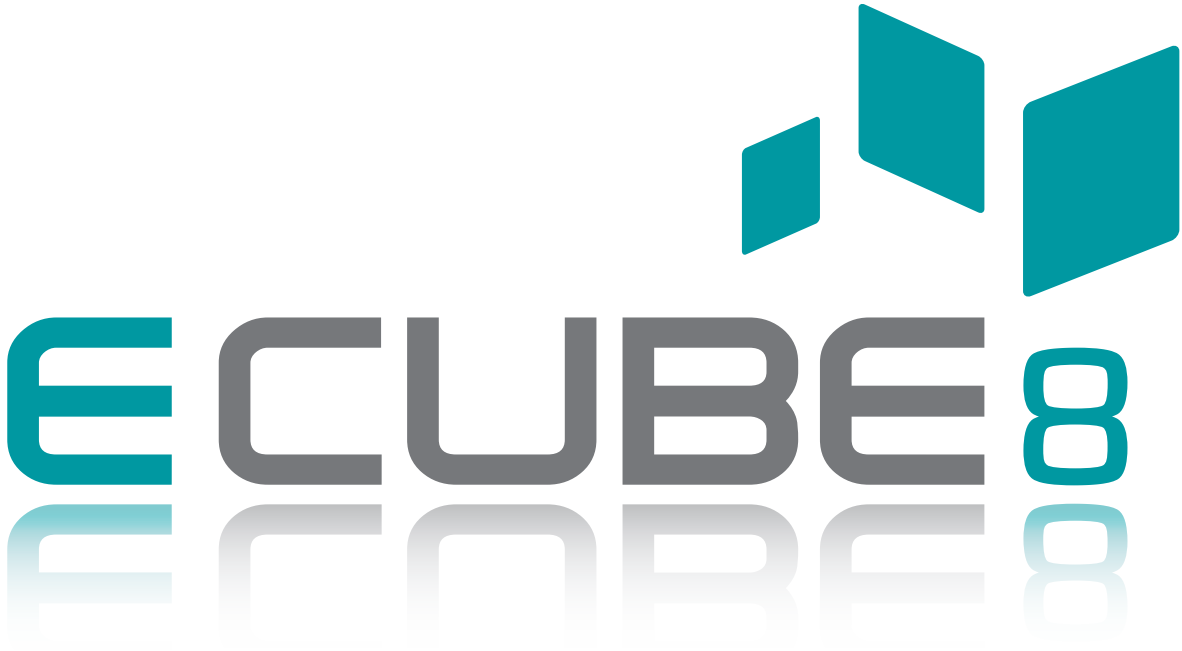


USER MANUAL

70004819 Rev. 7 (ENG)

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CE 2460

Revision Log

The following is a list of major changes and additions that have been made to this manual since it was first released.

Rev	Date (YYYY/MM/DD)	Description
Rev. 0	2017/04/18	User manual first released
Rev. 1	2017/08/31	Updated for Rev. 1 release
Rev. 2	2018/03/15	Updated for Rev. 2 release
Rev. 3	2019/04/30	Updated for Rev. 3 release
Rev. 4	2019/08/23	Updated for Rev. 4 release
Rev. 5	2021/12/15	Updated for Rev. 5 release
Rev. 6	2022/05/31	Updated for Rev. 6 release
Rev. 7	2022/10/14	Updated for Rev. 7 release

Table of Contents

1. System Basics 1-1

Introduction 1-2

System Components 1-6

Peripherals and Accessories 1-11

Image Display 1-17

Control Panel 1-19

QWERTY Keyboard 1-22

Touch Screen 1-23

Transducers 1-24

2. Getting Started 2-1

Operating Requirements 2-2

Moving and transporting the system 2-3

Powering On/Off 2-5

Adjusting the Monitor and Touch Screen 2-6

Connecting/Disconnecting the Transducer 2-8

Activating/Deactivating the Transducer 2-9

3. Starting a Study 3-1

Patient Registration 3-2

4. Imaging Modes 4-1

2D Mode 4-2

M Mode 4-18

Color Flow (CF) Mode 4-23

Power Doppler (PD) Mode 4-32

Pulsed Wave Doppler (PWD) Mode 4-38

Continuous Wave Doppler (CWD) Mode 4-47

Tissue Doppler Imaging (TDI) Mode 4-52

3D and 4D Modes 4-54

5. Imaging Functions 5-1

Freezing Images 5-2

Zooming Images 5-3

Screen Split 5-4

CINE Images 5-5

Annotating Images 5-6

Panoramic Imaging 5-12

Needle Vision™ Plus 5-16

Elastography 5-18

Stress Echo 5-25

Cube Strain™ 5-39

6. Managing Patient Information and Image 6-1

Clipboard 6-2

E-view 6-4

DICOM Spooler 6-16

Printer 6-18

DVR 6-19

7. Measurements and Reports 7-1

Basics 7-2

Abdomen 7-34

Obstetrics 7-43

Gynecology 7-80

Cardiology 7-90

Vascular 7-126

Urology 7-139

Pediatrics 7-146

Small Parts 7-155

Breast 7-163

Musculoskeletal (MSK) 7-170

Emergency Medicine (EM) 7-175

8. Transducer and Biopsy 8-1

Transducer 8-2

Biopsy 8-7

Transducer Accessories 8-18

9. Preset 9-1

System Preset 9-2

Image Preset 9-47

10. Care and Maintenance 10-1

System Care and Maintenance 10-2

Battery Care and Maintenance 10-6

Transducer Care and Maintenance 10-7

11. Safety and Regulatory Information 11-1

Safety Summary 11-2

Equipment Safety Information 11-3

Patient Safety Information 11-4

Anti-Virus Program 11-5

Electrical Safety Information 11-6

Transducer Safety Information 11-7

Biopsy Safety Information 11-9

System Symbols and Labels 11-10

Regulatory Information 11-14

Electromagnetic Compatibility (EMC) 11-17

Diagnostic Ultrasound Indications for Use Format 11-22

Acoustic Output 11-43

12. Appendix 12-1

Appendix A. Biopsy Guide 12-2

1

System Basics

This chapter describes the system overview and operator controls.

Introduction 1-2

System Components 1-6

Peripherals and Accessories 1-11

Image Display 1-17

Control Panel 1-19

QWERTY Keyboard 1-22

Touch Screen 1-23

Transducers 1-24

Introduction

System overview

The E-CUBE 8 ultrasound system provides excellent quality and reliability as well as these specific features:

Table 1-1 System feature

Physical Dimensions	• Height: 1115/1430 mm • Width: 532 mm • Depth: 787 mm • Weight: 55 kg (not including options)
Clinical Applications	• Abdomen • OB • GYN • Cardiology • Small Parts • MSK • Vascular • Urology • EM • TCD • Breast • Appendix
Available Imaging Modes	• 2D mode • Harmonic mode (HAR) • M mode • Color M mode • Anatomical M mode (AMM) • Color Flow Doppler (CF) mode • Power Doppler (PD) mode • Directional PD mode • Pulsed Wave Doppler (PWD) mode • Continuous Wave Doppler (CWD) mode • High PRF Doppler mode • Tissue Doppler Imaging (TDI) mode • 3D/4D mode
Image Processing Technology	• Xpeed™ • Full SRI™ • Spatial Compounding Image (SCI) • Panoramic • Live HQ™ • Needle Vision™/Needle Vision™ Plus • ECG • Elastography • Filter Method Tissue Harmonic Image (FTHI) • Pulse Inversion Tissue Harmonic Image (PTHI) • Raw Data Processing • Post Processing

Operable Transducers	Pencil Doppler	• CW2.0 • CW5.0
	Linear Array	• L3-12T • L3-12H • L3-12H^{WD} • L8-17H • IO3-12 • IO8-17T
	Sector Phased Array	• SP3-8T • P1-5CT
	Convex Array	• C1-6CT • C5-8NT • SC1-4H • SC1-4HS • SC1-6H
	Endocavity	• EV3-10T • EC3-10T • E3-10
	Volume Convex	• VC1-6T
	Volume Endocavity	• VE3-10H
Measurement Package	Including reports for: • Abdomen • OB • GYN • Cardiology • Vascular • Urology • Pediatrics • Small Parts • Breast • MSK • EM	
Basic Measurements (cont.)	2D Mode	• Distance, Ellipse, Trace • Area, Circumference • %Stenosis • Volume • Angle • A/B Ratio • Volume Flow Area
	Doppler Mode	• Velocity • Time • PI • Trace • Acceleration • S/D Ratio • RI • Auto Trace

Basic Measurements	M Mode	• A/B Ratio • Distance • Time • Slope • %Stenosis • HR
Connectivity	• Verification • DICOM storage • DICOM print • DICOM storage commitment • DICOM media • DICOM worklist • DICOM MPPS • DICOM Structured Report (OB-GYN) • DICOM Structured Report (Echocardiography) • DICOM Structured Report (Vascular) • Cube View™ • Network Storage • Wireless LAN (Option)	
User Interface	• English • German • French • Spanish • Italian • Russian • Portuguese • Chinese	

Documentation

CAUTION

Safety instructions must be reviewed before operating the unit.

E-CUBE 8 documentation consists of following manuals:

- The User Manual and Quick Guide (TRANSLATED) provides information needed by the user to operate the system safely. It describes the basic functions of the system, safety features, operating modes, measurements/calculations, transducers, and user care and maintenance.
- The Reference Manual (ENGLISH ONLY) contains data tables, such as Obstetric and Cardiology references.
- The Service Manual (ENGLISH ONLY) supplies block diagrams, lists of spare parts, descriptions, adjustment instructions or similar information which helps qualified technical personnel in repairing those parts of the system which have been defined as repairable.

The E-CUBE 8 manuals are written for users who are familiar with basic ultrasound principles and techniques. They do not include sonographic training or detailed clinical procedures.

NOTE

- The manuals are only provided in electronic format on the CD.
- The CD includes English and all translations.
- The screen images in this manual are only for illustrational purposes. Actual screen display may differ slightly from that shown in this manual.

Contraindication

Do not operate the system for an ophthalmic purpose or any use affecting the patient's eye by the acoustic beam.

Prescription device

United States law restricts this device to sale or use by, or on the order of a physician.

Intended operator profile

The E-CUBE 8 is intended for use by a qualified and trained physician or sonographer with at least basic ultrasound knowledge for ultrasound evaluation.

The operator must have read and understood the user manual.

System Components

Front view

There are the main components of your system:

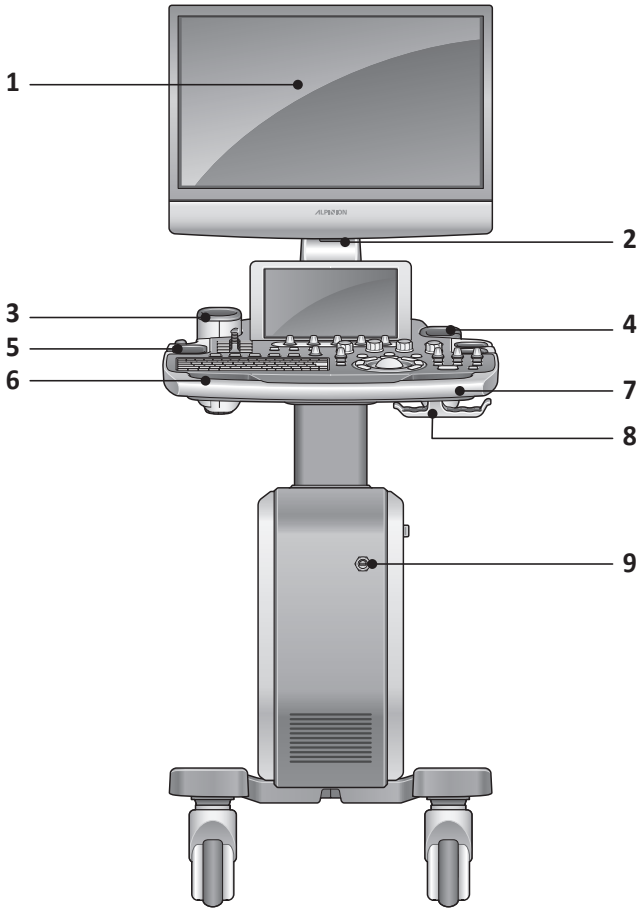


Figure 1-1 Front view

No.	Component	No.	Component
1	Monitor	**6**	Control panel
2	LED lamp	**7**	Handle
3	Gel warmer	**8**	Transducer cable holder
4	Transducer holder	**9**	CW port
5	Transducer holder		

Rear view

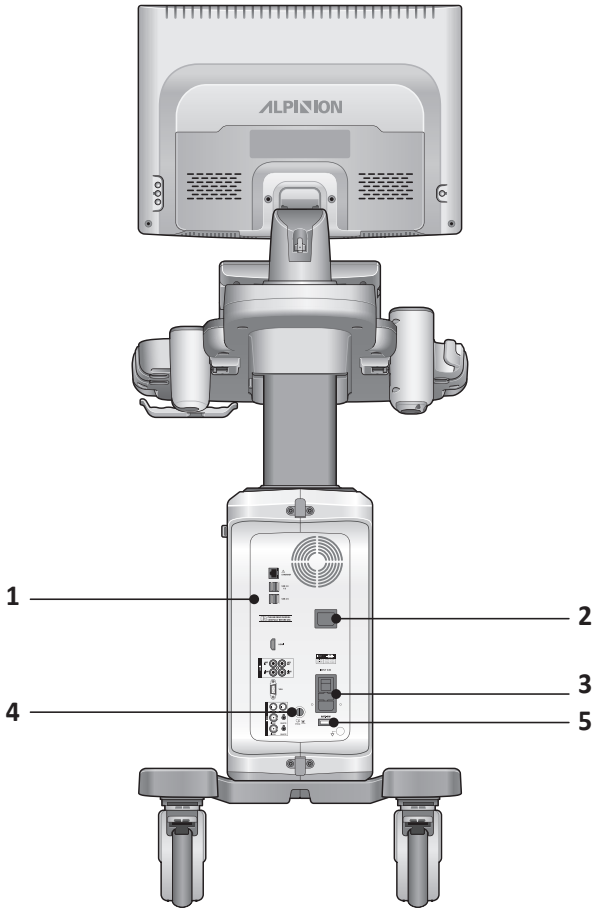


Figure 1-2 Rear view

No.	Component	No.	Component
1	I/O panel	**4**	ECG port
2	AC outlet	**5**	System on/off switch
3	AC inlet		

NOTE

When connecting an external monitor to your system, use the monitor with 1366 x 768 or higher resolution.

Side view

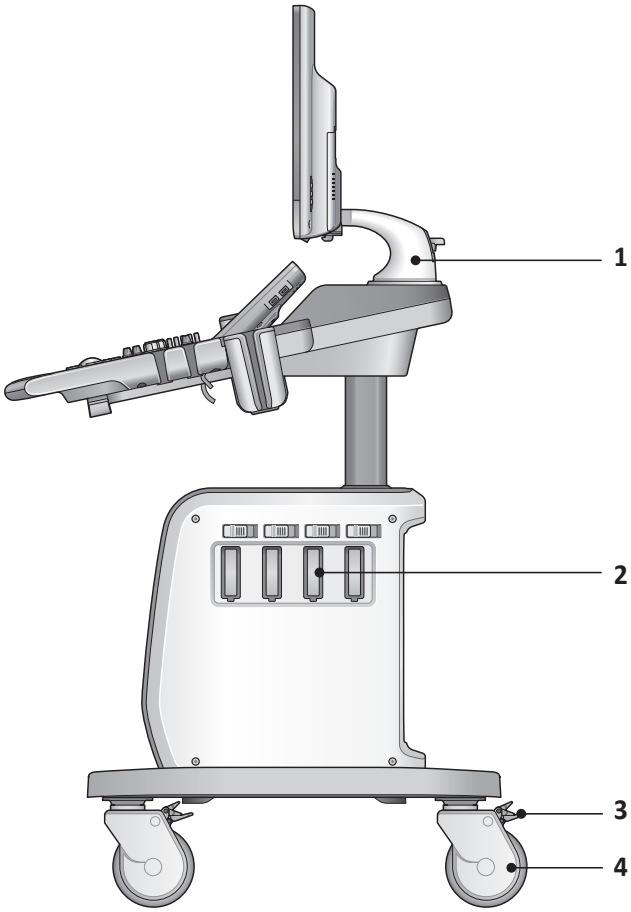


Figure 1-3 Side view

No.	Component	No.	Component
1	Monitor arm	**3**	Caster lock
2	Transducer port	**4**	Caster

Peripheral area

In the middle of the system, you can place optional peripherals such as black and white printer and color printer.

CAUTION

The peripheral area is only for peripheral devices. Do not place transducers or the footswitch in the peripheral area to prevent damaging them from accidentally falling off.

I/O panel

I/O panel located on the rear side of a system includes video input and output, audio input and output, Ethernet, power and control connections for a printer. See Figure 1-4 below for more details.

CAUTION

- Each outer (case) ground line of peripheral/accessory connectors are earth grounded. Signal ground lines are not isolated.
- For compatibility reasons, use only ALPINION approved transducers, peripherals or accessories.
- Be sure to plug the power supply cable of the peripherals to the connector panel of the system to avoid unexpected electrical shock.
- Do not connect any transducer or accessories without approval from ALPINION.

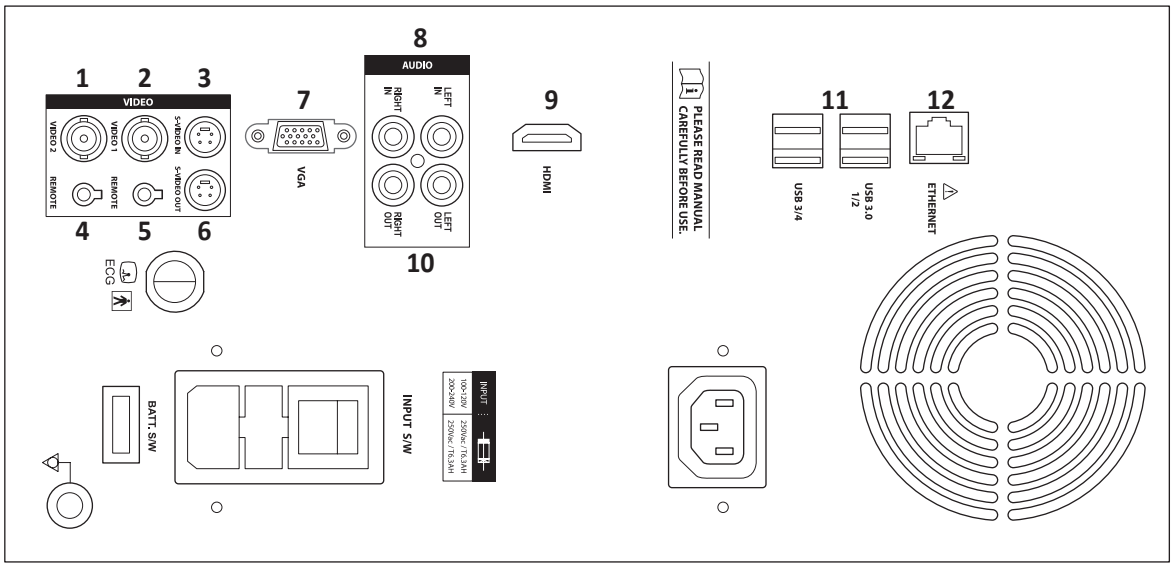


Figure 1-4 I/O panel

No.	Component	No.	Component
1	B/W printer port	7	VGA port
2	Color printer port	8	Audio in port (Reserved)
3	S-Video input port (Rerserved)	9	HDMI port
4	Remote control port for a B/W printer	10	Audio out port
5	Remote control port for a color printer	11	USB ports (4 ports)
6	S-Video output port	12	Ethernet port

NOTE

The external storage media such as USB HDD or DVD-RW should be connected with the system referring to the following instructions.

- If power consumption of the external storage media corresponds to more than 0.5 A and less than 1 A, you should use 3 or 4 port to get it activated properly.
- If power consumption of the external storage media exceeds 1A, you should use a Y-cable that makes the external storage media receive power from two USB ports at the same time.

CAUTION

- The connection of equipment or transmission network other than as specified in these instructions can result in electric shock hazard.
- Connected peripherals must meet IEC standard (An equipment that processes data: IEC 60950/EN 60950, a medical equipment: IEC 60601-1/EN 60601-1). For product configuration, it must meet the safety requirements of product standard IEC/EN 60601-1 or system standard IEC 60601-1-1/EN 60601-1-1.
- The operator shall not contact the parts (SIP/SOP) and the patient simultaneously.
- When connecting a cable to the ethernet (LAN) port, always use the optional LAN isolator (EN-20G by EMO system or any similar isolator complying with IEC/EN 60601-1) to protect your system from electrical damage.

Peripherals and Accessories

Before using the peripherals or accessories, you should consider the following requirements.

WARNING
Observe all warnings and cautions given in the operation manual of peripheral device.

CAUTION
For compatibility reasons, use only ALPINION approved peripherals or accessories. DO NOT connect any peripherals or accessories without approval by ALPINION.

Peripheral update for EU countries

The following is intended to provide the users in EU countries with updated information concerning the connection of the E-CUBE 8 to image recording and other devices or communication networks.

The E-CUBE 8 has been verified for overall safety, compatibility and compliance with the following on-board image recording devices:

- Color Printer
  Manufacturer: Sony Corporation
  Model: UP-D25MD, UP-25MD
- B/W Printer
  Manufacturer: Sony Corporation, Mitsubishi Electric Corporation
  Model: UP-D898MD, UP-X898MD, P95DE(P95DW)
- DVD-RW
  Manufacturer: Hitachi-LG Data Storage, Inc
  Model: GP50NW40

The E-CUBE 8 has also been verified for compatibility, and compliance for connection to a local area network (LAN) via the rear panel Ethernet connection, provided the LAN components are IEC/EN 60950 compliant.

The E-CUBE 8 may also be used safely while connected to devices other than those recommended above if the devices and their specifications, installation, and interconnection with the system conform to the requirements of IEC/EN 60601-1-1.

Basic accessories

The E-CUBE 8 has the following basic accessories:

• E-CUBE 8 console	• User Manual, Reference Manual (Soft copy)
• Sonic gel	• Quick Guide (Soft copy)

Optional supplies and accessories

The following tables show optional supplies and accessories that have been verified to be compatible with the system.

Biopsy kit
• L3-12 Biopsy Starter Kit (for L3-12T, L3-12H)
• SC1-6 Biopsy Starter Kit (for C1-6CT, SC1-4H, SC1-6H)
• SC1-4HS Biopsy Starter Kit (for SC1-4HS)
• VE3-10H Disposable Needle Guide (for VE3-10H)
• VE3-10H Reusable Needle Guide (for VE3-10H)
• E3-10 Disposable Needle Guide (for E3-10)
• E3-10 Reusable Needle Guide (for E3-10)
• EN3-10 Disposable Needle Guide (for EV3-10T, EC3-10T)
• EN3-10 Reusable Needle Guide (for EV3-10T, EC3-10T)

Optional function		
• Full SRI	• SRI	• Elastography
• FTHI (Filtered Tissue Harmonic)	• Auto IMT	• Cube View™
• Xpeed	• CW	• Needle Vision™
• Spatial compounding	• Anatomical-M	• Needle Vision™ Plus
• Value 3D/4D	• Frequency Compounding	• Auto NT
• CV M&R	• Panoramic	• Volume Advance
• DICOM 3.0 Connectivity	• Tissue Doppler Image	
• DICOM SR (OB)	• Stress Echo	
• DICOM SR (Adult Echo)	• Cube Strain™	
• DICOM SR (Vascular)	• Live HQ™	

Console accessory
• Tri-pedal footswitch

Footswitch (Option)

The optional tri-pedal footswitch that is connected with the rear panel of your system performs specific functions easily instead of pressing function keys on the control panel.

The each pedal of the footswitch may have different functions depending on the assigned settings such as **Freeze**, **P1**, **P2**, **P3** and **Rec/Pause**.

To assign the footswitch functions, press the **[System Preset]** key and go to **User Setting** > **Print/Foot Switch**.

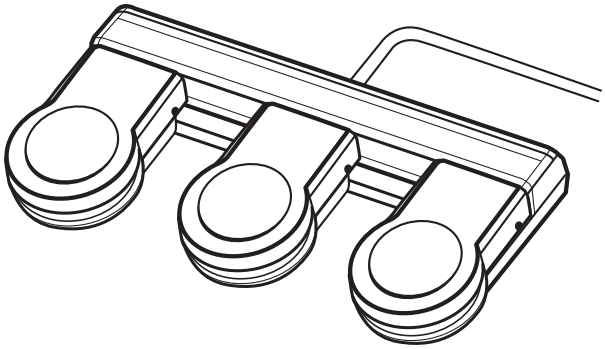


Figure 1-5 Footswitch

CAUTION

Do not place or store the footswitch in the peripheral area on the system to prevent damaging the footswitch from accidently falling off.

