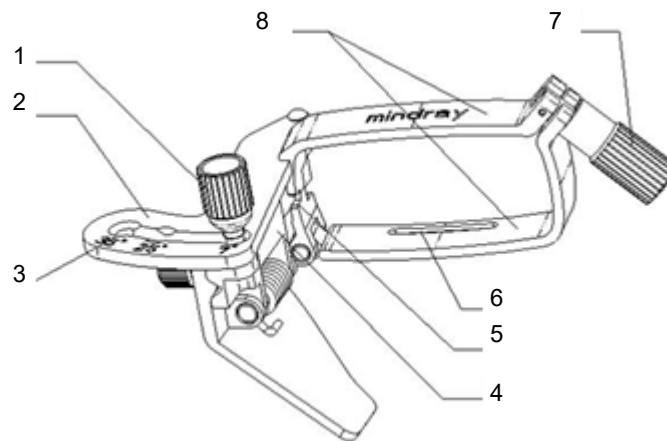


- a. Pull the lock pin and open up the V-shaped cover to expose the needle.
 - b. Separate the bracket and the probe from the needle.
5. Remove the needle-guided bracket:



- a. Screw the pinch nut to release the needle-guided bracket.
- b. Separate the bracket and the probe.

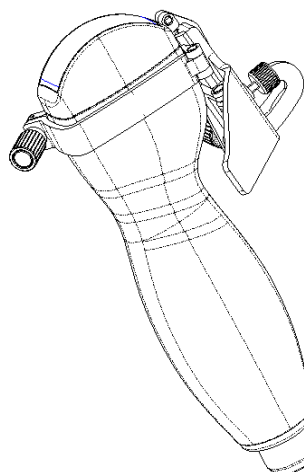
NGB-024 Metal-needle detachable needle-guided bracket



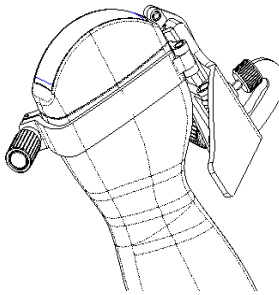
1	Angle locking nut
2	Angle adjusting block
3	Angle marker
4	Angle adjusting base
5	Groove
6	Slot
7	Right, left retaining nut
8	Right, left clamp

Perform the following procedure:

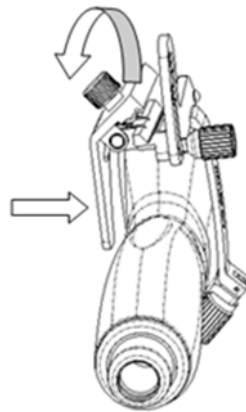
1. Install the needle-guided bracket:
 - a. Put on the sterile probe sheath.
 - b. Select the needle-guided bracket, and match the groove with the tab of the probe. Mount the bracket onto the probe.



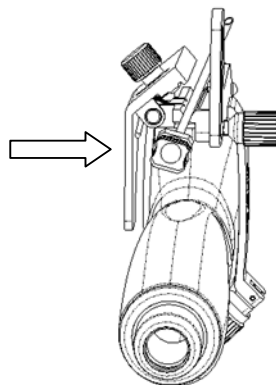
- c. Rotate the retaining nut to fix the bracket and the probe.



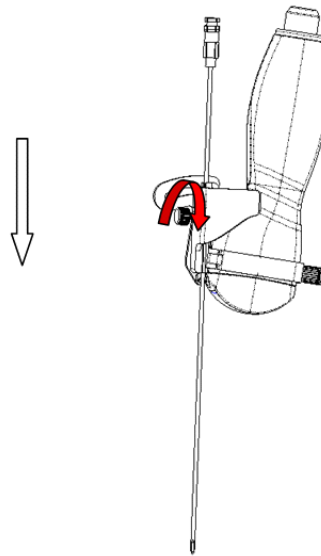
2. Adjust the needle angle to the proper shift as required:
 - a. Loosen the angle pinch nut.
 - b. Adjust the angle block to the desired level.
 - c. Tighten the angle pinch nut.
3. Insert the biopsy needle:
 - a. Hold the probe. Press the biopsy needle to separate needle guided V-shaped block from pressure position of the needle



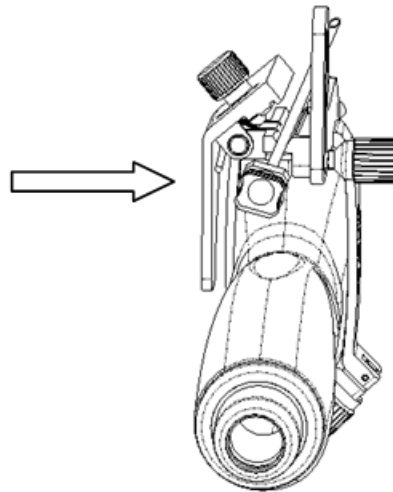
- b. Put the needle into the needle guided-bracket, and the needle leans to V-shaped block.



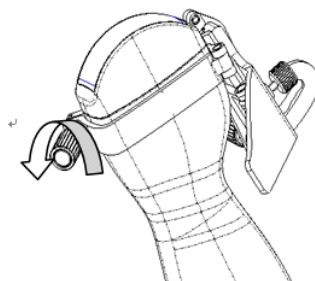
- c. Hold the probe, and release the pressure position of the needle. Adjust the needle-type adjusting nut manually (following the direction of the arrow). The needle moves smoothly at the vertical direction due to its gravity.



4. Release the needle from the bracket:



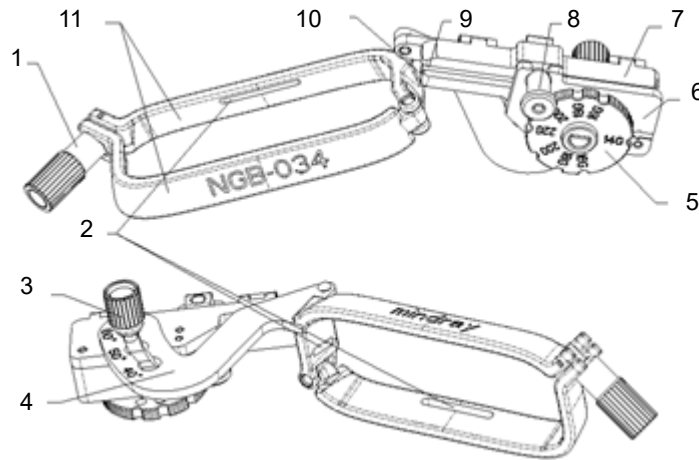
- a. Hold the probe. Press the biopsy needle to separate the needle from pressure position of the needle.
 - b. Separate the bracket and the probe from the needle.
5. Remove the needle-guided bracket:



- a. Rotate the clamping nuts of the needle guided-bracket on right and left side (following the direction of the arrow). The needle guided-bracket is separate from the probe.

- b. Hold the probe and take out the bracket.

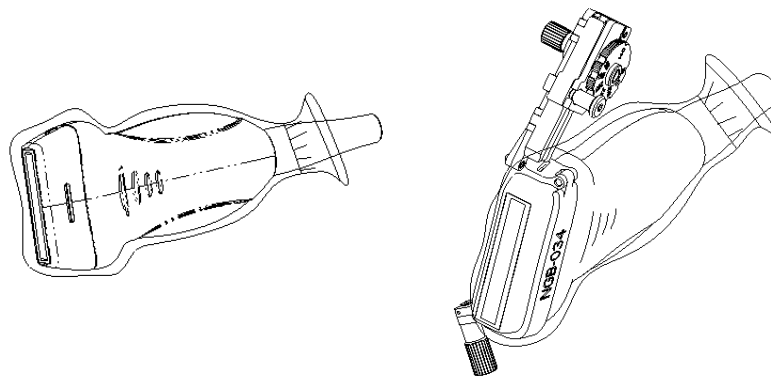
NGB-034 Metal-needle detachable needle-guided bracket



1	Needle fixing nut
2	Guiding groove
3	Angle fixing nut
4	Angle adjusting base
5	Needle type dial scale
6	Needle adjusting base
7	V-shape cover
8	Lock pin
9	Needle guide hole
10	V-shaped guiding block
11	Clamp

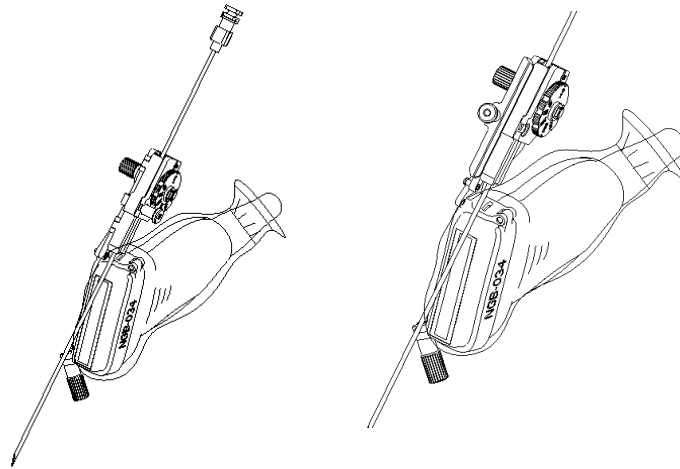
Perform the following procedure:

1. Install the needle-guided bracket:

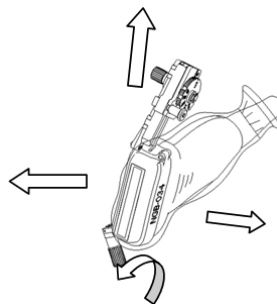


- a. Put on the sterile probe sheath.
- b. Select a proper needle-guided bracket, and match the locating groove with the tab of the probe. Mount the bracket onto the probe.

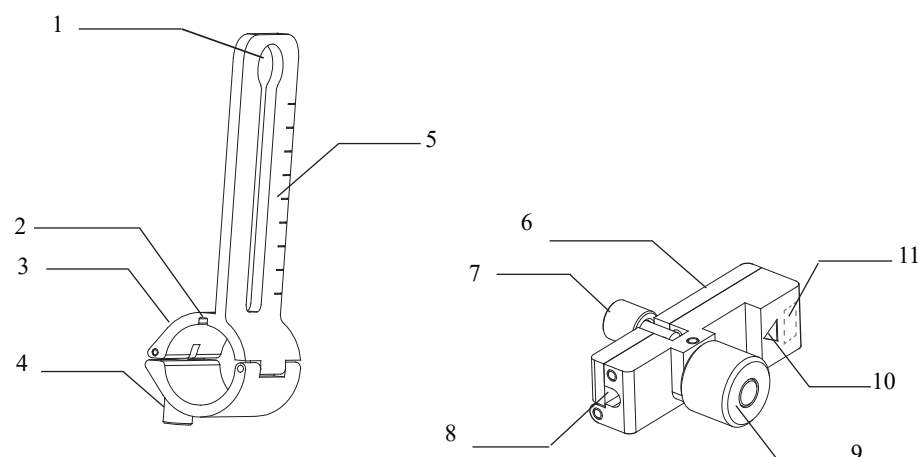
- c. Tighten the pinch nut of the needle-guided bracket to confirm that the needle-guided bracket is properly installed on the probe.
2. Adjust the needle angle to the proper shift as required:
 - a. Loosen the angle pinch nut.
 - b. Adjust the angle block to the desired level.
 - c. Tighten the angle pinch nut.
3. Insert the biopsy needle:
 - a. Adjust the dial scale to the required needle type shift.
 - b. Pull the lock pin and close the V-shaped cover to fix the lock pin in the groove of the needle type adjusting base, so as to install the needle into the guiding hole.
4. Release the needle from the bracket:



- a. Pull the lock pin out until the V-shaped cover can be turned and opened up.
 - b. Turn over the V-shaped cover to expose the needle. Remove the probe and bracket.
5. Remove the needle-guided bracket:



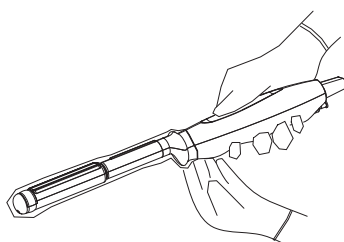
- a. Unscrew the pinch nut to release the needle-guided bracket.
 - b. Hold the probe and take out the bracket.

NGB-051 metal-needle detachable needle-guided bracket

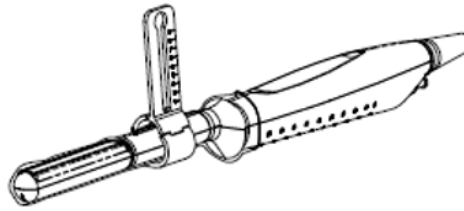
1	Support of needle-guided bracket
2	Knob of fixing needle-guided bracket
3	Groove
4	Hole for installing guiding block
5	Needle distance scales
6	Guiding block
7	Knob of detaching the needle
8	Guiding hole of the needle
9	Knob of fixing the guiding block
10	Mark of indicating scales
11	Specification of guiding block

Perform the following procedure:

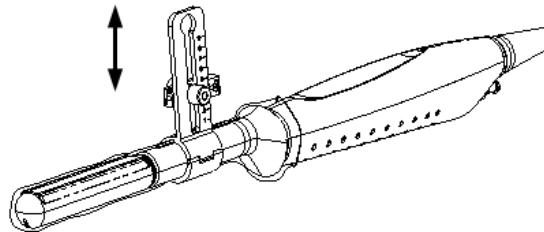
1. Install the needle-guided bracket:
 - a. Put on the sterile probe sheath.



- b. Cover the support of needle-guided bracket on the transducer, making the groove of the needle-guided bracket to match with the tab of the transducer. Set the needle-guided bracket at the desired position, turn tightly the knob of fixing needle-guided bracket to fix the needle-guided bracket.



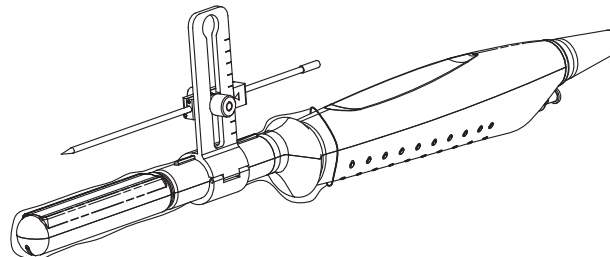
2. Install the guiding block:



- a. Select a proper guiding block and thread the knob of fixing the guiding block through the hole of installing guiding block, move the guiding block to the desired position.
- b. Turn tightly the knob of fixing the guiding block to fix the guiding block on the support of needle-guided bracket.

3. Insert the biopsy needle:

Insert a biopsy needle with the same specification as that of the guiding block into the hole of the guiding block and turn tightly the knob of fixing the needle.



4. Release the needle from the bracket:

Turn on the knob of detaching the needle and separate the needle from the needle-guided bracket.

5. Remove the needle-guided bracket:

- a. Turn on the knob of fixing guiding block and remove the guiding block from the hole of installing guiding block.
- b. Turn on the knob of fixing needle-guided bracket and remove the needle-guided bracket.

13.2.3 Verifying the Biopsy Guide Line

WARNING

- Prior to each biopsy procedure, be sure to verify the guide line.

- If the needle is not consistent with the guide line, DO NOT perform the biopsy procedure.

NOTE:

You can perform guide line verification on a single live B/C image, and all biopsy-irrelevant operations are forbidden.

Adjusting the needle mark is necessary before each biopsy procedure.

Perform the following procedure:

1. Confirm that the needle-guided bracket has been installed securely in the correct position.
2. Prepare a container filled with sterile water.
3. Place the head of the probe in the sterile water and place a biopsy needle in the needle guide.
4. When the biopsy needle appears on the image, confirm that the biopsy needle is displayed at almost the same position as the selected needle mark.
5. Enter Biopsy.
 - Select the biopsy bracket angle/guide line: If the needle-guided bracket supports more than one biopsy angle, select the angle/guideline by using [Biopsy Kit].
 - Select the guide line dot size by using [Dot Size].

NOTE:

- The distance between two dots is depth-dependent. Move the cursor over the big dot and a numeral, representing the biopsy depth, is displayed.
 - The biopsy guidezone adjusts along with image adjustments, such as image inversion/rotations, zoom and depth changes.
6. Tap [Verify] in the Biopsy tab to open the Biopsy Verify menu.
 - Adjust the guide line position: Use [Position] to change the position of the guide line.
 - Adjust the angle: Use [Angle] to change the guide line angle.
 - Save the verified settings: After the position and angle of the guide line are adjusted, tap [Save] and the system saves the current guide line settings. If biopsy is entered again, the displayed Position and Angle are the verified value.
 - Restore the factory default settings: Tap [Load Factory] and the position and angle of the guide line are restored to the factory default settings.
 - Exit biopsy verify status: Tap [Exit] and the system exits the guide line verification status.
 - When the imaging depth and area are changed, the guide line is adjusted.
 7. Select [Verify] in the Biopsy menu to open the Biopsy Verify menu.
 - Adjust the guide line position: Use [Position] to change the position of the guide line.
 - Adjust the angle: Use [Angle] to change the guide line angle.
 - Save the verified settings: After the position and angle of the guide line are adjusted, select [Save] and the system saves the current guide line settings. If biopsy is entered again, the displayed Position and Angle are the verified value.
 - Restore the factory default settings: select [Load Factory] and the position and angle of the guide line are restored to the factory default settings.
 - Exit biopsy verify status: select [Exit] and the system exits the guide line verification status.

13.2.4 Starting the biopsy procedure

DANGER

- Ensure that all guide parts are properly fixed prior to performing a biopsy.
- If you changed the probe or needle-guided bracket during the biopsy, verify the guide line again.
- Failure to match the guide zone displayed to the guide may cause the needle to track a path outside the zone.
- It is extremely important that when using the adjustable angle biopsy guides, the angle displayed on the screen matches the angle set on the guide, otherwise the needle will not follow the displayed guide zone and this could result in repeated biopsies or patient injury.

Perform the following procedure:

1. Select the correct needle-guided bracket and needle and install them properly.
2. Enter the biopsy.

If the current probe has no corresponding bracket, or the image is frozen and the guide line was hidden before the image was frozen, then you cannot enter the Biopsy menu.

3. Select the bracket and guide line according to the actual situation.

Select [Verify] to enter Biopsy Verify menu to fine tune the guide line if needed.

4. If available, use iNeedle function to help enhance the needle visualization when the needle display is not clear.

iNeedle is an option.

- a. Select [iNeedle].

The parameters that can be adjusted appear on the menu:

[B/iNeedle]: select to display B image and iNeedle image synchronously.

[Needle Dir.]: select to adjust the needle direction display according to actual direction of needle insertion. The iNeedle affecting region changes correspondingly.

- b. Select [iNeedle] again to exit.

5. Scan to locate the target. Center the target in the electronic guidezone path.
6. Direct the needle into the area of interest for specimen.
7. After extracting the biopsy sample is complete, gently remove the probe from the body.
8. Exit the Biopsy menu.
9. Disassemble the items and properly dispose of these items as required.

13.2.5 Clean and Sterilize the Needle-Guided Bracket

CAUTION

- Needle-guided brackets whose name starts with NGB are reusable, and need thorough cleaning and sterilization before and after each biopsy.
- Follow local regulations when selecting and using the disinfectant.

- Repeated sterilization may degrade the safety and performance of the needle-guided bracket. Before use, please check whether the needle-guided bracket has defects such as deformation and rusting. If such defects exist, the bracket has reached the end of its service life. In this case, stop using it and contact the Mindray service department.
 - It is recommended to use immersion sterilization for plastic needle-guided brackets and high-pressure steam sterilization for metal needle-guided brackets.
 - For detailed operations about the cleaning solvent, sterilant and high-temperature steam sterilizer, see the respective operator's manuals provided by the manufacturer.
-

NOTE:

Disposable components are packaged sterile and are single-use only. Do not use if integrity of packaging is violated or if expiration date has passed. Please use the disposable components compliant with the relevant local regulations.

Cleaning

Perform the following procedure:

1. Wear a pair of gloves to prevent infection.
2. After use, immerse the needle-guided bracket in distilled water immediately to prevent dirt from drying. Wipe the entire surface of the needle-guided bracket by using a piece of disposable lint-free soft cloth to remove coarse dirt.
3. Prepare a cleaning solvent (enzymatic or neutral pH detergent, e.g., liquinox, MetriZyme) by using distilled or softened water in accordance with the operator's manual provided by the manufacturer.
4. Detach all the detachable parts of the needle-guided bracket and immerse the needle-guided bracket and all its parts fully in the cleaning solvent for at least 1 minute or a period specified by the manufacturer.
5. Immerse the needle-guided bracket and all its parts fully in the cleaning solvent. Wipe and wash the surface and connecting parts of the needle-guided bracket gently by using a soft brush until no dirt is visible. Place the needle-guided bracket inside an ultrasonic cleaner and perform ultrasonic cleaning for 3–5 minutes.
6. Rinse the needle-guided bracket thoroughly by using a large amount of distilled or softened water (about 2 gallons) at room temperature for about 30 s to remove the residual dirt and cleaning solvent. Repeat the operation twice.
7. Wipe away the water on the needle-guided bracket by using a piece of disposable lint-free soft cloth.
8. Inspect the needle-guided bracket. If visible dirt still exists, repeat the preceding steps to wash the bracket until it is all clean.