Wireless LAN (Option)

A Wireless Network is available on the E-CUBE 8. For adjusting a wireless LAN connection, see "Network" on page 1-34.

Using unrecommended wirelss LAN adapter may cause system malfunction. To prevent system malfunction, only use wireless LAN adapters approved or recommended by ALPINION.

NOTE

Please contact your local agent to get the latest information on compatible wireless LAN adapters.

Battery (Option)

This system uses lithium ion batteries. The lithium ion battery provides power if AC power is not available.

NOTE

The battery is designed to work with E-CUBE 8 systems only. Use only the batteries authorized by Alpinion Medical Systems.

The length of the time the system can run on the battery will vary, depending on the diagnostic mode and the peripherals connected.

If the battery level runs low while using the system, connect it to an AC power source to recharge the battery.

WARNING

- The battery has a safety device. Do not disassemble or alter the battery.
- Do not heat the battery or discard it in a fire.
- Do not leave the battery in direct sunlight.
- Do not short-circuit the battery by directly connecting the negative terminals with metal objects.
- Do not subject batteries to mechanical shock.
- Do not use a damaged battery. If the battery emits an unusual odor or heat during use or recharging, immediately stop using it and contact an authorized agent or an ALPINION MEDICAL service engineer.

CAUTION

- This system has an embedded battery. The battery used in the system must be replaced by an authorized agent or an ALPINION MEDICAL service engineer.
- Ensure that water or liquids do not drip into the battery connection area.

Battery icons and status

The following battery icons describes the status of the battery and shown on the bottom right of the screen. With the battery icons, you can easily check the remaining battery level.

Table 1-2 Battery Icons and status

Icon	Status	Note
	Battery level is between 95 and 100%.	AC power cable is plugged.
	Battery level is between 40 and 94%.	
	Battery level is between 20 and 39%.	
	Battery level is between 1 and 19%.	
	Battery level is 0 %.	

Icon	Status	Note
	Battery level is between 95 and 100%.	AC power cable is unplugged.
	Battery level is between 40 and 94%.	
	Battery level is between 20 and 39%.	
	Battery level is between 1 and 19%.	
	Battery level is 0 %.	

Monitor and touch screen



Figure 1-6 Monitor buttons

No.	Component	No.	Component
1	Up (∧) button	**4**	USB port (2 ports)
2	Mode/Select (◇) button	**5**	LED lamp button
3	Down (∨) button	**6**	Brightness dial

CAUTION

The LED lamp may overheat. Be careful not to directly touch it to avoid injury.

Image Display

The image display consists of an ultrasound image, application information, patient information, and indicators.

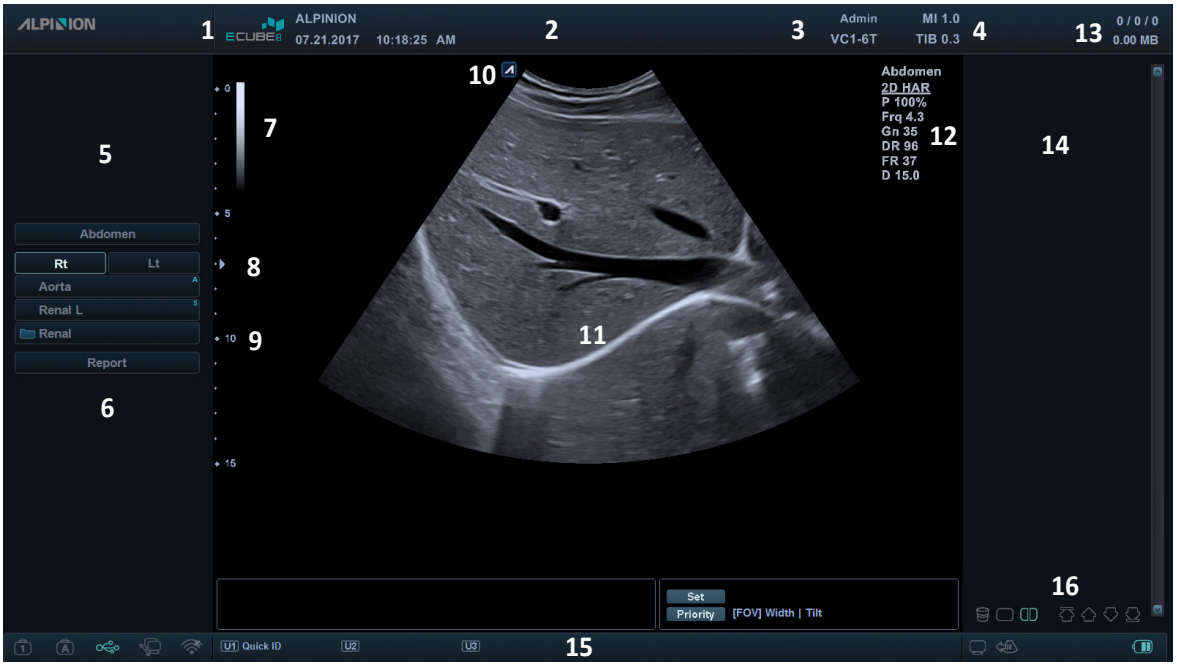


Figure 1-7 Image display

1	Hospital logo & name	**10**	Transducer orientation marker
	Current date & time	**11**	Image area
2	Patient ID, Patient name	**12**	Image parameter
3	Operator ID, Transducer name	**13**	Clipboard indicator
4	Mechanical index, Thermal index	**14**	Image clipboard
5	Zoom reference window	**15**	Status bar: Symbol lock, Caps lock, USB connection, Network connection, Wireless network connection, User defined key, Data backup status, Cube View connection, Battery status icon
6	Labeled measurement menu		
7	Gray/Color scale bar		
8	Focal zone marker	**16**	Clipboard icons: Recycle bin, Single & Dual layout format, Scroll Up/Down/Home/End
9	Depth scale marker		

Screen saver

Screen saver mode automatically activates to save the system power when you do not operate the system and the system stays in idle for a specified time. To deactivate this mode and return to normal operating mode, press any key on the control panel.

NOTE

To configure the screen saver settings, press the **[System Preset]** key and go to **System** > **General** > **Monitor**.

Control Panel

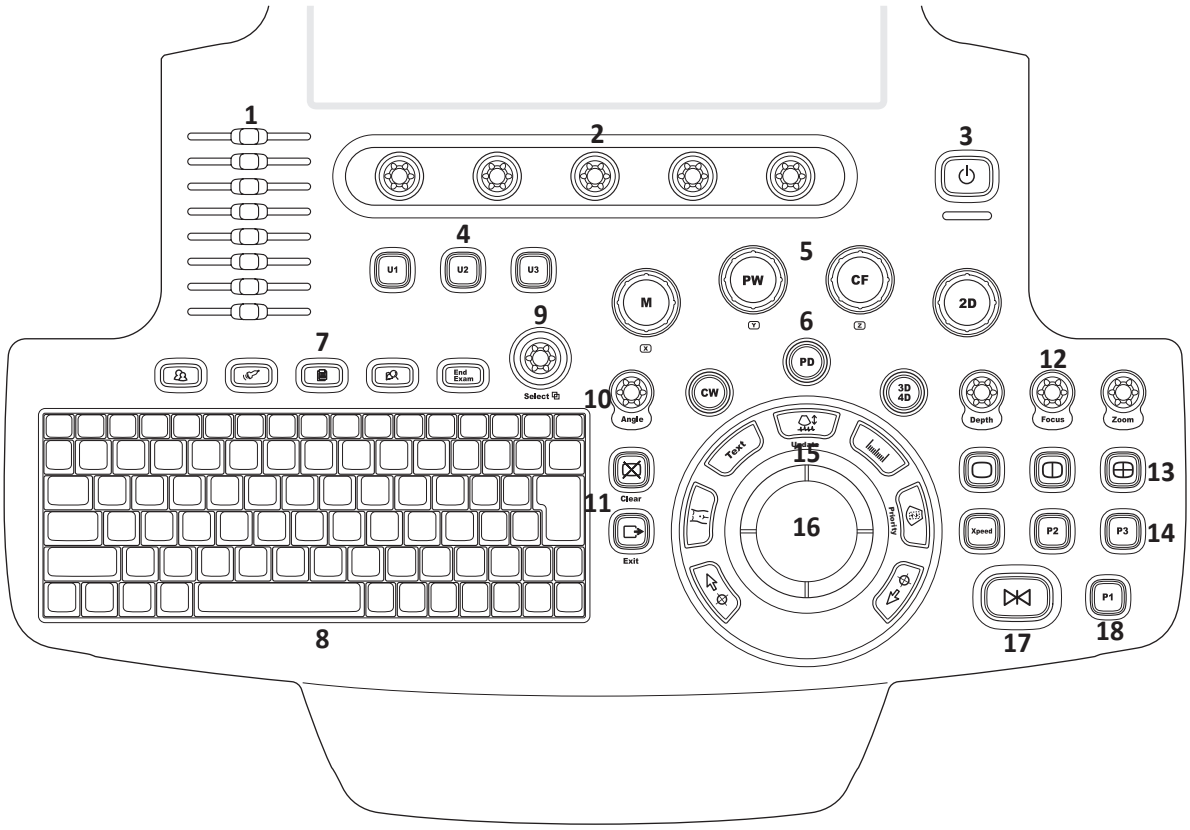


Figure 1-8 Control panel layout

Table 1-3 Key description

No	Controls	Description
1	**TGC slides**	Use these controls to adjust TGC values on images.
2	**Soft keys**	Use these controls to select or adjust the functions in the soft menu at the bottom of the touch screen. • Press to select the corresponding soft menu. • Rotate to adjust the function of the corresponding soft menu.
3	**Power on/off (⏻)**	Use this control to turn on and off the system.
4	**U1, U2, U3**	Use these controls to access user-defined functions.
5	**M, PW, CF, 2D**	Use these controls to activate M, PW, CF, or 2D mode.
6	**CW**	Use this control to activate Continuous Wave (CW) Doppler mode. This control is optional.
	PD	Use this control to activate Power Doppler mode.
	3D4D	Use this control to activate 3D and 4D modes.

No	Controls	Description
7	**Patient ( )**	Use this control to display the ***Patient Registration*** screen. You can enter patient data.
	Transducer ( )	Use this control to select the desired transducer, application, and preset.
	Report ( )	Use this control to create a report based on the exam result and edit it.
	E-view ( )	Use this control to activate image management with end of study options.
	End Exam	Use this control to end the current study.
8	**QWERTY keyboard**	Use this control to type numeric values and texts.
9	**Select**	Use this control to select the desired function from the context menu on the screen.
10	**Angle**	Use this control to change an angle. • In 2D or Color mode, rotate to adjust the angle steer. • In CW or PW mode, rotate to adjust the Doppler angle correct. • In Body pattern mode, rotate to adjust the transducer angle. • In Arrow mode, rotate to adjust the arrow angle. • In CW or PW mode, press to adjust the auto angle.
11	**Clear**	Use this control to delete the arrow, comment, and measurement.
	Exit	Use this control to exit current screen (mode) and return to the previous screen (mode).
12	**Depth**	Use this control to adjust the scanning depth of an image.
	Focus	Use this control to focus on the area of interest..
	Zoom	Use this control to turn Zoom mode on. • Rotate to activate Read zoom. • Press to activate Write zoom in Read zoom mode.
13	**Single, Dual, Quad (, ,)**	Use these controls to view an image in dual or quad screen.
14	**Xpeed**	Use this control to automatically optimize image parameters on the live screen.
	P2, P3	Use these controls to print out images.
15	**Set/Cur ( )**	Use this control to show the cursor on the screen and set the current function. You can select a menu on the screen using this cursor.
	Body Pattern ( )	Use this control to display the body pattern images.
	Text	Use this control to annotate images.
	Update ( )	Use this control to update a 2D image in real time based on the specified time or freeze a 2D image.
	Measure ( )	Use this control to perform measurement.
	Priority ( )	Use this control to adjust the priority of Trackball. • In 2D mode, press to select the priority between the width and tilt functions. • In Duplex or Triplex mode, press to select the priority between ROIs of the activated imaging modes.

No	Controls	Description
16	**Trackball**	Use this control to scroll through menus or options on the screen by moving the cursor.
17	**Freeze (⋈)**	Use this control to start and stop scanning.
18	**P1**	Use this control to print out images.

QWERTY Keyboard

The QWERTY keyboard is available which you can enter text or perform special functions.

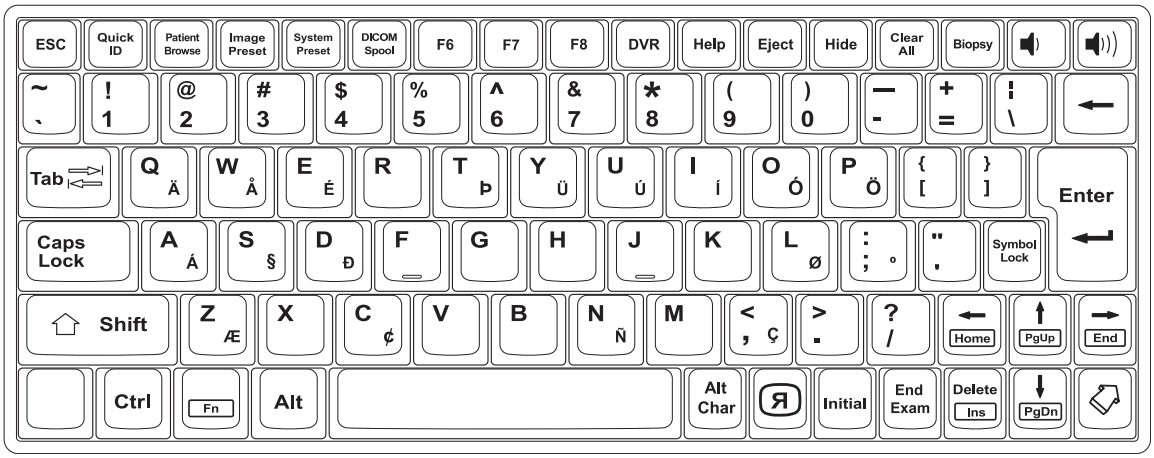


Figure 1-9 Keyboard layout

Using the special keys

Table 1-4 Special key description

No	Controls	Description
1	**Quick ID**	Access the **Quick ID** screen.
2	**Patient Browse**	Access the **E-View** menu.
3	**Image Preset**	Access the **Image Preset** menu.
4	**System Preset**	Access the **System Preset** menu.
5	**DICOM Spool**	Access the **DICOM Spooler** menu.
6	**F7**	Create your own user preset.
7	**DVR**	Access the **DVR** menu.
8	**Help**	Access the electronic manual.
9	**Eject**	Eject a media (CD, DVD, or USB).
10	**Hide**	Hide the current menu screen.
11	**Clear All**	Clear your input or cancel your selection.
12	**Biopsy**	Show the biopsy guideline.
13	Я	Flip the image 180 degrees left/right.
14	**Initial**	Restore the default settings of the current function.
15	**End Exam**	End the current study.
16		Show the arrow pointer on the screen.

Touch Screen

Your ultrasound system has the optional touch screen that enables you to easily access menus or adjust options on the current monitor display. With the touch screen, you can also enter text instead of using the QEWRTY keyboard. Simply touch the menu or option you want.

NOTE

For using the optional touch screen, you need an additional request to your local agent.



Figure 1-10 Touch screen

No	Controls	Description
1	**Power Preset**	Access user-defined preset customized to best suit the user's needs.
2	**E-Tool**	Access system configuration.
3	**Virtual Keyboard**	Access the virtual keyboard on the touch screen.
4	**Scanning Modes Tab**	Select the tab to activate scanning mode.
5	**Touch Menus**	Touch buttons with mode/function specific controls.
6	**Soft Menus**	Rotary/Push buttons with mode/function specific controls.
7	**Page Indicator**	Switch to the previous/next page of the touch menu screen.

Transducers

The E-CUBE 8 ultrasound system provides various types of transducers. Most of them have a state of art in transducer technology: single crystal transducers, composite transducers, and extreme fine pitch transducer, and real-time mechanical 4D transducers

Moving and storing transducers

Transducers should be placed inside their holders for moving short distances. For shipping or moving considerably a long distance, storing transducers in their carrying cases are strongly recommended. Storing them in carrying cases is not only to protect the transducers from physical damage such as shock or vibration, but also it will protect them from environmental damages such as humidity and temperature.

NOTE

For more information about transducer, see "Transducer" on page 1-2.

2

Getting Started

This chapter describes how to get started using your system.

Operating Requirements 2-2
Moving and transporting the system 2-3
Powering On/Off 2-5
Adjusting the Monitor and Touch Screen 2-6
Connecting/Disconnecting the Transducer 2-8
Activating/Deactivating the Transducer 2-9

Operating Requirements

Before using your system, you should consider the following requirements.

NOTE

Only qualified sonographers or physicians should perform scanning with the system.

WARNING

Do not install the system by yourself. Only ALPINION MEDICAL SYSTEMS service engineer should install the system.

Electrical requirements

You should use a system with the specified power outlet as follows:

- 100-120 / 200-240 VAC, 450 VA, 50-60 Hz

WARNING

Using the system in a wrong voltage range causes damages on the system.

Environmental requirements

You should use this system in proper environment to prevent it from radio wave interference, dust and gas.

WARNING

Using the system in an inappropriate environment might cause unexpected problems.

Make sure the area, which your system is installed, is well-ventilated, with a temperature, humidity, and pressure requirements. If the system is exposed to inappropriate temperature, humidity, or pressure, adapt your system to normal range of environment for a few hours.

Table 2-1 Environmental requirements

	Temperature	Humidity	Pressure
Operation	10–35 °C	30–75 %	700–1060 hPa
Storage	-25–60 °C	20–90 %	700–1060 hPa
Transportation	-25–60 °C	20–90 %	700–1060 hPa

CAUTION

Before powering the system on, make sure that the system meets the operational conditions in temperature and humidity.

Moving and transporting the system

Before moving the system

CAUTION

- For your safety, you must follow the precautions carefully before moving or transporting the system.
- Before moving the system, make sure that the peripherals in the storage area are installed securely.

Before you move the system, use the following steps.

1. Power off the system using the **[Power On/Off]** key on the control panel.
2. Unplug the power cord from the power outlet.
3. Disconnect all peripheral devices (e.g. printers or DVD) and the footswitch from the system.
4. Secure all cables.
5. Store all transducers or accessories in the proper spaces carefully.
6. Fold up the monitor.
7. Unlock the front and rear casters by stepping on the lock levers.

When moving the system

CAUTION

- For your safety, follow the precautions carefully when moving the system.
- Do not use the system cables to move the system.
- When you move the system with another person, take extra precaution not to injure feet.

When moving the system, use the following procedure.

1. Move the system by using the front or rear handle grip.
2. Take extra care when moving the system for long distances and on inclines.
   Ask for help, if necessary.
3. Use extra care to move the system when crossing door or elevator thresholds.
4. When you reach the destination, lock the front and rear casters.

When transporting the system

When transporting the system with vehicles, use the following procedure.

1. Only use vehicles that are capable of transporting your E-CUBE 8 system.
2. Load and unload the system to a vehicle parked on a level surface.
3. Ensure that the transporting vehicle can handle the weight of the system plus the passengers.
4. Ensure that the load capacity of the lift is capable of handling the weight of the system.
5. Ensure that the lift is in good working order.
6. Secure the system while it is on the lift so that it cannot roll. Use wood chocks, restraining straps, or other similar types of constraints. Do not attempt to hold it in place by hand.
7. Employ two to three persons to load and unload safely from a vehicle.
8. Load the unit aboard the vehicle carefully and keep its center of gravity. Keep the unit still and upright. (Do not lay the unit down on its side.)
9. Ensure that the system is firmly secured while inside the vehicle. Any movement, coupled with the weight of the system, could cause it to break loose.
10. Secure the system with straps or as directed otherwise to prevent motion during the transport.
11. Prevent vibration damage by driving cautiously. Avoid unpaved roads, excessive speeds, and erratic stops or starts.

Powering On/Off

Power on

1. Make sure that the power cord is plugged into the power outlet.

   CAUTION
   Make sure that the system power is supplied from a separate and properly rated power outlet.

2. Push the **System On/Off** switch to turn on the system power on the bottom rear of the system.
3. Press the **[Power On/Off]** key on the control panel.

Power off

1. Press the **[Power On/Off]** key on the control panel.
2. When the ***Power off*** dialog box appears, click **Shutdown** by using **[Trackball]**.

   NOTE
   Depending on the power-off setting, you can activate Sleep mode or turn the system off immediately. To change the power-off setting, press the **[System Preset]** key and go to **System** > **General** > **Power Off**.

   CAUTION
   Do not unplug the power cord during the system operation. Do not turn off the **System On/Off** switch before pressing the **[Power On/Off]** key. This may lead to data loss or system software damage.

Adjusting the Monitor and Touch Screen

Rotate, tilt, pan, and fold the monitor

The position of monitor can be easily adjusted to fit your viewing by help of the professional arm. This monitor can be adjusted in following positions:

- Tilting: The monitor can be tilted around its pivot point to both forward and backward.
- Folding: The monitor can be folded down close to the control panel to provide a stability when moving the system.

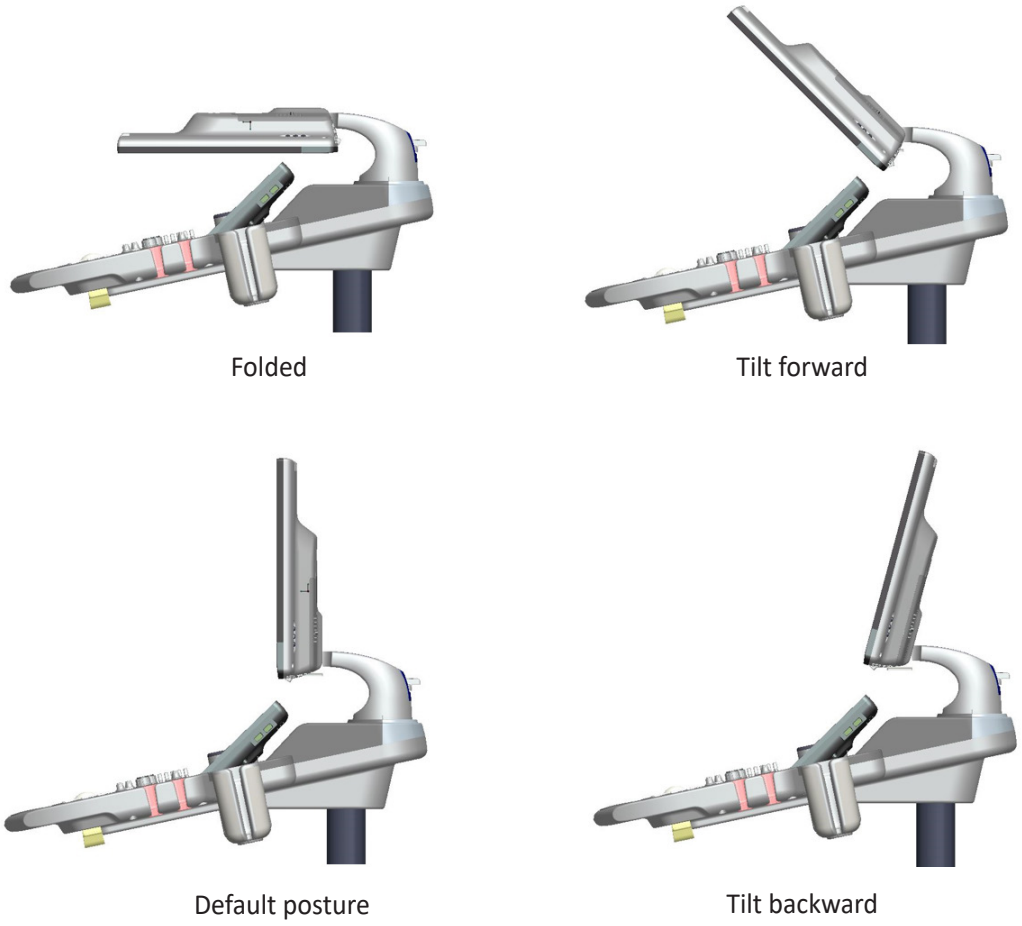


Figure 2-1 Adjusting the monitor

Contrast, brightness, and dim brightness

To adjust the contrast,

1. Press the **Mode/Select** (◇) button on the monitor once.
2. To increase the contrast, press the **Up** (∧) button. Press the **Down** (∨) button to decrease the contrast. Repeat step 2 until desired value is reached.

NOTE

Current contrast value is shown on the display.

To adjust the brightness of the monitor,

1. Press the **Mode/Select** (◇) button on the monitor twice.
2. To increase the brightness, press the **Up** (∧) button. Press the **Down** (∨) button to decrease the brightness. Repeat step 2 until the desired value is reached.

NOTE

Current brightness value is shown on the display.

To adjust the brightness of the touch screen,

1. Push up **Brightness dial** to increase the brightness.
2. To decrease the brightness, push down **Brightness dial**.

To adjust the dim brightness,

1. Press the **Mode/Select** (◇) button on the monitor three times.
2. To increase the dim brightness, press the **Up** (∧) button. Press the **Down** (∨) button to decrease the dim brightness. Repeat step 2 until the desired value is reached.

LED lamp

The LED lamp is adapted to offer proper light at a dark room to see the chart or readings. To turn the light on, press the **LED Lamp** button. Press this button once again to turn this lamp off.

Connecting/Disconnecting the Transducer

Connecting the transducer

You can connect the transducer to the transducer port when the system is powered off or on. Make sure that you press the **[Freeze]** key on the control panel before connecting the transducer.

CAUTION
Do not touch the patient when connecting or disconnecting a transducer.

1. Check if you press the **[Freeze]** key on the control panel.
2. Insert the transducer connector into the transducer port.

   CAUTION
   Do not forcibly insert the transducer connector to the system. Improper connection may cause damages to the system and transducer.
3. Push the connector locking lever to the left to secure the transducer connector.

   NOTE
   After connecting the transducer to the system, you need to activate the desired transducer by selecting it from the screen.

Disconnecting the transducer

You can disconnect the transducer from the transducer port when the system is powered off or on. Make sure that you press the **[Freeze]** key on the control panel before disconnecting the transducer.

CAUTION
Do not touch the exposed surface of the transducer connector when the transducer is removed.

1. Check if you press the **[Freeze]** key on the control panel.
2. Push the connector locking lever to the right to release the transducer connector.
3. Pull out the transducer connector from the transducer port.

Activating/Deactivating the Transducer

Activating the transducer

Use the following procedure to activate the transducer and application.

1. On the control panel, press the **[Transducer]** key.
   The dialog box for transducer and application selection appears.
2. Select the desired transducer, application and preset using **[Trackball]** on the control panel, and then press the **[Set]** key on the control panel.

   NOTE

   Default transducer for the selected preset or default preset for the selected transducer is selected automatically.

3. Click **Exit** to complete the transducer selection.

   NOTE

   Selecting the **Automatic Preset selection when changes the Transducer** check box shows the default application and preset for the selected transducer.

Deactivating the transducer

NOTE

Before deactivating the transducer, press the **[Freeze]** key on the control panel. An error may occur when you deactivate the transducer while the system is running.

Use the following procedure to deactivate the transducer.

1. Press the **[Freeze]** key on the control panel.
2. Gently wipe the excess gel on the transducer surface.
3. Place the transducer in its holder.

3

Starting a Study

This chapter describes how to begin a study.

Patient Registration 3-2

Patient Registration

You can enter the patient information on the ***Patient Registration*** screen. When the patient information is entered, you can perform measurement and calculation, save images to the image archive, and send the images to a DICOM device. You can also identify the patient information on the patient banner and report screen.

To enter the ***Patient Registration*** screen,

– Press the **[Patient]** key on the control panel.

Patient Registration display

The following components are shown on the screen:

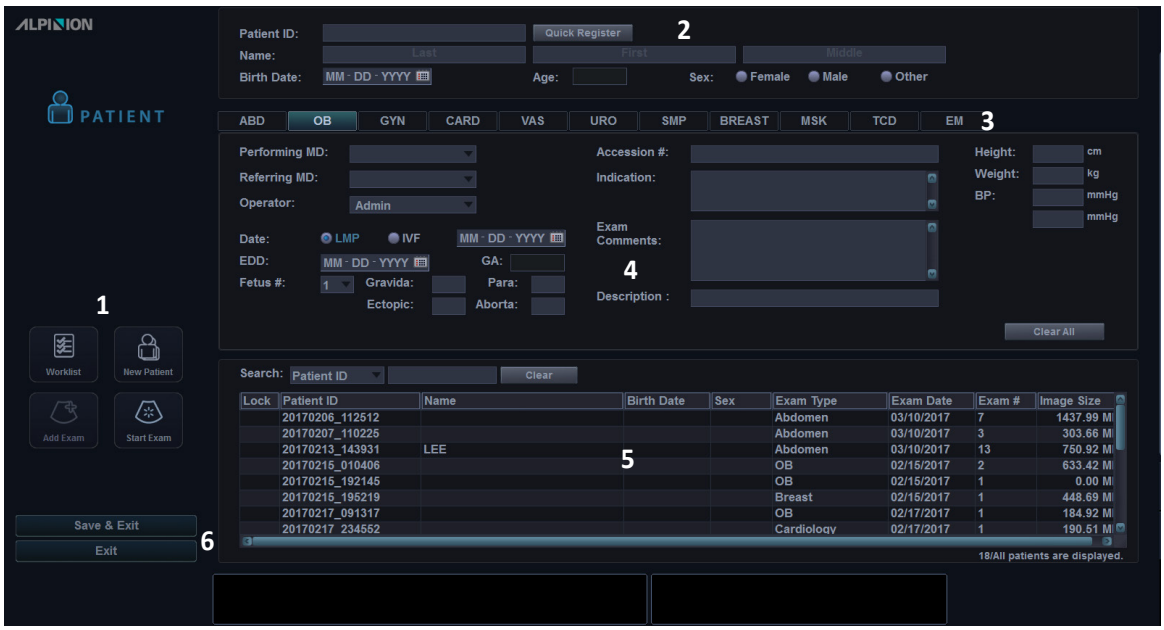


Figure 3-1 Patient display

1	Function selection	**4**	Exam information
2	Patient information	**5**	Patient list/Study list
3	Application selection	**6**	Save & Exit, Exit

Patient Registration menu

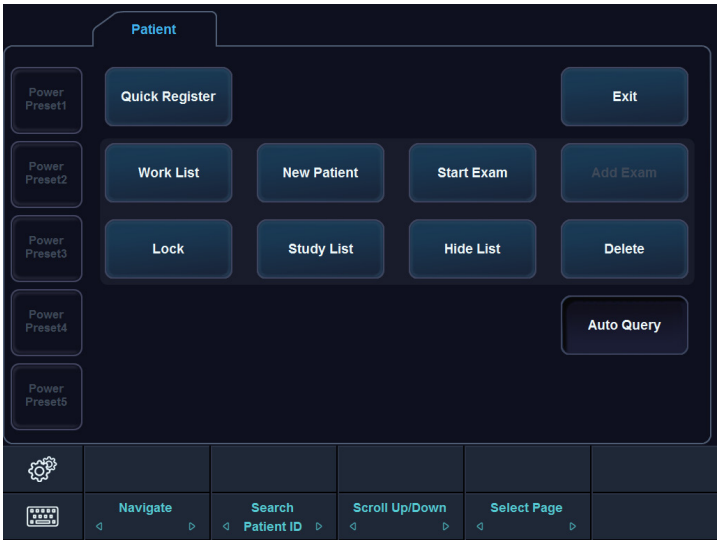


Figure 3-2 Patient menu

Starting a new patient

1. On the ***Patient Registration*** screen, enter the patient information using the QWERTY keyboard. You can also select  and use the virtual keyboard on the touch screen.
2. The cursor positions on the ***Patient ID*** field. Enter the patient information using the alphanumeric keyboard. The ***Patient Registration*** screen includes the following patient information fields.

Table 3-1 Patient information

Field	Description	Remarks
Patient ID	Identification code for a patient	Maximum 64 characters are supported. Use a unique ID for each patient.
Name	Patient's last, first, and middle name	Each of last name, middle name, and first name supports maximum 62 characters and the total name supports maximum 62 characters.
Birth Date	Patient's birth date	Click the calendar icon and select a date on the calendar. You can also manually enter a date.
Age	Patient's age	Automatically calculated when birth date is entered. You can also manually enter an age.
Sex	Female, Male, Other	

NOTE

- Using the **[TAB]** or **[Enter]** key on the QWERTY keyboard allows you to navigate through each field on the ***Patient Registration*** screen. You can use **[Trackball]** and the **[Set]** key on the control panel to move and fix the cursor.
- To automatically generate a patient ID with current date and time,
  - Press the **[System Preset]** key and go to **Patient Info**. Select the **Auto ID Generation** check box.
  - Press the **[Quick ID]** key on the QWERTY keyboard and select the **Auto ID Generation** check box on the ***Quick ID*** screen.
  - Select **Quick Register** on the touch screen.

3 Select a desired application from exam application categories: ABD, OB, GYN, CARD, VAS, URO, SMP, BREAST, MSK, TCD, or EM. When a category is selected, the measurement and category presets are displayed.

4 Enter the required application information for the selected application.

ABD application

No specific application data

OB and EM application

Table 3-2 OB and EM application

Field	Description
LMP/IVF	Select LMP or IVF first to calculate EDD and enter the date of the last menstrual period (or In Vitro Fertilization).
EDD	Estimated Date of Delivery. The system automatically calculates and displays EDD after entering LMP or IVF. When you enter or change EDD, the system calculates and displays values for LMP/IVF and GA. EDD = LMP + 280 days
GA	GA is automatically calculated when you enter LMP, IVF or EDD. GA = Current date - LMP
Fetus #	Select the fetus number (up to 4 fetuses).
Gravida	Enter the number of pregnancy.
Para	Enter the number of childbirth.
Ectopic	Enter the number of ectopic pregnancy.
Aborta	Enter the number of abortion.

GYN application

Table 3-3 GYN application

Field	Description
LMP	Enter the date of the last menstrual period using the selected date format (ex – MM/DD/YYYY).
Expected Ovulation Date	Enter an expected ovulation date.
Day of Cycle	Enter a menstrual cycle.
Gravida	Enter the number of pregnancy.
Para	Enter the number of childbirth.
Ectopic	Enter the number of ectopic pregnancy.
Aborta	Enter the number of abortion.

Cardio application

Table 3-4 Cardio application

Field	Description
BSA	Body Surface Area (Calculated, No input data)

Vascular application

Table 3-5 Vascular application

Field	Description
Left BP	Blood pressure of left arm, using the systole over diastole measurement in mmHg
Right BP	Blood pressure of right arm, using the systole over diastole measurement in mmHg
ABI	Ankle Brachial Index

Urology application

Table 3-6 Urology application

Field	Description
PSA	Enter the value of the Prostate-specific antigen.
PPSA coef.(1)	Enter the first value of the predicted PSA coefficient.
PPSA coef.(2)	Enter the second value of the predicted PSA coefficient.

Pediatrics application

No specific application data

Small Part application

No specific application data

5 Enter the general application information.

Table 3-7 General application information

Field	Description
Height	Enter the patient's height using selected dimension (cm, ft, inch).
Weight	Enter the patient's weight using selected dimension (kg, lb, oz).
BP	Blood pressure in mmHg
Accession #	Maximum 16 characters Identification code indicating the sequence of the current study as related to other studies for this patient. Usually generated by a HIS or RIS server.
Exam Comments	Maximum 144 characters
Indication	Maximum 72 characters
Performing MD	The name of performing MD
Referring MD	The name of referring MD
Operator	The name of operator
Description	Maximum 64 characters

NOTE

- To configure the measurement unit, press the **[System Preset]** key and go to **System** > **General** > **Location** > **Unit**.
- When you change the operator ID on the ***Patient Registration*** screen, the ***Log in*** dialog box appears on the screen. Select a desired operator ID from the ***Operator ID*** field and enter a valid password into the ***Password*** field, and then click **OK**.

6 Click **Save & Exit** or select **Start Exam** on the touch screen to save the patient and application information. The scan screen appears.
If you click **Exit**, return to the scan screen without saving the patient and application information.

CAUTION

Always verify the identification with the patient to avoid patient identification errors. Make sure that the correct patient identification appears on all screens before printing out the patient information.

Quick ID

With the Quick ID feature, you can quickly register a patient by entering the basic patient information. This feature is useful when you do not have enough time to register all patient information.

1 Press the **[Quick ID]** key on the QWERTY keyboard. Or select **Quick Register** on the touch screen. The ***Quick ID*** screen appears.

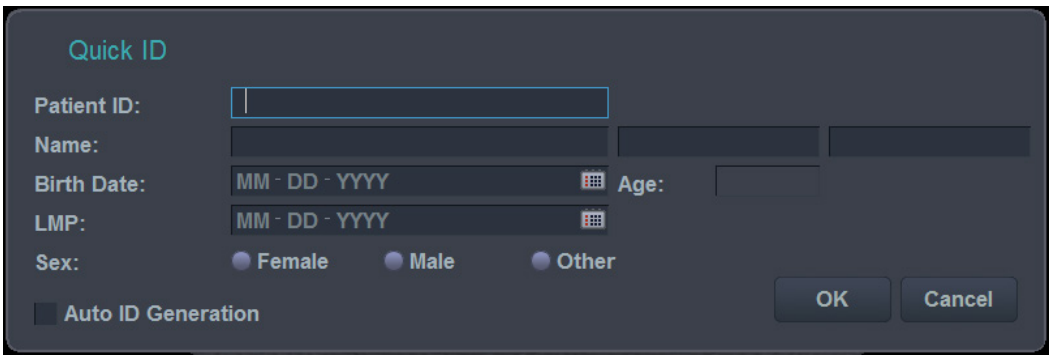


Figure 3-4 Quick ID screen

2 Enter Patient ID, Name, Birth Date, Age and Sex. Only OB application shows the LMP and EDD fields.

NOTE

Using the **[TAB]** or **[Enter]** key on the QWERTY keyboard allows you to navigate through each field on the ***Quick ID*** screen. You can use **[Trackball]** and the **[Set]** key on the control panel to move and fix the cursor.

To enter more information including the application information, go to the ***Patient Registration*** screen by pressing the **[Patient]** key on the control panel.

3 Click **OK** to save the patient information.

Searching for an existing patient

1. Press the **[Patient]** key on the control panel. The ***Patient Registration*** screen appears.
2. Select a search criteria (Patient ID, Patient Name, Birth Date, Sex, Exam Date, and Locked) from the ***Search*** drop-down list and enter a search keyword.
   If you select Exam Date, you can select a desired period (Today, Last Week, Last Month, and Last 3 Months) and a specific date from the drop-down list.

   NOTE

   To view all registered patients while entering a search keyword, click **Clear**.
3. The list of patients who match the criteria is displayed in the patient list.

Sorting the list

Sort the patient or study information by clicking the column names (e.g. Lock, Patient ID, Name, Birth Date, Sex, Image Size, Exam Type, Exam Date, and Exam #) of the patient or study list in ascending or descending order.

Starting a new exam on an existing patient

NOTE

When you register a patient, the study list appears on the display. If the patient is not registered, the patient list appears instead.

1. Press the **[Patient]** key on the control panel. The ***Patient Registration*** screen appears.
2. Select a desired patient from the patient list.
3. If necessary, enter or edit the patient information.
4. Select **Start Exam** on the touch screen to create a new study and return to the scan screen.

Retrieving patient information via worklist

1. Press the **[Patient]** key on the control panel. The ***Patient Registration*** screen appears.
2. Select **Worklist** on the function selection to view patient data from the default worklist server.
3. To change the worklist server, select a source from the ***Source*** drop-down list.

   NOTE

   Before connecting to the worklist server, you need to configure worklist settings. To configure worklist settings, press the **[System Preset]** and go to **Connectivity** > **Worklist**.

4. Select **Worklist** to retrieve patient data from the worklist server.
   The search results appear on the list.
5. Select the patient you want to start a study.
6. Select **Transfer** on the touch screen to transfer the selected study to the patient archive.

   NOTE

   Destination for transfer is always Local Archive HDD.

Locking a patient or study

To prevent deleting or moving patient data, use Lock functionality.

Locking the existing patient

1. Search and select a patient from the patient list.
2. Select **Lock** on the touch screen.
3. You can see the locked patient with the lock icon in the patient list.

   NOTE

   When you select a locked patient, you can see all of the studies are locked.

Locking the existing study

1. Select a study from the study list.
2. Select **Lock** on the touch screen.
3. You can see the locked study with the lock icon in the study list.

   NOTE

   To unlock the locked patient or study, select **Unlock** on the touch screen.

Deleting a patient or study

CAUTION

Before deleting a patient or study, make sure you have already backed up the patient data using Backup Patient Archive or export function. After deleting the patient or study, you CANNOT recover it.

NOTE

To select multiple patients from the patient list, press the **[Set]** key while the **[Ctrl]** or **[Shift]** key is pressed.

Deleting a patient

NOTE

To switch between the patient list and the study list, use **Patient List** or **Study List**.

1. Search and select a patient from the patient list.
2. Select **Delete** on the touch screen.
3. When the ***Message*** dialog box appears, click **Yes** to delete the selected patient.

NOTE

When the patient you want to delete is locked, you cannot delete the patient by using **Delete**. You have to unlock the locked patient before deleting it.

Deleting a study

1. Select a study from the study list.
2. Select **Delete** on the touch screen.
3. When the ***Message*** dialog box appears, click **Yes** to delete the selected study.

NOTE

When the study you want to delete is locked, you cannot delete the study by using **Delete**. You have to unlock the locked study before deleting it.

Ending a study

When you end a study, all images of the current study are saved in the local hard disk.

- Press the **[End Exam]** key on the control panel to save the current study.
- Press the **[End Exam]** key on the QWERTY keyboard to save the current study.
- You can also end a study by selecting **New Patient** on the ***Patient Registration*** screen.

NOTE

You can return to the ***Patient Registration*** screen after ending the current study. To configure, press the **[System Preset]** key and go to **System** > **General** > **After End Exam**.

4

Imaging Modes

This chapter describes the general functions of the imaging modes.

2D Mode 4-2

M Mode 4-18

Color Flow (CF) Mode 4-23

Power Doppler (PD) Mode 4-32

Pulsed Wave Doppler (PWD) Mode 4-38

Continuous Wave Doppler (CWD) Mode 4-47

Tissue Doppler Imaging (TDI) Mode 4-52

3D and 4D Modes 4-54

2D Mode

In 2D mode ultrasound, your transducer simultaneously scans a plane through the body that can be viewed as a two-dimensional image on the screen. Two-dimensional images and measurements of the anatomical structures of soft tissues such as internal organs and vascularities can be determined.

2D mode display



Figure 4-1 2D mode display

General workflow

To start a scan in 2D mode,

1. Press the **[2D]** key on the control panel to start 2D mode.
2. Use the following controls for image optimization:
   - **[2D]** key (rotate to adjust 2D mode gain)
   - **[Depth]** and **[Focus]** keys
   - **[TGC]** slide controls

   NOTE

   To reset the current image settings, press the **[Initial]** key on the QWERTY keyboard.
3. Use additional soft keys, if necessary.
4. To enter another imaging mode, press the corresponding mode key.
5. Press the **[2D]** key to return to 2D mode from another imaging mode.

Image optimization controls

Select an option on the touch screen, or rotate the corresponding soft key to select the following imaging functions.

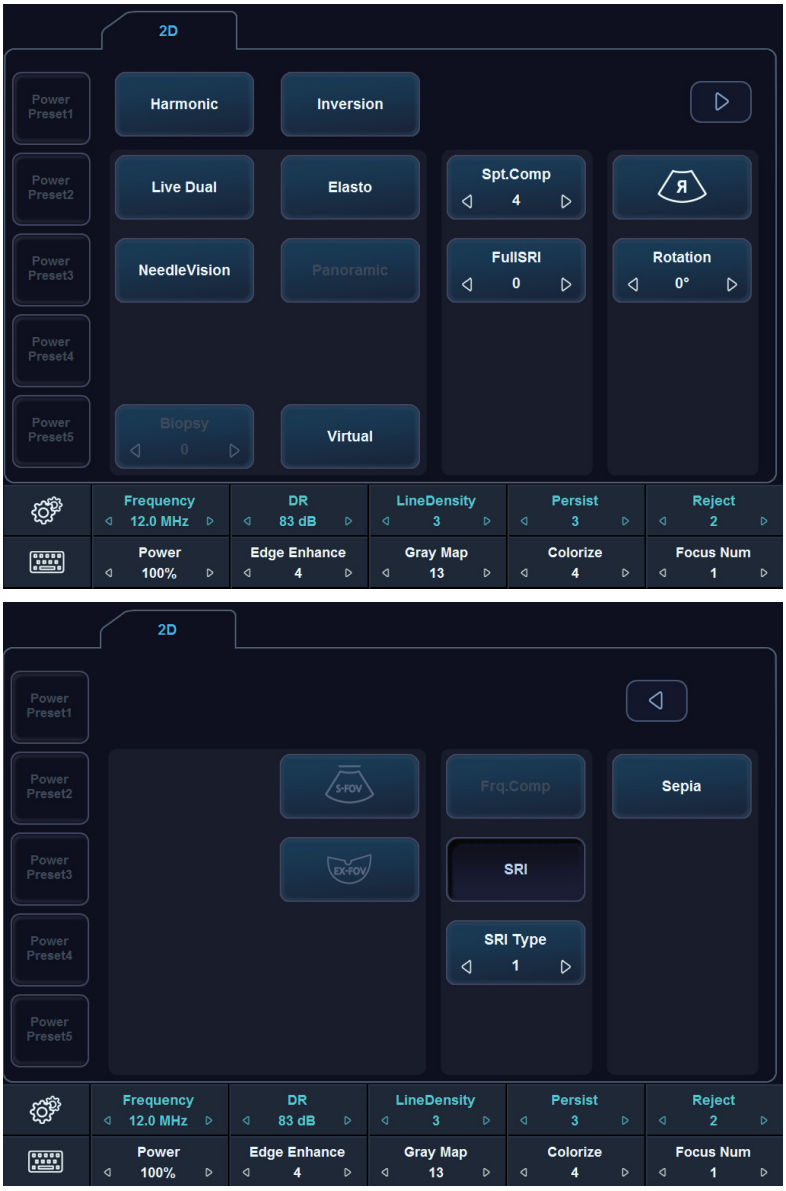


Figure 4-2 2D mode touch screen

Gain

Increase or decrease in the amount of echo information displayed in an image. It may have the effect of brightening or darkening the image if sufficient echo information is generated.

Adjusting the gain

Increase or decrease the sensitivity of the instrument. You can use two controls to adjust gain: The overall gain control and TGC. To increase or decrease overall gain, rotate the **[2D]** key on the control panel.

Gain values

Gain is shown as **Gn** on the display. Gain values may vary depending on the transducer, application, and frequency setting.

Gain values are returned to the factory or user preset value when you change one of the followings: Transducer, application, or new patient.

Remarks

Commonly, you need to decrease the gain when you increase the Power Output; to increase the gain, decrease the power output. Gain and TGC interact by adding together.

Depth

Increasing the depth enables the deeper structures to be visualized. You can decrease the depth if you do not need the bottom portion of the display.

Adjusting Depth

To increase or decrease the depth, rotate the **[Depth]** key clockwise or counter- clockwise on the control panel. You can see the display and image parameters are automatically changed.

Depth values

Maximum and minimum depth selections are dependent on the frequency of the transducer you are currently using.

NOTE

- You might adjust TGC and focus with depth adjustment. Adjusting depth erases real-time calculations of the graphic on the screen (but not the completed results on the worksheet page).
- Incrementing depth depends on what transducer and application you use. When you change the transducer, application, preset, or click **New Patient** on the ***Patient Registration*** screen, depth parameters are set to the factory or user preset settings.

Xpeed™

Xpeed™ is an auto-optimizing technology that enables you to easily adjust an image's the contrast resolution and brightness uniformity. For using this feature, you need an additional request to your local agent.

Adjusting Xpeed

To activate or deactivate Xpeed, press the **[Xpeed]** key on the control panel.

Time Gain Compensation (TGC)

To compensate for weak signals or over-bright signals at various depths, you can adjust Time Gain Compensation (TGC) using the TGC slide controls. The 2D control adjusts the overall receiver gain and compensates for the brightness of the image.

Adjusting the TGC

TGC slide control selectively adjusts the sensitivity (brightness) in depth.

– Slide the slide control to the left to decrease the gain in the corresponding specific 2D depth.

– Slide the slide control to the right to increase the gain in the corresponding specific 2D depth.

TGC values

TGC compensates for attenuation in tissue by increasing the receiver gain as a function of time following each transmit pulse.

Focus

Convex array, linear array, and phased array transducers support multiple transmit focus zones, which you can select in 2D-mode images. Focal zone markers display on the left side of the image screen.

Focus Num

Focus Num is used to control the number of focal points.

- **Adjusting Focus Num**

  To increase or decrease the number of focal zones, press the **[Focus]** key on the control panel and then rotate the key clockwise or counter-clockwise.

- **Focus Num values**

  Focal zone number may vary depending on the depth, zoom, transducer, application, and selected frequency setting. Focus Num values are returned to the factory or user preset value when you change one of the followings: Transducer, application, or new patient.

Focus Pos

Focus Pos is used to change the location of the focal point. A triangular focus marker indicates the depth of the focal point.

- **Adjusting the focus position**

  To move the focal zone to the near/far field, rotate the **[Focus]** key on the control panel.

- **Focus Pos values**

  Focal zone position may vary depending on the depth, zoom, transducer, application, and selected frequency setting.