Sterilization with a sterilant

Perform the following procedure:

1. Wear a pair of gloves to prevent infection.
2. Clean thoroughly in accordance with the cleaning procedure before sterilization.

3. Prepare a sterilant by using sterile distilled water when necessary.

Table 13-4 Recommended sterilization solution

Chemical name	Trade name	Procedures
Glutaraldehyde (2.4%)	Cidex Activated Dialdehyde Solution (applicable for FDA region only)	Refer to the instructions provided by the solution manufacturer for details.
22% Hydrogen Peroxide 4.5% Peroxyacetic Acid	Minnicare liquid disinfectant (applicable for Canada only)	Refer to the instructions provided by the solution manufacturer for details.
Glutaraldehyde (2.6%)	Metricide	Refer to the instructions provided by the solution manufacturer for details.

4. Immerse the needle-guided bracket fully in the sterilant and shake the bracket appropriately to remove any bubbles on the surface. Use a syringe to draw an appropriate amount of sterilant and inject the sterilant into the hole to remove the bubbles inside the hole if necessary.

For details about the immersion duration, see the operator's manual provided by the manufacturer.
5. After sterilization, wash the needle-guided bracket thoroughly by using a large amount of sterile distilled water (about 2 gallons) at room temperature for about 30s to remove the residual sterilant. Repeat the operation twice.
6. Dry the needle-guided bracket by using a piece of sterile disposable lint-free soft cloth.
7. Store the needle-guided bracket in a cool, clean and dry environment.

High-pressure steam sterilization

High-pressure steam sterilization is preferred for the metal guided brackets. And the sterilizer and accessories should be cleared by FDA for the intended sterilization cycle.

Perform the following procedure:

1. Wear a pair of gloves to prevent infection.
2. Clean thoroughly in accordance with the cleaning procedure before sterilization.
3. Package the needle-guided bracket in accordance with the sterilization requirements of surgical instruments using the sterilization wrap or pouch cleared by FDA.
4. Place the packaged needle-guided bracket inside a high-temperature steam sterilizer and perform sterilization. The sterilization parameters are 121 °C and 30 minutes for a gravity displacement steam sterilizer and are 132 °C and 4 minutes for a dynamic-air-removal steam sterilizer.
5. Take out the sterilization package after sterilization and dry it in an oven at 60 °C for 20 minutes to 30 minutes.

Keep the sterilization package together with other sterilized surgical instruments in a sterile item storage area.

13.2.6 Storage and Transportation

- Do not use the carrying case for storing the needle-guided bracket. If the carrying case is used for storage, it may become a source of infection.
- Between examinations, keep the needle-guided bracket in a sterile environment.

- If the needle-guided bracket is sent to your MINDRAY representative for repair, be sure to disinfect or sterilize it and keep it in the carrying case to prevent infection.
- Sterilize the carrying case as necessary.
- Store or transport the needle-guided bracket under the following ambient conditions:
 - Ambient temperature: -20 °C to 55 °C
 - Relative humidity: 20% to 95% (no condensation)
 - Atmospheric pressure: 700hPa~1060hPa

13.2.7 Disposal

Be sure to sterilize the needle-guided bracket before disposing of it.

Disposal of the needle-guided brackets is in accordance with SanPiN 2.1.7.2790-10.

Contact your MINDRAY representative when disposing of this device.

13.3 Middle Line

Middle Line helps to locate and observe the focus point of lithotripsy wave during lithotripsy treatment. By means of providing information for the lithotripsy machine as well as a tool for watching the procedure of lithotripsy in real-time, you can adjust the intension and frequency of the lithotripsy wave through lithotripsy machine.

NOTE:

This function in the ultrasound system is for lesion (stone) location and observation only. For details, please refer to lithotripsy machine accompanying manuals.

Turn on Middle Line function.

- The middle line is a vertical dotted line located in the middle of the screen, the position and direction of which cannot be changed.
- There is a mark icon of “×” located on the middle line which can be moved up and down along the line.
- To use the Middle Line function of the ultrasound system:
 - a. Change the mark position and by adjusting lithotripsy machine tools or patient posture to locate the stone center at the mark.
 - b. Read the depth of the mark by observing the depth caliper on the screen.
 - c. After the stone is located, refer to lithotripsy machine manuals to perform the lithotripsy.
 - d. The depth of the mark is displayed in the image parameter area of the screen.

14 System Maintenance

Routine system maintenance shall be carried out by the user. System maintenance after the warranty has expired is the full responsibility of the owner/operator.

The responsibility for maintenance and management of the product after delivery resides with the customer who has purchased the product.

If you have any questions, please contact Mindray Customer Service Department or sales representative.

WARNING

- Only an authorized Mindray service engineer can perform maintenance not specified in this operator's manual.
 - For the sake of the system performance and safety, you should perform periodical checks for the system.
-

14.1 Daily Maintenance

You are responsible for daily maintenance.

14.1.1 Cleaning the System

WARNING

- Before cleaning the system, be sure to turn off the power and disconnect the power cord from the outlet. Cleaning the system while the power is "On" may result in electric shock.
 - DO NOT directly spray solution onto the monitor, system control panel or hard surfaces that is under pressure or pumped. Ingress fluid leakage into the monitor or system can damage the monitor or system, causing possible electric shock or system failure.
-

CAUTION

Do not spill water or other liquid into the system while you perform the cleaning. Otherwise it may result in malfunction or electric shock.

NOTE:

- DO NOT use hydrocarbon glass cleaner or cleaner for OA (Office Automation) equipment to clean the monitor. These substances may cause deterioration of the monitor.

- Please clean the control panel periodically, otherwise the button may be blocked by dirt and the system will be buzzing while the button makes no response.
-

Cleaning probes

Tools: mild soapy water, dry soft cloth, soft brush

Method:

1. Wipe out the dust attached to surface of probe head, connector and cable.
 2. Use soft brush to brush the dust inside probe connector gently.
 3. Remained stain or dust attached to surface of cable or surface of connector should be washed out by cloth with a little soapy water, and then air-dry.
-

NOTE:

Don't use cloth with water to clean the probe connector.

Cleaning holders

Tools: soft dry cloth, soapy water, soft brush.

Remaining stains should be wiped away using a cloth with clean or soapy water and the surface left to air dry.

Perform the following procedure:

1. Use a soft dry cloth to wipe away dust attached to the inside, outside and gaps in the probe holder. Use a soft brush to brush away dust or stains from the small intra-cavity probe holder or its gap.
2. Remaining stains on the inside and outside of the holder should be wiped away using a cloth with a little soapy water and then air dried.

Cleaning the monitor

Tool: soft dry cloth, soapy water

The surfaces of the monitor and touch screen should be cleaned with a soft dry cloth. Remaining stains should be wiped away using a cloth with a little soapy water and then air dried.

Cleaning the main panel

Tools: soft dry cloth, soapy water

1. Use a soft dry cloth to clean the surface of the control panel.

If the control panel is dirty, moisten the soft cloth with a little mild soapy water and wipe away any stains.

2. Use another soft dry cloth to remove any moisture and allow all hard surfaces to completely air dry.

If the control panel is difficult to clean, disassemble the key caps first and then clean it with mild soapy water.

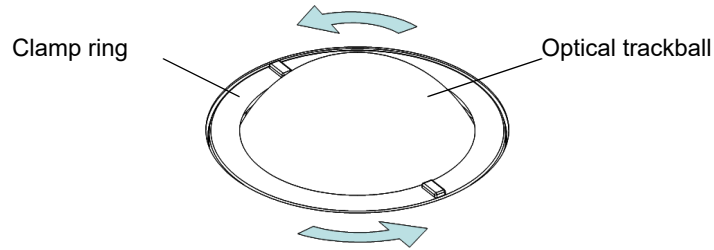
Cleaning the trackball

Tools: paper, dry cloth, mild soapy water

For the stable performance of the system, you should perform periodical cleaning for the trackball. A dumb cursor may be resulted from dirt inside the trackball.

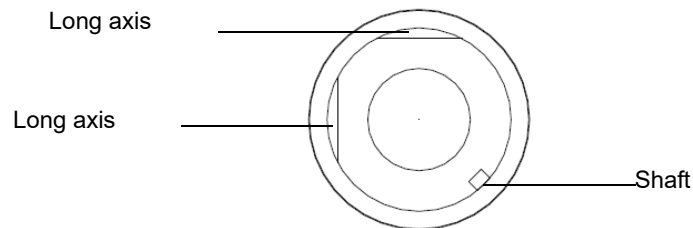
Perform the following procedure:

1. Disassembling:



Rotate the trackball clamp ring anticlockwise. When the clamping ring lifts, remove the clamping ring and trackball. You can draw out the ball with the help of adhesive tape.

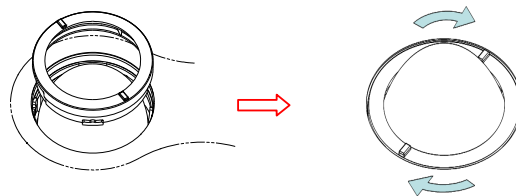
2. Cleaning:



Clean the lens slightly using the tissue until there is no foreign matter. Then clean the other parts and the dust excluder. Make sure to exert force properly when clean the small ball, otherwise, the small ball may drop down.

When liquid is spray onto the trackball area, most of the liquid can be discharged through the waterspout, besides, you can dry the leaving water using the tissue or cloth.

3. Installing:



Put back the ball, align the buckle with gap of the front cover, press the clamp ring with both hands and rotate it clockwise to click the buckle. At this moment, the clamp ring cannot be moved any further, it indicates that the clamp ring clicks in position.

Cleaning the dust-proof covers

CAUTION

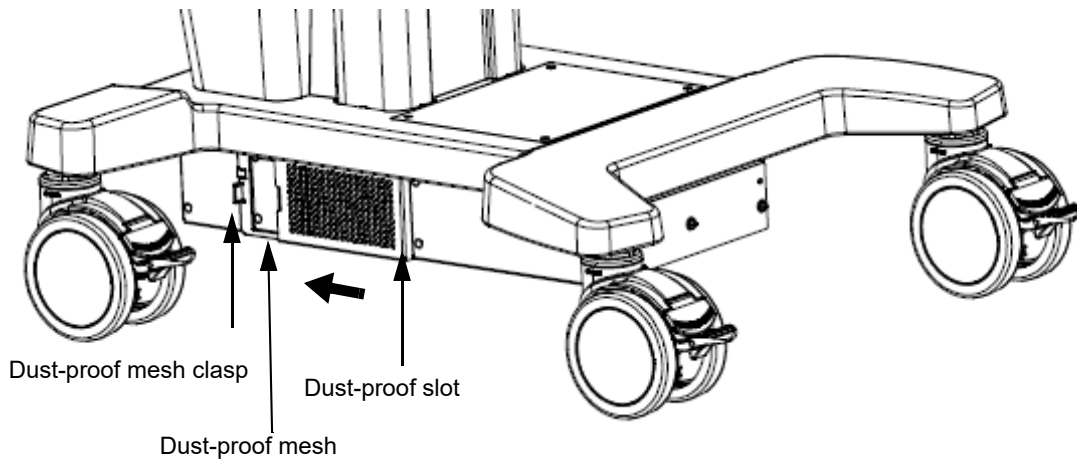
Please clean all dust-proof covers of the system periodically (1 time per month); otherwise, system damage may result. Cleaning times can be increased when the system is used in the open air or somewhere dust is more.

Tool: soft brush

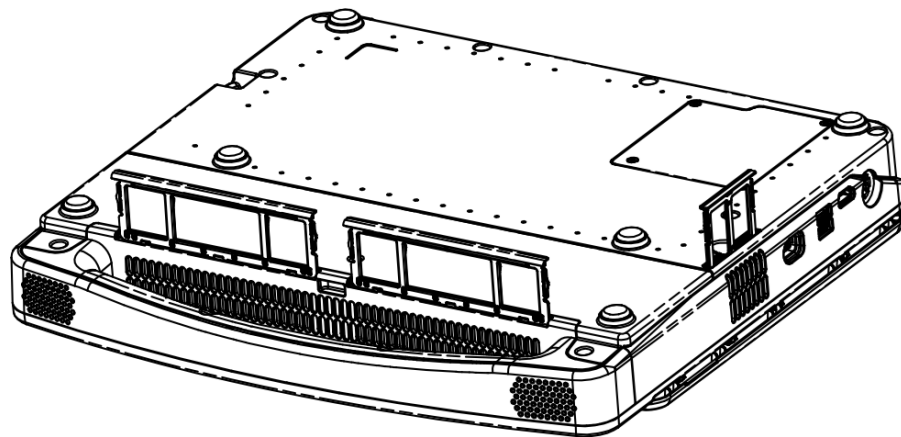
Method:

Disassemble dust-proof cover before cleaning.

Dust-proof mesh of trolley: open the clasp of dust-proof mesh. Push the dust-proof mesh towards the arrow to let it fall off completely from dust-proof slot. Then, take it out.



Dust-proof mesh of main unit: take out the dust-proof mesh of the main unit.



14.1.2 Disinfecting the Main Unit

For details about disinfecting the main unit, please refer to the Cleaning, Disinfection & Sterilization Guide.

14.1.3 Cleaning the peripherals

Do the cleaning maintenance according to your actual peripheral configuration; items which are not configured can be skipped.

Content	Description
Color and B/W video printer	First wipe off dust or stain attached to the cover of printer with soft dry cloth, then clean the inside of printer. Be sure to do the cleaning maintenance according to the operation manual if necessary.
Graph / text printer	First wipe off dust or stain attached to the cover of printer with soft dry cloth, then clean the inside of printer. Be sure to do the cleaning maintenance according to the operation manual if necessary.
Footswitch	Use soft dry cloth with a little mild soap water to wipe off the dust or stain attached to the pedals or cable of foot switch.

Content	Description
Barcode reader	First use soft dry cloth to wipe off dust attached to glass panel of the reader, then the dust or strain attached to cable and bracket.

14.1.4 Checking the Probe

- Visually check to confirm that there are no cracks or expansion of the probe head.
- Visually check to confirm that there is no deterioration or erosion of the probe cable.
- Visually check to confirm that none of the connector pins are bent, destroyed or falling off.

14.1.5 Checking the Power Cable and Plug

Visually check to confirm that there are no wrinkles, cracks or deterioration, and no cracks or expansion on the surface of the adapter.

Manually check to confirm that there is no looseness or rupture. The connection of the plug is reliable.

14.1.6 Checking Appearance

Check if there are any cracks in the covers:

- Ultrasound system covers.
- Probe appearance.
- External appearance of the ECG lead.

14.1.7 System Hard Drive Backup

To prevent deterioration or loss of data stored in the system hard drive (including patient info data, preset data, etc.), create a backup copy of the hard drive at regular intervals.

14.2 Troubleshooting

If any persistent system malfunction is experienced, e.g., an onscreen error message, blank imaging screen, absent menus, see the table below. If the failure cannot be resolved, contact the Mindray Customer Service Department or a sales representative.

No.	Failure	Cause	Measure
1	After the AC power input is connected, the power indicator does not light up.	Abnormal power system or incorrect connection of the power cord.	Check that the system is plugged in.
			Check that the plug has not become loose or dislodged from the back of the system.
2	The power indicator of the monitor is lit up, but the image is blank.	The interval between turning off and restarting the system is too short - wait at least 20 seconds.	Turn off the system and wait at least 1 minute, then restart the system.
		The monitor brightness or contrast may be improperly set.	Adjust the monitor brightness and contrast back to the factory defaults.

No.	Failure	Cause	Measure
3	The monitor displays the characters and menus but no images.	The transmission power, overall gain or TGC controls are improperly set.	Adjust the transmission power, gain or TGC control.
		Check that a probe is connected and/or fully connected.	Ensure proper probe connection.
		The system is in freeze status.	Unfreeze the image.
4	The image quality is degraded	The exam mode is incorrect.	Select an appropriate exam mode.
		The image post-processing settings are incorrect.	Adjust the image post-processing settings or reset post-processing to the default values.
		The image presets are inappropriate.	Reset the factory default presets.
5	The button does not respond and the system is buzzing	There is dirt blocking the button	Check the control panel for the blocked button and press it several times to release it.
			Clean the button.

A Barcode Reader

The system supports logging data as patient ID by using the barcode reader. For details of the JADAK or Honeywell barcode readers, please refer to the accompanying manuals.

CAUTION

Ensure the information acquired by barcode reader is consistent with the actual information.

TIP:

The reader does not support decoding of Multi-language.

A.1 1-D Barcode Reader

The laser transmitted by SYMBOL LS2208 is Class 2 laser.

WARNING

Class 2 laser adopts low power, visible LED. DO NOT stare into beam because of unknown hazards of transient radiation provided by class 2 laser.

There are 2 operation modes for 1-D barcode readers:

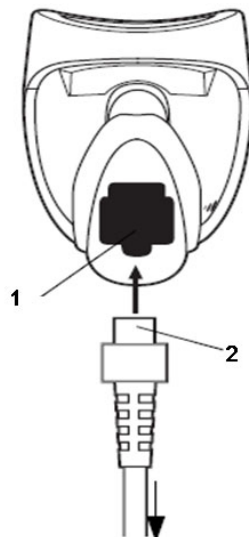
- Hand-held mode: press the trigger to decode.
- Hands-free mode: seat the reader in the stand to enter the mode, the reader decodes automatically.



1	LED	<ul style="list-style-type: none">• Green: A barcode was successfully decoded.• Red: A data transmission error or reader malfunction occurred.
---	-----	---

2	Scan window	Scan the barcode.
3	Trigger	Press to decode.

A.1.1 Setting Up the Reader



1	Cable interface port
2	Interface cable modular connector

Perform the following procedure:

1. Plug the interface cable modular connector into the cable interface port on the bottom of the reader handle, and ensure the connector is properly secured.
2. Connect the other end of the interface cable to the host.

A.1.2 Setting

The reader has factory settings, refer to the following table for parameter defaults:

Parameter		Defaults	Parameter	Defaults
1-D Symbolologies			Interleaved 2 of 5 (ITF)	
UPC/EAN			Interleaved 2 of 5 (ITF) Enable	Enable
UPC-A	Enable		Set Lengths for I 2 of 5	14
UPC-E	Enable		I 2 of 5 Check Digit Verification	Disable
UPC-E1	Disable		Transmit I 2 of 5 Check Digit	Disable
EAN-8/JAN 8	Enable		Convert I 2 of 5 to EAN 13	Disable
EAN-13/JAN 13	Enable		Codabar (NW - 7)	
Bookland EAN	Disable		Codabar	Enable
Decode UPC/EAN/JAN Supplementals (2and 5 digits)	Ignore		Set Lengths for Codabar	5 to 55
UPC/EAN/JAN Supplemental Redundancy	10		CLSI Editing	Disable

Parameter	Defaults	Parameter	Defaults
Transmit UPC-A Check Digit	Enable	NOTIS Editing	Disable
Transmit UPC-E Check Digit	Enable		
Transmit UPC-E1 Check Digit	Enable	2-D Symbologies	
UPC-A Preamble	System Character	PDF417	Enable
UPC-E Preamble	System Character	MicroPDF417	Disable
UPC-E1 Preamble	System Character	Code 128 Emulation	Disable
Convert UPC-E to A	Disable	Data Matrix	Enable
Convert UPC-E1 to A	Disable	Maxicode	Enable
EAN-8/JAN-8 Extend	Disable	QR Code	Enable
UCC Coupon Extended Code	Disable		
Code 128			
Code 128	Enable		
UCC/EAN-128	Enable		
ISBT 128	Enable		
Code 39			
Code 39	Enable		
Trioptic Code 39	Disable		
Convert Code 39 to Code 32 (Italian Pharmacy Code)	Disable		
Code 32 Prefix	Disable		
Set Length(s) for Code 39	2 to 55		
Code 39 Check Digit Verification	Disable		
Transmit Code 39 Check Digit	Disable		
Code 39 Full ASCII Conversion	Disable		
Buffer Code 39	Disable		
Code 93			
Code 93	Enable		
Set Length(s) for Code 93	4 to 55		

The reader supports some user-defined functions as introduced below.

For more details, please contact the SYMBOL reader agents or Mindray Customer Service Department.

Volume setting

Scan the following barcode to set the volume parameter.

- Low Volume:



Low Volume

- Medium Volume:



Medium Volume

- High Volume:



High Volume

Code 93 and codebar scanning

- To enable or disable Code 93, scan the appropriate barcode below.



Enable Code 93

- To enable Codebar, scan the appropriate barcode below.



Enable Codebar

Code 39 full ASCII scanning

Code 39 Full ASCII is a variant of Code 39 which pairs characters to encode the full ASCII character set. To enable or disable Code 39 Full ASCII, scan the appropriate barcode below.



Enable Code 39 Full ASCII



Disable Code 39 Full ASCII

I 2 of 5 symbols setting:



I 2 of 5 - One Discrete Length

Select this option to decode only I 2 of 5 symbols containing a selected length. Select the length using the numeric barcodes below. For example, to decode only I 2 of 5 symbols with 8 characters, scan I 2 of 5 - One Discrete Length, then scan 0 followed by 8.