Remarks

Using multiple focal zones causes a reduction in the frame rate. The amount of frame rate reduction depends on the depth of view and the transducer.

Harmonic

Tissue Harmonic Imaging (THI) is a system feature that can enhance the contrast resolution with fine tissue differentiation, benefiting patients with poor images. THI creates images from received signals using the harmonics of the transmitted frequency.

For certain applications, Filtered THI (FTHI) can be used to optimize temporal resolution. The frame rate of FTHI is higher than THI between similar images. To use the FTHI function, you need an additional request to your local agent.

Adjusting THI

To adjust THI,

1. Select **Harmonic** on the touch screen. **2D HAR** appears next to 2D image parameters.
2. To change the frequency of THI, rotate the **Frequency** soft key clockwise or counter-clockwise.
3. To exit THI, select **Harmonic** on the touch screen.

To adjust FTHI,

1. Select **Harmonic** on the touch screen. **2D HAR** appears next to 2D image parameters.
2. If **INV** appears next to 2D image parameters, select **Inversion** on the touch screen to switch to FTHI (HAR).
3. To change the frequency of FTHI, rotate the **Frequency** soft key clockwise or counter-clockwise.
4. To exit FTHI, select **Harmonic** on the touch screen.

Harmonic values

Changing multi-frequency resets those parameters which are presettable by frequency to their preset values for the current harmonic frequency. Multi frequency values are returned to the factory or user preset value when you change one of the followings: Transducer, application.

Dual/Quad Imaging

Using Dual (or Quad) imaging, you can view two (or four) images at the same time on the display. Dual or quad imaging is available in all 2D live imaging modes, M mode, Color Flow mode, and TDI mode.

Adjusting Dual/Quad imaging

To activate the image layout,

1. In 2D mode, Color Flow mode, or M mode imaging, press the **[Dual]** (or **[Quad]**) key on the control panel. The image is shown on the left of the display.
2. Press the **[Dual]** (or **[Quad]**) key again to activate the second image.
3. To switch between the two (or four) images, press the **[Dual]** (or **[Quad]**) key.
4. Press the **[2D]** key to exit the dual (or quad) imaging.

Priority

The priority function has the following two options: Width, Tilt

Width

Control the size or angle width of the 2D image sector. A smaller angle generally produces an image with a higher frame rate.

You can widen or narrow the size of the sector angle to maximize the image's region of interest (ROI).

- **Adjusting the width**
  To narrow or widen the ROI, press the **[Priority]** key on the control panel. **Width** is highlighted in the message line. Move **[Trackball]** left or right to decrease or increase the angle size. Then, press the **[Priority]** key to set the region of interest (ROI).
- **Width values**
  Width values may vary depending on the transducer (not applicable for linear transducers) and application.

Tilt

After the size or angle width of the 2D image sector is set, you can steer the image sector by using the tilt option. Press the **[Priority]** key to select the tilt function. Then move **[Trackball]** to tilt the angle.

NOTE

The priority function may not be available with linear transducers.

Up/Down (If Preset)

Up/Down allows you to flip the image 180 degrees up/down.

Adjusting the up/down

To flip the image vertically, press the **U/D Flip** key on user-defined key.

NOTE

To assign the Up/Down function to user-defined key, press the **[System Preset]** key and go to **User Setting** > **User Defined key** > **Assign User Key** or **Assign Numeric Key** and select the **U/D Flip**.

Up/Down values

Up/Down values may vary depending on the transducer and application. The values are returned to the factory or user preset value when you change one of the followings: Transducer, application, or new patient.

Angle Steer

In 2D mode, you can tilt an image left or right by using a linear transducer.

Adjusting the angle steer

To adjust the angle steer, rotate the **[Angle]** key clockwise or counter- clockwise on the control panel. The each level of the angle increment/decrement is 5 degrees.

NOTE

This function may not be available when the virtual convex function is applied to the current image.

Frequency

You can adjust the operating frequency of the transducer. The selected frequency is displayed in the Image Parameter.

Changing the frequency value on the display is selecting different transmit patterns associated with that value, including transmit pulse shape, frequency and transmit sequence.

Adjusting the frequency

To adjust the frequency, rotate the **Frequency** soft key clockwise or counter-clockwise.

NOTE

Changing the frequency may not be available when the image is frozen.

Frequency values

Frequency values may vary depending on the transducer and application.
The values are returned to the factory or user preset value when you change one of the followings: Transducer, application, or new patient.

Dynamic Range

Dynamic range is useful for optimizing tissue texture in different anatomy. Dynamic range should be adjusted so that the highest amplitude edges appear as white while lowest levels (such as blood) are just visible.

Adjusting the dynamic range

To adjust the dynamic range, rotate the **DR** soft key clockwise or counter-clockwise.

NOTE

When the dynamic range is set high, the image is softer and more low-level data is visible.

Dynamic Range values

Dynamic range values are 30 dB to 250 dB. Dynamic range operates in real-time, freeze, CINE, and CINE timeline, but is not available during the VCR playback. It also affects Gain.

Reject

Low echo information will not be displayed on the screen below the adjusted rejection level.

The rejection function determines the amplitude level below which echoes are suppressed (rejected). Rejection set to high leads to bad tissue display.

Adjusting the reject

To adjust the rejection values, rotate the **Reject** soft key clockwise or counter-clockwise.

NOTE

When you increase the rejection, low-level echoes are rejected and appear in the 2D image.

Rejection values

Rejection values are 0 to 10.

Live Dual

Live Dual is a feature that enables you to view the 2D image and activate other function at the same time.

The following combination imaging modes are available:

- 2D(BW), 2D(BW)
- 2D(BW), Color Flow(CF)
- 2D(BW), Power Doppler(PD)
- Color Flow(CF), 2D(BW)
- Power Doppler(PD), 2D(BW)

NOTE

You can set up the Live Dual Default Layout in Image preset menu. In Live Dual, the current imaging mode takes priority over the default layout values.

Adjusting the Live Dual

To activate Live Dual, select **Live Dual** on the touch screen. You can change the imaging mode by pressing the **[CF]** key or the **[PD]** key.

NOTE

Live Dual may not be available when the image is frozen or rotated 90/270 degrees.

Live Dual values

Live Dual values are On and Off.

Virtual Convex

On linear transducers, virtual convex provides a larger field of view in the far field.

Adjusting the virtual convex

To activate or deactivate the virtual convex, select **Virtual** on the touch screen.

Virtual convex values

Virtual convex values are On and Off. Virtual convex allows for a wider field of view. This is available in 2D mode, Color Flow mode, and Doppler mode.

Sepia

Sepia function is used to activate the sepia map.

Adjusting the sepia

To activate or deactivate the sepia map, select **Sepia** on the touch screen.

Sepia values

Sepia values are On and Off.

Needle Vision™ Plus

Needle Vision™ Plus is a needle enhancement feature that can enhance viewing of the needle to assist you in guiding the needle to the target anatomy. For using this feature, you need an additional request to your local agent.

NOTE

See "Needle Vision™ Plus" on page 1-16 for more information.

Adjusting Needle Vision™ Plus

To activate or deactivate Needle Vision™ Plus,

1. Select **NeedleVision** on the touch screen.
2. Adjust the image parameters to obtain an optimized image.
3. To exit Needle Visions™ Plus, select **OFF** on the touch screen.

Needle Vision™ Plus values

Needle Vision™ Plus values are Shallow, Medium, and Steep.

NOTE

The Needle Vision™ values are On and Off.

Elastography

Elastography is a technique that adds value to the sonographic examination by enabling you to evaluate the stiffness of tissue. For using this feature, you need an additional request to your local agent.

NOTE

See "Elastography" on page 1-18 for more information.

Adjusting Elastography

To activate or deactivate Elastography,

1. Select **Elasto** on the touch screen. The system displays two images on the screen in a live, dual format.
2. Perform the scan. Proper manual compression/decompression is displayed by the colored strain map.
3. Adjust the image parameters to obtain an optimized image.
4. When you have finished acquiring an image, press the **[Freeze]** key on the control panel.
5. If necessary, press the **[P1]** key to save the image.
6. To perform a measurement, press the **[Measure]** key on the control panel.
7. Estimate the size and hardness of lesions.
8. To exit the Elastography mode, select **Exit** on the touch screen.

Elastogralhy values

Elastography values are On and Off.

Panoramic

The Panoramic feature extends your field of view by piecing together multiple 2D images into a single, extended 2D image. For using this feature, you need an additional request to your local agent.

CAUTION

The quality of the resulting image is user-dependent and requires some additional skill and practice to develop proper technique and become fully proficient. Therefore, the measurement results may be inaccurate. Before using the Panoramic imaging feature, be sure to read and understand the instructions. See "Panoramic Imaging" on page 1-12 for more information.

Adjusting the panoramic

To activate or deactivate Panoramic function,

1. Select **Panoramic** on the touch screen. You can access the Panoramic setup mode, and the blue-colored ROI appears.
2. Press the **[Set]** key to start the image acquisition.
3. Move the transducer linearly along the scan path.

   NOTE

   To acquire an optimal image, move the transducer slowly and steadily.
4. When you have finished acquiring an image, press the **[Freeze]** key on the control panel.
5. Adjust the image parameters to optimize the image, if necessary.
6. Press the **[Measure]** key to perform a measurement.
7. Press the **[P1]** key to save the image.
8. To exit the Panoramic imaging mode, press the **[2D]** key or select **Exit** on the touch screen.

NOTE

- When the panoramic feature is activated, you may not use the following imaging functions: Spatial compound, Virtual convex, Persist.
- For linear transducers, errors of the distance measurements may be within 5%.

S-FOV (Selected FOV)

On convex transducers, S-FOV provides larger field of view in the far field.

Adjusting the S-FOV

To activate or deactivate S-FOV, select  on the touch screen.

EX-FOV (Extended FOV)

On endocavity transducers, EX-FOV provides wide angle field of view.

Adjusting the EX-FOV

To activate or deactivate EX-FOV, select  on the touch screen.

Reverse

Reverse allows you to flip the image 180 degrees left/right.

Adjusting the reverse

To flip the image horizontally, select  on the touch screen or press the Я key on the QWERTY keyboard.

Gray Map

Gray Map provides you with the system maps for 2D, M, and Doppler modes.

Adjusting the gray map

To adjust the gray map, rotate the **Gray Map** soft key to clockwise or counter-clockwise.

Gray Map values

Gray maps gradually change from the least contrasty or softest to the most contrasty. Gray Map values may vary depending on the transducer.

Colorize

Colorize is the colorization of a conventional 2D mode image or Doppler Spectrum to enhance the user's ability to discern 2D mode, M mode, and Doppler mode intensity valuations. Colorize is NOT a Doppler mode.

Adjusting the colorize

To adjust the colorize, rotate the **Colorize** soft key clockwise or counter-clockwise.

Colorize values

Colorize values are 0 to 42.

Rotation

In 2D mode, you can rotate an image clockwise by 90 degrees.

Adjusting the rotation

To adjust the rotation, select **<** or **>** of **Rotation** on the touch screen.

Rotation values

Rotation values are 0, 90, 180, and 270.

Persist

Persistence provides a visible smoothing effect to the 2D-mode image by persisting lines of image data for each frame of imaging.

Adjusting the persist

To adjust the persist, rotate the **Persist** soft key clockwise or counter-clockwise.

Persist values

Persist values may vary depending on the transducer and application. The values are returned to the factory or user preset value when you change one of the followings: Transducer, application, or new patient.

Power

Power controls the amount of acoustic power applied in all modes.

Adjusting the power

To adjust the power, rotate the **Power** soft key clockwise or counter-clockwise.

Power values

Power values are 1 to 100.

SRI

Speckle Reduction Imaging (SRI) is a smart solution that enables you to reduce unnecessary elements of your image such as speckles and image noises. SRI is useful when unnecessary elements interfere with the desired image detail. After applying SRI, you can view your image more smoothly. The SRI feature is available in 2D, 3D, and 4D modes.

Adjusting SRI

To activate or deactivate SRI, select **SRI** on the touch screen.

SRI values

SRI values are On and Off.

Edge Enhance

Edge Enhance demonstrates subtle tissue differences and boundaries by enhancing the gray scale differences corresponding to the edges of structures. This function allows your system to display the outline of tissues or an organ more clearly.

Adjusting the edge enhance

To adjust the edge enhance, rotate the **Edge Enhance** soft key clockwise or counter-clockwise.

NOTE

Edge Enhance may not be available in freeze mode or in CINE mode.

Edge enhance values

Edge enhance values are 0 to 10.

Full SRI™

Full SRI™ is a more powerful SRI feature that allows you to adjust the SRI level according to your image condition or imaging mode. The full SRI feature is available in 2D, 3D, and 4D modes. For using this feature, you need an additional request to your local agent.

Adjusting the full SRI

To adjust the full SRI, select **<** or **>** of **FullSRI** on the touch screen.

Full SRI values

Full SRI values are 0 to 5.

Spatial Compound

Spatial compound allows you to combine different steering frames to form a single frame at real-time frame rates.

Adjusting the spatial compound

To adjust the spatial compound, select **<** or **>** of **Spt.Comp** on the touch screen.

Spatial compound values

Spatial compound values may vary depending on the transducer and application. The values are returned to the factory or user preset value when you change one of the followings: Transducer, application, or new patient.

NOTE

The spatial compound function may not be available with phased array transducers.

Line Density

Line density optimizes 2D mode frame rate or spatial resolution for the best possible image. A lower line density is useful in fetal heart beat, adult cardiac applications and in clinical Radiology applications requiring significantly higher frame rates. A higher line density is useful in obtaining very high resolution (e.g. thyroid, testicles).

Adjusting the line density

Line density changes the vector density and frame rate. To adjust the line density, rotate the **LineDensity** soft key clockwise or counter-clockwise.

Line density values

Line density values may vary depending on the transducer and application. The values are returned to the factory or user preset value when you change one of the followings: Transducer, application, or new patient. A lower line density is useful in fetal heart beat, and adult cardiac.

Frequency Compound

Frequency compound allows your system to compound images on between high and low frequencies. By using each imaging feature on different frequencies, you can obtain a better image of enhanced resolution and penetration.

Adjusting the frequency compound

To activate or deactivate the frequency compound, select **Frq.Comp** on the touch screen.

Frequency compound values

Frequency compound values are On and Off.

M Mode

The M mode display is formed by using a stationary ultrasound beam, yielding distance/motion versus time information for reflections along a single ultrasound beam line. M mode provides a display format and measurement capability that represents tissue displacement (motion) occurring over time along a single vector.

In M mode, you can learn the movement of an area of anatomy. First, you position the M-line in the 2D image on the anatomy of Interest. Then you can display information about movement along that line in M mode trace. M mode trace can be helpful when you perform measurements, especially measuring the heart rate.

M mode display

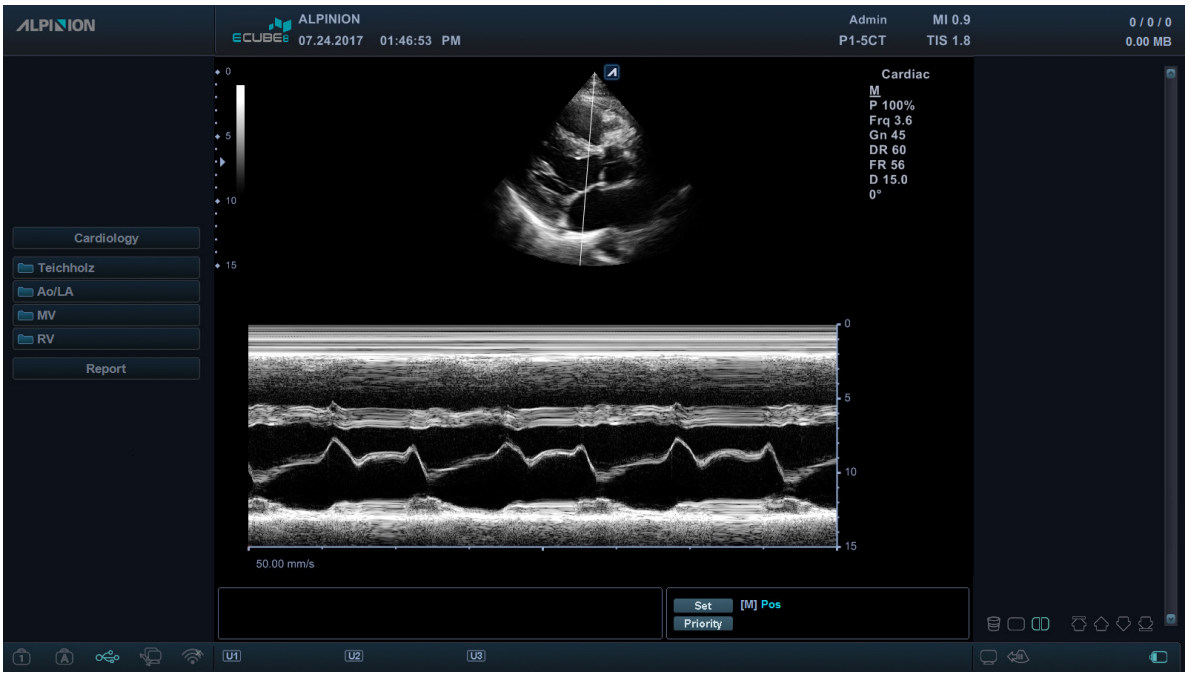


Figure 4-3 M mode display

General workflow

1. On the control panel, press the **[M]** key to activate M mode.
2. Move the M-line to the anatomy of interest by using **[Trackball]**.
3. Rotate the **[M]** key to change the initial gain for M mode.
4. To change the sweep speed, select **<** or **>** of **Sweep** on the touch screen.
5. To review the M mode trace, press the **[Freeze]** key, and use **[Trackball]** to scroll forward or backward.
6. To exit M mode, press the **[2D]** key.

Image optimization controls

Select an option on the touch screen, or rotate the corresponding soft key to select the following imaging functions.



Figure 4-4 M mode touch screen

Gain

With the Gain control, you can adjust the brightness of M mode image. The adjustment of the Gain control determines the amount of amplification applied to the received echoes. All received echoes are amplified with the same gain value regardless of the scan depth. The M Gain function influences the M trace only.

To adjust the brightness of the entire image, rotate the **[M]** key on the control panel.

- Rotate the **[M]** key clockwise to increase the brightness.
- Rotate the **[M]** key counter-clockwise to decrease the brightness.

Frequency

In Multi-frequency mode, you can change the frequency of the transducer. The frequency function is the same as the one in 2D mode. For adjusting the frequency, see "Frequency" on page 4-9.

TGC Slide Controls

In M mode, the TGC slide controls have the same functions in 2D mode. See "Time Gain Compensation (TGC)" on page 4-5 for more information.

Depth

In M mode, the depth function is the same as the one in 2D mode. See "Depth" on page 4-5 for more information.

CINE

In M mode, image trace information can be recalled. When freezing an image, a certain time frame (M information of the last examination sequence) is stored in the loop memory. The sequence can be reviewed second by second.

Sweep Speed

During M mode imaging, you can adjust the sweep speed of the display.

Adjusting the sweep speed

To increase or decrease the sweep speed, select **<** or **>** of **Sweep** on the touch screen.

Sweep speed values

Sweep speed values are 0 to 6.

Remarks

You can speed up or slow down the timeline to see more or fewer occurrences over time.

Full Timeline

Full timeline expands the display to full timeline display.

Adjusting the full timeline

To activate or deactivate the full timeline, select **Full M** on the touch screen.

Full timeline values

Full timeline values are On and Off.

Display Format

Display Format changes the horizontal/vertical layout between 2D mode and Doppler mode or timeline only. You can select how to have your Doppler time line and anatomy displayed.

Adjusting the display format

To adjust the display format, select **<** or **>** of **Display Format** on the touch screen.

NOTE

This function can not be adjusted when Full M is activated.

Display format values

Display format values are as follows: Vert. 1:1, Vert. 1:2, Vert. 2:1, Horiz. 1:1, Horiz. 1:2, Horiz. 2:1.

Reject

Low echo information will not be displayed on the screen below the adjusted rejection level.

The rejection function determines the amplitude level below which echoes are suppressed (rejected). Rejection set to high leads to bad tissue display.

For adjusting the rejection, see "Reject" on page 4-10.

Power

Power controls the amount of acoustic power applied in all modes. For adjusting the power, see "Power" on page 4-15.

Dynamic Range

Dynamic range is useful for optimizing tissue texture in different anatomy. Dynamic range should be adjusted so that the highest amplitude edges appear as white while lowest levels (such as blood) are just visible. For adjusting the dynamic range, see "Dynamic Range" on page 4-9.

Gray Map

Gray Map provides you with the system maps for 2D, M, and Doppler modes. For adjusting the gray map, see "Gray Map" on page 4-14.

Colorize

Colorize is the colorization of a conventional 2D mode image or Doppler Spectrum to enhance the user's ability to discern 2D mode, M mode, and Doppler mode intensity valuations. Colorize is NOT a Doppler mode. For adjusting the colorize, see "Colorize" on page 4-14.

M mode zoom

When the system is in M mode, you can magnify a portion of the reference image using M mode zoom function.

To adjust the M mode zoom,

1. In M mode or 2D mode with the M-line displayed, press the **[Zoom]** key on the control panel to activate Write zoom. To activate Read zoom, rotate the **[Zoom]** key.
2. Use **[Trackball]** to position the zoom box and M line in the zoomed image, and press the **[Set]** key.
3. Use **[Trackball]** to adjust the size of the zoom box, and press the **[Set]** key.
4. To zoom out, press the **[Exit]** key.

Anatomical M mode

Anatomical M mode allows you to move or rotate an M line and review an image on the desired region. For using this feature, you need an additional request to your local agent.

To activate Anatomical M mode,

1. In M mode, select **Anatomical M** on the touch screen.
   The cursor line of the Anatomical M mode appears in the middle of a 2D image.
2. Use **[Trackball]** to move the cursor line (left/right/up/down).
3. Rotate the **[Angle]** key on the control panel to rotate the angle.

M color mode

M color mode is a combination mode of M mode and Color Flow mode which color flow information overlays the M mode image by using the velocity and color map. The color flow wedge is shown on the M-mode timeline. The color map in this mode is the same as in Color Flow mode, but the size and position of the color flow window depends on the 2D mode image.

To activate M color mode,

1. Press the **[M]** key, and then press the **[CF]** key.
2. To switch to Color Flow mode, press the **[M]** key.
   To return to M color mode, press the **[M]** key again.

Color Flow (CF) Mode

Color Flow mode is useful when you see the flow in a broad area. Color flow allows visualization of the flow in the CF ROI whereas Doppler mode provides spectral information in a smaller area.

Color Flow mode is also used as a stepping stone to Doppler mode. Use Color Flow mode to locate flow and vessels before activating Doppler mode.

CF mode display

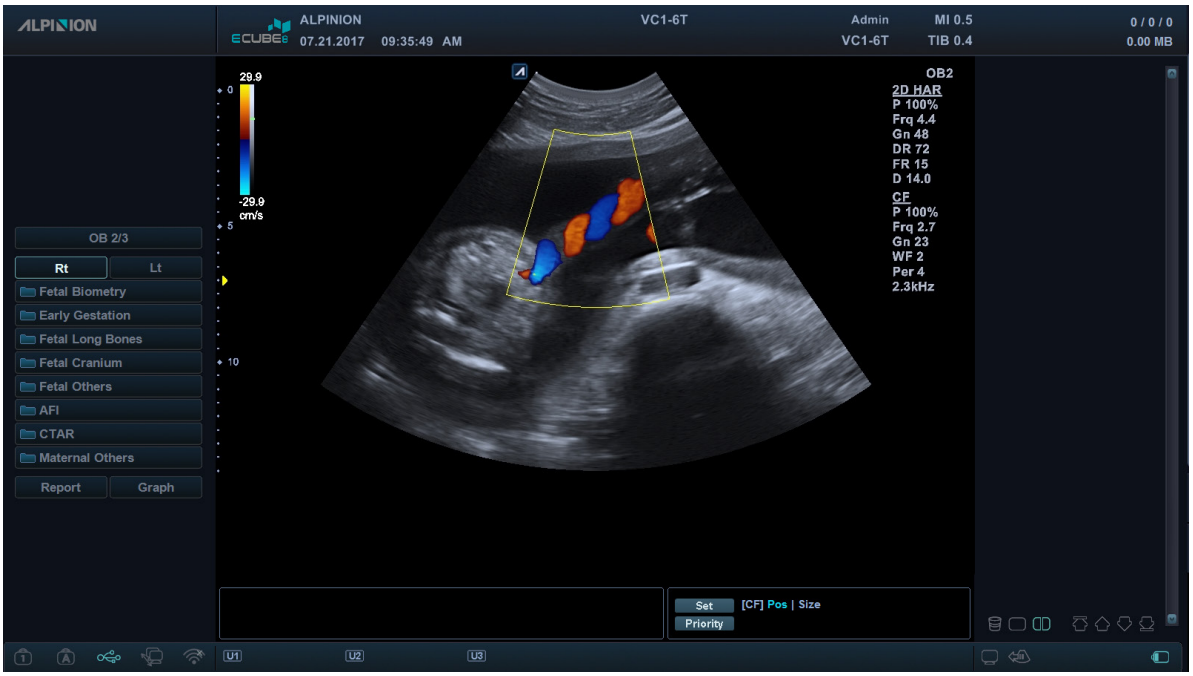


Figure 4-5 CF mode display

General workflow

1. Press the **[CF]** key on the control panel. The CF window appears over the 2D mode image.
2. Move the cursor to the CF window by using **[Trackball]**.
3. Use **[Trackball]** to change the position of the color ROI.
4. Press the **[Set]** key and use **[Trackball]** to change the size of the color ROI.
5. Press the **[Set]** key to move the color ROI to the left or right.
6. Press the **[Freeze]** key to hold the image in the memory.
7. Record color flow images, if necessary.
8. To exit Color Flow mode, press the **[CF]** or **[2D]** key.

The combination imaging modes of Color Flow mode and Power Doppler mode

The following combination imaging modes are available:

- 2D mode with Color Flow or Power Doppler
- 2D mode with color and zoom
- 2D/Doppler mode with Color Flow or Power Doppler

Color flow imaging parameters

Use the ultrasound system controls and soft key selections to change the settings for imaging parameters. The system increases the lighting intensity of the control or key associated with the active function.

Positioning, sizing, and steering the ROI

When you press the **[CF]** key in 2D mode, the color window or ROI appears on the image.

The initial location and the shape of the window depend on the active transducer and default imaging depth.

Changing the size and position of the color ROI

1. Press the **[CF]** key on the control panel. The system places the ROI, outlined in solid yellow, on the image.
2. Use **[Trackball]** to reposition the ROI.
3. To resize the ROI, press the **[Set]** key and move **[Trackball]**. The system outlines the ROI with a dotted yellow line with solid corners.
4. Press the **[Set]** key to set the size.
5. To exit Color Flow mode, press the **[CF]** or **[2D]** key.

Image optimization controls

Select an option on the touch screen, or rotate the corresponding soft key to select the following imaging functions.



Figure 4-6 CF mode touch screen

Gain

Gain amplifies the overall strength of echoes processed in the Color Flow window or spectral Doppler timeline.

Adjusting the Gain

– Rotate the **[CF]** key clockwise to increase the gain; rotate the key counter- clockwise to decrease the gain.

– Rotate the **[CF]** key to adjust the receive gain for color without affecting the 2D mode image gain.

Gain values

Gain values may vary by transducer, application, and multi-frequency setting. Gain value is shown as **Gn** on the display. Gain values are returned to the factory or user preset value when you change one of the followings: Transducer, application, or new patient.

Frequency

In Multi-frequency mode, you can change the frequency of the transducer. The frequency function is the same as the one in 2D mode. For adjusting the frequency, see "Frequency" on page 4-9.

PRF (Pulse Repetition Frequency)

PRF function is used to adjust the velocity scale to accommodate faster/slower blood flow velocities. Velocity scale determines the pulse repetition frequency (PRF).

Adjusting the PRF

To raise or lower the velocity scale, rotate the **PRF** soft key clockwise or counter-clockwise.

PRF values

PRF values may vary depending on the transducer and application. The values are returned to the factory or user preset value when you change one of the followings: Transducer, application, or new patient. PRF is in kHz.

Ensemble

Ensemble allows you to select the density of the scan line. With increasing the number of ensemble, the frame rate decreases.

Adjusting the ensemble

To adjust the ensemble, rotate the **Ensemble** soft key clockwise or counter-clockwise.

Ensemble values

Ensemble values are 6 to 16.

Persist

Persistence provides a visible smoothing effect to the 2D-mode image by persisting lines of image data for each frame of imaging. For adjusting the persist, see "Persist" on page 4-15.

Wall Filter

Wall filter filters out clutter signals caused from vessel movement.

Adjusting the wall filter

To raise or lower the wall filter, rotate the **WF** soft key clockwise or counter-clockwise.

Wall filter values

Wall filter values may vary depending on the transducer and application. The values are returned to the factory or user preset value when you change the following: Transducer, application, new patient.

Power

Power controls the amount of acoustic power applied in all modes. For adjusting the power, see "Power" on page 4-15.

Smooth

Smooth allows you to make a color image smoother by enhancing connection in the axial direction.

Adjusting the smooth

To adjust the smooth, rotate the **Smooth** soft key to clockwise or counter-clockwise.

Smooth values

Smooth values are 0 to 10.

Color Map

Color Map allows you to change the color map used for Color Flow mode, Power Doppler mode and Tissue Doppler Imaging mode.

Adjusting the color map

To adjust the color map, rotate the **Color Map** soft key clockwise or counter-clockwise.

Color map values

Color map values are 0 to 26.

Baseline

Baseline adjusts the Color Flow or Doppler spectrum baseline to accommodate higher velocity blood flow to eliminate aliasing.

Baseline adjusts the alias point. The default baseline is at the midpoint of the spectrum.

Adjusting the baseline

To adjust the baseline, rotate the **Baseline** soft key.

Baseline values

Zero velocity follows the baseline. The total scale range remains the same. Values may vary by transducer and application. Baseline values are returned to the factory or user preset value when you change one of the followings: Transducer, application, or new patient.

Threshold

Threshold assigns the grayscale level at which color information stops.

Adjusting the threshold

To increase or decrease the grayscale threshold, rotate the **Threshold** soft key clockwise or counter-clockwise.

Threshold values

Threshold values may vary depending on the transducer and application. The values are returned to the factory or user preset value when you change one of the followings: Transducer, application, or new patient.

TDI

TDI switches to Tissue Doppler Imaging (TDI) mode. For more information on Tissue Doppler Imaging (TDI), see "Tissue Doppler Imaging (TDI) Mode" on page 4-52.

Adjusting the TDI

To switch to TDI mode, select **TDI** on the touch screen.

Live Dual

Live Dual is a feature that enables you to view the 2D image and activate other function at the same time. For activating or adjusting the Live Dual, see "Live Dual" on page 4-10.

Adaptive Blend

Adaptive Blend superimposes a translucent color image over a 2D image in the color image area. You can adjust the transparency of the color image (easily, rapidly) to demonstrate the tissues behind the color.

Adjusting the adaptive blend

To activate or deactivate this function, select **Adaptive Blend** on the touch screen.

Adaptive blend values

Adaptive blend values are On and Off.

Remarks

If you activate this function, **Adaptive Level** soft menu is enabled on the touch screen.

Adaptive Blend Level

Adaptive Blend Level allows you to specify the blending ratio between the 2D image and the color image.

Adjusting the adaptive blend level

To adjust this function, select **<** or **>** of **Adaptive Level** on the touch screen.

Adaptive blend level values

Adaptive blend level values are 1 to 25.

Remarks

A lower value gives the 2D image greater prominence.

Blend

Blend superimposes a translucent color image over a 2D image in the color image area. You can adjust the transparency of the color image to demonstrate the tissues behind the color.

Adjusting the blend

To activate or deactivate this function, select **Blend** on the touch screen.

Blend values

Blend values are On and Off.

Remarks

If you activate this function, **Blend Level** soft menu is enabled on the touch screen.

Blend Level

Blend Level allows you to specify the blending ratio between the 2D image and the color image.

Adjusting the blend level

To adjust this function, select **<** or **>** of **Blend Level** on the touch screen.

Blend level values

Blend level values are 1 to 25.

Remarks

A lower value gives the 2D image greater prominence.

Flow State

Flow State adjusts the PRF of the color image.

Adjusting the flow state

To adjust this function, select **<** or **>** of **Flow State** on the touch screen.

Flow state values

Flow state values are Low, Mid, and High. The flow state values may vary depending on the transducer and application.

Color Only

Color Only function hides the 2D image from the display so that you can see the color image only.

Adjusting the color only

To activate or deactivate the color only function, select **ColorOnly** on the touch screen.

Color only values

Color only values are On and Off.

Hide Color

Hide Color function hides the color image from the display so that you can see the 2D image only.

Adjusting the hide color

To activate or deactivate the hide color, select **Hide Color** on the touch screen.

Hide color values

Hide color values are On and Off.

Line Density

Line density optimizes the Color Flow mode frame rate or spatial resolution for the best possible color image. A lower line density is useful in fetal heart beat, adult cardiac applications and in clinical Radiology applications requiring significantly higher frame rates. A higher line density is useful in obtaining very high resolution (e.g. thyroid, testicles).

Adjusting the line density

To adjust the line density, select **<** or **>** of **LineDensity** on the touch screen.

Line density values

Line density values may vary depending on the transducer and application. The values are returned to the factory or user preset value when you change one of the followings: Transducer, application, or new patient. A lower line density is useful in fetal heart beat, and adult cardiac.

Invert (Color Invert)

Invert allows you to view blood flow from a different perspective, e.g., red away (negative velocities) and blue toward (positive velocities). You can invert a real-time or frozen image.

NOTE

- Invert reverses the color map, NOT the color scale.
- While viewing an inverse image, be careful not to confuse over scan direction or left/right image reversal.

Adjusting the invert

To reverse the color flow, select **Invert** on the touch screen.
In Triplex mode, both Color Flow and Doppler mode velocity scales are inverted.

Invert values

Invert values are On and Off.

Angle Steer

You can tilt the ROI of the color flow image to the left or right by using a linear transducer.

Adjusting the angle steer

On the control panel, rotate the **[Angle]** key clockwise or counter-clockwise. The each level of the angle increment/decrement is 5 degrees.

NOTE

This function may not be available when the virtual convex function is applied to the current image.

Power Doppler (PD) Mode

Power Doppler imaging is another way of color flow mapping technology which maps the strength of the Doppler signal from the blood flow. Power Doppler mode, unlike Color flow mode, displays color flow imaging by using the number of reflectors that are moving. Therefore, this mode has no aliasing and is able to measure the slow blood flow.

PD mode display

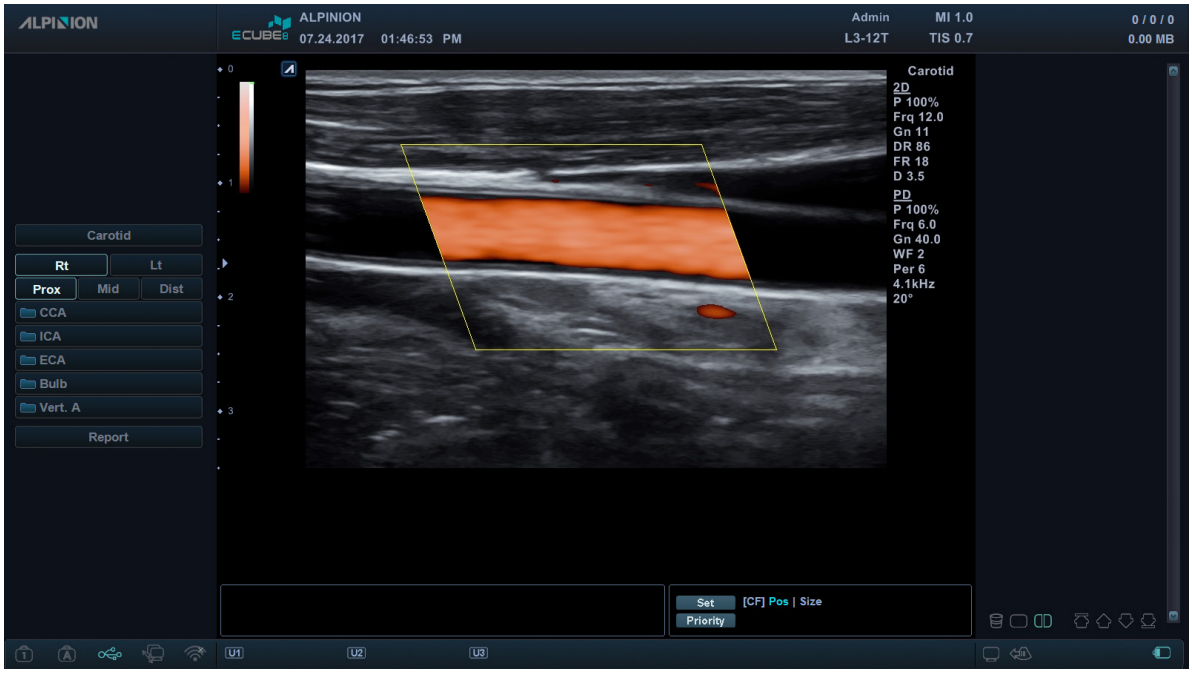


Figure 4-7 PD mode display

General workflow

1. Press the **[PD]** key on the control panel. The Power Doppler window appears over the 2D mode image.
2. Use **[Trackball]** to change the position of the color box.
3. Press the **[Set]** key and use **[Trackball]** to change the size of the color box.
4. Press the **[Set]** key.
5. Press the **[Freeze]** key to hold the image in the memory.
6. Record color flow images, if necessary.
7. To exit Power Doppler mode, press the **[PD]** key or the **[2D]** key.

Image optimization controls

Select an option on the touch screen, or rotate the corresponding soft key to select the following imaging functions.



Figure 4-8 PD mode touch screen

Gain

Gain amplifies the overall strength of echoes processed in the Color Flow window or spectral Doppler timeline.

Adjusting the Gain

– Rotate the **[CF]** key clockwise to increase the gain; rotate the key counter- clockwise to decrease the gain.

– Rotate the **[CF]** key to adjust the receive gain for color without affecting the 2D mode image gain.

Gain values

Gain values may vary by transducer, application, and multi-frequency setting. Gain value is shown as **Gn** on the display. Gain values are returned to the factory or user preset value when you change one of the followings: Transducer, application, or new patient.

Frequency

In Multi-frequency mode, you can change the frequency of the transducer. The frequency function is the same as the one in 2D mode. For adjusting the frequency, see "Frequency" on page 4-9.

PRF (Pulse Repetition Frequency)

PRF function is used to adjust the velocity scale to accommodate faster/slower blood flow velocities. Velocity scale determines the pulse repetition frequency (PRF). For adjusting the PRF, see "PRF (Pulse Repetition Frequency)" on page 4-26.

Ensemble

Ensemble allows you to select the density of the scan line. With increasing the number of ensemble, the frame rate decreases. For adjusting the ensemble, see "Ensemble" on page 4-26.

Persist

Persistence provides a visible smoothing effect to the 2D-mode image by persisting lines of image data for each frame of imaging. For adjusting the persist, see "Persist" on page 4-15.

Wall Filter

Wall filter filters out clutter signals caused from vessel movement. For adjusting the wall filter, see "Wall Filter" on page 4-26.

Power

Power controls the amount of acoustic power applied in all modes. For adjusting the power, see "Power" on page 4-15.

Smooth

Smooth allows you to make a color image smoother by enhancing connection in the axial direction. For adjusting the smooth, see "Smooth" on page 4-27.

Color Map

Color Map allows you to change the color map used for Color Flow mode and Power Doppler mode. Color map values are 0 to 28. For adjusting the color map, see "Color Map" on page 4-27.

Baseline

Baseline adjusts the Color Flow or Doppler spectrum baseline to accommodate higher velocity blood flow to eliminate aliasing.

Baseline adjusts the alias point. The default baseline is at the midpoint of the spectrum.

For adjusting the baseline, see "Baseline" on page 4-27.

Threshold

Threshold assigns the grayscale level at which color information stops. For adjusting the threshold, see "Threshold" on page 4-28.

TDI

TDI switches to Tissue Doppler Imaging (TDI) mode. For more information on Tissue Doppler Imaging (TDI), see "Tissue Doppler Imaging (TDI) Mode" on page 4-52.

Adjusting the TDI

To switch to TDI mode, select **TDI** on the touch screen.

Live Dual

Live Dual is a feature that enables you to view the 2D image and activate other function at the same time. For activating or adjusting the Live Dual, see "Live Dual" on page 4-10.

Directional power Doppler Imaging (DPDI)

DPDI (Directional power Doppler Imaging) function shows information on the intensity and direction of blood flow.

Adjusting the DPDI

To activate or deactivate this function, select **DPDI** on the touch screen.

DPDI values

DPDI values are On and Off.

Blend

Blend superimposes a color image over a 2D image in the color image area.

Adjusting the blend

To activate or deactivate this function, select **Blend** on the touch screen.

Blend values

Blend values are On and Off.

Remarks

If you activate this function, **Blend Level** soft menu is enabled on the touch screen.

Blend Level

Blend Level allows you to specify the blending ratio between the 2D image and the color image.

Adjusting the blend level

To adjust this function, select **<** or **>** of **Blend Level** on the touch screen.

Blend level values

Blend level values are 1 to 25.

Remarks

A lower value gives the 2D image greater prominence.

Flow State

Flow State adjusts the PRF of the color image.

Adjusting the flow state

To adjust this function, select **<** or **>** of **Flow State** on the touch screen.

Flow state values

Flow state values are Low, Mid, and High. The flow state values may vary depending on the transducer and application.

Color Only

Adjusting the color only

To activate or deactivate the color only function, select **ColorOnly** on the touch screen.

Color only values

Color only values are On and Off.

Hide Color

Hide Color hides the color bar and the ROI box from the screen.

Adjusting the hide color

To activate or deactivate the hide color, select **Hide Color** on the touch screen.

Hide color values

Hide color values are On and Off.

Line Density

Line density optimizes the Color Flow mode frame rate or spatial resolution for the best possible color image. A lower line density is useful in fetal heart beat, adult cardiac applications and in clinical Radiology applications requiring significantly higher frame rates. A higher line density is useful in obtaining very high resolution (e.g. thyroid, testicles). For adjusting the line density, see "Line Density" on page 4-30.

Invert (Color Invert)

Invert allows you to view blood flow from a different perspective, e.g., red away (negative velocities) and blue toward (positive velocities). You can invert a real-time or frozen image. For activating or deactivating the invert, see "Invert (Color Invert)" on page 4-31.

Angle Steer

In Power Doppler mode, you can tilt an image left or right by using a linear transducer.

Adjusting the angle steer

To adjust the angle steer, rotate the **[Angle]** key clockwise or counter-clockwise. The each level of the angle increment/decrement is 3 or 5 degrees depending on the linear transducer type.

NOTE

This function may not be available when the virtual convex function is applied to the current image.

Pulsed Wave Doppler (PWD) Mode

Pulsed Wave Doppler (PWD) is a Doppler mode that measures velocity in a PW sample volume and displays that information in a spectral trace with an audio output.

Doppler is intended to provide measurement data concerning the velocity of moving tissues and fluids. PW Doppler lets you examine the blood flow data selectively from a small region called the sample volume.

Doppler equipment is commonly used for detecting and evaluating the blood flow in arteries and veins. The Doppler effect is used in medical ultrasound to detect moving reflectors and to measure and characterize the blood flow.

PWD mode display

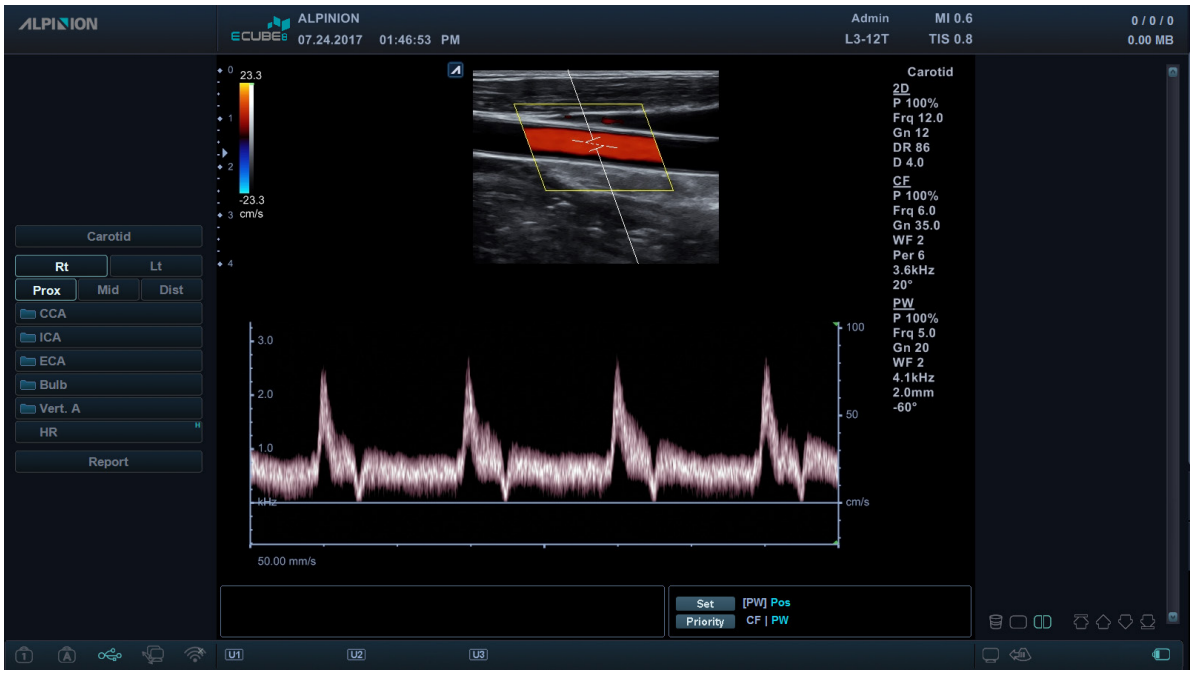


Figure 4-9 PWD mode display

General workflow

1. In 2D mode, press the **[PW]** key on the control panel.
2. Adjust the position and the size of the sample volume.
3. To change the sample volume size, select **SV** on the touch screen.
4. To adjust the angle-to-flow correction, rotate the **[Angle]** key on the control panel.
5. To change the sweep speed, select **Sweep** on the touch screen.
6. To exit PW Doppler mode, press the **[PW]** or **[2D]** key.

Image optimization controls

Select an option on the touch screen, or rotate the corresponding soft key to select the following imaging functions.



Figure 4-10 PWD mode touch screen

PW Doppler angle

Angle between the direction of reflector motion and the direction of propagation of the ultrasound beam.

PW Doppler effect

Phenomenon whereby there is a change in the perceived frequency of a sound source relative to the transmitted frequency when there is a relative motion between a sound source and the listener.

Angle Correct

Estimate the flow velocity in a direction at an angle to the Doppler vector by computing the angle between the Doppler vector and the flow to be measured.

NOTE

When the Doppler mode cursor and angle correct indicator are aligned (the angle is 0), you cannot see the angle correct indicator.

Adjusting the angle correct

Flow toward the transducer is mapped above the baseline and vice versa.

To adjust the angle relative to the transducer face, rotate the **[Angle]** key on the control panel. The velocity scale changes when you adjust angle correct.

Angle correct values

Angle correct values are -89 to 89.

Frequency

In Multi-frequency mode, you can change the frequency of the transducer. The frequency function is the same as the one in 2D mode. For adjusting the frequency, see "Frequency" on page 4-9.

PRF (Pulse Repetition Frequency)

PRF function is used to adjust the velocity scale to accommodate faster/slower blood flow velocities. Velocity scale determines the pulse repetition frequency (PRF). For adjusting the PRF, see "PRF (Pulse Repetition Frequency)" on page 4-26.

HPRF (High Pulse Repetition Frequency)

High Pulse Repetition Frequency (HPRF) is a special operating mode of PW Doppler. HPRF function 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 selected PW Doppler scale.

Activating HPRF (High PRF)

The system automatically switches to HPRF mode when the velocity scale factor or sample volume gate depth exceeds certain limits. When HPRF function is activate, multiple sample volume gates appear on the Doppler mode cursor.

NOTE

To set the system automatically switch to HPRF mode, press the **[Image Preset]** key and select the **HPRF Enable** check box.

Remarks

Make sure that more than two sample volume gates are not located in a blood vessel. If the sample volume gates are placed together in the same area, all Doppler signals appear in the spectrum, causing noise.

Doppler sample volume length

Size the sample volume gate.

Adjusting the sample volume length

To increase or decrease the gate size, rotate the **SV** soft key clockwise or counter-clockwise. You can adjust the sample volume gate length whenever the sample volume gate appears on the display.

NOTE

Adjustments to the sample volume gate size are made from the center point of the sample volume position.

Sample volume length values

Sample volume length values may vary depending on the transducer and application. Sample volume gate size values are returned to the factory or user preset value when you change one of the followings: Transducer, application, or new patient.

Baseline

Baseline adjusts the Color Flow or Doppler spectrum baseline to accommodate higher velocity blood flow to eliminate aliasing.

Baseline adjusts the alias point. The default baseline is at the midpoint of the spectrum.

For adjusting the baseline, see "Baseline" on page 4-27.

Reject

Low echo information will not be displayed on the screen below the adjusted rejection level.

The rejection function determines the amplitude level below which echoes are suppressed (rejected). Rejection set to high leads to bad tissue display.

For adjusting the rejection, see "Reject" on page 4-10.

Power

Power controls the amount of acoustic power applied in all modes. For adjusting the power, see "Power" on page 4-15.