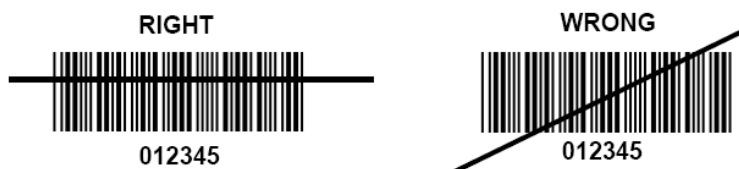


A.1.3 Scanning in Hand-Held Mode

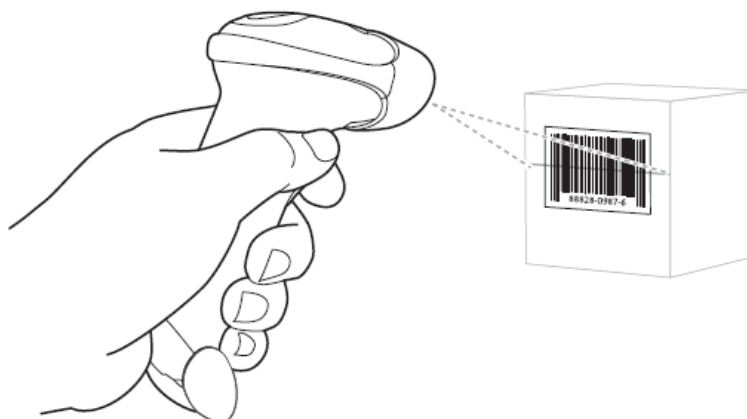
Perform the following procedure:

1. Ensure all connections are secure.
2. Aim the reader at the barcode. Press the trigger.

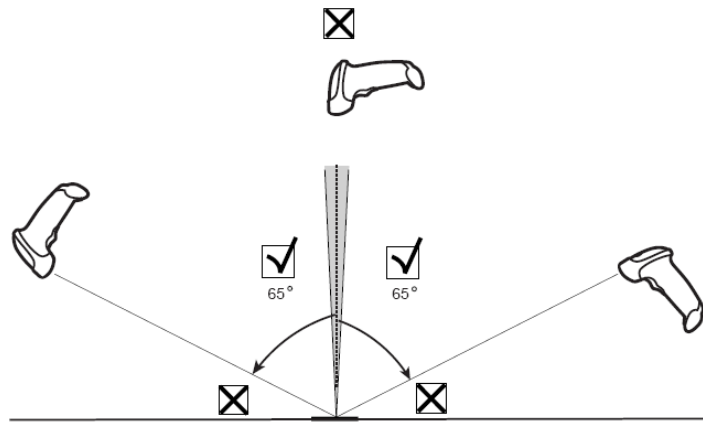
Ensure the scan line crosses every bar and space of the symbol, see the figure below.



3. Upon successful decode, the reader beeps and the LED turns green.

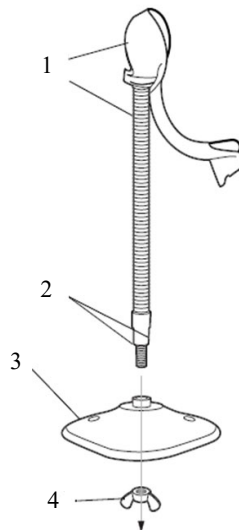


Do not hold the reader directly over the barcode. Laser light reflecting directly back into the reader from the barcode is known as specular reflection. This specular reflection can make decoding difficult. You can tilt the reader up to 55° forward or back and achieve a successful decode.



A.1.4 Scanning in Hands-Free Mode

Assembling the Intellistand



1	One piece scanner “cup” with flexible neck
2	Flat areas
3	Stand base
4	Wingnut

Perform the following procedure:

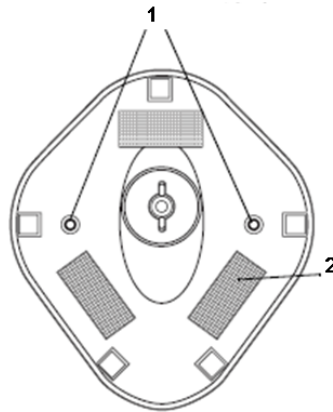
1. Unscrew the wingnut from the bottom of the one piece scanner “cup”.
2. Fit the bottom of the neck piece into the opening on the top of the stand base.
3. Tighten the wingnut underneath the base to secure the cup and neck piece to the base.

Before tightening the wingnut under the base, ensure that the flat areas on the flexible neck fit securely in the grooves in the base.

4. Bend the neck to the desired position for scanning.

Mounting the Stand (optional)

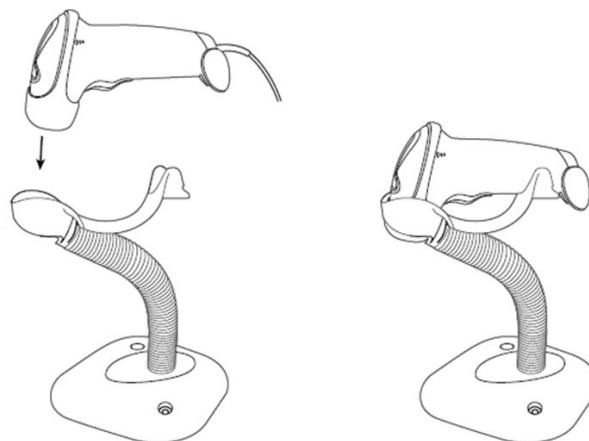
You can attach the base of the reader's stand to a flat surface using two screws or double-sided tape (not provided).



1	Two screw-mount holes	For Screw Mount, follow the steps below: 1. Position the assembled base on a flat surface. 2. Screw one #10 wood screw into each screw-mount hole until the base of the stand is secure
2	Double-side tap areas (3 places, dimensions: 1"×2")	For Tape Mount, follow the steps below: 1. Peel the paper liner off one side of each piece of tape and place the sticky surface over each of the three rectangular tape holders. 2. Peel the paper liner off the exposed sides of each piece of tape and press the stand on a flat surface until it is secure.

Perform Scanning in Hands-Free Mode

When the reader is seated in the scanner cup, the reader's built-in sensor places the reader in hands-free mode. When you remove the reader from the stand it operates in its normal hand-held mode.



A.2 2D Barcode Reader (Take DS4308 as an example)

SYMBOL DS4308 is classified as “EXEMPT RISK GROUP” according to IEC 62471:2006 and EN 62471:2008.

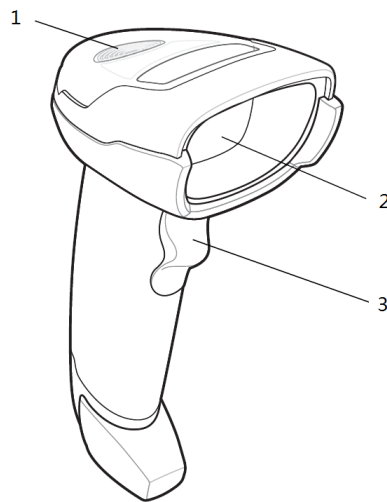
WARNING

DO NOT stare into beam emitted by SYMBOL DS4308 for more than 10 s.

The 2-D barcode reader supports hand-held operation mode.

Hand-held mode: press the trigger to decode.

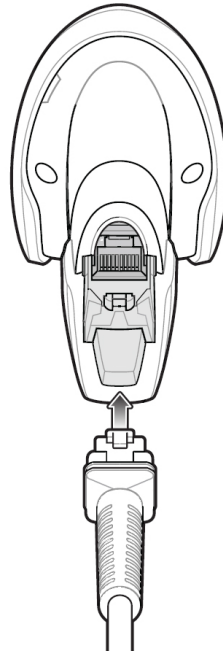
A.2.1 Overview



1	LED	<ul style="list-style-type: none">• Green: A barcode was successfully decoded.• Red: A data transmission error or reader malfunction occurred.
2	Scan window	Scan the barcode.
3	Trigger	Press to decode.

A.2.2 Setting Up the Digital Imager Reader

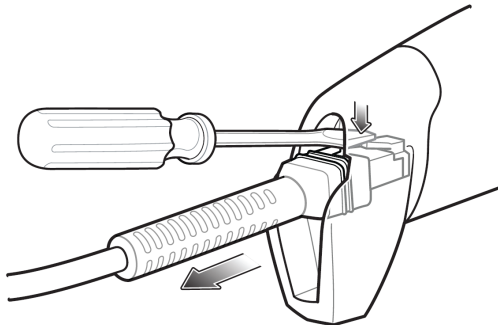
Installing the Interface Cable



Perform the following procedure:

1. Plug the interface cable modular connector into the cable interface port on the bottom of the reader handle and ensure the connector is properly secure.
2. Connect the other end of the interface cable to the host.

Removing the Interface Cable



Perform the following procedure:

1. Using the tip of a screwdriver or some other tools with a sharp head, depress the cable's modular connector clip.
2. Carefully slide out the cable.

A.2.3 Setting

The reader has factory settings, refer to the following table for parameter defaults:

Parameter	Defaults	Parameter	Defaults
1-D Symbolologies		Interleaved 2 of 5 (ITF)	

Parameter	Defaults	Parameter	Defaults
UPC/EAN		Interleaved 2 of 5 (ITF) Enable	Enable
UPC-A	Enable	Set Lengths for I 2 of 5	14
UPC-E	Enable	I 2 of 5 Check Digit Verification	Disable
UPC-E1	Disable	Transmit I 2 of 5 Check Digit	Disable
EAN-8/JAN 8	Enable	Convert I 2 of 5 to EAN 13	Disable
EAN-13/JAN 13	Enable	Codabar (NW - 7)	
Bookland EAN	Disable	Codabar	Enable
Decode UPC/EAN/JAN Supplementals (2and 5 digits)	Ignore	Set Lengths for Codabar	5 to 55
UPC/EAN/JAN Supplemental Redundancy	10	CLSI Editing	Disable
Transmit UPC-A Check Digit	Enable	NOTIS Editing	Disable
Transmit UPC-E Check Digit	Enable		
Transmit UPC-E1 Check Digit	Enable	2-D Symbologies	
UPC-A Preamble	System Character	PDF417	Enable
UPC-E Preamble	System Character	MicroPDF417	Disable
UPC-E1 Preamble	System Character	Code 128 Emulation	Disable
Convert UPC-E to A	Disable	Data Matrix	Enable
Convert UPC-E1 to A	Disable	Maxicode	Enable
EAN-8/JAN-8 Extend	Disable	QR Code	Enable
UCC Coupon Extended Code	Disable		
Code 128			
Code 128	Enable		
UCC/EAN-128	Enable		
ISBT 128	Enable		
Code 39			
Code 39	Enable		
Trioptic Code 39	Disable		
Convert Code 39 to Code 32 (Italian Pharmacy Code)	Disable		
Code 32 Prefix	Disable		
Set Length(s) for Code 39	2 to 55		
Code 39 Check Digit Verification	Disable		
Transmit Code 39 Check Digit	Disable		
Code 39 Full ASCII Conversion	Disable		

Parameter	Defaults	Parameter	Defaults
Buffer Code 39	Disable		
Code 93			
Code 93	Enable		
Set Length(s) for Code 93	4 to 55		

The reader supports some user-defined functions as introduced below.

For more details, please contact the SYMBOL reader agents or Mindray Customer Service Department.

Volume setting

Scan the following barcode to set the volume parameter.

- Low Volume



Low Volume
(2)

- Medium Volume



Medium Volume
(1)

- High Volume



***High Volume**
(0)

Code 93 and codabar setting

- To enable Code 93, scan the appropriate barcode below.



***Enable Code 93**
(1)

- To enable Codabar, scan the appropriate barcode below



***Enable Codabar
(1)**

Code 39 full ASCII setting

Code 39 Full ASCII is a variant of Code 39 which pairs characters to encode the full ASCII character set. To enable or disable Code 39 Full ASCII, scan the appropriate barcode below.



**Enable Code 39 Full ASCII
(1)**



***Disable Code 39 Full ASCII
(0)**

I 2 of 5 symbols setting



I 2 of 5 - One Discrete Length

Select this option to decode only I 2 of 5 symbols containing a selected length. Select the length using the numeric barcodes below. For example, to decode only I 2 of 5 symbols with 8 characters, scan I 2 of 5 - One Discrete Length, then scan 0 followed by 8.



0



1



2



3



4



5



6



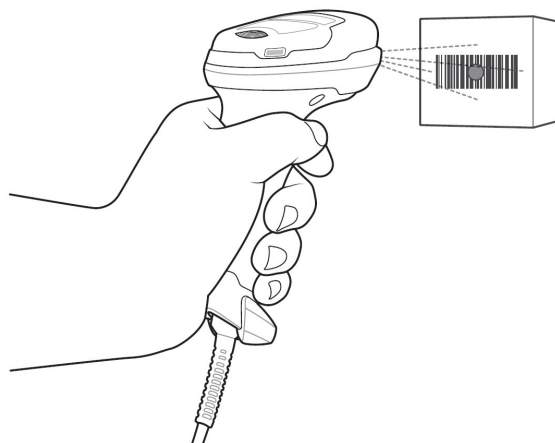
7



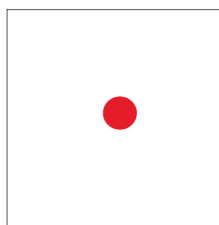
A.2.4 Scanning in Hand-Held Mode

Perform the following procedure:

1. Ensure all connections are secure (see the appropriate host chapter.)
2. Aim the digital imager reader at the barcode.

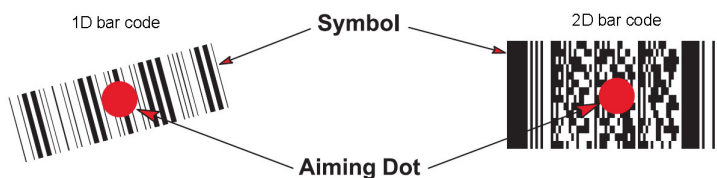


3. When the digital imager reader senses movement, in its default Auto Aim trigger mode, it projects a red LED dot which allows positioning the barcode within the field of view.



If necessary, the digital imager reader turns on its red LEDs to illuminate the target barcode.

4. Center the symbol. Be sure the entire symbol is within the rectangular area formed by the illumination LEDs.



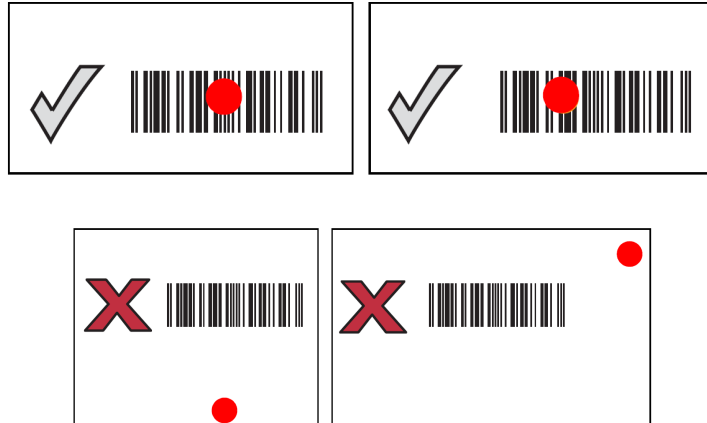
5. Hold the trigger until the digital imager reader beeps, indicating the barcode is successfully decoded.

Steps 2 - 4 above may be required to repeat on poor quality or difficult barcodes.

The aiming pattern is smaller when the digital imager reader is closer to the symbol and larger when it is farther from the symbol. Scan symbols with smaller bars or elements (mil size)

closer to the digital imager reader, and those with larger bars or elements (mil size) farther from the digital imager reader.

The digital imager reader can also read a barcode presented within the aiming dot not centered. The top examples in show acceptable aiming options, while the bottom examples cannot be decoded.



A.3 Maintenance

Cleaning the exit window is the only maintenance required. A dirty window can affect scanning accuracy.

- Do not allow any abrasive material to touch the window.
- Remove any dirt particles with a damp cloth.
- Wipe the window using a tissue moistened with ammonia/water.

Do not spray water or other cleaning liquids directly into the window.

B Trolley and Accessories

WARNING

- DO NOT connect the trolley to the outlets with the same circuit breakers and fuses that control the current to devices such as life-support systems. If the trolley or the system malfunctions and generates over-current, or when there is an instantaneous current at power ON, the circuit breakers and fuses of the building's supply circuit may be tripped.
 - When you connect another device to the trolley, you should use the equipotential wire to connect each of equipotential terminals; otherwise electric shock may result.
 - Be sure to connect the equipotential wire before inserting the power plug into the receptacle; be sure to remove the power plug from the receptacle before disconnecting the equipotential wire; otherwise electric shock may result.
 - Connect the earth cable before powering ON. Disconnect the earth cable after powering OFF. Otherwise, electric shock may result.
-

CAUTION

- Maximum output power of the outlet in the trolley is 240 VA.
 - When moving the trolley with mounted system, please take care of the connector of the power adapter in case of damage.
 - DO NOT insert fingers into the gap next to the plug in case of injury.
-

B.1 UMT-500/UMT-500Plus Trolley

B.1.1 Configuration

UMT-500 accessories

- Probe& gel holder
- Probe cable hook
- Storage tray
- Black / white video printer bracket
- Storage basket

UMT-500Plus accessories

- Power cord

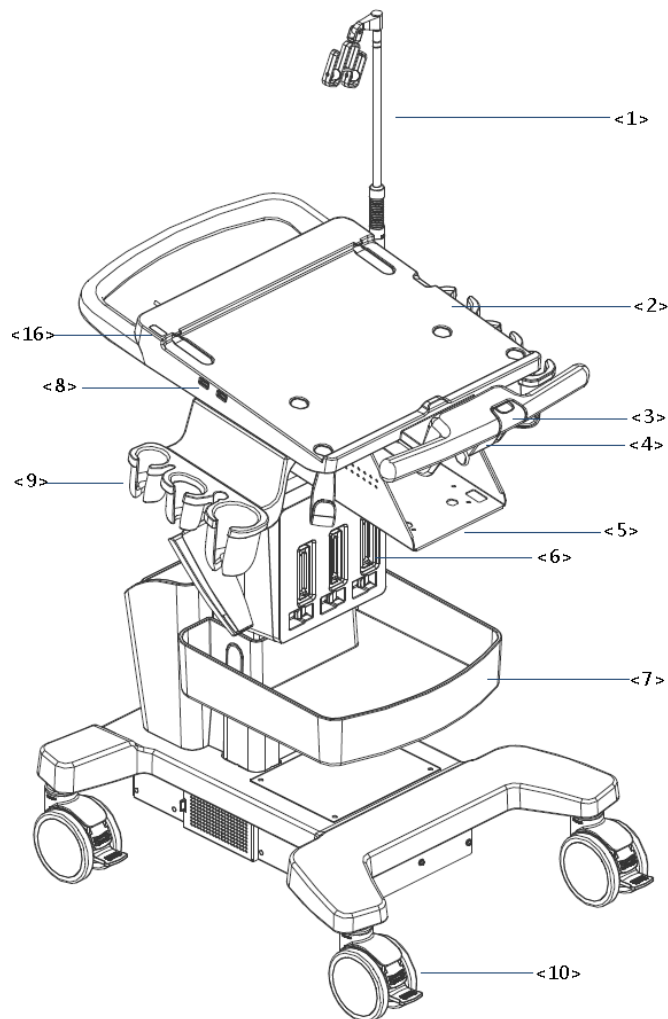
- Cover grounding cable
- Probe& gel holder
- Probe cable hook
- Storage tray
- Black / white video printer bracket
- Storage basket
- Auxiliary output cable

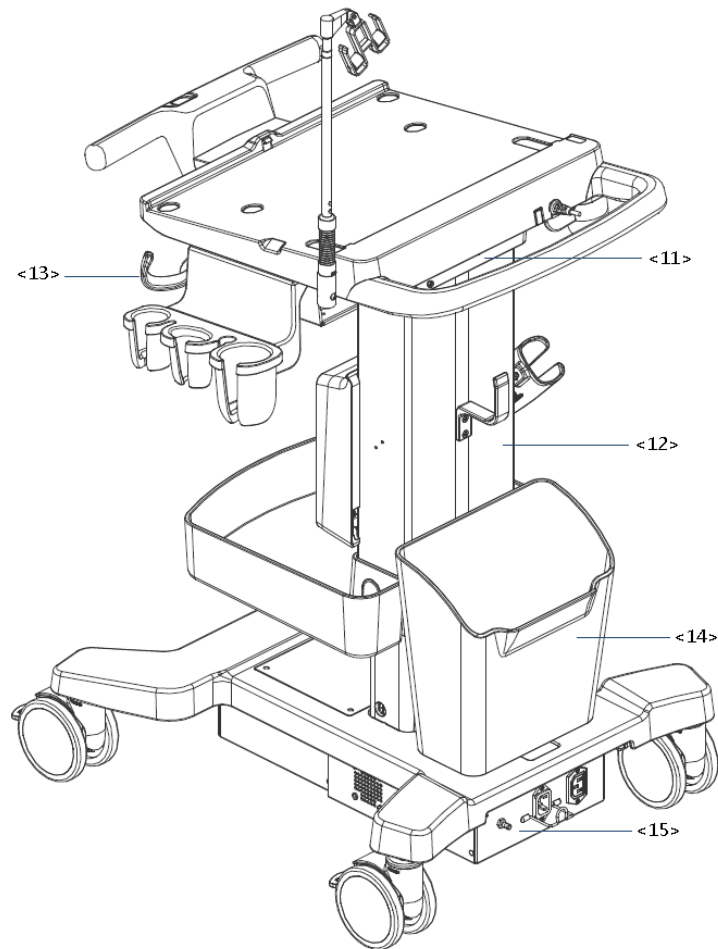
B.1.2 Power supply

- Voltage: 100-240V AC
- Frequency: 50/60Hz
- Input power: 500VA
- Fuse: 250V~T5AL, 250V~T5AH
- Battery voltage: 14.8V
- Capacity: 6600mAh (single battery)

B.1.3 Introduction of Each Unit

Overview of the Trolley (Taking UMT-500Plus as an example)

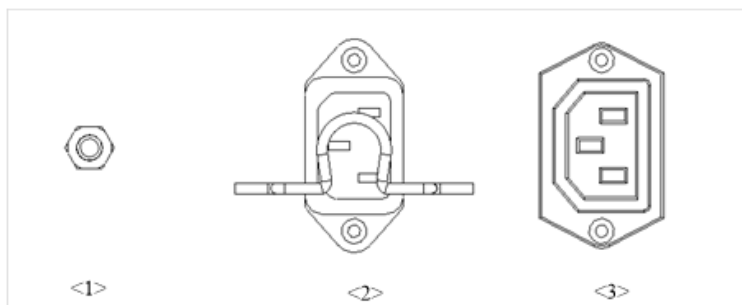





No.	Name	Function
<1>	Probe cable hook	Manage probe cable
<2>	Ultrasound main unit	Ultrasound system
<3>	Ascending/descending switch	Press to adjust the height of operation panel
<4>	Anti-theft lock	Used for fix the ultrasound system to the trolley.
<5>	Printer bracket	Used for place the printer
<6>	Probe extension module	Used for extend ports for connecting probes (optional)
<7>	Storage tray	Used for place the adaptor, gel and other stuff.
<8>	USB port	Connects USB devices (2 ports)
<9>	Probe holder	Used for place probes temporarily
<10>	Caster	Used for securing or moving the system Step on the second footswitch to lock the trolley. Step on the first footswitch to unlock the trolley.
<11>	Audio/video extender	Used for switch audio/video (optional)
<12>	Lifting column	Used for adjust the height of operation panel
<13>	Moveable hook	Manage probe cable

No.	Name	Function
<14>	Storage box	Used for place report or other stuff.
<15>	Power supply panel	Used for offer output/input port, equipotential terminal for power supply.
<16>	Indicator	<p>Battery status indicator.</p> <p>Charging status:</p> <ul style="list-style-type: none"> • It illuminates in orange when batteries are charging; • It illuminates in green when batteries are charged fully. • It illuminates in green color when the power of the batteries is sufficient; • It illuminates in orange color for low battery power. <p>AC indicator:</p> <ul style="list-style-type: none"> • The indicator is green at AC supply. • The indicator is off when batteries are supplied without AC supply.