Dynamic Range

Dynamic range is useful for optimizing tissue texture in different anatomy. Dynamic range should be adjusted so that the highest amplitude edges appear as white while lowest levels (such as blood) are just visible. For adjusting the dynamic range, see "Dynamic Range" on page 4-9.

Gray Map

Gray Map provides you with the system maps for 2D, M, and Doppler modes. For adjusting the gray map, see "Gray Map" on page 4-14.

Colorize

Colorize is the colorization of a conventional 2D mode image or Doppler Spectrum to enhance the user's ability to discern 2D mode, M mode, and Doppler mode intensity valuations. Colorize is NOT a Doppler mode. For adjusting the colorize, see "Colorize" on page 4-14.

Sound

Sound adjusts the Doppler sound volume.

CAUTION

Doppler audio sounds may change abruptly. Adjust the volume of sound in smaller increments to avoid startling the patient.

Adjusting the sound

To adjust the sound, rotate the **Sound** soft key clockwise or counter-clockwise.

Sound values

Sound values are 0 to 100.

Remarks

Audio sounds of the blood flow in a vessel can be used to check the proper position of the transducer.

Update (D pause)

In simultaneous mode of 2D and Doppler modes, you can pause a Doppler image and move the image to the 2D live screen by adjusting the Doppler gate.

Adjusting the update

1. In 2D mode, press the **[PW]** key on the control panel.
2. Press the **[Update]** key to freeze the Doppler image (2D mode remains live).
3. Use **[Trackball]** to adjust the Doppler gate.
4. Press the **[Update]** key. The Doppler image is moved to the 2D mode screen.

Angle Steer

Angle steer tilts the sample volume for the Doppler spectrum. This function is only for linear transducers.

Adjusting the angle steer

To adjust the angle steer, select **<** or **>** of **Angle Steer** on the touch screen. The each level of the angle increment/decrement is 5 degrees.

NOTE

This function may not be available when the virtual convex function is applied to the current image.

Angle steer values

Angle steer values are -20, -15, -10, 0, 10, 15, and 20.

Auto Angle

Auto angle allows you to adjust the angle by 60 degrees.

Adjusting the auto angle

To adjust the PW Doppler angle, select **Auto Angle** on the touch screen.

NOTE

This function may not be available when the virtual convex function is applied to the current image.

Auto angle values

Auto angle values are -60, 0, and 60.

AutoCalc

Activate the calculation automatically when the AutoCalc is in Frozen or Live.

Adjusting the AutoCalc

To adjust the AutoCalc, select **<** or **>** of **AutoCalc** on the touch screen.

AutoCalc values

AutoCalc values are OFF, Frozen, and Live.

AutoCalc Cycle

AutoCalc Cycle is used to adjust the number of cycles.

Adjusting the AutoCalc Cycle

To adjust the AutoCalc Cycle, select **<** or **>** of **AutoCalc Cycle** on the touch screen.

NOTE

This function can be adjusted when AutoCalc is activated.

AutoCalc Cycle values

AutoCalc Cycle values are 1 to 5.

Direction

Direction is used to specify the part of the spectrum to calculate when using AutoCalc.

Adjusting the direction

To adjust the direction, select **<** or **>** of **Direction** on the touch screen.

NOTE

This function can be adjusted when AutoCalc is activated.

Direction values

Direction values are Both, Below, and Above.

Invert

Invert vertically inverts the spectral trace without affecting the baseline position.

Adjusting the invert

To invert the spectral trace, select **Invert** on the touch screen. The plus (+) and minus (-) signs on the velocity scale are reversed when the spectrum is inverted. Positive velocities display below the baseline.

Invert values

Invert values are On and Off.

Sweep Speed

Sweep speed allows you to adjust the sweep speed of the Doppler spectrum.

Adjusting the sweep speed

To increase or decrease the sweep speed, select **<** or **>** of **Sweep** on the touch screen.

Sweep speed values

Sweep speed values are 0 to 6.

Remarks

You can speed up or slow down the timeline to see more or fewer occurrences over time.

Display Format

Display Format changes the horizontal/vertical layout between 2D mode and Doppler mode or timeline only. You can select how to have your Doppler time line and anatomy displayed.

Adjusting the display format

To adjust the display format, select **<** or **>** of **Display Format** on the touch screen.

NOTE

This function can not be adjusted when Full D is activated.

Display format values

Display format values are as follows: Vert. 1:1, Vert. 1:2, Vert. 2:1, Horiz. 1:1, Horiz. 1:2, Horiz. 2:1.

Full Timeline

Full timeline allows you to expand the display in full timeline.

Adjusting the full timeline

To expand the display in full timeline, select **Full D** on the touch screen.

Full timeline values

Full timeline values are On and Off.

Method

Method is used to trace the average mean and peak velocities in realtime or frozen images.

Adjusting the method

To adjust the method, select **<** or **>** of **Method** on the touch screen.

NOTE

This function can be adjusted when AutoCalc is activated.

Method values

Method values are Max, Mean, and Both.

Sensitivity

Sensitivity is used to adjust the trace to follow the waveform for signal strength.

Adjusting the sensitivity

To adjust the sensitivity, select **<** or **>** of **Sensitivity** on the touch screen.

NOTE

This function can be adjusted when AutoCalc is activated.

Sensitivity values

Sensitivity values are -10 to 10.

TimeForRes

TimeForRes allows you to adjust the balance between the time resolution and spatial resolution.

Adjusting the TimeForRes

To adjust this function, select **<** or **>** of **TimeForRes** on the touch screen.

TimeForRes values

TimeForRes values are 1 to 7.

Wall Filter

Wall filter filters out clutter signals caused from vessel movement.

Adjusting the wall filter

To raise or lower the wall filter, select **<** or **>** of **WF** on the touch screen.

Wall filter values

Wall filter values may vary depending on the transducer and application. The values are returned to the factory or user preset value when you change the following: Transducer, application, new patient.

Continuous Wave Doppler (CWD) Mode

Continuous Wave Doppler (CWD) mode allows you to view the velocity and direction of a blood flow at a certain position. As you move the Doppler cursor, images on the Doppler line appear by time order. For using this feature, you need an additional request to your local agent. It also requires CWD mode-supported transducers such as a phased array transducer or Doppler pencil transducer.

CWD mode display

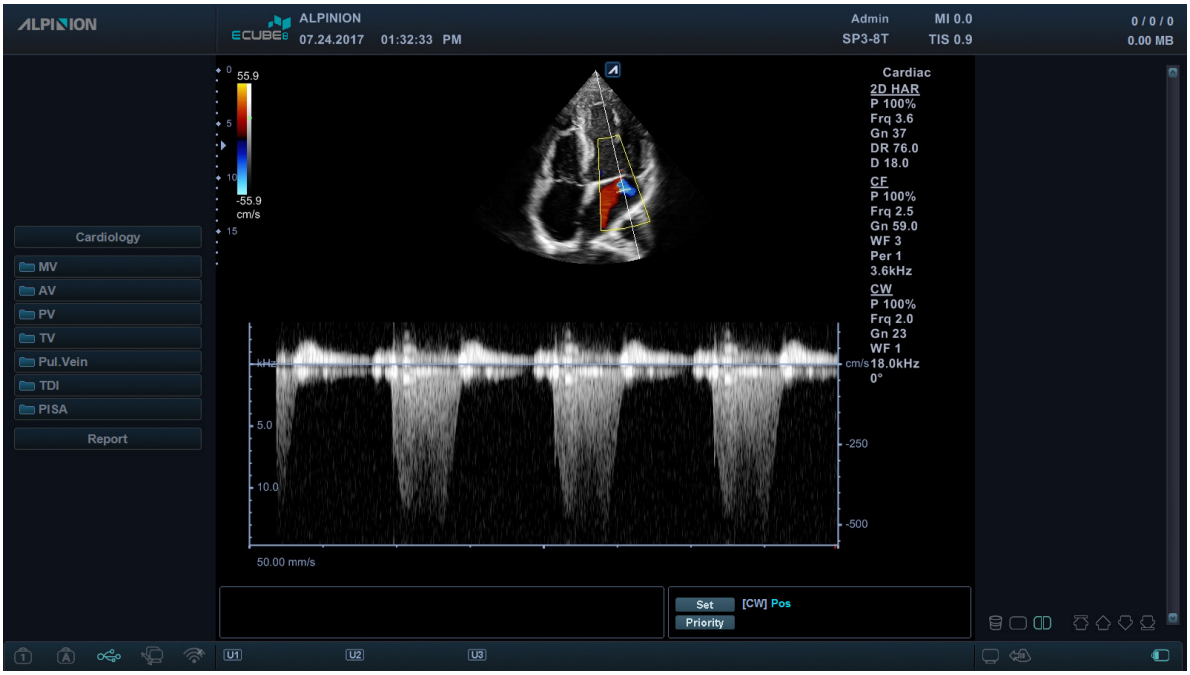


Figure 4-11 CWD mode display

General workflow

To activate CWD mode,

1. Make sure that the dedicated transducer is connected to your system.
2. In 2D mode, press the **[CW]** key on the control panel.
   When a CWD transducer is connected to your system, CWD mode is automatically activated.
3. To adjust the angle-to-flow correction, rotate the **[Angle]** key on the control panel.
4. To change the sweep speed, select **Sweep** on the touch screen.
5. To exit CWD mode, press the **[CW]** or **[2D]** key.

Image optimization controls

Select an option on the touch screen, or rotate the corresponding soft key to select the following imaging functions.

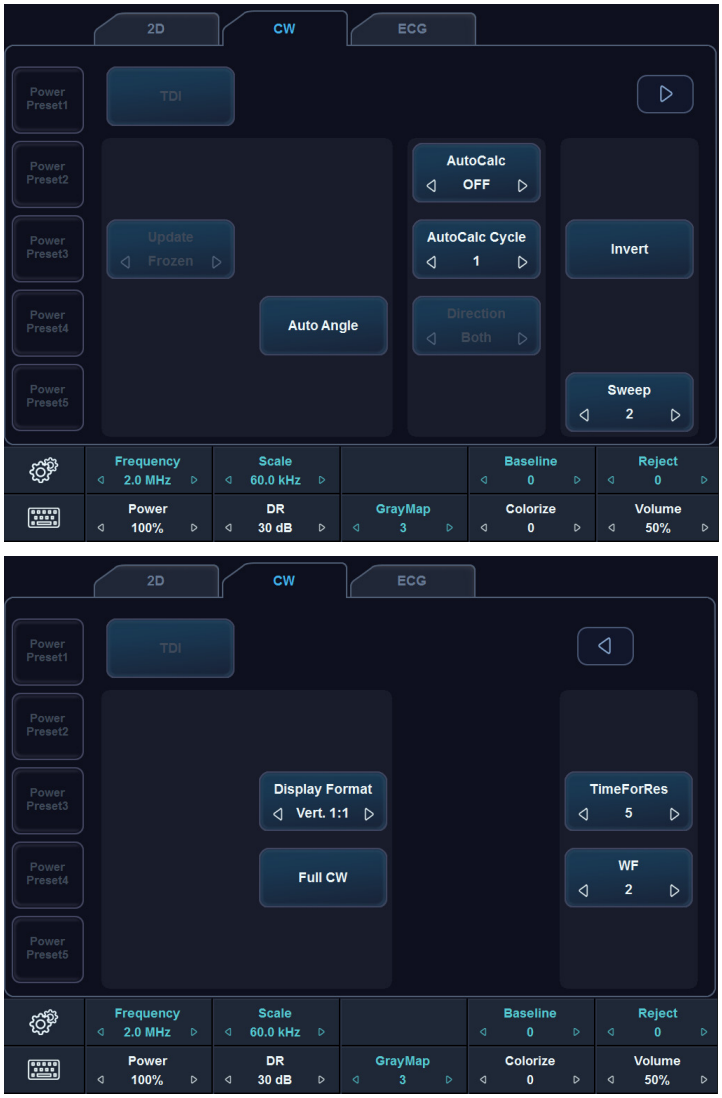


Figure 4-12 CWD mode touch screen

Update (D pause)

In simultaneous mode of 2D and Doppler modes, you can pause a Doppler image and move the image to the 2D live screen by adjusting the Doppler gate.

Adjusting the update

1. In 2D mode, press the **[CW]** key on the control panel.
2. Press the **[Update]** key to freeze the Doppler image (2D mode remains live).
3. Use **[Trackball]** to adjust the Doppler gate.
4. Press the **[Update]** key. The Doppler image is moved to the 2D mode screen.

Frequency

In Multi-frequency mode, you can change the frequency of the transducer. The frequency function is the same as the one in 2D mode. For adjusting the frequency, see "Frequency" on page 4-9.

PRF (Pulse Repetition Frequency)

PRF function is used to adjust the velocity scale to accommodate faster/slower blood flow velocities. Velocity scale determines the pulse repetition frequency (PRF). For adjusting the PRF, see "PRF (Pulse Repetition Frequency)" on page 4-26.

Baseline

Baseline adjusts the Color Flow or Doppler spectrum baseline to accommodate higher velocity blood flow to eliminate aliasing.

Baseline adjusts the alias point. The default baseline is at the midpoint of the spectrum.

For adjusting the baseline, see "Baseline" on page 4-27.

Reject

Low echo information will not be displayed on the screen below the adjusted rejection level.

The rejection function determines the amplitude level below which echoes are suppressed (rejected). Rejection set to high leads to bad tissue display.

For adjusting the rejection, see "Reject" on page 4-10.

Power

Power controls the amount of acoustic power applied in all modes. For adjusting the power, see "Power" on page 4-15.

Dynamic Range

Dynamic range is useful for optimizing tissue texture in different anatomy. Dynamic range should be adjusted so that the highest amplitude edges appear as white while lowest levels (such as blood) are just visible. For adjusting the dynamic range, see "Dynamic Range" on page 4-9.

Gray Map

Gray Map provides you with the system maps for 2D, M, and Doppler modes. For adjusting the gray map, see "Gray Map" on page 4-14.

Colorize

Colorize is the colorization of a conventional 2D mode image or Doppler Spectrum to enhance the user's ability to discern 2D mode, M mode, and Doppler mode intensity valuations. Colorize is NOT a Doppler mode. For adjusting the colorize, see "Colorize" on page 4-14.

Sound

Sound adjusts the Doppler sound volume. For adjusting the sound, see "Sound" on page 4-42.

Angle Correct

Estimate the flow velocity in a direction at an angle to the Doppler vector by computing the angle between the Doppler vector and the flow to be measured.

NOTE

When the Doppler mode cursor and angle correct indicator are aligned (the angle is 0), you cannot see the angle correct indicator.

Adjusting the angle correct

Flow toward the transducer is mapped above the baseline and vice versa. To adjust the angle relative to the transducer face, rotate the **[Angle]** key on the control panel. The velocity scale changes when you adjust angle correct.

Angle correct values

Angle correct values are -89 to 89.

Auto Angle

Auto angle allows you to adjust the angle by 60 degrees. For activating or deactivating the auto angle, see "Auto Angle" on page 4-43.

AutoCalc

Activate the calculation automatically when the AutoCalc is in Frozen or Live. For adjusting the AutoCalc, see "AutoCalc" on page 4-43.

AutoCalc Cycle

AutoCalc Cycle is used to adjust the number of cycles. For adjusting the AutoCalc Cycle, see "AutoCalc Cycle" on page 4-43.

Direction

Direction is used to specify the part of the spectrum to calculate when using AutoCalc. For adjusting the direction, see "Direction" on page 4-44.

Invert

Invert vertically inverts the spectral trace without affecting the baseline position. For activating or deactivating the invert, see "Invert" on page 4-44.

Sweep Speed

Sweep speed allows you to adjust the sweep speed of the Doppler spectrum. For adjusting the sweep speed, see "Sweep Speed" on page 4-44.

Display Format

Display Format changes the horizontal/vertical layout between 2D mode and Doppler mode or timeline only. You can select how to have your Doppler time line and anatomy displayed. For adjusting the display format, see "Display Format" on page 4-45.

Full Timeline

Full timeline allows you to expand the display in full timeline.

Adjusting the full timeline

To expand the display in full timeline, select **Full CW** on the touch screen.

Full timeline values

Full timeline values are On and Off.

TimeForRes

TimeForRes allows you to adjust the balance between the time resolution and spatial resolution.

Adjusting the TimeForRes

To adjust this function, select **<** or **>** of **TimeForRes** on the touch screen.

TimeForRes values

TimeForRes values are 1 to 7.

Wall Filter

Wall filter filters out clutter signals caused from vessel movement. For adjusting the wall filter, see "Wall Filter" on page 4-46.

Tissue Doppler Imaging (TDI) Mode

Tissue Doppler Imaging (TDI) mode allows you to view the status of the myocardium by measuring the velocity of the tissue movement on the Doppler image. This mode only is available for adult cardiac application.

The combination imaging modes of TDI mode

The following combination imaging modes are available:

- PW tissue Doppler
- Color 2D tissue Doppler

TDI mode display

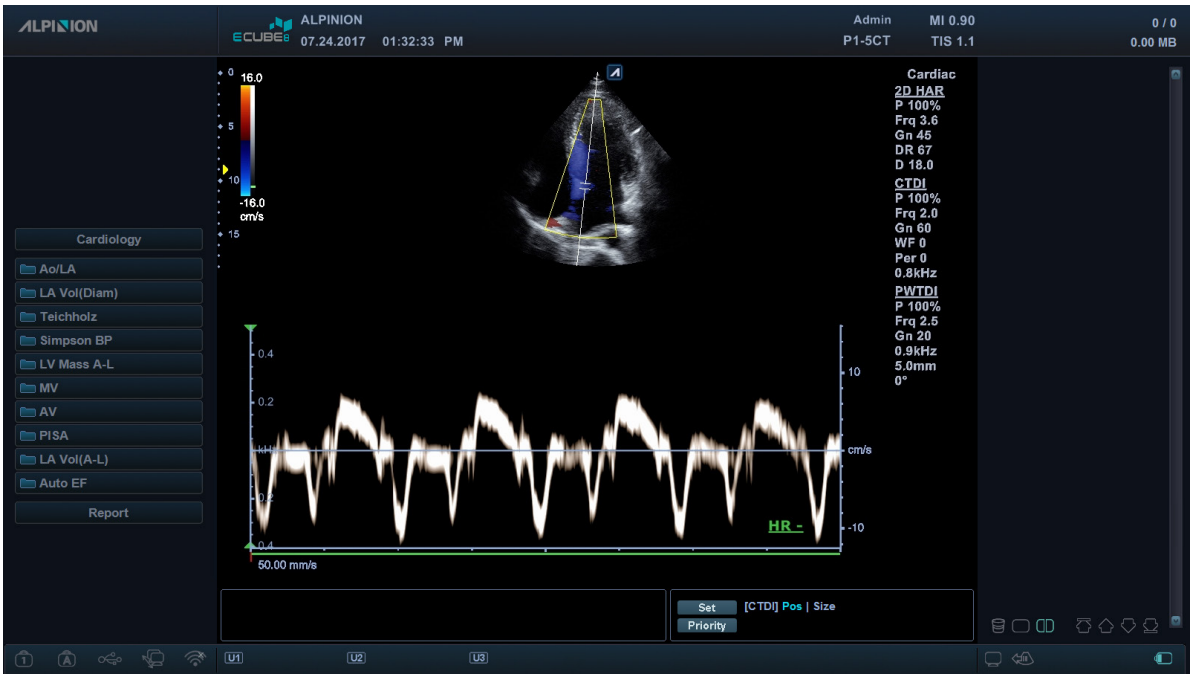


Figure 4-13 TDI mode display

Image optimization controls

Select an option on the touch screen, or rotate the corresponding soft key to select the following imaging functions.



Figure 4-14 TDI mode touch screen

General workflow

1. In 2D mode, press the **[CF]** Key on the control panel. CF mode is activated.
2. Select **TDI** on the touch screen.
   Color 2D tissue Doppler mode is activated.
3. To activate PW tissue Doppler mode, press the **[PW]** key.
4. To exit TDI mode, select **TDI** on the touch screen.

3D and 4D Modes

3D mode and 4D mode are optional modes that you need to request additionally. If this mode is not available, the 3D and 4D options on the touch screen are deactivated. In 3D/4D setup mode, the region of interest (ROI) graphic appears on the image. The 3D ROI defines the area that will be processed during 3D review and live 3D acquisition.

The following table describes functions in 3D and 4D modes.

Table 4-1 3D/4D mode

Mode	Descriptions
3D/4D setup mode	Configure the settings for 3D and 4D modes.
3D mode	Reconstruct 3D image with obtained one volume image.
4D mode	Obtain the 3D volume data on real time and rendering this.

3D/4D mode display



Figure 4-15 4D mode display

Available features in 3D and 4D modes

The following features are available in 3D and 4D modes:

- Most of 2D controls
- Text and Arrow
- Measurement
- Zoom
- CINE (Only for 4D mode)
- Sectional Planes: Multi Plane, AnySlice, Cubic View
- Multi Slice: MSV, Free Angle MSV
- Volume Analysis

NOTE

Multi Plane, AnySlice, Free Angle MSV, and Volume Analysis are optional features. For using these feature, you need an additional request to your local agent.

Operation controls for 3D and 4D modes

The following table describes the key functions in 3D and 4D modes.

Table 4-2 3D/4D controls

Key	Description
Freeze	In 3D/4D setup mode, press to obtain a 3D or 4D image. In 3D mode, press to switch to 3D/4D setup mode. In 4D mode, press to switch to 3D mode. Press again to return to 4D mode.
M	In 3D or 4D mode, rotate the X axis; up and down rotation.
PW	In 3D or 4D mode, rotate the Y axis; left and right rotation.
CF	In 3D or 4D mode, rotate the Z axis; clockwise and counter-clockwise rotation.
Select/Depth	In 3D or 4D mode, move parallel. • **PlaneA**: Left/Right • **PlaneB**: Up/Down • **PlaneC** or **3D**: Forward/Backward
Single	Show a 3D image.
Dual	Show one reference image and one 3D image.
Quad	Show three reference images and one 3D image.
Priority	While or after acquiring the volume data, press to change the function. The activated function is shown on the bottom right of the display: • **Priority**: Cine, Cine Calc., Move, ROI, Curved ROI, Line1,2,3 • **Set**: Run and Stop (Cine or Cine Calc.), Image and Axis (Move), Pos and Size (ROI), Pos and Rot (Line1,2,3) • **Cursor**: Cursor (Display remains blank.)
Trackball	Adjust the position, light direction, and the size of the ROI box. When the **[Priority]** key is pressed, use to perform the activated function: • **Cine** or **Cine Calc.**: Use to move the cine frame. • **Move**: Use to move the image. • **ROI**: Use to adjust the clipping box size of ROI. • **Curved ROI**: Use to change the contour of the clipping line. • **Cursor**: Use to move the cursor to a desired location. • **Light Direction**: Use to change Light Direction in LiveHQ.

3D/4D setup mode

Setting up for volume acquisition

You can optimize the image and select settings for the volume acquisition by using the following imaging options.



Figure 4-16 Imaging options for volume acquisition (3D/4D)

Table 4-3 Imaging options

Imaging option	Description
View Types	MPR, Sectional Planes, Multi Slice
Display Format	Change the display layout. • 1: One rendered volume image • 2: One rendered volume image and one slice image • 4: One rendered volume image and three slice images
User Preset	Show the user preset values such as surface and spine.
3D	Switch to 3D mode.
4D	Switch to 4D mode.
Render Direction	Adjust the direction of the image view.
Quality	Change the line density to adjust image quality and acquisition time. • **Low**: Low quality and fast acquisition time • **Mid**: Better quality but slower acquisition time than the low quality • **H1**: Better quality but slower acquisition time than the medium quality • **H2**: Best quality and the slowest acquisition time
Volume Angle	Set the range of the volume sweep: • Volume Convex: 15, 30, 45, 60, 75

NOTE

The imaging options are returned to their factory values when you change the transducer.

Volume acquisition mode

Adjusting the region of interest (ROI)

You can adjust the ROI using **[Trackball]**. The 3D ROI allies to both single sweep 3D and 4D acquisition.



Figure 4-17 Region of Interest (ROI)

To adjust the 3D ROI of the display,

1. On the touch screen, select **3D** or **4D**.
2. Use **[Trackball]** to move the 3D ROI.
3. Press the **[Set]** key to change the size of the ROI box.
4. Use **[Trackball]** to adjust the size of the 3D ROI box.
5. Press the **[Priority]** key to change the line of the Curved ROI.
6. Use **[Trackball]** to adjust the line of the Curved ROI.

Performing 4D image scanning

In 4D mode, you can acquire real-time 4D images through an acquisition interface.

1. Obtain a 2D image and optimize the image for the best quality.
2. On the control panel, press the **[3D/4D]** key. If you are in 3D mode, select **4D** on the touch screen. The yellow-colored ROI and soft menus for 4D mode appear.
3. Rotate the **Volume Angle** soft key.
4. Select the desired display format on the touch screen to change the display layout.
5. Rotate the **Quality** soft key to adjust the image quality.
6. To change the direction of the image view, rotate the **Render Direction** soft key.
7. When you have finished, press the **[Freeze]** key on the control panel to acquire the image data.

Performing 3D image scanning

In 3D mode, you can acquire 3D images through an acquisition interface.

1. Obtain a 2D image and optimize the image for the best quality.
2. On the control panel, press the **[3D/4D]** key. If you are in 4D mode, select **3D** on the touch screen. The yellow-colored ROI and soft menus for 3D mode appear.
3. Rotate the **Volume Angle** soft key.
4. Select the desired display format on the touch screen to change the display layout.
5. Rotate the **Quality** soft key to adjust the image quality.
6. To change the direction of the image view, rotate the **Render Direction** soft key.
7. When you have finished, press the **[Freeze]** key on the control panel to acquire the image data.

Volume visualization mode

Viewing volume data

The following view types are available: **MPR**, **Sectional Planes**, **Multi Slice** and **Volume Analysis**. You can change the view type after acquiring volume data by selecting a view type menu.

To change view type,

– Select a view type (**MPR**, **Sectional Planes**, **Multi Slice** or **Volume Analysis**) on the touch screen.

NOTE

Volume Analysis is only available in 3D mode.

MPR (Multi-Planar Reformatting)

MPR (Multi-Planar Reformatting) shows a single volume data. The system automatically displays the volume and MPRs during the 4D imaging volume acquisition, after the 3D volume acquisition, or during the review of retrieved volumes.

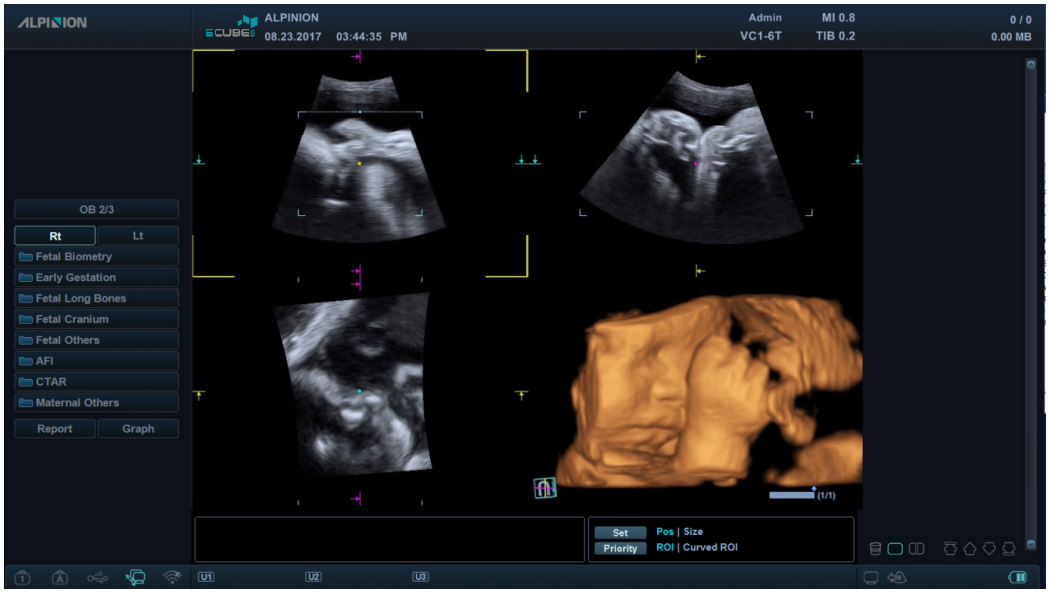


Figure 4-18 MPR view

To acquire the volume data,

1. Press the **[Freeze]** key to acquire the volume data.
2. After you acquire the volume data, the 4D mode screen appears.
3. To magnify the volume, rotate the **[Zoom]** key on the control panel.

NOTE

If the image stops while scanning an image, try acquiring the 3D volume of interest again.

Defining volume of interest (VOI) and viewing planes

You can define a data to be displayed in the volume quadrant by enabling the VOI (volume of interest) and then resizing and repositioning the VOI in relation to the acquired volume data. The system displays the VOI in the volume and the related view plane in each orthogonal MPR.

The view plane is the side of the VOI represented by a solid or dotted line.

A : Sagittal Plane	B : Transverse Plane
C : Coronal Plane	3D : Volume Image

Changing the view line (Clipping box line) of the VOI

To adjust the VOI size,

1. Select **Ref. Plane** on the touch screen.
   The selected plane appears on the display.
2. Select the ROI item by pressing the **[Priority]** key.
3. Select the Pos item by pressing the **[Set]** key.
4. Control the view line by using **[Trackball]**.
   The size of the volume image changes according to the view line.

Changing the volume of a plane

You can change the volume of a plane by curving the VOI.

1. Select the curved ROI item by pressing the **[Priority]** key.
2. Control the curved line by using **[Trackball]**.
   The volume image changes according to the curved line.

Customizing the render settings

After acquiring the volume data, imaging options appear on the touch screen. Imaging options allow you to optimize the volume tissue components.

The following table describes the rendering imaging options that you can use in 4D mode.

Table 4-4 Rendering imaging options

Option	Description
Edit ROI	Select to adjust the size of the Region of Interest (ROI).
Vol.Sync	• **On**: Rotate the MPR image and the volume image simultaneously. • **Off**: Rotate the MPR image and the volume image separately.
Cine	Manual selection of single volume frames.
Cine Calc.	Displays the Cine Calculations menu.
Easy Cut	Displays the Easy Cut menu.
Brightness	Adjust the overall brightness of volume.
Contrast	Adjust the contrast.
Threshold	Adjust the threshold to define structures of interest.
Quality (Only for 4D mode)	Change the line density to adjust image quality and acquisition time.
Volume Angle (Only for 4D mode)	Adjust the range of the volume sweep.
Opacity	Adjust the opacity to eliminate darker gray shades, background noise.
Smooth	Adjust the smooth to apply a low-pass filter.
SRI	Activate or deactivate SRI on the MPR view.
DR	Adjust the dynamic range.
Gray Map	Select the desired gray map.
2D Colorize	Colorize the 2D image.
Initial	Reset the current 3D or 4D settings.
User Preset	Reloads the presets for the selected application.
Ref. Plane	The reference plane contains the focus for control panel keys, allowing you to manipulate or optimize that plane. The reference plane selection appears differently according to the display format of rendering setting. • Single display format: The reference plane does not appear. • Dual or Quad display format: The selections for the reference plane are A, B, C.
3D Orientation	Adjust the orientation to rotate the fetus position.

Option	Description
Live HQ	This function enables you to represent a realistic live image. To use this function, adjust the **Brightness** and **HQ Scatter** options. Move **[Trackball]** to adjust the direction of the light. • **On**: Apply the Live HQ preset. • **Off**: Apply the previous preset.
Live HQ_Render Setup	• **Front Scale**: Adjust the front depth scale of the Live HQ function. • **Back Scale**: Adjust the back depth scale of the Live HQ function. • **HQ Scatter**: Adjust scattering for the Live HQ function.
Light Direction	Adjust the direction of the light for the Live HQ function.
Live HQ Color Map	Select the desired color map.
Render Setup	For better image, be familiar with the following render settings: • **Surface**: It is possible to combine the gradient and texture shading. This is done by calculating each weighted sum of the colors derived for gradient and texture shading. • **Max IP**: Maximum intensity projection. Represent a 3D image in maximum intensity. This option can be useful for observation of bone structure. • **Min IP**: Minimum intensity projection. Represents a 3D image in minimum intensity. This option can be useful for observation of vessels or cavities in the human body. • **Light**: Represent the highlight and shadow on the surface of the image. An image area close to viewer is shown bright; an image area distant from the viewer is shown shaded. • **XRay**: Represent a 3D image in average intensity. An image is shown like an X-ray image.
Render Direction	Adjust the direction of the image view.
3D Color Map	Select the desired color map.

Creating presets

Presets contain a selection of predefined rendering parameters. Thus desired combination of filter can be set at once. All of rendering settings support changing the preset.

On the touch screen, select **Define Preset**. When the ***User Preset Setting*** dialog box appears, the following options are available:

- **Default All** : Recover all user preset to default factory setting.
- **Reset** : Recover the user preset to default setting.
- **Overwrite**: Overwrite an existing preset with a new preset.
- **Rename**: Change the name of an existing preset.
- **Save** : Save the current preset.
- **Cancel**: Cancel saving the user preset.

NOTE

You can apply the preset after acquiring volume data or scanning a live image.

Cine

Cine allows you to save and review the acquired volume data as animated images. When you press the **[Freeze]** key, Cine options appear on the touch screen. Cine gauge bar is located on the bottom right corner. The selected volume cine number is shown with the color bar.

NOTE

Cine may not be available in 3D mode.

Table 4-5 Cine options

Option	Description
Full	Start or stop the playback of the full Cine clip.
Clip	Start or stop the playback of the selected Cine clip defined by start and end volume.
Loop Mode	Play 3D Cine images in one direction and then play them in reverse direction or continue to play 3D Cine images in one direction repeatedly.
Vol.byVol.	Select Cine volumes.
Start	Select the starting Cine number.
End	Select the ending Cine number.
Speed	Change the playback speed.

Cine Calc.

Cine Calc. allows the volume image to be rotated automatically according to specific orientation and customized angle. When volume acquisition is paused, you can review the volume data in Cine mode.

Table 4-6 Cine Calc. options

Option	Description
Rotate Axis	Rotate according to the selected axis centrally.
Rotate Angle	Rotate image according to standards of volume data.
Step Angle	Rotate image according to the selected step angle within the Rotate Angle range.
Speed	Change the playback speed.
Calculate Cine Seq.	Control the Loop Mode and Play/Stop.
Play/Stop	Start or stop playback.
Loop Mode	Play 3D Cine images in one direction and then play them in reverse direction or continue to play 3D Cine images in one direction repeatedly.
Save Ani.	Save as animated images.

Easy Cut

Easy Cut allows you to electronically edit images by cutting away unwanted structures on the ROI.

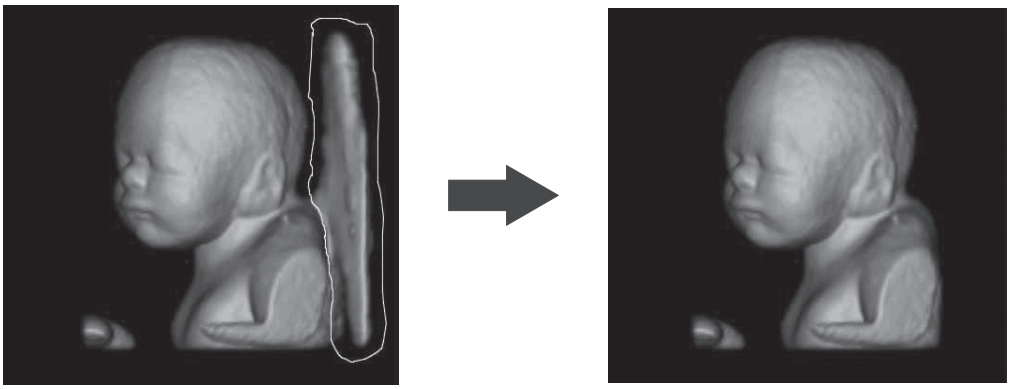


Figure 4-19 Easy Cut

1. Select **MPR** on the touch screen.
2. Select **Easy cut** on the touch screen.
3. Select desired options in the **Easy Cut** menu and press the **[Set]** key.
4. Edit the image by using **[Trackball]**.
5. When you have finished, press the **[Set]** key.

The following Easy Cut options are available:

Table 4-7 Easy Cut options

Option	Description
Trace Inside	Structures within the contour will be discarded.
Trace Outside	Structures outside the contour will be discarded.
Box in	All information inside the box will be cut.
Box out	All information outside the box will be cut.
Eraser Small	All information inside the small circle will be cut.
Eraser Medium	All information inside the medium circle will be cut.
Eraser Large	All information inside the large circle will be cut.
Undo/Redo	Select to undo or redo.
Remove All	Select to remove all.

Sectional Planes

Sectional Planes supports following view types: Multi Plane, AnySlice, and Cubic View. An image can be viewed in multiple slices.

Multi Plane

Multi Plane supports the Cine Calc. to review the sliced images.

NOTE

The volume data is not displayed in Multi Plane mode.

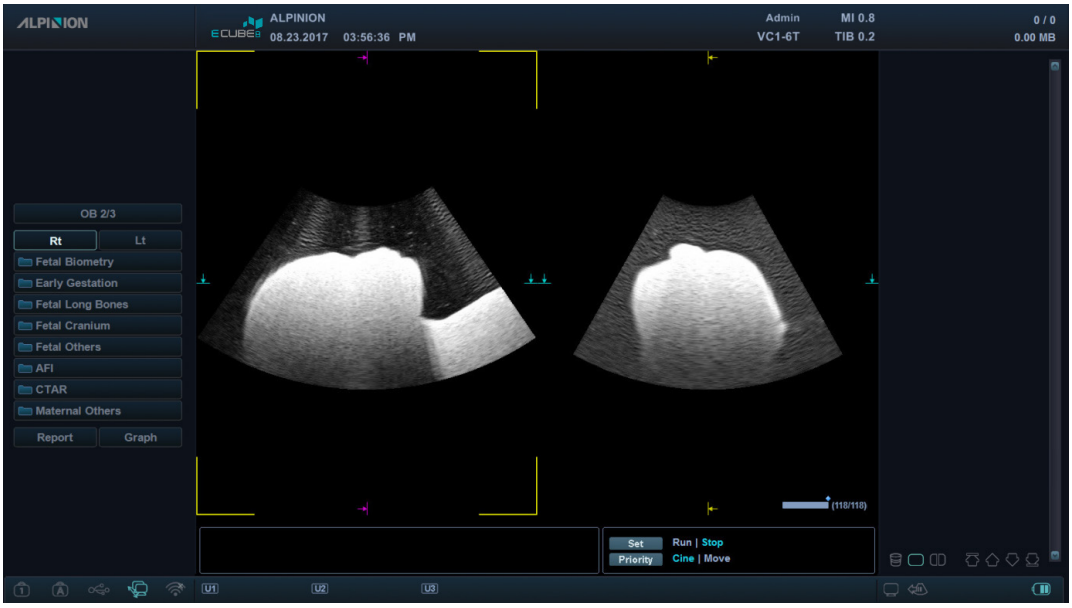


Figure 4-20 Multi Plane

1. Select **Sectional Planes** on the touch screen.
2. Select **Multi Plane** on the touch screen.
3. Rotate the **Thickness** soft key to adjust the slice thickness.
4. Select a plane type of **Ref. Plane** to select a reference image.
5. Select **Cine Calc.** to activate the Cine calculation.
   The slice playback menu appears on the touch screen.
6. Rotate the **Start** soft key to take the first slice.
7. Rotate the **End** soft key to take the last slice.
8. Rotate the **Speed** soft key to set the playback speed for Cine images.
9. Select **Full** to start the playback of the full Cine clip.
   Or select **Clip** to start the playback of the selected Cine clip.
10. Select **Full** again to stop the playback of the full Cine clip.
    Or select **Clip** again to stop the playback of the selected Cine clip.

AnySlice

AnySlice allows you to observe the sectional images after drawing a curved line on the selected image in MPR mode.

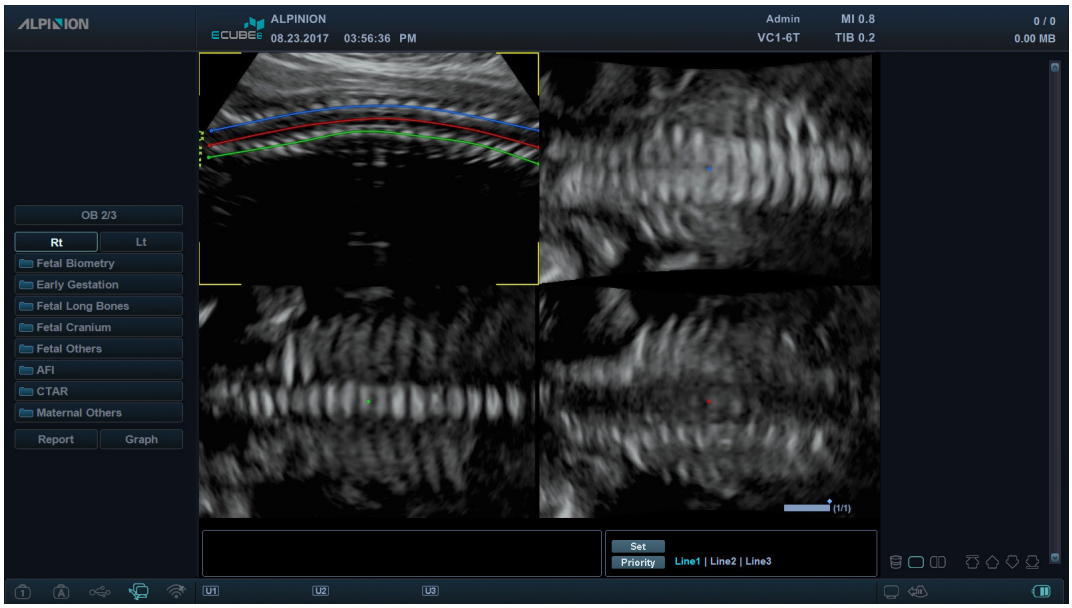


Figure 4-21 AnySlice

1. Select **Sectional Planes** on the touch screen.
2. Select **AnySlice** on the touch screen. The "✣" mark appears.
3. Select **Ref. Line** on the touch screen, or press the **[Priority]** key on the control panel.
4. Draw a curved line on a reference image by using the **[Trackball]** and press the **[Set]** key.
5. If you have finished drawing a line, press the **[Cursor]** key.
6. Optimize the image for observation by using options on the touch screen.

Cubic View

In Cubic View, the display shows Sagittal, Transverse, and Coronal plane images in volume data.

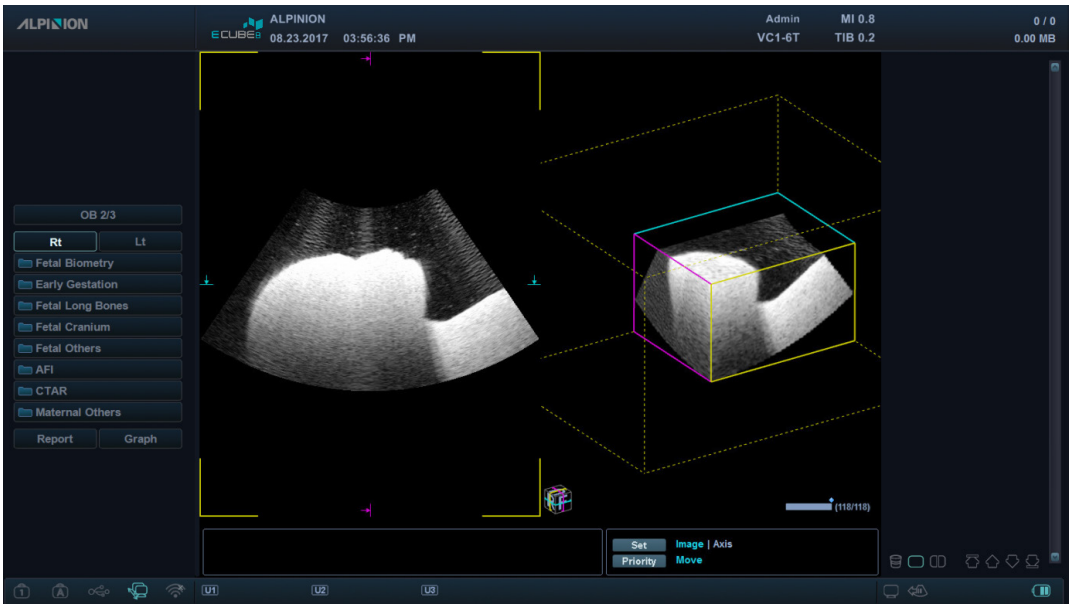


Figure 4-22 Cubic View

1. Select **Sectional Planes** on the touch screen.
2. Select **Cubic View** on the touch screen.
3. Adjust the cube size by using the following methods:

   a. Using Trackball,

      (1) Select **Ref. Plane** on the touch screen.

      (2) Select the Move item by pressing the **[Priority]** key on the control panel.

      (3) Select the Axis item by pressing the **[Set]** key on the control panel.

      (4) Adjust the volume size using **[Trackball]** key.

   b. Using the soft key,

      – Rotate the **SlicePlaneA**, **SlicePlaneB**, or **SlicePlaneC** soft key.

NOTE

- In Cubic View, the dual image layout may not be available.
- You can rotate X, Y, and Z axes with the corresponding keys on the control panel.
- The volume review function is the same as the function in MPR.

Multi Slice

Multi Slice shows parallel cut planes which are aligned along the X, Y, or Z axis of volume's bounding box. The each texture is shown as an individual view. The reference image is distinguished with a dotted axis line.

1 Select **Multi Slice** on the touch screen.

2 Adjust the multi-sliced images by using the following imaging options.

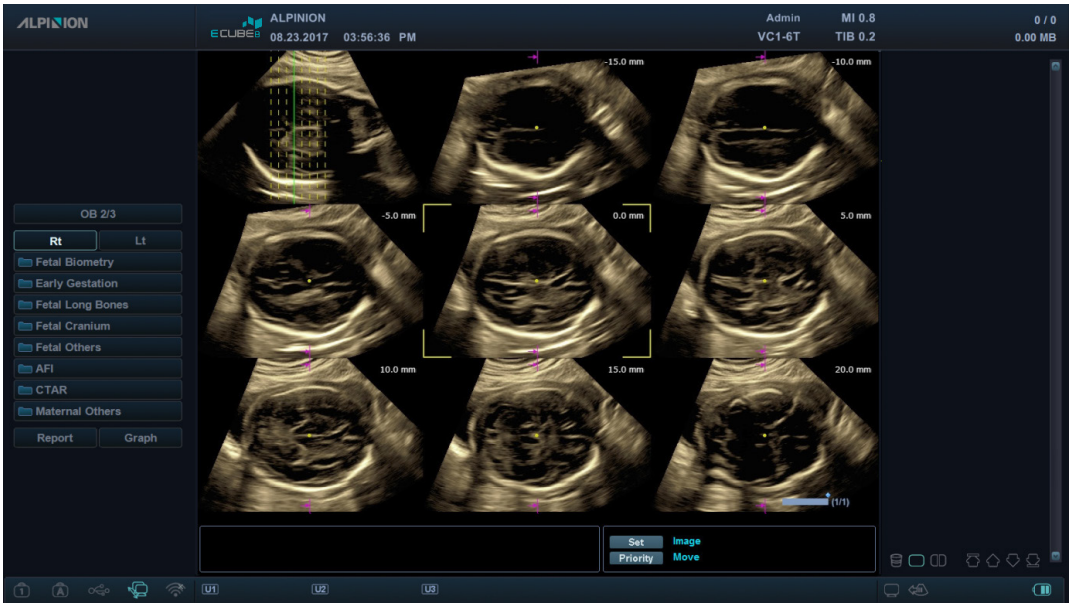


Figure 4-23 Multi Slice

NOTE

- The image layout keys (Single, Dual, and Quad) may not work for this view type.
- Multi Slice can be used when the display format is 3 x 3 or 4 x 4.

The following table describes the Multi Slice options.

Table 4-8 Multi Slice options

Option	Description
Display Format	Select a number of the multi-slice to be shown as determining the layout.
Ref. Plane	Select a plane type to view multi-slice images.
Render Direction	Adjust the direction of the image view.
ActiveView	Slice through the Multi-Slice display.
Guide View	Set the orientation plane of the Multi-Slice display.
Thickness	Select the slice thickness.
SRI	Activate or deactivate SRI on the Multi Slice view.
Pitch	Change a step (pitch size) of multi-slice image. Set the distance of multi slice.

Option	Description
Prev./Next	Move to the next or previous multi-slice image. – Rotate the **Prev./Next** soft key clockwise for next images. – Rotate the **Prev./Next** soft key counter-clockwise for previous images.
Vol.byVol.	Select Cine volumes.
2D Colorize	Colorize the 2D image.

Free Angle MSV (Free Angle Multi Slice View)

Free Angle MSV mode shows several MPR views with parallel orientation.