Power Supply Panel



No.	Name	Function
1	Equipotential terminal	Used for equipotential connection, balancing the protective earth potentials between the system and other electrical equipment.
2	Power inlet	AC power inlet
3	Power outlet	Supply power for optional peripheral devices (e.g. DVR)

The symbol  represents the equipotential terminal that is used for balancing the protective earth potentials between the system and other electrical equipment.

B.1.4 Battery Overview

WARNING

- Only technical professionals from Mindray or engineers authorized by Mindray after training can perform battery installation and uninstallation.

- If you need to change the battery or buy a new one, please contact your sales representative.

External batteries performance on UMT-500Plus:

Powering time of the battery is more than 90 minutes (condition: connect a convex probe by probe extend module under power on status with no peripherals. And scanning time takes 60% of the working time)

Under power off or standby status, charging time of the battery from capacity 0 to 100% takes less than 4.5 hours.

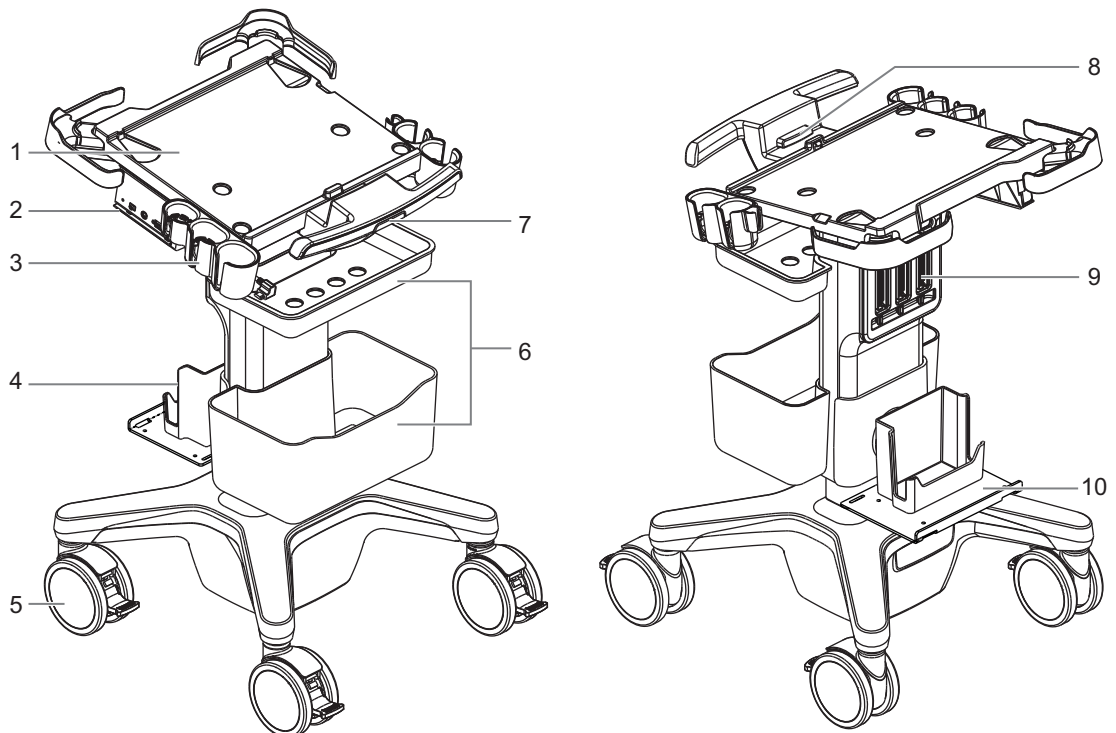
B.2 MT5 Trolley

MT5 is a kind of mobile trolley, which is a passive device, used to mechanical support for the main unit and placing some accessories.

B.2.1 Configuration

- Probe& gel holder
- Probe extend module
- Audio/video extend module bracket
- Printer bracket

B.2.2 Introduction of Each Unit



No.	Name	Function
1.	Main unit tray	Used for placing and fixing the main unit
2.	Audio/video extend module bracket	Used for installing the Audio/video extend module
3.	Probe holder	Used for place probes temporarily
4.	Power adapter bracket	Used for placing the power adapter
5.	Caster	Used for securing or moving the system Step on the second footswitch to lock the trolley. Step on the first footswitch to unlock the trolley.
6.	Storage box	Used for place report or other stuff
7.	Height lever	Used for adjusting the height of the stand
8.	Anti-theft lock	Used for fix the ultrasound system to the trolley
9.	Probe extension module	Used for extend ports for connecting probes (optional)
10.	Printer bracket	Used for placing the printer.

C Electrical Safety Inspection

The following electrical safety tests are recommended as part of a comprehensive preventive maintenance program. They are a proven means of detecting abnormalities that, if undetected, could prove dangerous to either the patient or the operator. Additional tests may be required according to local regulations.

All tests can be performed using commercially-available safety analyzer test equipment. These procedures assume the use of a 601PROXL International Safety Analyzer or equivalent safety analyzer. Other popular testers which comply with IEC 60601-1 and are used in Europe, such as Fluke, Metron or Gerb, may require modifications to the procedure. Follow the analyzer manufacturer's instructions.

An electrical safety inspection should be periodically performed every two years. The safety analyzer is also an excellent troubleshooting tool for detecting abnormalities in line voltage and grounding, as well as total current loads.

NOTE:

Make sure the safety analyzer is authorized and complies with the requirements of IEC 61010-1. Follow the analyzer manufacturer's instructions.

C.1 Power Cord Plug

C.1.1 The Power Plug

Test Item		Acceptance Criteria
The power plug	The power plug pins	No broken or bent pins. No discolored pins.
	The plug body	No physical damage to the plug body.
	The strain relief	No physical damage to the strain relief. No plug warmth when device is in use.
	The power plug	No loose connections.
The power cord		No physical damage to the cord. No deterioration to the cord.
		For devices with detachable power cords, inspect the connection with the device.
		For devices with non-detachable power cords, inspect the strain relief at the device.

C.2 Device Enclosure and Accessories

C.2.1 Visual Inspection

Test Item	Acceptance Criteria
The enclosure and accessories	No physical damage to the enclosure and accessories.
	No physical damage to meters, switches, connectors, etc.
	No residue of fluid spillage (e.g., water, coffee, chemicals, etc.).
	No loose or missing parts (e.g., knobs, dials, terminals, etc.).

C.2.2 Contextual Inspection

Test Item	Acceptance Criteria
The enclosure and accessories	No unusual noises (e.g., rattles inside the case).
	No unusual smells (e.g., burning or smoky smells, particularly from ventilation holes).
	No taped notes that may suggest device deficiencies or operator concerns.

C.3 Device Labeling

Check that the labels provided by the manufacturer or the healthcare facility are present and legible.

- Main unit label
- Integrated warning labels

C.4 Protective Earth Resistance

1. Plug the analyzer probes into the device's protective earth terminal and the protective earth terminal of the AC power cord.
2. Test the earth resistance with a current of 25 A.
3. Verify the resistance is less than the limits.

LIMITS

ALL COUNTRIES $R = 0.2 \Omega$ Maximum

C.5 Earth Leakage Test

Run an Earth Leakage test on the device being tested before performing any other leakage tests.

The following outlet conditions apply when performing the Earth Leakage test.

- normal polarity (Normal Condition);
- reverse polarity (Normal Condition);

- normal polarity with open neutral (Single Fault Condition);
- reverse polarity with open neutral (Single Fault Condition).

LIMITS

- For ES 60601-1:
 - 300 μA in Normal Condition.
 - 1000 μA in Single Fault Condition.
- For IEC 60601-1:
 - 500 μA in Normal Condition.
 - 1000 μA in Single Fault Condition.

C.6 Enclosure Leakage Test

The following outlet conditions apply when performing the Enclosure Leakage test.

- normal polarity (Normal Condition);
- reverse polarity (Normal Condition);
- normal polarity with open neutral (Single Fault Condition);
- reverse polarity with open neutral (Single Fault Condition);
- normal polarity with open earth (Single Fault Condition);
- reverse polarity with open earth (Single Fault Condition).

LIMITS

- For ES 60601-1
 - 100 μA in Normal Condition.
 - 300 μA in Single Fault Condition.
- For IEC 60601-1:
 - 100 μA in Normal Condition.
 - 500 μA in Single Fault Condition.


C.7 Patient Leakage Current

Patient leakage currents are measured between a selected applied part and mains earth. All measurements have a true RMS only.

The following outlet conditions apply when performing the Patient Leakage Current test.

- normal polarity (Normal Condition);
- reverse polarity (Normal Condition);
- normal polarity with open neutral (Single Fault Condition);
- reverse polarity with open neutral (Single Fault Condition);
- normal polarity with open earth (Single Fault Condition);
- reverse polarity with open earth (Single Fault Condition).

LIMITS

For BF  applied parts:

- 100 μA in Normal Condition.
- 500 μA in Single Fault Condition.


C.8 Mains on Applied Part Leakage

The Mains on Applied Part test applies a test voltage, which is 110% of the mains voltage using a limiting resistance, to selected applied part terminals. Current measurements are then taken between the selected applied part and earth. Measurements are taken with the test voltage (110% of mains) on applied parts in the normal and reverse polarity conditions.

The following outlet conditions apply when performing the Mains on Applied Part test.

- Normal Polarity;
- Reversed Polarity.

LIMITS

For BF  applied parts: 5000 μ A.


C.9 Patient Auxiliary Current

Patient Auxiliary currents are measured between any selected Applied Part connector and the remaining Applied Part connectors. All measurements may have a true RMS response.

The following outlet conditions apply when performing the Patient Auxiliary Current test.

- normal polarity (Normal Condition);
- reverse polarity (Normal Condition);
- normal polarity with open neutral (Single Fault Condition);
- reverse polarity with open neutral (Single Fault Condition);
- normal polarity with open earth (Single Fault Condition);
- reverse polarity with open earth (Single Fault Condition).

LIMITS

For BF  applied parts,

- 100 μ A in Normal Condition.
- 500 μ A in Single Fault Condition.

D Wireless LAN

The system provides wireless net adapter configuration, so as to assist information query and unlimited network service. The ultrasound system can be connected to router, mobile phone, tablet, ultrasound workstation, server network device and so on via wireless network.

WARNING

- Use the wireless LAN function prudently in OR/ICU/CCU as it may interfere with other devices.
 - When the wireless LAN function is turned on, the ultrasound system may suffer interference from other equipment, even if that other equipment complies with CISPR EMISSION requirements.
 - Keep at least 20 cm away from the ultrasound system when the wireless LAN function is in use.
-

NOTE:

Disconnection may be caused if the devices connected exceed the router capacity (please refer to settings of the router, generally it should be ≤ 5 .)

DO NOT connect devices other than specified into the LAN.

Medical devices within the same LAN may interfere with each other, the operator should be cautious. (Do not connect devices that may cause strong interference. For example, life-supporting devices should not be connected in the same LAN.)




Other non-medical devices in the same frequency band may cause interference, please be cautious.

For a better wireless LAN transmission effect, please take the following settings:

- SSID > 80% with stable WLAN network.
 - Wireless router and the server are in the same network segment.
 - Router setting:
 - Wireless standard 802.11n.
 - Maximum transmission speed 300 Mbps.
 - Number of the devices connected to the same router ≤ 5 .
 - Target server setting:
 - Network is stable and not under overloading state (e.g. high CPU/memory usage, fast HDD speed, limited HDD space).
 - Level other than the highest level of firewall is adopted.
 - Operating system is Windows 10 or higher versions and it supports a Gigabit Ethernet.
-

D.1 Use the Wireless feature

Perform the following procedure:

1. Press <Cursor> to show the cursor, click  in the bottom bar to open the wireless network manager.
2. Move the cursor to the target network and press <Set> to select it, then click [Connect] to connect to the network.
3. When connecting an encrypted network, enter the password in the box first. You can select to hide password characters or not.
4. The system tries to connect and the wireless manager icon turns into  or  after successful connection.
5. Click [Refresh] to refresh the “Wireless Network Connection” list.

D.2 IP Configure

NOTE:

- When the system background is processing network task (DICOM sending for example), please do not enter network setting to change the IP, otherwise the background task may fail. You can check if there are tasks undergoing in the task manager.
- If the IP address displays as 0.0.0.0, this means that the network is abnormal. The reason for the failure may be disconnection or the system cannot obtain the IP address.

IP config is used for setting local network parameters, which is also applied to DICOM connection. Perform the following procedure:

1. In Wireless network manager screen, click [IP Config] to open the configuration page.
 - If “DHCP” is selected, the IP address will be automatically obtained from the DNS server.
 - If “Static” is selected (using a static IP address), enter the IP address.

IP address of the system should be in the same network segment with the server.
2. Click [OK] to save current setting. Click [Cancel] to exit.

D.3 EAP Network

For setting EAP network, contact Mindray Customer Service Department or the sales representatives.

D.4 Specifications

Wireless specification and technology

No.	Item	Specifications
1	Standards	IEEE 802.11 a/b/g/n
2	Modulation mode	802.11b: DSSS 802.11a/g/n: OFDM
3	Operating frequency	2.412-2.472 GHz, 2.484 GHz
4	Channel spacing	5 MHz

No.	Item	Specifications
5	Output power	≤17dbm
6	Wireless network mode	Infrastructure, ad-hoc

Wireless Quality of Service

No.	Item	Specifications
1	Data rate	802.11b: up to 11 Mbps @ 2.4 GHz 802.11g: up to 54 Mbps @ 2.4 GHz 802.11n: up to 300 Mbps @ 2.4 GHz and 5 GHz
2	Data security	WPA2-PSK encryption
3	Application-layer delay	No requirement. It's not used in real time.
4	Application-layer reliability	No requirement. Application failure will be notified to the user immediately.
5	System capacity	No more than one device can be allowed to link to the ultrasound system
6	System anti-interference	Can be coexistent with other Wi-Fi devices.
7	Network interruption alarm	Network interruption is notified by disconnection icon and failure in transmission is notified by the dialog box.
8	EMC test process	Wi-Fi function is not affected when the system is imposed with radiation interference complied with IEC60601-1-2:2014 standard.

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E iScanHelper

By providing the referential information, such as, the ultrasonic image, the anatomic graphic, scanning pictures/other scanning tips or diagnosis comments, the system helps the doctors to operate the scanning by iScanHelper. Furthermore, it is a good platform for the self-learning and training of ultrasound scanning technique for doctors. The system also plays a role in the assistant software system in fulfilling training and education.

NOTE:

THIS “iScanHelper” IS FOR REFERENCE OR TUTORIAL PURPOSES ONLY, AND THE MANUFACTURER WILL NOT BE LIABLE FOR DAMAGES AND/OR OTHER UNDESIRABLE CONSEQUENCE IN ANY KIND THAT MAY OCCUR TO THE PATIENT OR THE USERS BY USING THE SOFTWARE.

TIP:

iScanHelper feature is available under abdominal, nerve block, Cardiac Diff/Adult Cardiac and EM FAST exam modes.

E.1 Use iScanHelper for Reference

Perform the following procedure:

1. Perform ordinary scanning procedure.
2. Press the user-defined key for “iScanHelper” to enter iScanHelper status.
3. Move the cursor onto the target view name and then press <Set>.
4. Perform scanning according to information displayed on the help information area.
5. Press the user-defined key again to exit.

E.2 Use iScanHelper for Learning or Training

Perform the following procedure:

1. Switch to the exam modes that support iScanHelper.
2. Press the user-defined key for “iScanHelper” to enter iScanHelper status.
3. Learn and practice views by system defaulted sequence according to the information displayed on help information area; or select unfamiliar views to practice.
4. Press the user-defined key again to exit iScanHelper.

E.3 Basic Operation

E.3.1 View Selecting Area

Move the cursor onto the target view, related information will be displayed over the imaging area.

E.3.2 Help Information Area

Help information area provides ultrasonic image, anatomic graphic, scanning picture and scanning tips.

F iVision

The iVision function is used to demonstrate the stored images. Image files are played one by one according to file names (including system-relevant and PC-compatible format images).

Perform the following procedure:

1. Press the user-defined key for “iVision” to enter the iVision screen.
2. Add the contents to be played and select demo mode.
3. Select an item in the list and click [Start] to begin the demonstration.
4. Click [Exit] to exit iVision status.

F.1 Demonstration item

Demonstration items are image files in formats supported by the system. You can add exam data from the patient database or system-supported image files and folders to the demonstration list. For files and folders in the demonstration list, the images in the directory and subdirectory are played one by one, and the system will automatically skip files that cannot be opened.

F.2 Demonstration catalog

There are two kinds of catalog: Demo Catalog and Customize Catalog.

F.2.1 Demo Catalog

The demo catalog is a folder on the hard disk where the factory DEMO is stored. The system plays the images in this folder when performing demonstrations.

The system supports importing, deleting or clearing the data in the demo catalog.

Click [Demo Manager] to operate:

- [>]: to import data into the demo catalog.
- [<]: to delete selected data.
- [<<]: to delete all data.

F.2.2 Customize Catalog

The catalog of the displayed images is saved here. The system plays the images in the catalog when performing demonstrations.

Operate the catalog or the files using the buttons on the right:

- [Add File]: to add files to the file list.
- [Add Catalog]: to add a catalog of files to the list.
- [Delete]: to delete selected files or catalogs from the file list.
- [Clear]: to clear all the files or catalogs in the file list.
- [Export]: to export selected directories/files to external storage devices. Click [Export] to bring up the Browse dialog box, select the path and click [OK].

F.3 Copy the file

Transfer files between the mobile hard disk and the ultrasound system.

Perform the following procedure:

1. Plug the USB disk, and click [Copy File].
2. Select the path of the source file from the “Drive” and “File Name”.
3. Click [Choose Catalog]. Select the path of the source file from the “Drive” and “File Name”, and then click [OK].
4. Click [OK] again to complete the task.

F.4 Demonstration mode

The system automatically plays all the image files in the list one by one.

The time interval between images played is same and can be changed.

F.5 Option of Demo

You can choose whether to repeat the demonstration or exit after a demonstration is completed.

G List of Vocal Commands

The ultrasound system can automatically recognize some vocal commands. You can use a microphone device to input the vocal commands as shown in the following table. After the input command is recognized, the system automatically performs the corresponding operations.

Vocal command	Operation
Hello Mindray	Turn On Audio Control
Turn Off	Turn Off Audio Control
B Mode	Back to B Mode
CDI Mode	Turn on/off CDI Mode
Power Mode	Turn on/off Power Mode
M Mode	Turn on/off M Mode
PW Mode	Turn on/off PW Mode
3D	Turn on/off 3D Mode
Freeze	Freeze Image
UnFreeze	UnFreeze Image
Clear	Clear
Dual	Enter Dual Windows Format
Quad	Enter Quad Windows Format
QSave	QSave
Update	Update
Full Image	Turn on/off Full Image Mode
Middle Line	Display/Hide Middle Line
iNeedle	Turn on/off iNeedle Mode
iTouch	Turn on iTouch Mode
Depth Increase	Depth Increase One
Depth Decrease	Depth Decrease One
Focus Position Up	Increase the Focus Position
Focus Position Down	Decrease the Focus Position
Gain Increase	Gain Increase One
Gain Decrease	Gain Decrease One
Gain Auto Increase	Gain Auto Increase
Gain Auto Decrease	Gain Auto Decrease
Gain Stop	Gain Stop Auto Increase/Decrease

Vocal command	Operation
Zoom In	Zoom In Image
Zoom Out	Zoom Out Image
Open Smart Track	Turn on Smart Track Mode
Close Smart Track	Turn off Smart Track Mode
Sound Volume Up	Turn Sound Volume Up
Sound Volume Down	Turn Sound Volume Down
Angle More	Angle More One
Angle Less	Angle Less One
Left Steer	Left Steer the Color ROI or Linear Image
Right Steer	Right Steer the Color ROI or Linear Image
BaseLine Down	Decrease the Baseline Position
BaseLine Up	Increase the Baseline Position
Save Image	Save Image
Save Clip	Save Clip
Save Screen	Save Screen
Adult Abdomen	Switch Exam Mode to Adult Abdomen
Abdomen Difficult	Switch Exam Mode to Adult Abdomen Difficult
Pediatric Abdomen	Switch Exam Mode to Pediatric Abdomen
Abdomen Vascular	Switch Exam Mode to Abdomen Vascular
Neonatal Abdomen	Switch Exam Mode to Neonatal Abdomen
Adult Cardiac	Switch Exam Mode to Adult Cardiac
Cardiac Difficult	Switch Exam Mode to Adult Cardiac Difficult
Pediatric Cardiac	Switch Exam Mode to Pediatric Cardiac
Left Ventricular Opacification	Switch Exam Mode to LVO
Neonatal Cardiac	Switch Exam Mode to Neonatal Cardiac
TEE Cardiac	Switch Exam Mode to TEE Cardiac
Coronary Artery	Switch Exam Mode to Coronary Artery
Gynecology	Switch Exam Mode to Gynecology
1st Trimester	Switch Exam Mode to 1st Trimester
2nd & 3rd Trimester	Switch Exam Mode to 2nd & 3rd Trimester
Fetal Echo	Switch Exam Mode to Fetal Echo
Kidney	Switch Exam Mode to Kidney
Urology	Switch Exam Mode to Urology
Prostate	Switch Exam Mode to Prostate
Transcranial Imaging	Switch Exam Mode to Transcranial Imaging
Carotid	Switch Exam Mode to Carotid

Vocal command	Operation
Upper External Artery	Switch Exam Mode to Upper Ext Artery
Lower External Artery	Switch Exam Mode to Lower Ext Artery
Upper External Vein	Switch Exam Mode to Upper Ext Vein
Lower External Vein	Switch Exam Mode to Lower Ext Vein
Thyroid	Switch Exam Mode to Thyroid
Breast	Switch Exam Mode to Breast
Testicle	Switch Exam Mode to Testicle
Musculoskeletal	Switch Exam Mode to Musculoskeletal
Superficial	Switch Exam Mode to Superficial
Intraoperative	Switch Exam Mode to Intraoperative
Nerve Block	Switch Exam Mode to Nerve Block
Emergency Abdomen	Switch Exam Mode to Emergency Abdomen
Emergency FAST	Switch Exam Mode to Emergency Focused Assessment with Sonography for Trauma
Emergency Obstetrics	Switch Exam Mode to Emergency Obstetrics
Emergency Vascular	Switch Exam Mode to Emergency Vascular
Emergency Superficial	Switch Exam Mode to Emergency Superficial
Lung	Switch Exam Mode to Lung
Neonatal Head	Switch Exam Mode to Neonatal Head
Orthopedic	Switch Exam Mode to Orthopedic
Renal Artery	Switch Exam Mode to Renal Artery
IMT	Switch Exam Mode to IMT
Open Patient Info Dialog	Open Patient Info Dialog
Close Patient Info Dialog	Close Patient Info Dialog
Open Probe Dialog	Open Probe Dialog
Close Probe Dialog	Close Probe Dialog
Open Review Dialog	Open Review Dialog
Close Review Dialog	Close Review Dialog
Open Report Dialog	Open Report Dialog
Close Report Dialog	Close Report Dialog
Open Preset Dialog	Open Preset Dialog
Close Preset Dialog	Close Preset Dialog

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H Acoustic Output

This section of the operator's manual applies to the overall system including the main unit, probes, accessories and peripherals. This section contains important safety information for operators of the device, pertaining to acoustic output and how to control patient exposure through use of the ALARA (as low as reasonably achievable) principle. Also this section contains information regarding the acoustic output testing and the real-time output display.

Read this information carefully before using the system.

H.1 Concerns with Bioeffects

Diagnostic ultrasound is recognized as being safe. In fact, there have been no reports of injuries to patients caused by diagnostic ultrasound.

It cannot be stated categorically that ultrasound is 100% safe. Studies have revealed that ultrasound with extremely high intensity is harmful to body tissues.

Diagnostic ultrasound technology has made a great leap forward during the last several years. This rapid advance has generated concerns about the potential risk of bioeffects when new applications or diagnostic technologies become available.

H.2 Prudent Use Statement

Although there are no confirmed biological effects on patients caused by exposures from present diagnostic ultrasound instruments, the possibility exists that such biological effects may be identified in the future. Thus ultrasound should be used in a prudent manner to provide medical benefit to the patient. High exposure levels and long exposure times should be avoided while acquiring necessary clinical information.

H.3 ALARA Principle (As Low As Reasonably Achievable)

It is required to practice ALARA when using ultrasound energy. Practicing ALARA ensures that the total energy level is controlled below a low enough level at which bioeffects are not generated while diagnostic information is being accumulated. The total energy is controlled by output intensity and total radiation time. The output intensity necessary for examinations differs depending on the patient and the clinical case.

Not all examinations can be performed with an extremely low level of acoustic energy. Controlling the acoustic level at an extremely low level leads to low-quality images or insufficient Doppler signals, adversely affecting the reliability of the diagnosis. However, increasing the acoustic power more than necessary does not always contribute to an increase in quality of information required for diagnosis, rather increasing the risk of generating bioeffects.

Users must take responsibility for the safety of patients and utilize ultrasound deliberately. Deliberate use of ultrasound means that output power of ultrasound must be selected based on ALARA.

Additional information regarding the concept of ALARA and the possible bioeffects of Ultrasound is available in a document from the AIUM (American Institute of Ultrasound Medicine) title “Medical Ultrasound Safety”.

H.4 MI/TI Explanation

H.4.1 Basic Knowledge of MI and TI

Mechanical Bioeffect and Thermal Bioeffect

The relationship of various ultrasound output parameters (frequency, acoustic pressure and intensity, etc.) to bioeffects is not fully understood presently. It is recognized that two fundamental mechanisms may induce bioeffects. One is a thermal bioeffect with tissue absorption of ultrasound, and another one is a mechanical bioeffect based on cavitations. Thermal Index (TI) gives the relative index of temperature increase by thermal bioeffect, and Mechanical Index (MI) gives the relative index of mechanical bioeffect. TI and MI indices reflect instantaneous output conditions, so they DO NOT consider the cumulative effects of the total examination time. TI and MI models contain practical simplifications to complex bioeffects interaction. Then the operator should be aware that the actual worst case temperature rise may be up to several times higher than the displayed TI value.

MI (Mechanical Index)

The mechanical bioeffects are the result of compression and decompression of insonated tissues with the formation of micro bubbles that may be referred to as cavitations.

MI is an index that shows the possibility of the cavitations generation based on acoustic pressure, and the value in which the peak-rarefactional acoustic pressure is divided by the square root of the frequency. Therefore MI value becomes smaller when the frequency is higher or the peak-rarefactional acoustic pressure is lower, it becomes difficult to generate the cavitations.

$$MI = \frac{P_{r, \alpha}}{\sqrt{f_{awf}} \times C_{MI}}$$

$$C_{MI} = 1 \text{ (MPa} / \sqrt{\text{MHz}} \text{)}$$

For the frequency 1 MHz and the peak rarefactional acoustic pressure 1 MPa, MI becomes 1. It is possible to think MI to be one threshold of the cavitations generation. Especially, it is important to keep MI value to be low when both gases and the soft tissues exist together, for such as lung exposure in cardiac scanning and bowel gas in abdominal scanning.

TI (Thermal Index)

TI is determined by the ratio of the total acoustic power to the acoustic power required to raise the tissue temperature by 1 degree C. In addition, because the temperature rises is greatly different according to tissue structures, TI is divided three kinds: TIS (Soft-tissue Thermal Index), TIB (Bone Thermal Index) and TIC (Cranial-bone Thermal Index).

- TIS: Thermal index related to soft tissues, such as abdominal and cardiac applications.
- TIB: Thermal index for applications, such as fetal (second and third trimester) or neonatal cephalic (through the fontanel), in which the ultrasound beam passes through soft tissue and a focal region is in the immediate vicinity of bone.
- TIC: Thermal index for applications, such as pediatric and adult cranial applications, in which the ultrasound beam passes through bone near the beam entrance into the body.

Although the output power is automatically controlled for the selected applications, high TI values should be kept to a minimum or avoided in obstetric applications. WFUMB (World Federation for Ultrasound in Medicine and Biology) guidelines: state that temperature increase of 4 degree C for 5 min or more should be considered as potentially hazardous to embryonic and fetal tissue.

The smaller the MI/TI values, the lower the bioeffects.

H.4.2 MI/TI Display

TI and MI values are displayed in the upper part of the screen in real-time. The operator should monitor these index values during examinations and ensure that exposure time and output values are maintained at the minimum amounts needed for effective diagnosis.

NOTE:

If there is a value of MI or TI exceeds 1.0, you must be careful to practice the ALARA principle.

The display precision is 0.1.

Real-time Display accuracy: MI within $\pm 28.5\%$, TI within $\pm 38.7\%$

H.5 Acoustic Power Setting

Acoustic power adjustment

Use the [A.power] to adjust the acoustic power percentage, and its value is displayed on the corresponding item, as well as at the top of the screen. The greater the acoustic power percentage, the greater the current acoustic output. When the image is frozen, the system stops transmitting acoustic power.

Default setting of acoustic power

Selection of diagnostic applications is the most important factor for controlling ultrasound output. The permissible level of intensity of ultrasound differs depending on the region of interest. For fetal examinations, in particular, much care must be exercised.

In this system, imaging setups can be created using the ultrasound output set by you.

Once you perform preset settings, default setting values of the system may be changed and invalid. It is the user's responsibility for any change to the default settings.

Adjusting range

Initial power: 3.2% to 100%*

Definition of 100%: The maximum acoustic power of a probe determined by the increase in probe surface temperature in the selected mode and the acoustic power restrictions specified by the FDA.

Default settings of acoustic power value refer to the best image quality of the probe. The larger the acoustic power value, the better the image quality.

In the product, to obtain optimum images for applications under the requirements of safety and ALARA principle, we set acoustic power default values in factory to be maximum 93.3% in OB1, OB2/3 and Fetal-Cardiac exam modes and maximum 96.6% in other modes for a better image quality. The user can make adjustments according to the imaging effect in practical use.

NOTE:

This system automatically returns to the settings whenever changes are made to the values (when you turn on the power, switch between probes, end the exam, or select OK or Cancel in

the Setup menu). In the factory default settings, the Acoustic Output is limited below 100%. Following the ALARA restriction, you are allowed to increase the acoustic power under FDA 510 (k) Guidance-Track 3 limits and to set it in the image preset screen.

The acoustic output of the system has been measured and calculated in accordance with IEC60601-2-37: 2015, FDA 510(K) GUIDANCE, IEC 62359: 2017, Ultrasonics-Field characterization-Test methods for the determination of thermal and mechanical indices related to medical diagnostic ultrasonic fields.

H.6 Acoustic Power Control

The qualified operator may use the system controls to limit the ultrasound output and to adjust the quality of the images. There are three categories of system controls relative to output. They are,

- Controls that have direct effect on the output
- Controls that indirectly control output
- Controls that are receiver controls

Direct controls

It is possible to control, if necessary, the acoustic output with the “A.power” item. In this case, the maximum value of the acoustic output never exceeds an MI of 1.9 and an $I_{SPTA,3}$ of 720 mW/cm² in any mode of operation.

Indirect controls

The controls that indirectly affect output are the many imaging parameters. These are operating modes, frequency, focal point positions, overall depth, and PRF.

The operating mode determines whether the ultrasound beam is scanning or non-scanning. Thermal bioeffect is closely connected to M mode, Doppler and Color mode. Acoustic attenuation of tissue is directly related to probe frequency. The focal point is related to active aperture of probe and beam width. For the higher PRF (pulse repetition frequency), the more output pulses occur over a period of time.

Receiver controls

The receiver controls (for example, gain, dynamic range, and image post-processing, etc.) won't affect output. These controls should be used, when possible, to improve the image quality before using controls that directly or indirectly affect output.

H.7 Acoustic Output

H.7.1 Derated Ultrasonic Output Parameters

In order to determine the relevant Ultrasonic Output Parameters, a method is used which allows for the comparison of ultrasound systems which operate at different frequencies and are focused at different depths. This approach, called “derating” or “attenuating”, adjusts the acoustic output as measured in a water tank to account for the effect of ultrasound propagation through tissue. By convention, a specific average intensity attenuation value is used, which corresponds to a loss of 0.3 dB/cm/MHz. That is, the intensity of ultrasound will be reduced by 0.3 dB/MHz for every centimeter of travel from the probe. This can be expressed by the following equation:

$$I_{atten} = I_{water} \times 10^{((-0.3)/10 \times f_c \times z)}$$

Where I_{atten} is the attenuated intensity, I_{water} is the intensity measured in a water tank (at distance z), f_c is the center frequency of the ultrasound wave (as measured in water), and z is the distance from the probe. The equation for attenuating pressure values is similar except that the attenuation coefficient is 0.15 dB/cm/MHz, or one-half the intensity coefficient. The intensity coefficient is double the pressure coefficient because intensity is proportional to the square of pressure.

Although the attenuation coefficient chosen, 0.3 dB/cm/MHz, is significantly lower than any specific solid tissue in the body, this value was chosen to account for fetal examinations. In early trimester ultrasound fetal examinations, there may be a significant fluid path between the probe and the fetus, and the attenuation of fluid is very small. Therefore the attenuation coefficient was lowered to account for this case.

H.7.2 Limits of Acoustic Output

In accordance with the FDA Track 3 requirements, the derating (or attenuated) approach was incorporated into the FDA Acoustic Output Limits, as listed below. The maximum acoustic output level from any probe in any operating mode is expected to fall below these limits.

FDA Maximum Acoustic Output Limits for Track 3 (Attenuated Values)

Application: Regions (except eyes)	$I_{\text{spta.3}} \text{ (mW/cm}^2\text{)} \leq 720$	$I_{\text{sppa.3}} \text{ (W/cm}^2\text{)} \leq 190$ or $MI \leq 1.9$
Application: Ophthalmic	$I_{\text{spta.3}} \text{ (mW/cm}^2\text{)} \leq 50$	$MI \leq 0.23$

H.7.3 Differences between Actual and Displayed MI and TI

In operation, the system will display to the operator the Acoustic Output Parameters Thermal Index, TI, or Mechanical Index, MI (or sometimes both parameters simultaneously). These parameters were developed as general indicators of risk from either thermal or mechanical action of the ultrasound wave. They serve to indicate to the operator whether a particular setting of the system increases or decreases the possibility of Thermal or Mechanical effect. More specifically, they were designed to assist in the implementation of the ALARA principle. As an operator changes a given system control, the potential effect of the change in output will be indicated. However, the Thermal Index is not the same as temperature rise in the body, for several reasons. First of all, in order to provide a single display index to you, a number of simplifying assumptions had to be made. The biggest assumption was the use of the attenuating formula described above, which is much lower than the actual value for most tissues within the body. Scanning through muscle or organ tissue, for example, will produce much higher attenuation than 0.3 dB/cm/MHz. There were also significant simplifications made for the thermal properties of tissue. Therefore, scanning through highly perfused tissue, such as the heart or vasculature, will produce significantly less thermal effect than that suggested by the Thermal Index.

Similarly, the Mechanical Index was derived to indicate the relative possibility of mechanical (cavitation) effects. The MI is based on the derated peak-rarefactional pressure and the center frequency of the ultrasound wave. The actual peak-rarefactional pressure is affected by the actual attenuation caused by tissue in the path between the probe and the focal point. Again, all solid tissues within the body have higher attenuation than the prescribed 0.3 dB/cm/MHz value, and therefore, the actual peak-rarefactional pressure will be lower. Further, the actual peak-rarefactional pressure will change depending upon the region of the body being scanned.

For these reasons, the TI and MI displays should only be used to assist the operator in implementing ALARA at the time of the patient examination.

H.8 Measurement Uncertainty

The total estimated measurement uncertainty (where the total uncertainty includes the uncertainties in hydrophone response, measurement, calculation, and positioning) are:

Acoustic Quantities	Total Uncertainties (Standard)
Power	26.48% for non-scan modes; 6.03% for scan modes.
Frequency	0.22%
Pressure	13.01%
Ita	26.48% for non-scan modes; 26.95% for scan modes.
Ipa	26.5%
Mechanical Index	13.01%
Total Uncertainty for TIS	26.48% for non-scan modes; 6.03% for scan modes.
Total Uncertainty for TIB	26.48% or 18.72% for non-scan modes; 6.03% for scan modes.
Total Uncertainty for TIC	26.48% for non-scan modes; 6.03% for scan modes.

H.9 References for Acoustic Power and Safety

- “Bioeffects and Safety of Diagnostic Ultrasound” issued by AIUM in 1993
- “Medical Ultrasound Safety” issued by AIUM in 1994
- Marketing Clearance of Diagnostic Ultrasound Systems and Transducers, February 21, 2023. Center for Devices and Radiological Health.
- Medical electrical equipment-Part 2-37: Particular requirements for the basic safety and essential performance of ultrasonic medical diagnostic and monitoring equipment issued by IEC in 2015
- IEC 62359, Ultrasonics-Field characterization-Test methods for the determination of thermal and mechanical indices related to medical diagnostic ultrasonic fields, 2017.

EMC Guidance and Manufacturer's Declaration

The system complies with the EMC standard IEC 60601-1-2:2014+A1:2020

Intended Environments: HOME HEALTHCARE ENVIRONMENT (except for near active HF SURGICAL EQUIPMENT and the RF shielded room of an ME SYSTEM for magnetic resonance imaging).

WARNING

- The use of unapproved accessories may diminish system performance.
- Use of components, accessories, probes, and cables other than those specified may result in increased emission or decreased immunity of system.
- Operation of system, in the case that the patient physiological signal is lower than the minimum amplitude or value specified in the product specifications, results may not be obtained (results can be obtained when the HR is in the range of 30-250 bpm or when the QRS wave amplitude is between 0.5-5 mV.)
- Use of the system adjacent to or stacked with other equipment should be avoided because it could result in improper operation. If such use is necessary, this equipment and the other equipment should be observed to verify that they are operating normally.
- Use of accessories, transducers and cables other than those specified or provided by the manufacturer of this equipment could result in increased electromagnetic emissions or decreased electromagnetic immunity of this equipment and result in improper operation.
- Portable RF communications equipment (including peripherals such as antenna cables and external antennas) should be used no closer than 30 cm (12 inches) to any part of the system, including cables specified by the manufacturer. Otherwise, degradation of the performance of this equipment could result.
- Keep a distance of at least 20 cm away from the monitor when WiFi function is in use.
- The system should be away from RFID, MRI, diathermy, and electrocautery testing wireless power transfer, 5G cellular and security equipment (such as electromagnetic anti-theft system and metal detector). If the devices are near and are interfered by the concealed and undiscovered RF transmitter (for example, scanning mode changes or image disturbances affecting diagnosis), the user should immediately take mitigation measures, such as redirecting, repositioning or shielding the RF transmitter.

- This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
-

NOTE:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

The device has been evaluated to meet general RF exposure requirement. The device can be used in portable exposure condition without restriction.

NOTE:

- The system needs special precautions regarding EMC and needs to be installed and put into service according to the EMC information provided below.
 - Preventing conducted RF immunity. Due to technological limitations, the conducted RF immunity level are limited to 3 Vrms level, conducted RF interference above 3 Vrms may cause wrong diagnosis and measurements. We suggest that you position system further from sources of conducted RF noise.
 - The probes P7-3Ts/P8-3Ts/P8-2Ts/LAP13-4Cs which integrated in the system was declared to the category of CISPR11 Group1 Class A. The EMISSIONS characteristics of this equipment make it suitable for use in industrial areas and hospitals (CISPR 11 class A). If it is used in a residential environment (for which CISPR 11 class B is normally required) this equipment might not offer adequate protection to radio-frequency communication services. The user might need to take mitigation measures, such as relocating or re-orienting the equipment
-

If the system is operated within the electromagnetic environment listed in Table I-3 and Table I-4, the system will remain safe and will provide the following basic performances:

- Imaging;
- Doppler acoustic spectral displaying;
- Taking measurements;
- Patient information;
- Date/time information.

Table I-1

GUIDANCE AND MINDRAY DECLARATION-ELECTROMAGNETIC EMISSIONS		
The system is intended for use in the electromagnetic environment specified below. The customer or the user of system should assure that it is used in such an environment.		
EMISSIONS TEST	COMPLIANCE	ELECTROMAGNETIC ENVIROMENT-GUIDANCE
RF emissions CISPR 11	Group 1	The system uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class B	The system is suitable for use in all establishments including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes
Harmonic Emissions IEC 61000-3-2	Class A	
Voltage Fluctuations/ Flicker Emissions IEC 61000-3-3	Compliance	


Table I-2

GUIDANCE AND MINDRAY DECLARATION-ELECTROMAGNETIC EMISSIONS		
The probes P7-3Ts/P8-3Ts/P8-2Ts/LAP13-4Cs which integrated in the system is intended for use in the electromagnetic environment specified below. The customer or the user of system should assure that it is used in such an environment.		
EMISSIONS TEST	COMPLIANCE	ELECTROMAGNETIC ENVIROMENT-GUIDANCE
RF emissions CISPR 11	Group 1	The system uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class A	The system is suitable for use in all establishments other than domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes
Harmonic Emissions IEC 61000-3-2	Class A	
Voltage Fluctuations/ Flicker Emissions IEC 61000-3-3	Compliance	

Table I-3

GUIDANCE AND MINDRAY DECLARATION-ELECTROMAGNETIC IMMUNITY			
The system is intended for use in the electromagnetic environment specified below. The customer or the user of system should assure that it is used in such an environment.			
IMMUNITY TEST	IEC 60601 TEST LEVEL	COMPLIANCE LEVEL	ELECTROMAGNETIC ENVIRONMENT- GUIDANCE
Electrostatic Discharge(ESD) IEC 61000-4-2	±8 kV contact; ±2 kV, ±4 kV, ±8 kV, ±15 kV air	±8 kV contact; ±2 kV, ±4 kV, ±8 kV, ±15kV air	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	±2 kV for power supply lines; ±1 kV for input/output lines	±2 kV for power supply lines; ±1 kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	±0,5 kV, ±1 kV line(s) to line(s); ±0,5 kV, ±1 kV, ±2 kV line(s) to earth	±0,5 kV, ±1 kV line(s) to line(s); ±0,5 kV, ±1 kV, ±2 kV line(s) to earth	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, Short interruptions and voltage variation on power supply input voltage IEC 61000-4-11	0 % U_T ; 0,5 cycle g) At 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315° 0 % U_T ; 1 cycle 70% U_T for 25/30 cycle at 0° 0 % U_T ; 250/300 cycle	0 % U_T ; 0,5 cycle g) At 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315° 0 % U_T ; 1 cycle 70% U_T for 25/30 cycle at 0° 0 % U_T ; 250/300 cycle	Mains power quality should be that of a typical commercial or hospital environment. If you require continued operation during power mains interruptions, it is recommended that our product be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 HZ) magnetic field IEC 61000-4-8	30 A/m	30 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
NOTE: U_T is the A.C. mains voltage prior to application of the test level.			

Table I-4

GUIDANCE AND MINDRAY DECLARATION-ELECTROMAGNETIC IMMUNITY			
The system is intended for use in the electromagnetic environment specified below. The customer or the user of system should assure that it is used in such an environment.			
IMMUNITY TEST	IEC 60601 TEST LEVEL	COMPLIANCE LEVEL	ELECTROMAGNETIC ENVIRONMENT-GUIDANCE
Conducted RF IEC 61000-4-6	3 Vrms 0,15 MHz – 80 MHz 6 Vrms in ISM and amateur radio bands ^a between 0,15 MHz and 80 MHz	3 Vrms 0,15 MHz – 80 MHz 6 Vrms in ISM and amateur radio bands ^a between 0,15 MHz and 80 MHz	Portable and mobile RF communications equipment should be used no closer to any part of system, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance $d = 1.2 \times \sqrt{P}$ $d = 2 \times \sqrt{P}$ $d = 1.2 \times \sqrt{P} \text{ 80 MHz to 800 MHz}$ $d = 2.3 \times \sqrt{P} \text{ 800 MHz to 2.7 GHz}$ 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 ^b , should be less than the compliance level in each frequency range ^c . Interference may occur in the vicinity of equipment marked with the following symbol: 
Radiated RF IEC 61000-4-3	10 V/m 80MHz - 2.7GHz	10 V/m 80MHz - 2.7GHz	

Note 1: At 80 MHz and 800 MHz, the higher frequency range applies.

Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

a. The ISM (industrial, scientific, and medical) bands between 150 kHz and 80 MHz are 6,765 MHz to 6,795 MHz; 13,553 MHz to 13,567 MHz; 26,957 MHz to 27,283 MHz; and 40,66 MHz to 40,70 MHz. The amateur radio bands between 0,15 MHz and 80 MHz are 1,8 MHz to 2,0 MHz, 3,5 MHz to 4,0 MHz, 5,3 MHz to 5,4 MHz, 7 MHz to 7,3 MHz, 10,1 MHz to 10,15 MHz, 14 MHz to 14,2 MHz, 18,07 MHz to 18,17 MHz, 21,0 MHz to 21,4 MHz, 24,89 MHz to 24,99 MHz, 28,0 MHz to 29,7 MHz and 50,0 MHz to 54,0 MHz.

b. 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 device is used exceeds the applicable RF compliance level above, the device should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the device.

c. Over the frequency ranges 150 kHz to 80 MHz, field strengths should be less than 3V/m.

Table I-5

GUIDANCE AND MINDRAY DECLARATION—ELECTROMAGNETIC IMMUNITY			
The system is intended for use in the electromagnetic environment specified below. The customer or the user of system should assure that it is used in such an environment.			
IMMUNITY TEST	IEC 60601 TEST LEVEL	COMPLIANCE LEVEL	ELECTROMAGNETIC ENVIROMENT – GUIDANCE
Proximity magnetic fields IEC 61000-4-39	8 A/m 30 kHz CW	8 A/m 30 kHz CW	/
	65 A/m 134,2 kHz Pulse modulation 2,1 kHz	65 A/m 134,2 kHz Pulse modulation 2,1 kHz	
	7,5 A/m 13,56 MHz Pulse modulation 50 kHz	7,5 A/m 13,56 MHz Pulse modulation 50 kHz	

Table I-6 Test specifications and minimum distances

RECOMMENDED SEPARATION DISTANCES BETWEEN PORTABLE AND MOBILE RF COMMUNICATIONS EQUIPMENT AND THE SYSTEM						
The system is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the system can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the system as recommended below, according to the maximum output power of the communications equipment. Portable and mobile radio communications equipment (e.g. two-way radio, cellular/ cordless telephones and similar equipment) should be used no closer to any part of this system, including cables, than determined according to the following method:						
Test frequency (MHz)	Band (MHz)	Service	Modulation	Maximum power (W)	Distance (m)	Immunity test level (V/m)
385	380 - 390	TETRA 400	Pulse modulation 18Hz	1.8	0.3	27
450	430 -470	GMRS 460 FRS 460	FM ± 5 kHz deviation 1 kHz sine	2	0.3	28

Table I-6 Test specifications and minimum distances

RECOMMENDED SEPARATION DISTANCES BETWEEN PORTABLE AND MOBILE RF COMMUNICATIONS EQUIPMENT AND THE SYSTEM						
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Test frequency (MHz)	Band (MHz)	Service	Modulation	Maximum power (W)	Distance (m)	Immunity test level (V/m)
710	704 - 787	LTE Band 13,17	Pulse modulation 217 Hz	0.2	0.3	9
745						
780						
810	800 - 960	GSM 800/900, tetra 800, iDEN 820, CDMA 850, LTE Band 5	Pulse modulation 18 Hz	2	0.3	28
870						
930						
1720	1700 -1990	GSM 1800, CDMA 1900, GSM 1900, DECT, LTE Band 1, 3,4,25,UMTS	Pulse modulation 217 Hz	2	0.3	28
1845						
1970						
2450	2400 -2570	Bluetooth, WLAN, 802.11 b/g/n, RFID 2450, LTE Band 7	Pulse modulation 217 Hz	2	0.3	28
5240	5100 -5800	WLAN, 802.11 a/n	Pulse modulation 217 Hz	0.2	0.3	9
5500						
5785						

Table I-7

RECOMMENDED SEPARATION DISTANCES BETWEEN PORTABLE AND MOBILE RF COMMUNICATION DEVICE AND THE SYSTEM				
The system is intended for use in an electromagnetic environment in which radiated RF disturbance are controlled. The customer or the user of system can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communication equipment (transmitters) and system as recommended below, according to the maximum output power of the communication equipment.				
Rated Maximum Output power of Transmitter (W)	Separation Distance According to Frequency of Transmitter			
	150kHz -80MHz Out ISM and amateur radio bands $d=1.2 \sqrt{P}$	150kHz -80MHz in ISM and amateur radio bands $d=2 \sqrt{P}$	80MHz-800MHz $d=1.2 \sqrt{P}$	800MHz-2.7GHz $d=2.3 \sqrt{P}$
0.01	0.12	0.2	0.12	0.23
0.1	0.38	0.64	0.38	0.73
1	1.2	2	1.2	2.3
10	3.8	6.4	3.8	7.3
100	12	20	12	23
For transmitters at a maximum output power not listed above, the recommended separation distanced in meters (m) can be determined 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.				
If system image distortion occurs, it may be necessary to position system further from sources of conducted RF noise or to install external power source filter to minimize RF noise to an acceptable level.				
Note 1: At 80 MHz and 800 MHz, the higher frequency range applies.				
Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.				

Table I-8 Cable

No.	Name	Cable length (m)	Shield or not	Remarks
1	AC inlet cable for the main unit	2.5	Not shielded	/
2	Power cable for adapter	2.5	Not shielded	/
3	ECG Lead	2.9	Shielded	/
4	ECG Module connecting cable	2.0	Shielded	
5	Foot-switch control cable	2.9	Shielded	/
6	Probe cable	<3.0	Shielded	All probe cables
7	External DVD recorder connecting cable	1.5	Shielded	/
8	Video module cable	2.0	Shielded	/

Table I-8 Cable

No.	Name	Cable length (m)	Shield or not	Remarks
9	SIP/SOP cable	<3.0	Shielded	/

Radio Regulatory Compliance

RF parameter

Features	2.4GHz	5GHz
Frequency Range	2412MHz - 2483.5MHz	5.15 - 5.25GHz 5.25 - 5.35GHz 5.47 - 5.725GHz 5.725 - 5.850GHz
Modulation	DSSS and OFDM	OFDM
Output Power	≤20dBm	

NOTE:

Keep a distance of at least 20cm away from the monitor when Wi-Fi function is in use.

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Indications for use

System	M9/M9CV/M9T/M8 Elite/M10/M10CV/Crius M10/M11/M11CV/Crius M11/Operus M11/M9 Premium Diagnostic Ultrasound System								
Transducer	N/A								
Intended Use	Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:								
Clinical Application	Mode of Operation								
General (Track 1 Only)	Specific (Track 1 & 3)	B	M	PWD	CWD	Color Doppler	Amplitude Doppler	Combined (specify)	Other (specify)
Ophthalmic	Ophthalmic								
Fetal Imaging & Other	Fetal	P	P	P		P	P	P	Note 1, 2,4,8,9
	Abdominal	P	P	P	P	P	P	P	Note 1, 2,4,8,9,10
	Intra-operative (Specify*)	P	P	P		P	P	P	Note 1,2,8
	Intra-operative (Neuro)								
	Laparoscopic	P	P	P		P	P	P	Note 1
	Pediatric	P	P	P	P	P	P	P	Note 1, 2,4,8
	Small Organ (Specify**)	P	P	P		P	P	P	Note 1,2,6,8
	Neonatal Cephalic	P	P	P	P	P	P	P	Note 1,2,4,8
	Adult Cephalic	P	P	P	P	P	P	P	Note 1, 2,4,8
	Trans-rectal	P	P	P		P	P	P	Note 1,2,4,6,8
	Trans-vaginal	P	P	P		P	P	P	Note 1, 2,4,8
	Trans-urethral								
	Trans-esoph. (non-Card.)								
	Musculo-skeletal (Conventional)	P	P	P	P	P	P	P	Note 1,2,4,6,8
	Musculo-skeletal (Superficial)	P	P	P		P	P	P	Note 1,2,6,8
	Intravascular								
Cardiac	Cardiac Adult	P	P	P	P	P	P	P	Note 1,2,3,4,7,8
	Cardiac Pediatric	P	P	P	P	P	P	P	Note 1,2,3,4,8
	Intravascular (Cardiac)								
	Trans-esoph. (Cardiac)	P	P	P	P	P	P	P	Note 1, 3,4
	Intra-cardiac								
Peripheral vessel	Peripheral vessel	P	P	P	P	P	P	P	Note 1,2,4,6,8
	Other (Specify***)	P	P	P		P	P	P	Note 1,2,4,6,8
N=new indication;P=previously cleared by FDA									
Additional comments: Combined modes--B+M、PW+B、Color + B、Power + B、PW +Color+ B、Power + PW +B.									
*Intraoperative includes abdominal, thoracic, and vascular etc.									
**Small organ-breast, thyroid, testes.									
***Other use includes Urology.									
Note 1: Tissue Harmonic Imaging. The feature does not use contrast agents.									
Note 2: iScape									
Note 3:TDI									
Note 4: Color M									
Note6: Elastography									
Note7: Contrast imaging (Contrast agent for LVO)									
Note8: Smart 3D									
Note9: 4D(Real-time 3D)									
Note10: Contrast imaging (Contrast agent for Liver)									

Transducer: C11-3s

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application		Mode of Operation							
General (Track 1 Only)	Specific (Track 1 & 3)	B	M	PWD	CWD	Color Doppler	Amplitude Doppler	Combined (specify)	Other (specify)
Ophthalmic	Ophthalmic								
Fetal Imaging & Other	Fetal								
	Abdominal	P	P	P		P	P	P	Note 1,2,4,8
	Intra-operative (Specify*)								
	Intra-operative (Neuro)								
	Laparoscopic								
	Pediatric	P	P	P		P	P	P	Note 1,2,4,8
	Small Organ (Specify**)								
	Neonatal Cephalic	P	P	P		P	P	P	Note 1,2,4,8
	Adult Cephalic								
	Trans-rectal								
	Trans-vaginal								
	Trans-urethral								
	Trans-esoph. (non-Card.)								
	Musculo-skeletal (Conventional)								
	Musculo-skeletal (Superficial)								
	Intravascular								
Cardiac	Cardiac Adult								
	Cardiac Pediatric	P	P	P		P	P	P	Note 1,2,4,8
	Intravascular (Cardiac)								
	Trans-esoph. (Cardiac)								
	Intra-cardiac								
Peripheral vessel	Peripheral vessel	P	P	P		P	P	P	Note 1,2,4,8
	Other (Specify***)								
N=new indication; P=previously cleared by FDA									
Additional comments: Combined modes--B+M、PW+B、Color + B、Power + B、PW +Color+ B、Power + PW +B.									
*Intraoperative includes abdominal, thoracic, and vascular etc.									
**Small organ-breast, thyroid, testes.									
***Other use includes Urology.									
Note 1: Tissue Harmonic Imaging. The feature does not use contrast agents.									
Note 2: iScape									
Note 3:TDI									
Note 4: Color M									
Note6: Elastography									
Note7: Contrast imaging (Contrast agent for LVO)									
Note8: Smart 3D									
Note9: 4D(Real-time 3D)									
Note10: Contrast imaging (Contrast agent for Liver)									

Transducer: C5-1s

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application		Mode of Operation							
General (Track 1 Only)	Specific (Track 1 & 3)	B	M	PWD	CWD	Color Doppler	Amplitude Doppler	Combined (specify)	Other (specify)
Ophthalmic	Ophthalmic								
Fetal Imaging & Other	Fetal	P	P	P		P	P	P	Note 1,2,4,8
	Abdominal	P	P	P		P	P	P	Note 1,2,4,8,10
	Intra-operative (Specify*)								
	Intra-operative (Neuro)								
	Laparoscopic								
	Pediatric	P	P	P		P	P	P	Note 1,2,4,8
	Small Organ (Specify**)								
	Neonatal Cephalic								
	Adult Cephalic								
	Trans-rectal								
	Trans-vaginal								
	Trans-urethral								
	Trans-esoph. (non-Card.)								
	Musculo-skeletal (Conventional)	P	P	P		P	P	P	Note 1,2,4,8
	Musculo-skeletal (Superficial)								
	Intravascular								
Cardiac	Cardiac Adult								
	Cardiac Pediatric								
	Intravascular (Cardiac)								
	Trans-esoph. (Cardiac)								
	Intra-cardiac								
Peripheral vessel	Peripheral vessel	P	P	P		P	P	P	Note 1,2,4,8
	Other (Specify***)								
N=new indication; P=previously cleared by FDA									
Additional comments: Combined modes--B+M、PW+B、Color + B、Power + B、PW +Color+ B、Power + PW +B.									
*Intraoperative includes abdominal, thoracic, and vascular etc.									
**Small organ-breast, thyroid, testes.									
***Other use includes Urology.									
Note 1: Tissue Harmonic Imaging. The feature does not use contrast agents.									
Note 2: iScape									
Note 3:TDI									
Note 4: Color M									
Note6: Elastography									
Note7: Contrast imaging (Contrast agent for LVO)									
Note8: Smart 3D									
Note9: 4D(Real-time 3D)									
Note10: Contrast imaging (Contrast agent for Liver)									

Transducer: L12-4s

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application		Mode of Operation							
General (Track 1 Only)	Specific (Track 1 & 3)	B	M	PWD	CWD	Color Doppler	Amplitude Doppler	Combined (specify)	Other (specify)
Ophthalmic	Ophthalmic								
Fetal Imaging & Other	Fetal								
	Abdominal	P	P	P		P	P	P	Note 1,2,8
	Intra-operative (Specify*)								
	Intra-operative (Neuro)								
	Laparoscopic								
	Pediatric	P	P	P		P	P	P	Note 1,2,8
	Small Organ (Specify**)	P	P	P		P	P	P	Note 1,2,6,8
	Neonatal Cephalic	P	P	P		P	P	P	Note 1,2,8
	Adult Cephalic								
	Trans-rectal								
	Trans-vaginal								
	Trans-urethral								
	Trans-esoph. (non-Card.)								
	Musculo-skeletal (Conventional)	P	P	P		P	P	P	Note 1,2,6,8
	Musculo-skeletal (Superficial)	P	P	P		P	P	P	Note 1,2,6,8
	Intravascular								
Cardiac	Cardiac Adult								
	Cardiac Pediatric								
	Intravascular (Cardiac)								
	Trans-esoph. (Cardiac)								
	Intra-cardiac								
Peripheral vessel	Peripheral vessel	P	P	P		P	P	P	Note 1,2,8
	Other (Specify***)								
N=new indication; P=previously cleared by FDA									
Additional comments: Combined modes--B+M、PW+B、Color + B、Power + B、PW +Color+ B、Power + PW +B.									
*Intraoperative includes abdominal, thoracic, and vascular etc.									
**Small organ-breast, thyroid, testes.									
***Other use includes Urology.									
Note 1: Tissue Harmonic Imaging. The feature does not use contrast agents.									
Note 2: iScape									
Note 3:TDI									
Note 4: Color M									
Note6: Elastography									
Note7: Contrast imaging (Contrast agent for LVO)									
Note8: Smart 3D									
Note9: 4D(Real-time 3D)									
Note10: Contrast imaging (Contrast agent for Liver)									

Transducer: P7-3Ts

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application		Mode of Operation							
General (Track 1 Only)	Specific (Track 1 & 3)	B	M	PWD	CWD	Color Doppler	Amplitude Doppler	Combined (specify)	Other (specify)
Ophthalmic	Ophthalmic								
Fetal Imaging & Other	Fetal								
	Abdominal								
	Intra-operative (Specify*)								
	Intra-operative (Neuro)								
	Laparoscopic								
	Pediatric								
	Small Organ (Specify**)								
	Neonatal Cephalic								
	Adult Cephalic								
	Trans-rectal								
	Trans-vaginal								
	Trans-urethral								
	Trans-esoph. (non-Card.)								
	Musculo-skeletal (Conventional)								
	Musculo-skeletal (Superficial)								
	Intravascular								
Cardiac	Cardiac Adult								
	Cardiac Pediatric								
	Intravascular (Cardiac)								
	Trans-esoph. (Cardiac)	P	P	P	P	P	P	P	Note 1, 3,4
	Intra-cardiac								
Peripheral vessel	Peripheral vessel								
	Other (Specify***)								
N=new indication; P=previously cleared by FDA									
Additional comments: Combined modes--B+M、PW+B、Color + B、Power + B、PW +Color+ B、Power + PW +B.									
*Intraoperative includes abdominal, thoracic, and vascular etc.									
**Small organ-breast, thyroid, testes.									
***Other use includes Urology.									
Note 1: Tissue Harmonic Imaging. The feature does not use contrast agents.									
Note 2: iScape									
Note 3:TDI									
Note 4: Color M									
Note6: Elastography									
Note7: Contrast imaging (Contrast agent for LVO)									
Note8: Smart 3D									
Note9: 4D(Real-time 3D)									
Note10: Contrast imaging (Contrast agent for Liver)									

Transducer: SP5-1s

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application		Mode of Operation							
General (Track 1 Only)	Specific (Track 1 & 3)	B	M	PWD	CWD	Color Doppler	Amplitude Doppler	Combined (specify)	Other (specify)
Ophthalmic	Ophthalmic								
Fetal Imaging & Other	Fetal								
	Abdominal	P	P	P	P	P	P	P	Note 1,2,4,8
	Intra-operative (Specify*)								
	Intra-operative (Neuro)								
	Laparoscopic								
	Pediatric	P	P	P	P	P	P	P	Note 1,2,4,8
	Small Organ (Specify**)								
	Neonatal Cephalic	P	P	P	P	P	P	P	Note 1,2,4,8
	Adult Cephalic	P	P	P	P	P	P	P	Note 1,2,4,8
	Trans-rectal								
	Trans-vaginal								
	Trans-urethral								
	Trans-esoph. (non-Card.)								
	Musculo-skeletal (Conventional)								
	Musculo-skeletal (Superficial)								
	Intravascular								
Cardiac	Cardiac Adult	P	P	P	P	P	P	P	Note 1,2,3,4,7,8
	Cardiac Pediatric	P	P	P	P	P	P	P	Note 1,2,3,4,8
	Intravascular (Cardiac)								
	Trans-esoph. (Cardiac)								
	Intra-cardiac								
Peripheral vessel	Peripheral vessel								
	Other (Specify***)								
N=new indication; P=previously cleared by FDA									
Additional comments: Combined modes--B+M、PW+B、Color + B、Power + B、PW +Color+ B、Power + PW +B.									
*Intraoperative includes abdominal, thoracic, and vascular etc.									
**Small organ-breast, thyroid, testes.									
***Other use includes Urology.									
Note 1: Tissue Harmonic Imaging. The feature does not use contrast agents.									
Note 2: iScape									
Note 3:TDI									
Note 4: Color M									
Note6: Elastography									
Note7: Contrast imaging (Contrast agent for LVO)									
Note8: Smart 3D									
Note9: 4D(Real-time 3D)									
Note10: Contrast imaging (Contrast agent for Liver)									

Transducer: P10-4s

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application		Mode of Operation							
General (Track 1 Only)	Specific (Track 1 & 3)	B	M	PWD	CWD	Color Doppler	Amplitude Doppler	Combined (specify)	Other (specify)
Ophthalmic	Ophthalmic								
Fetal Imaging & Other	Fetal								
	Abdominal	P	P	P	P	P	P	P	Note 1,4,8
	Intra-operative (Specify*)								
	Intra-operative (Neuro)								
	Laparoscopic								
	Pediatric	P	P	P	P	P	P	P	Note 1,4,8
	Small Organ (Specify**)								
	Neonatal Cephalic	P	P	P	P	P	P	P	Note 1,4,8
	Adult Cephalic								
	Trans-rectal								
	Trans-vaginal								
	Trans-urethral								
	Trans-esoph. (non-Card.)								
	Musculo-skeletal (Conventional)								
	Musculo-skeletal (Superficial)								
	Intravascular								
Cardiac	Cardiac Adult								
	Cardiac Pediatric	P	P	P	P	P	P	P	Note 1, 3,4,8
	Intravascular (Cardiac)								
	Trans-esoph. (Cardiac)								
	Intra-cardiac								
Peripheral vessel	Peripheral vessel								
	Other (Specify***)								
N=new indication; P=previously cleared by FDA									
Additional comments: Combined modes--B+M、PW+B、Color + B、Power + B、PW +Color+ B、Power + PW +B.									
*Intraoperative includes abdominal, thoracic, and vascular etc.									
**Small organ-breast, thyroid, testes.									
***Other use includes Urology.									
Note 1: Tissue Harmonic Imaging. The feature does not use contrast agents.									
Note 2: iScape									
Note 3:TDI									
Note 4: Color M									
Note6: Elastography									
Note7: Contrast imaging (Contrast agent for LVO)									
Note8: Smart 3D									
Note9: 4D(Real-time 3D)									
Note10: Contrast imaging (Contrast agent for Liver)									

Transducer: L14-6Ns

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application		Mode of Operation							
General (Track 1 Only)	Specific (Track 1 & 3)	B	M	PWD	CWD	Color Doppler	Amplitude Doppler	Combined (specify)	Other (specify)
Ophthalmic	Ophthalmic								
Fetal Imaging & Other	Fetal								
	Abdominal	P	P	P		P	P	P	Note 1,2,8
	Intra-operative (Specify*)								
	Intra-operative (Neuro)								
	Laparoscopic								
	Pediatric	P	P	P		P	P	P	Note 1,2,8
	Small Organ (Specify**)	P	P	P		P	P	P	Note 1,2,6,8
	Neonatal Cephalic	P	P	P		P	P	P	Note 1,2,8
	Adult Cephalic								
	Trans-rectal								
	Trans-vaginal								
	Trans-urethral								
	Trans-esoph. (non-Card.)								
	Musculo-skeletal (Conventional)	P	P	P		P	P	P	Note 1,2,6,8
	Musculo-skeletal (Superficial)	P	P	P		P	P	P	Note 1,2,6,8
	Intravascular								
Cardiac	Cardiac Adult								
	Cardiac Pediatric								
	Intravascular (Cardiac)								
	Trans-esoph. (Cardiac)								
	Intra-cardiac								
Peripheral vessel	Peripheral vessel	P	P	P		P	P	P	Note 1,2,8
	Other (Specify***)								
N=new indication ; P=previously cleared by FDA									
Additional comments: Combined modes--B+M、PW+B、Color + B、Power + B、PW +Color+ B、Power + PW +B.									
*Intraoperative includes abdominal, thoracic, and vascular etc.									
**Small organ-breast, thyroid, testes.									
***Other use includes Urology.									
Note 1: Tissue Harmonic Imaging. The feature does not use contrast agents.									
Note 2: iScape									
Note 3:TDI									
Note 4: Color M									
Note6: Elastography									
Note7: Contrast imaging (Contrast agent for LVO)									
Note8: Smart 3D									
Note9: 4D(Real-time 3D)									
Note10: Contrast imaging (Contrast agent for Liver)									

Transducer: V11-3Ws

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application		Mode of Operation							
General (Track 1 Only)	Specific (Track 1 & 3)	B	M	PWD	CWD	Color Doppler	Amplitude Doppler	Combined (specify)	Other (specify)
Ophthalmic	Ophthalmic								
Fetal Imaging & Other	Fetal	P	P	P		P	P	P	Note 1,2,4,8
	Abdominal								
	Intra-operative (Specify*)								
	Intra-operative (Neuro)								
	Laparoscopic								
	Pediatric								
	Small Organ (Specify**)								
	Neonatal Cephalic								
	Adult Cephalic								
	Trans-rectal	P	P	P		P	P	P	Note 1,2,4,8
	Trans-vaginal	P	P	P		P	P	P	Note 1,2,4,8
	Trans-urethral								
	Trans-esoph. (non-Card.)								
	Musculo-skeletal (Conventional)								
	Musculo-skeletal (Superficial)								
	Intravascular								
Cardiac	Cardiac Adult								
	Cardiac Pediatric								
	Intravascular (Cardiac)								
	Trans-esoph. (Cardiac)								
	Intra-cardiac								
Peripheral vessel	Peripheral vessel								
	Other (Specify***)	P	P	P		P	P	P	Note 1,2,4,8
N=new indication; P=previously cleared by FDA									
Additional comments: Combined modes--B+M、PW+B、Color + B、Power + B、PW +Color+ B、Power + PW +B.									
*Intraoperative includes abdominal, thoracic, and vascular etc.									
**Small organ-breast, thyroid, testes.									
***Other use includes Urology.									
Note 1: Tissue Harmonic Imaging. The feature does not use contrast agents.									
Note 2: iScape									
Note 3:TDI									
Note 4: Color M									
Note6: Elastography									
Note7: Contrast imaging (Contrast agent for LVO)									
Note8: Smart 3D									
Note9: 4D(Real-time 3D)									
Note10: Contrast imaging (Contrast agent for Liver)									

Transducer: CW2s

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application		Mode of Operation							
General (Track 1 Only)	Specific (Track 1 & 3)	B	M	PWD	CWD	Color Doppler	Amplitude Doppler	Combined (specify)	Other (specify)
Ophthalmic	Ophthalmic								
Fetal Imaging & Other	Fetal								
	Abdominal								
	Intra-operative (Specify*)								
	Intra-operative (Neuro)								
	Laparoscopic								
	Pediatric				P				
	Small Organ (Specify**)								
	Neonatal Cephalic								
	Adult Cephalic				P				
	Trans-rectal								
	Trans-vaginal								
	Trans-urethral								
	Trans-esoph. (non-Card.)								
	Musculo-skeletal (Conventional)								
	Musculo-skeletal (Superficial)								
	Intravascular								
Cardiac	Cardiac Adult				P				
	Cardiac Pediatric				P				
	Intravascular (Cardiac)								
	Trans-esoph. (Cardiac)								
	Intra-cardiac								
Peripheral vessel	Peripheral vessel				P				
	Other (Specify***)								
N=new indication; P=previously cleared by FDA									
Additional comments: Combined modes--B+M、PW+B、Color + B、Power + B、PW +Color+ B、Power + PW +B.									
*Intraoperative includes abdominal, thoracic, and vascular etc.									
**Small organ-breast, thyroid, testes.									
***Other use includes Urology.									
Note 1: Tissue Harmonic Imaging. The feature does not use contrast agents.									
Note 2: iScape									
Note 3:TDI									
Note 4: Color M									
Note6: Elastography									
Note7: Contrast imaging (Contrast agent for LVO)									
Note8: Smart 3D									
Note9: 4D(Real-time 3D)									
Note10: Contrast imaging (Contrast agent for Liver)									

Transducer: CW5s

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application		Mode of Operation							
General (Track 1 Only)	Specific (Track 1 & 3)	B	M	PWD	CWD	Color Doppler	Amplitude Doppler	Combined (specify)	Other (specify)
Ophthalmic	Ophthalmic								
Fetal Imaging & Other	Fetal								
	Abdominal								
	Intra-operative (Specify*)								
	Intra-operative (Neuro)								
	Laparoscopic								
	Pediatric				P				
	Small Organ (Specify**)								
	Neonatal Cephalic								
	Adult Cephalic								
	Trans-rectal								
	Trans-vaginal								
	Trans-urethral								
	Trans-esoph. (non-Card.)								
	Musculo-skeletal (Conventional)								
	Musculo-skeletal (Superficial)								
	Intravascular								
Cardiac	Cardiac Adult								
	Cardiac Pediatric				P				
	Intravascular (Cardiac)								
	Trans-esoph. (Cardiac)								
	Intra-cardiac								
Peripheral vessel	Peripheral vessel								
	Other (Specify***)								
N=new indication; P=previously cleared by FDA									
Additional comments: Combined modes--B+M、PW+B、Color + B、Power + B、PW +Color+ B、Power + PW +B.									
*Intraoperative includes abdominal, thoracic, and vascular etc.									
**Small organ-breast, thyroid, testes.									
***Other use includes Urology.									
Note 1: Tissue Harmonic Imaging. The feature does not use contrast agents.									
Note 2: iScape									
Note 3:TDI									
Note 4: Color M									
Note6: Elastography									
Note7: Contrast imaging (Contrast agent for LVO)									
Note8: Smart 3D									
Note9: 4D(Real-time 3D)									
Note10: Contrast imaging (Contrast agent for Liver)									

Transducer: C6-2Gs

Intended Use: Diagnostic Ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application		Mode of Operation							
General (Track 1 Only)	Specific (Track 1 & 3)	B	M	PWD	CWD	Color Doppler	Amplitude Doppler	Combined (specify)	Other (specify)
Ophthalmic	Ophthalmic								
Fetal Imaging & Other	Fetal	P	P	P		P	P	P	Note1,2,4,8
	Abdominal	P	P	P		P	P	P	Note1,2,4,8,10
	Intra-operative (Specify*)								
	Intra-operative (Neuro)								
	Laparoscopic								
	Pediatric	P	P	P		P	P	P	Note1,2,4,8
	Small Organ (Specify**)								
	Neonatal Cephalic								
	Adult Cephalic								
	Trans-rectal								
	Trans-vaginal								
	Trans-urethral								
	Trans-esoph. (non-Card.)								
	Musculo-skeletal (Conventional)								
	Musculo-skeletal (Superficial)								
	Intravascular								
Cardiac	Cardiac Adult								
	Cardiac Pediatric								
	Intravascular (Cardiac)								
	Trans-esoph. (Cardiac)								
	Intra-cardiac								
Peripheral vessel	Peripheral vessel								
	Other (Specify***)								
N=new indication; P=previously cleared by FDA									
Additional comments: Combined modes--B+M、PW+B、Color + B、Power + B、PW +Color+ B、Power + PW +B.									
*Intraoperative includes abdominal, thoracic, and vascular etc.									
**Small organ-breast, thyroid, testes.									
***Other use includes Urology.									
Note 1: Tissue Harmonic Imaging. The feature does not use contrast agents.									
Note 2: iScape									
Note 3:TDI									
Note 4: Color M									
Note6: Elastography									
Note7: Contrast imaging (Contrast agent for LVO)									
Note8: Smart 3D									
Note9: 4D(Real-time 3D)									
Note10: Contrast imaging (Contrast agent for Liver)									

Transducer: L14-6Ws

Intended Use: Diagnostic Ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application		Mode of Operation							
General (Track 1 Only)	Specific (Track 1 & 3)	B	M	PWD	CWD	Color Doppler	Amplitude Doppler	Combined (specify)	Other (specify)
Ophthalmic	Ophthalmic								
Fetal Imaging & Other	Fetal								
	Abdominal	P	P	P		P	P	P	Note 1,2,8
	Intra-operative (Specify*)								
	Intra-operative (Neuro)								
	Laparoscopic								
	Pediatric	P	P	P		P	P	P	Note 1,2,8
	Small Organ (Specify**)	P	P	P		P	P	P	Note 1,2,6,8
	Neonatal Cephalic	P	P	P		P	P	P	Note 1,2,8
	Adult Cephalic								
	Trans-rectal								
	Trans-vaginal								
	Trans-urethral								
	Trans-esoph. (non-Card.)								
	Musculo-skeletal (Conventional)	P	P	P		P	P	P	Note 1,2,8
	Musculo-skeletal (Superficial)	P	P	P		P	P	P	Note 1,2,8
	Intravascular								
Cardiac	Cardiac Adult								
	Cardiac Pediatric								
	Intravascular (Cardiac)								
	Trans-esoph. (Cardiac)								
	Intra-cardiac								
Peripheral vessel	Peripheral vessel	P	P	P		P	P	P	Note 1,2,8
	Other (Specify***)								
N=new indication; P=previously cleared by FDA									
Additional comments: Combined modes--B+M、PW+B、Color + B、Power + B、PW +Color+ B、Power + PW +B.									
*Intraoperative includes abdominal, thoracic, and vascular etc.									
**Small organ-breast, thyroid, testes.									
***Other use includes Urology.									
Note 1: Tissue Harmonic Imaging. The feature does not use contrast agents.									
Note 2: iScape									
Note 3:TDI									
Note 4: Color M									
Note6: Elastography									
Note7: Contrast imaging (Contrast agent for LVO)									
Note8: Smart 3D									
Note9: 4D(Real-time 3D)									
Note10: Contrast imaging (Contrast agent for Liver)									

Transducer: P7-3s

Intended Use: Diagnostic Ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application		Mode of Operation							
General (Track 1 Only)	Specific (Track 1 & 3)	B	M	PWD	CWD	Color Doppler	Amplitude Doppler	Combined (specify)	Other (specify)
Ophthalmic	Ophthalmic								
Fetal Imaging & Other	Fetal								
	Abdominal	P	P	P	P	P	P	P	Note 1, 2,4,8
	Intra-operative (Specify*)								
	Intra-operative (Neuro)								
	Laparoscopic								
	Pediatric	P	P	P	P	P	P	P	Note 1, 2,4,8
	Small Organ (Specify**)								
	Neonatal Cephalic	P	P	P	P	P	P	P	Note 1, 2,4,8
	Adult Cephalic	P	P	P	P	P	P	P	Note 1, 2,4,8
	Trans-rectal								
	Trans-vaginal								
	Trans-urethral								
	Trans-esoph. (non-Card.)								
	Musculo-skeletal (Conventional)	P	P	P	P	P	P	P	Note 1, 2,4,8
	Musculo-skeletal (Superficial)								
	Intravascular								
Cardiac	Cardiac Adult	P	P	P	P	P	P	P	Note 1, 2,3,4,8
	Cardiac Pediatric	P	P	P	P	P	P	P	Note 1, 2,3,4,8
	Intravascular (Cardiac)								
	Trans-esoph. (Cardiac)								
	Intra-cardiac								
Peripheral vessel	Peripheral vessel								
	Other (Specify***)								
N=new indication ; P=previously cleared by FDA									
Additional comments : Combined modes--B+M、PW+B、 Color + B、 Power + B、 PW +Color+ B、 Power + PW +B.									
*Intraoperative includes abdominal, thoracic, and vascular etc.									
**Small organ-breast, thyroid, testes.									
***Other use includes Urology.									
Note 1: Tissue Harmonic Imaging. The feature does not use contrast agents.									
Note 2: iScape									
Note 3:TDI									
Note 4: Color M									
Note6: Elastography									
Note7: Contrast imaging (Contrast agent for LVO)									
Note8: Smart 3D									
Note9: 4D(Real-time 3D)									
Note10: Contrast imaging (Contrast agent for Liver)									

Transducer: L10-3s

Intended Use: Diagnostic Ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application		Mode of Operation							
General (Track 1 Only)	Specific (Track 1 & 3)	B	M	PWD	CWD	Color Doppler	Amplitude Doppler	Combined (specify)	Other (specify)
Ophthalmic	Ophthalmic								
Fetal Imaging & Other	Fetal								
	Abdominal	P	P	P		P	P	P	Note 1,2,8
	Intra-operative (Specify*)								
	Intra-operative (Neuro)								
	Laparoscopic								
	Pediatric	P	P	P		P	P	P	Note 1,2,8
	Small Organ (Specify**)	P	P	P		P	P	P	Note 1,2,6,8
	Neonatal Cephalic	P	P	P		P	P	P	Note 1,2,8
	Adult Cephalic								
	Trans-rectal								
	Trans-vaginal								
	Trans-urethral								
	Trans-esoph. (non-Card.)								
	Musculo-skeletal (Conventional)	P	P	P		P	P	P	Note 1,2,8
	Musculo-skeletal (Superficial)	P	P	P		P	P	P	Note 1,2,8
	Intravascular								
Cardiac	Cardiac Adult								
	Cardiac Pediatric								
	Intravascular (Cardiac)								
	Trans-esoph. (Cardiac)								
	Intra-cardiac								
Peripheral vessel	Peripheral vessel	P	P	P		P	P	P	Note 1,2,8
	Other (Specify***)								
N=new indication; P=previously cleared by FDA									
Additional comments: Combined modes--B+M、PW+B、Color + B、Power + B、PW +Color+ B、Power + PW +B.									
*Intraoperative includes abdominal, thoracic, and vascular etc.									
**Small organ-breast, thyroid, testes.									
***Other use includes Urology.									
Note 1: Tissue Harmonic Imaging. The feature does not use contrast agents.									
Note 2: iScape									
Note 3:TDI									
Note 4: Color M									
Note6: Elastography									
Note7: Contrast imaging (Contrast agent for LVO)									
Note8: Smart 3D									
Note9: 4D(Real-time 3D)									
Note10: Contrast imaging (Contrast agent for Liver)									

Transducer: L16-4Hs

Intended Use: Diagnostic Ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application		Mode of Operation							
General (Track 1 Only)	Specific (Track 1 & 3)	B	M	PWD	CWD	Color Doppler	Amplitude Doppler	Combined (specify)	Other (specify)
Ophthalmic	Ophthalmic								
Fetal Imaging & Other	Fetal								
	Abdominal	P	P	P		P	P	P	Note1,2,8
	Intra-operative (Specify*)	P	P	P		P	P	P	Note1,2,8
	Intra-operative (Neuro)								
	Laparoscopic								
	Pediatric	N	N	N		N	N	N	Note1,2,8
	Small Organ (Specify**)	N	N	N		N	N	N	Note1,2,8
	Neonatal Cephalic	N	N	N		N	N	N	Note1,2,8
	Adult Cephalic								
	Trans-rectal								
	Trans-vaginal								
	Trans-urethral								
	Trans-esoph. (non-Card.)								
	Musculo-skeletal (Conventional)	P	P	P		P	P	P	Note1,2,8
	Musculo-skeletal (Superficial)	P	P	P		P	P	P	Note1,2,8
	Intravascular								
Cardiac	Cardiac Adult								
	Cardiac Pediatric								
	Intravascular (Cardiac)								
	Trans-esoph. (Cardiac)								
	Intra-cardiac								
Peripheral vessel	Peripheral vessel	P	P	P		P	P	P	Note1,2,8
	Other (Specify***)								
N=new indication; P=previously cleared by FDA									
Additional comments: Combined modes--B+M、PW+B、Color + B、Power + B、PW +Color+ B、Power + PW +B.									
*Intraoperative includes abdominal, thoracic, and vascular etc.									
**Small organ-breast, thyroid, testes.									
***Other use includes Urology.									
Note 1: Tissue Harmonic Imaging. The feature does not use contrast agents.									
Note 2: iScape									
Note 3:TDI									
Note 4: Color M									
Note6: Elastography									
Note7: Contrast imaging (Contrast agent for LVO)									
Note8: Smart 3D									
Note9: 4D(Real-time 3D)									
Note10: Contrast imaging (Contrast agent for Liver)									
(PLEASE DO NOT WRITE BELOW THIS LINE-CONTINUE ON ANOTHER PAGE NEEDED)									
Concurrence of CDRH, Office of Device Evaluation(ODE)									
Prescription USE (Per 21 CFR 801.109)									

Transducer: P8-3Ts

Intended Use: Diagnostic Ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application		Mode of Operation							
General (Track 1 Only)	Specific (Track 1 & 3)	B	M	PWD	CWD	Color Doppler	Amplitude Doppler	Combined (specify)	Other (specify)
Ophthalmic	Ophthalmic								
Fetal Imaging & Other	Fetal								
	Abdominal								
	Intra-operative (Specify*)								
	Intra-operative (Neuro)								
	Laparoscopic								
	Pediatric								
	Small Organ (Specify**)								
	Neonatal Cephalic								
	Adult Cephalic								
	Trans-rectal								
	Trans-vaginal								
	Trans-urethral								
	Trans-esoph. (non-Card.)								
	Musculo-skeletal (Conventional)								
	Musculo-skeletal (Superficial)								
	Intravascular								
Cardiac	Cardiac Adult								
	Cardiac Pediatric								
	Intravascular (Cardiac)								
	Trans-esoph. (Cardiac)	P	P	P		P	P	P	Note 1, 3,4
	Intra-cardiac								
Peripheral vessel	Peripheral vessel								
	Other (Specify***)								
N=new indication; P=previously cleared by FDA									
Additional comments: Combined modes--B+M、PW+B、Color + B、Power + B、PW +Color+ B、Power + PW +B.									
*Intraoperative includes abdominal, thoracic, and vascular etc.									
**Small organ-breast, thyroid, testes.									
***Other use includes Urology.									
Note 1: Tissue Harmonic Imaging. The feature does not use contrast agents.									
Note 2: iScape									
Note 3:TDI									
Note 4: Color M									
Note6: Elastography									
Note7: Contrast imaging (Contrast agent for LVO)									
Note8: Smart 3D									
Note9: 4D(Real-time 3D)									
Note10: Contrast imaging (Contrast agent for Liver)									

Transducer: L20-5s

Intended Use: Diagnostic Ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application		Mode of Operation							
General (Track 1 Only)	Specific (Track 1 & 3)	B	M	PWD	CWD	Color Doppler	Amplitude Doppler	Combined (specify)	Other (specify)
Ophthalmic	Ophthalmic								
Fetal Imaging & Other	Fetal								
	Abdominal								
	Intra-operative (Specify*)								
	Intra-operative (Neuro)								
	Laparoscopic								
	Pediatric								
	Small Organ (Specify**)	P	P	P		P	P	P	Note 1, 2,8
	Neonatal Cephalic								
	Adult Cephalic								
	Trans-rectal								
	Trans-vaginal								
	Trans-urethral								
	Trans-esoph. (non-Card.)								
	Musculo-skeletal (Conventional)	P	P	P		P	P	P	Note 1, 2,6,8
	Musculo-skeletal (Superficial)	P	P	P		P	P	P	Note 1, 2,6,8
	Intravascular								
Cardiac	Cardiac Adult								
	Cardiac Pediatric								
	Intravascular (Cardiac)								
	Trans-esoph. (Cardiac)								
	Intra-cardiac								
Peripheral vessel	Peripheral vessel	P	P	P		P	P	P	Note 1, 2,8
	Other (Specify***)								
N=new indication ; P=previously cleared by FDA									
Additional comments : Combined modes--B+M、PW+B、 Color + B、 Power + B、 PW +Color+ B、 Power + PW +B.									
*Intraoperative includes abdominal, thoracic, and vascular etc.									
**Small organ-breast, thyroid, testes.									
***Other use includes Urology.									
Note 1: Tissue Harmonic Imaging. The feature does not use contrast agents.									
Note 2: iScape									
Note 3:TDI									
Note 4: Color M									
Note6: Elastography									
Note7: Contrast imaging (Contrast agent for LVO)									
Note8: Smart 3D									
Note9: 4D(Real-time 3D)									
Note10: Contrast imaging (Contrast agent for Liver)									

Transducer: D7-2s

Intended Use: Diagnostic Ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application		Mode of Operation							
General (Track 1 Only)	Specific (Track 1 & 3)	B	M	PWD	CWD	Color Doppler	Amplitude Doppler	Combined (specify)	Other (specify)
Ophthalmic	Ophthalmic								
Fetal Imaging & Other	Fetal	P	P	P		P	P	P	Note 1, 2, 4, 9
	Abdominal	P	P	P		P	P	P	Note 1, 2, 4, 9
	Intra-operative (Specify*)								
	Intra-operative (Neuro)								
	Laparoscopic								
	Pediatric								
	Small Organ (Specify**)								
	Neonatal Cephalic								
	Adult Cephalic								
	Trans-rectal								
	Trans-vaginal								
	Trans-urethral								
	Trans-esoph. (non-Card.)								
	Musculo-skeletal (Conventional)								
	Musculo-skeletal (Superficial)								
	Intravascular								
Cardiac	Cardiac Adult								
	Cardiac Pediatric								
	Intravascular (Cardiac)								
	Trans-esoph. (Cardiac)								
	Intra-cardiac								
Peripheral vessel	Peripheral vessel								
	Other (Specify***)								
N=new indication; P=previously cleared by FDA									
Additional comments: Combined modes--B+M、PW+B、Color + B、Power + B、PW +Color+ B、Power + PW +B.									
*Intraoperative includes abdominal, thoracic, and vascular etc.									
**Small organ-breast, thyroid, testes.									
***Other use includes Urology.									
Note 1: Tissue Harmonic Imaging. The feature does not use contrast agents.									
Note 2: iScape									
Note 3:TDI									
Note 4: Color M									
Note6: Elastography									
Note7: Contrast imaging (Contrast agent for LVO)									
Note8: Smart 3D									
Note9: 4D(Real-time 3D)									
Note10: Contrast imaging (Contrast agent for Liver)									

Transducer: L14-5sp

Intended Use: Diagnostic Ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application		Mode of Operation							
General (Track 1 Only)	Specific (Track 1 & 3)	B	M	PWD	CWD	Color Doppler	Amplitude Doppler	Combined (specify)	Other (specify)
Ophthalmic	Ophthalmic								
Fetal Imaging & Other	Fetal								
	Abdominal	P	P	P		P	P	P	Note 1, 2,8
	Intra-operative (Specify*)	P	P	P		P	P	P	Note 1, 2,8
	Intra-operative (Neuro)								
	Laparoscopic								
	Pediatric	P	P	P		P	P	P	Note 1, 2,8
	Small Organ (Specify**)	P	P	P		P	P	P	Note 1, 2,8
	Neonatal Cephalic	P	P	P		P	P	P	Note 1, 2,8
	Adult Cephalic								
	Trans-rectal								
	Trans-vaginal								
	Trans-urethral								
	Trans-esoph. (non-Card.)								
	Musculo-skeletal (Conventional)	P	P	P		P	P	P	Note 1, 2,8
	Musculo-skeletal (Superficial)	P	P	P		P	P	P	Note 1, 2,8
	Intravascular								
Cardiac	Cardiac Adult								
	Cardiac Pediatric								
	Intravascular (Cardiac)								
	Trans-esoph. (Cardiac)								
	Intra-cardiac								
Peripheral vessel	Peripheral vessel	P	P	P		P	P	P	Note 1, 2,8
	Other (Specify***)								
N=new indication ; P=previously cleared by FDA									
Additional comments : Combined modes--B+M、PW+B、 Color + B、 Power + B、 PW +Color+ B、 Power + PW +B.									
*Intraoperative includes abdominal, thoracic, and vascular etc.									
**Small organ-breast, thyroid, testes.									
***Other use includes Urology.									
Note 1: Tissue Harmonic Imaging. The feature does not use contrast agents.									
Note 2: iScape									
Note 3:TDI									
Note 4: Color M									
Note6: Elastography									
Note7: Contrast imaging (Contrast agent for LVO)									
Note8: Smart 3D									
Note9: 4D(Real-time 3D)									
Note10: Contrast imaging (Contrast agent for Liver)									

Transducer:	SC6-1s								
Intended Use: Diagnostic Ultrasound imaging or fluid flow analysis of the human body as follows:									
Clinical Application		Mode of Operation							
General (Track 1 Only)	Specific (Track 1 & 3)	B	M	PWD	CWD	Color Doppler	Amplitude Doppler	Combined (specify)	Other (specify)
Ophthalmic	Ophthalmic								
Fetal Imaging & Other	Fetal	P	P	P		P	P	P	Note 1,2,4,8
	Abdominal	P	P	P		P	P	P	Note 1,2,4,8,10
	Intra-operative (Specify*)								
	Intra-operative (Neuro)								
	Laparoscopic								
	Pediatric								
	Small Organ (Specify**)								
	Neonatal Cephalic								
	Adult Cephalic								
	Trans-rectal								
	Trans-vaginal								
	Trans-urethral								
	Trans-esoph. (non-Card.)								
	Musculo-skeletal (Conventional)	P	P	P		P	P	P	Note 1,2,4,8
	Musculo-skeletal (Superficial)								
	Intravascular								
Cardiac	Cardiac Adult								
	Cardiac Pediatric								
	Intravascular (Cardiac)								
	Trans-esoph. (Cardiac)								
	Intra-cardiac								
Peripheral vessel	Peripheral vessel	P	P	P		P	P	P	Note 1,2,4,8
	Other (Specify***)								
N=new indication; P=previously cleared by FDA									
Additional comments: Combined modes--B+M、 PW+B、 Color + B、 Power + B、 PW +Color+ B、 Power + PW +B.									
*Intraoperative includes abdominal, thoracic, and vascular etc.									
**Small organ-breast, thyroid, testes.									
***Other use includes Urology.									
Note 1: Tissue Harmonic Imaging. The feature does not use contrast agents.									
Note 2: iScape									
Note 3:TDI									
Note 4: Color M									
Note6: Elastography									
Note7: Contrast imaging (Contrast agent for LVO)									
Note8: Smart 3D									
Note9: 4D(Real-time 3D)									
Note10: Contrast imaging (Contrast agent for Liver)									

Transducer:		L9-3s							
Intended Use: Diagnostic Ultrasound imaging or fluid flow analysis of the human body as follows:									
Clinical Application		Mode of Operation							
General (Track 1 Only)	Specific (Track 1 & 3)	B	M	PWD	CWD	Color Doppler	Amplitude Doppler	Combined (specify)	Other (specify)
Ophthalmic	Ophthalmic								
Fetal Imaging & Other	Fetal	P	P	P		P	P	P	Note 1,2,8
	Abdominal	P	P	P		P	P	P	Note 1,2,8,10
	Intra-operative (Specify*)								
	Intra-operative (Neuro)								
	Laparoscopic								
	Pediatric	P	P	P		P	P	P	Note 1,2,8
	Small Organ (Specify**)	P	P	P		P	P	P	Note 1,2,6,8
	Neonatal Cephalic								
	Adult Cephalic								
	Trans-rectal								
	Trans-vaginal								
	Trans-urethral								
	Trans-esoph. (non-Card.)								
	Musculo-skeletal (Conventional)	P	P	P		P	P	P	Note 1,2,6,8
	Musculo-skeletal (Superficial)	P	P	P		P	P	P	Note 1,2,6,8
	Intravascular								
Cardiac	Cardiac Adult								
	Cardiac Pediatric								
	Intravascular (Cardiac)								
	Trans-esoph. (Cardiac)								
	Intra-cardiac								
Peripheral vessel	Peripheral vessel	P	P	P		P	P	P	Note 1,2,6,8
	Other (Specify***)								
N=new indication; P=previously cleared by FDA									
Additional comments: Combined modes--B+M、PW+B、Color + B、Power + B、PW +Color+ B、Power + PW +B.									
*Intraoperative includes abdominal, thoracic, and vascular etc.									
**Small organ-breast, thyroid, testes.									
***Other use includes Urology.									
Note 1: Tissue Harmonic Imaging. The feature does not use contrast agents.									
Note 2: iScape									
Note 3:TDI									
Note 4: Color M									
Note6: Elastography									
Note7: Contrast imaging (Contrast agent for LVO)									
Note8: Smart 3D									
Note9: 4D(Real-time 3D)									
Note10: Contrast imaging (Contrast agent for Liver)									

Transducer:		P8-2Ts							
Intended Use: Diagnostic Ultrasound imaging or fluid flow analysis of the human body as follows:									
Clinical Application		Mode of Operation							
General (Track 1 Only)	Specific (Track 1 & 3)	B	M	PWD	CWD	Color Doppler	Amplitude Doppler	Combined (specify)	Other (specify)
Ophthalmic	Ophthalmic								
Fetal Imaging & Other	Fetal								
	Abdominal								
	Intra-operative (Specify*)								
	Intra-operative (Neuro)								
	Laparoscopic								
	Pediatric								
	Small Organ (Specify**)								
	Neonatal Cephalic								
	Adult Cephalic								
	Trans-rectal								
	Trans-vaginal								
	Trans-urethral								
	Trans-esoph. (non-Card.)								
	Musculo-skeletal (Conventional)								
	Musculo-skeletal (Superficial)								
	Intravascular								
Cardiac	Cardiac Adult								
	Cardiac Pediatric								
	Intravascular (Cardiac)								
	Trans-esoph. (Cardiac)	P	P	P		P	P	P	Note 1,3,4
	Intra-cardiac								
Peripheral vessel	Peripheral vessel								
	Other (Specify***)								
N=new indication; P=previously cleared by FDA									
Additional comments: Combined modes--B+M、PW+B、Color + B、Power + B、PW +Color+ B、Power + PW +B.									
*Intraoperative includes abdominal, thoracic, and vascular etc.									
**Small organ-breast, thyroid, testes.									
***Other use includes Urology.									
Note 1: Tissue Harmonic Imaging. The feature does not use contrast agents.									
Note 2: iScape									
Note 3:TDI									
Note 4: Color M									
Note6: Elastography									
Note7: Contrast imaging (Contrast agent for LVO)									
Note8: Smart 3D									
Note9: 4D(Real-time 3D)									
Note10: Contrast imaging (Contrast agent for Liver)									

Transducer:	LAP13-4Cs								
Intended Use: Diagnostic Ultrasound imaging or fluid flow analysis of the human body as follows:									
Clinical Application		Mode of Operation							
General (Track 1 Only)	Specific (Track 1 & 3)	B	M	PWD	CWD	Color Doppler	Amplitude Doppler	Combined (specify)	Other (specify)
Ophthalmic	Ophthalmic								
Fetal Imaging & Other	Fetal								
	Abdominal								
	Intra-operative (Specify*)								
	Intra-operative (Neuro)								
	Laparoscopic	P	P	P		P	P	P	Note 1
	Pediatric								
	Small Organ (Specify**)								
	Neonatal Cephalic								
	Adult Cephalic								
	Trans-rectal								
	Trans-vaginal								
	Trans-urethral								
	Trans-esoph. (non-Card.)								
	Musculo-skeletal (Conventional)								
	Musculo-skeletal (Superficial)								
	Intravascular								
Cardiac	Cardiac Adult								
	Cardiac Pediatric								
	Intravascular (Cardiac)								
	Trans-esoph. (Cardiac)								
	Intra-cardiac								
Peripheral vessel	Peripheral vessel								
	Other (Specify***)								
N=new indication; P=previously cleared by FDA									
Additional comments: Combined modes--B+M、 PW+B、 Color + B、 Power + B、 PW +Color+ B、 Power + PW +B.									
*Intraoperative includes abdominal, thoracic, and vascular etc.									
**Small organ-breast, thyroid, testes.									
***Other use includes Urology.									
Note 1: Tissue Harmonic Imaging. The feature does not use contrast agents.									
Note 2: iScape									
Note 3:TDI									
Note 4: Color M									
Note6: Elastography									
Note7: Contrast imaging (Contrast agent for LVO)									
Note8: Smart 3D									
Note9: 4D(Real-time 3D)									
Note10: Contrast imaging (Contrast agent for Liver)									

Transducer: ELC13-4s									
Intended Use: Diagnostic Ultrasound imaging or fluid flow analysis of the human body as follows:									
Clinical Application		Mode of Operation							
General (Track 1 Only)	Specific (Track 1 & 3)	B	M	PWD	CWD	Color Doppler	Amplitude Doppler	Combined (specify)	Other (specify)
Ophthalmic	Ophthalmic								
Fetal Imaging & Other	Fetal								
	Abdominal								
	Intra-operative (Specify*)								
	Intra-operative (Neuro)								
	Laparoscopic								
	Pediatric								
	Small Organ (Specify**)								
	Neonatal Cephalic								
	Adult Cephalic								
	Trans-rectal	P	P	P		P	P	P	Note 1,2,4,6,8
	Trans-vaginal								
	Trans-urethral								
	Trans-esoph. (non-Card.)								
	Musculo-skeletal (Conventional)								
	Musculo-skeletal (Superficial)								
	Intravascular								
Cardiac	Cardiac Adult								
	Cardiac Pediatric								
	Intravascular (Cardiac)								
	Trans-esoph. (Cardiac)								
	Intra-cardiac								
Peripheral vessel	Peripheral vessel								
	Other (Specify***)	P	P	P		P	P	P	Note 1,2,4,6,8
N=new indication; P=previously cleared by FDA									
Additional comments: Combined modes--B+M、PW+B、Color + B、Power + B、PW +Color+ B、Power + PW +B.									
*Intraoperative includes abdominal, thoracic, and vascular etc.									
**Small organ-breast, thyroid, testes.									
***Other use includes Urology.									
Note 1: Tissue Harmonic Imaging. The feature does not use contrast agents.									
Note 2: iScape									
Note 3:TDI									
Note 4: Color M									
Note6: Elastography									
Note7: Contrast imaging (Contrast agent for LVO)									
Note8: Smart 3D									
Note9: 4D(Real-time 3D)									
Note10: Contrast imaging (Contrast agent for Liver)									

Transducer:	P8-2s								
Intended Use: Diagnostic Ultrasound imaging or fluid flow analysis of the human body as follows:									
Clinical Application		Mode of Operation							
General (Track 1 Only)	Specific (Track 1 & 3)	B	M	PWD	CWD	Color Doppler	Amplitude Doppler	Combined (specify)	Other (specify)
Ophthalmic	Ophthalmic								
Fetal Imaging & Other	Fetal								
	Abdominal	N	N	N	N	N	N	N	Note 1, 2,4,8
	Intra-operative (Specify*)								
	Intra-operative (Neuro)								
	Laparoscopic								
	Pediatric	N	N	N	N	N	N	N	Note 1, 2,4,8
	Small Organ (Specify**)								
	Neonatal Cephalic	N	N	N	N	N	N	N	Note 1, 2,4,8
	Adult Cephalic	N	N	N	N	N	N	N	Note 1, 2,4,8
	Trans-rectal								
	Trans-vaginal								
	Trans-urethral								
	Trans-esoph. (non-Card.)								
	Musculo-skeletal (Conventional)	N	N	N	N	N	N	N	Note 1, 2,4,8
	Musculo-skeletal (Superficial)								
	Intravascular								
Cardiac	Cardiac Adult	N	N	N	N	N	N	N	Note 1, 2,3,4,8
	Cardiac Pediatric	N	N	N	N	N	N	N	Note 1, 2,3,4,8
	Intravascular (Cardiac)								
	Trans-esoph. (Cardiac)								
	Intra-cardiac								
Peripheral vessel	Peripheral vessel								
	Other (Specify***)								
N=new indication; P=previously cleared by FDA; E=added under Appendix E									
Additional comments: Combined modes--B+M, PW+B, Color + B, Power + B, PW +Color+ B, Power + PW +B.									
*Intraoperative includes abdominal, thoracic, and vascular etc.									
**Small organ-breast, thyroid, testes.									
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