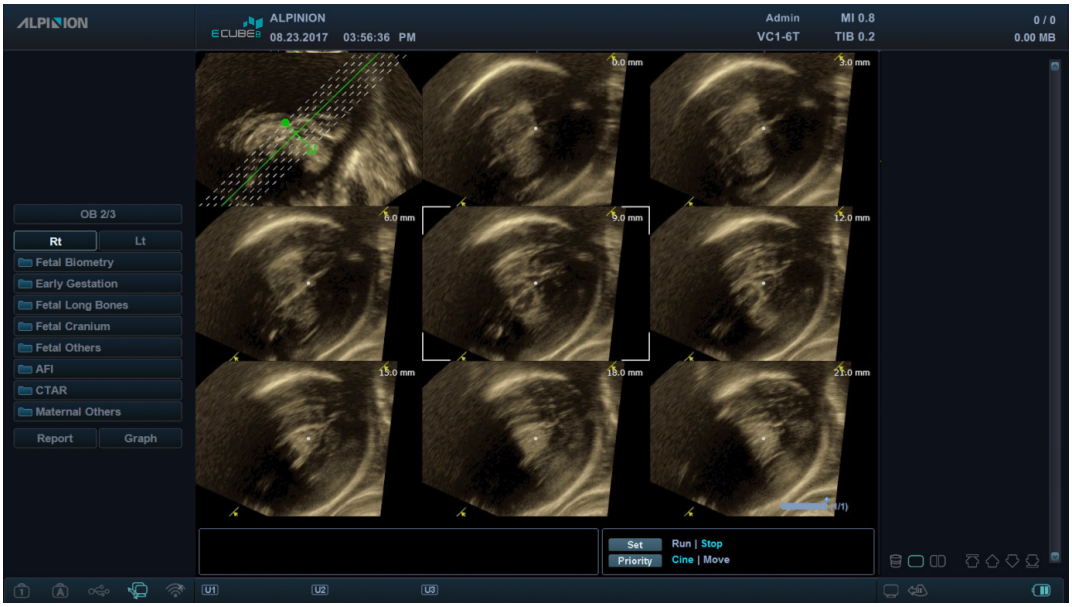


Figure 4-24 Free Angle MSV

1. Select **Multi Slice** on the touch screen.
2. Select **Free Angle** on the touch screen. The marker appears.
3. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
4. Use **[Trackball]** to move the marker to the end point, and press the **[Set]** key.
5. The dotted lines appear on the reference image.

Volume Analysis

Volume Analysis allows you to review parallel cut planes in specific portions of the anatomy. And you can calculate the volume of an object by cutting it into multiple slices.

NOTE

In Multi Slice, Volume Analysis is not displayed.

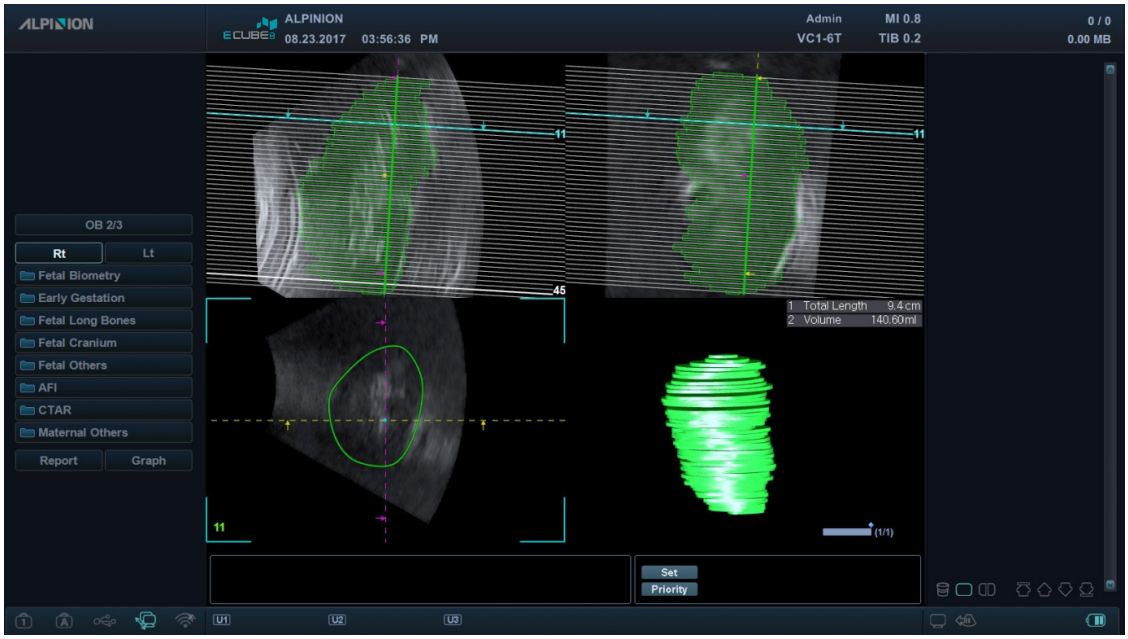


Figure 4-25 Volume Analysis

1. Select **Volume Analysis** on the touch screen. The marker appears.
2. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
3. Use **[Trackball]** to move the marker to the end point, and press the **[Set]** key.
4. The solid lines appear on the reference images, and the total length (**Total Length**) and the volume (**Volume**) are shown on the display.

The following table describes the Volume Analysis options.

Table 4-9 Volume Analysis options

Option	Description
Display Format	Select a number of the multi-slice to be shown as determining the layout.
Ref. Plane	Select a plane type to view multi-slice images.
Current Plane Disc	The selected disc is displayed and a spline can be drawn. Or an existing spline can be deleted.
Disc Thickness	Set the thickness of a disc plane.
Disc Transparency	Set the transparency value for the disc rendering.
Delete All	Select to delete all discs.

Option	Description
Delete	Select to delete the spline in the selected disc.
Propagate Disc	The disc of the current slice is propagated to the next slice.
Volume Display	Select to show or hide the volume rendering in the result view.

Saving a 3D/4D image

You can save 3D or 4D volume data in the system memory.

To save an image or volume data,

1 Acquire a 3D or 4D volume image.

2 Press the **[P1]** key on the control panel to save the still image.
Press the **[P2]** key on the control panel to save the volume data.

NOTE

- You can assign a different function to the **[P2]** key in **System Preset**.
- Saving a real-time image may not be available in 4D mode.

To review an image or volume data,

– On the touch screen, select **Review**, and then select an image. You can also click a saved thumbnail image on the right side in 2D mode.

NOTE

- After saving a video or volume data, you can configure the render settings.
- To assign the print keys for saving an image or volume data, press the **[System Preset]** key and go to **User Setting > Print/Foot Switch**.

5

Imaging Functions

This chapter describes the imaging functions and how to adjust images.

Freezing Images 5-2

Zooming Images 5-3

Screen Split 5-4

CINE Images 5-5

Annotating Images 5-6

Panoramic Imaging 5-12

Needle Vision™ Plus 5-16

Elastography 5-18

Stress Echo 5-25

Cube Strain™ 5-39

Freezing Images

Condition in which 2D, M, Doppler, and Color flow image data are retained in a scan converter's memory for examination and/or photograph as well as for video recording.

Freezing an image

1 While scanning an image, press the **[Freeze]** key on the control panel to freeze the image.
You can also freeze an image with the right pedal of the footswitch, if supported.

2 To reactivate the image, press the **[Freeze]** again.
To enter CINE mode, use **[Trackball]**.

NOTE

- Deactivating the **[Freeze]** key allows you to erase all measurements including calculations from the screen (Not from the worksheet).
- Selecting a new transducer unfreezes the image.
- To configure the each pedal of the footswitch, press the **[System Preset]** key and go to **User Setting** > **Print/Foot Switch**.
- To configure the **[Freeze]** key function after freezing an image, press the **[System Preset]** key and go to **System** > **Control Panel** > **Key** > **Active Function on Freeze**.

Processing an image

In freeze mode, you can process 2D, Color Flow (CF) or Doppler mode image. The following controls are available:

2D mode	CF mode	PD mode	PWD mode
Zoom	Threshold	Threshold	Baseline
Reverse	Baseline	Color map	Sweep speed
Gain	Invert	DPDI	Invert
Dynamic range	Color map	Gain	Color map
Up/Down	Gain	Blend Level	Gray map
Colorize	Blend Level	Adaptive Level	Auto Angle
Gray map	Adaptive Level		Angle Correction
Full SRI			Reject
Edge Enhance			Dynamic range
Reject			

Zooming Images

You can magnify a region of interest (ROI) in a live image or in CINE mode. The zoom option magnifies the ROI on the display. There are two zoom functions that you can use: Read zoom and Write zoom

Read zoom

Read zoom allows you to manipulate the negative picture and enlarge it. You can use Read zoom after using Write zoom.

To activate Read zoom, rotate the **[Zoom]** key on the control panel.

Write zoom

Writing zoom allows you to use the telephoto lens to bring the image closer before acquiring an image. You can use Write zoom after using Read zoom.

To activate Write zoom, press the **[Zoom]** key on the control panel while scanning a live image.

Screen Split

Screen Split allows you to view active images as the dual display view.

1. Press the **[Dual]** key on the control panel.
2. To display other active images, press the **[Dual]** key again.

CINE Images

The CINE function is available in all imaging modes. During the real-time imaging, the system places the most recently acquired images as well as the image currently on the screen into a CINE memory buffer.

CINE image review functions as a storage and enables you to review the sequence of images in the system memory. CINE review is available by pressing the **[Freeze]** key. Moving **[Trackball]** to the left or right scrolls through the CINE sequence.

Images from a CINE sequences can be measured and annotated. You can play back CINE images to simulate a real-time motion, or review an image at one time.

NOTE

CINE is useful for focusing on images during a specific part of the heart cycle or to view short segments of a scan session.

General workflow

To activate CINE mode,

1. Press the **[Freeze]** key on the control panel.
2. Use **[Trackball]** to scroll through the CINE sequences.
   To move the CINE sequence by frame, rotate the **Frame by Frame** soft key.
3. On the touch screen, select **Move First Frame** to take the first frame.
4. Select **Move Last Frame** to take the last frame.
5. To exit CINE mode, press the **[Freeze]** or **[2D]** key on the control panel.

Annotating Images

The annotation feature provides the capability to type the comments of free text or insert the pre-defined comments from the comment library. It also provides the user with arrow marks to point to parts of the image.

You can place text labels and arrow marks on an image to identify anatomical structures and positions and also annotate an image with a body pattern image that indicates the part of the anatomy that you are scanning.

NOTE

The annotation feature is available in live-acquisition mode and in freeze mode.

Annotation display

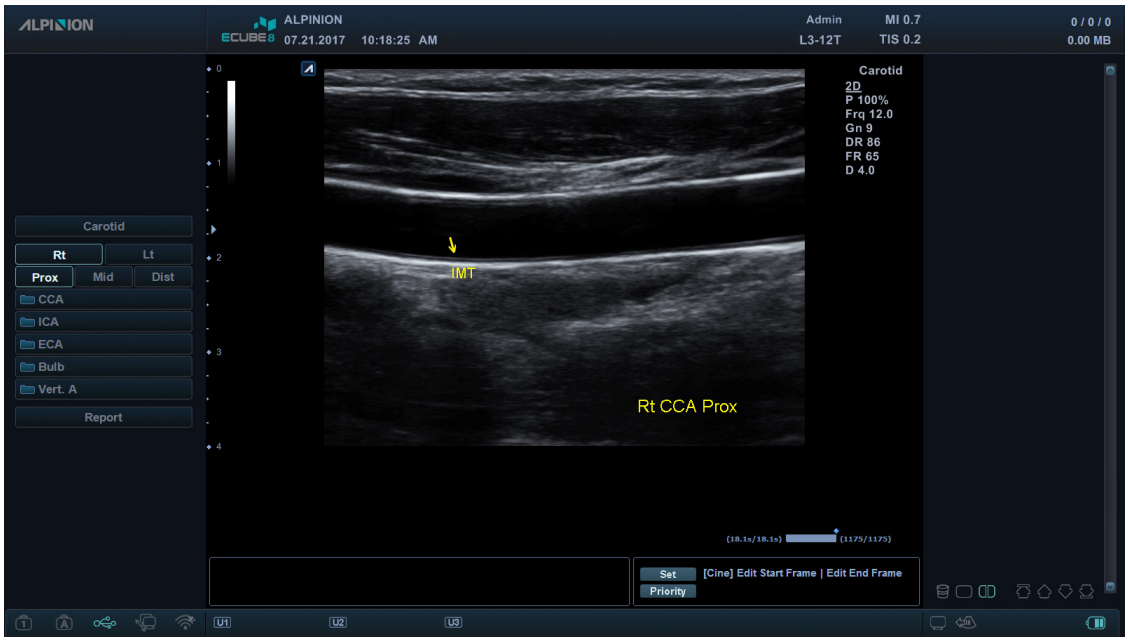


Figure 5-1 Annotation display

Annotation options



Figure 5-2 Annotation touch screen

General workflow

1. Press the **[Text]** key on the control panel to activate Annotation mode.
2. To configure the default position of the comment cursor, use **[Trackball]** to place the comment cursor to the desired location of the image screen and select **Set Home** on the touch screen.
3. The system automatically searches for the word you want in the text bar.
4. After activating the text mode, a vertical bar type cursor appears on the screen. Use **[Trackball]** to move the cursor.

   NOTE

   The default text color is yellow. The color selection can be changed to any of the colors available on the system.

5. When a specific comment or comment group is selected, the color turns to green. Once the comment is set or fixed, the color returns to yellow or to the user-selected color.
6. Delete characters or all comments, if necessary.
   - To delete comments by character, select **Back Space** on the touch screen.
   - To delete comments by word, rotate and press the **Grab/Delete** soft key.
   - To delete the comments only, press the **[Clear]** key right after pressing the **[Text]** key.
   - To delete the arrow marks only, press the **[Clear]** key right after pressing the **[Arrow]** key.
   - To delete all comments as well as arrow marks, press the **[Clear]** key after entering the scan mode.
7. Rotate the **Grab/Delete** soft key to move a group of words on the screen.
8. To deactivate Annotation mode, press the **[Text]** key.

Inserting annotations

Inserting directional arrow pointers

1. Press the **[Arrow]** key on the QWERTY keyboard, or select **Arrow** on the touch screen.
   An arrow pointer appears on the image screen.
   The green-colored pointer indicates that it is active and movable.
2. Use **[Trackball]** to move the pointer to the desired position of the screen. The pointer head direction can be controlled as you move **[Trackball]**.
3. Adjust the length, thickness, or the angle of the pointer, if necessary.
   - To select the type of the pointer you want, rotate the **Arrow Type** soft key.
   - To change the size of the pointer you want, rotate the **Arrow Size** soft key.
   - To adjust the direction of the pointer head, rotate the **Arrow Angle** soft key.
4. Press the **[Set]** key to fix the placement of the pointer and the direction of the pointer head.
   The GREEN color turns to YELLOW (or the default color if changed).
5. To delete all fixed pointers, press the **[Clear]** or **[Clear All]** key.

Annotating images using the library

To reduce the amount of time spent annotating an image, store frequently-used comments in the comment library.

1. Press the **[Text]** key.
2. Rotate the **Application** soft key to select the desired application.
3. Rotate the **Library** soft key to select the desired comment library.
4. Select the desired comment on the touch screen.
5. Use **[Trackball]** to move the selected comment to the desired position of the screen.
6. When you have finished, press the **[Set]** key.

Annotating images with typed words

1. Press the **[Text]** key.
2. Type the desired comment using the QWERTY keyboard.
   Press the **[Enter]** key to change or add line.

   NOTE
   To complete a comment automatically, rotate the **Auto-Complete (on)** soft key.
3. To change the font size of comments, rotate the **Font Size** soft key.
4. Use **[Trackball]** to move the comment to the desired position of the screen.
5. When you have finished, press the **[Set]** key.

Editing annotations

Moving text

You can move the entered text to the desired place.

1. To select the desired comment or comment group, rotate the **Grab/Delete** soft key.
   The selected comment color turns to green.
2. Use **[Trackball]** to move the selected comment to the desired position of the screen.
3. When you have finished, press the **[Set]** key to fix the position.

Replacing text

1. To select the desired comment, rotate the **Grab/Delete** soft key.
   The selected comment color turns to green.
2. Type a new comment to replace the selected comment. Or select the desired comment on the touch screen.
3. When you have finished, press the **[Set]** key.

Adding text

1. Place the comment cursor onto the desired text position to correct the comment and press **[Set]** key.
2. Select **Back Space** on the touch screen to delete comment by character, if necessary.
3. Type a new text to add to previous comments.
4. When you have finished, press the **[Set]** key.

Deleting annotations

To delete all fixed text and pointers,

– Press the **[Clear]** key or press the **[Clear All]** key on the QWERTY keyboard.

Body Pattern

Body Pattern is an additional way to annotate the image. Body patterns are small graphic images represent the anatomy being examined. Using body patterns and transducer marker, you can indicate the scan position and the position of the transducer during the examination.

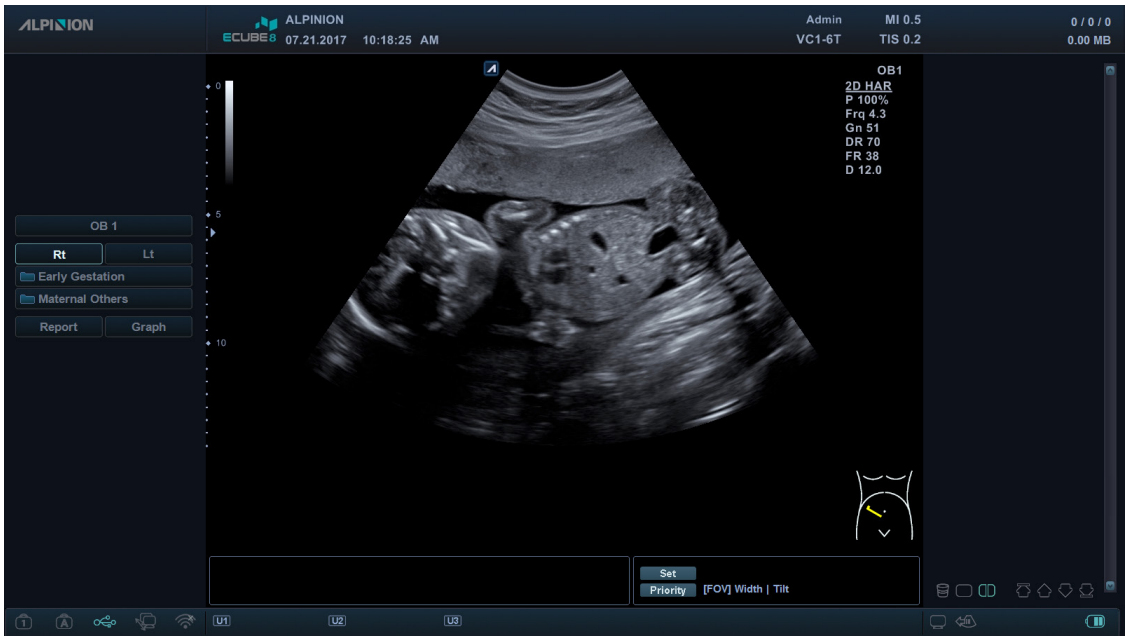


Figure 5-3 Body pattern display



Figure 5-4 Body pattern touch screen

Inserting a body pattern

1. To activate Body Pattern, press the **[Body Pattern]** key on the control panel.
   A list of body patterns appears on the touch screen.
   A default body pattern is displayed automatically when Body Pattern is activated.

   NOTE
   To configure the body pattern list, press the **[System Preset]** key and go to **Annotation** > **BodyPattern**.

2. Rotate the **Library** soft key to select the desired application.

   NOTE
   The body pattern list that appears on the touch screen will vary depending on the selected application.

3. Select the desired body pattern on the touch screen.
   The body pattern with a transducer marker is shown on the screen.
4. To reposition the body pattern, press the **Move Pattern** soft key.
5. Use **[Trackball]** to adjust the position of the body pattern and press the **[Set]** key.
6. Rotate the **Probe Size** soft key to select the desired size of transducer marker.
   The selected transducer marker appears on the screen.
7. Rotate the **Probe Angle** soft key to adjust the angle of the transducer marker.
8. Use **[Trackball]** to adjust the position of the transducer marker and press the **[Set]** key.

Deleting a body pattern

To delete a body pattern,

– Press the **[Clear]** key or press the **[Clear All]** key on the QWERTY keyboard.

Panoramic Imaging

The Panoramic imaging feature extends your field of view by piecing together multiple 2D images into a single, extended 2D image. For using this feature, you need an additional request to your local agent.

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

You can perform the Panoramic imaging feature on 2D images with linear and convex transducers.

CAUTION

The panoramic imaging constructs an extended image from individual image frames. The quality of the resulting image is user-dependent and requires some additional skill and practice to develop proper technique and become fully proficient. To avoid technique-related artifacts and measurement inaccuracies, read this entire chapter before using the Panoramic imaging feature.

Panoramic imaging display

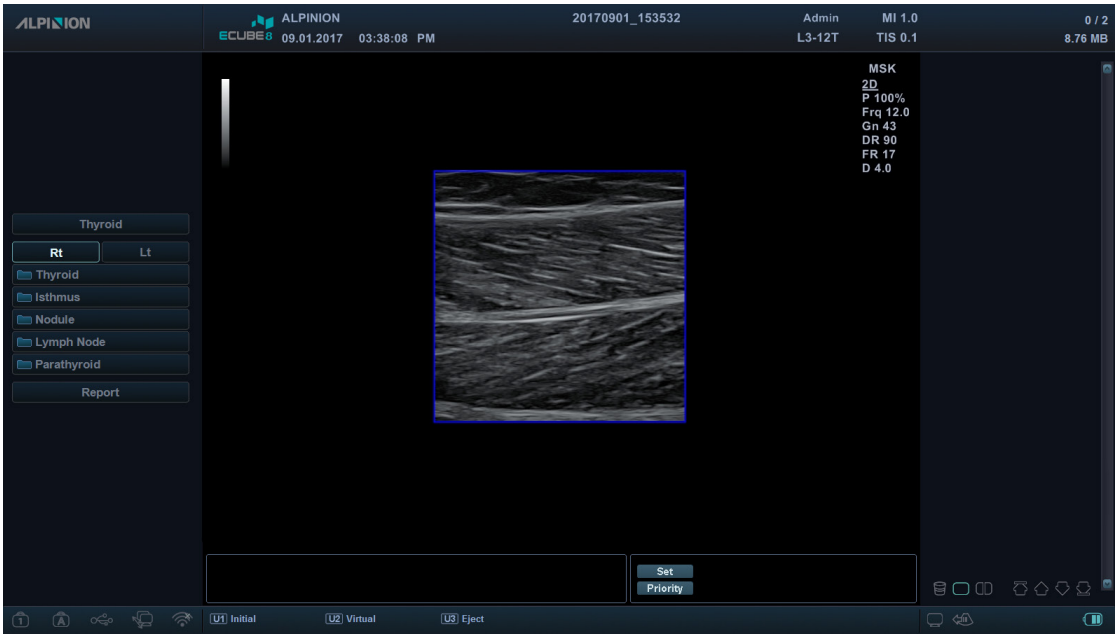


Figure 5-5 Panoramic setup mode

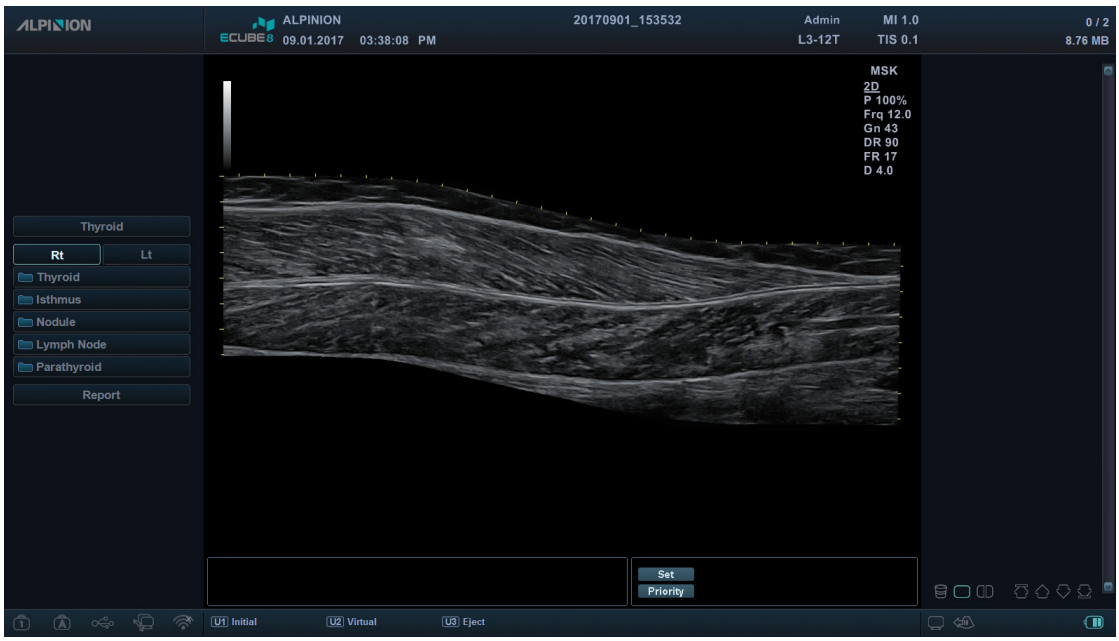


Figure 5-6 Panoramic image acquisition

Panoramic imaging options

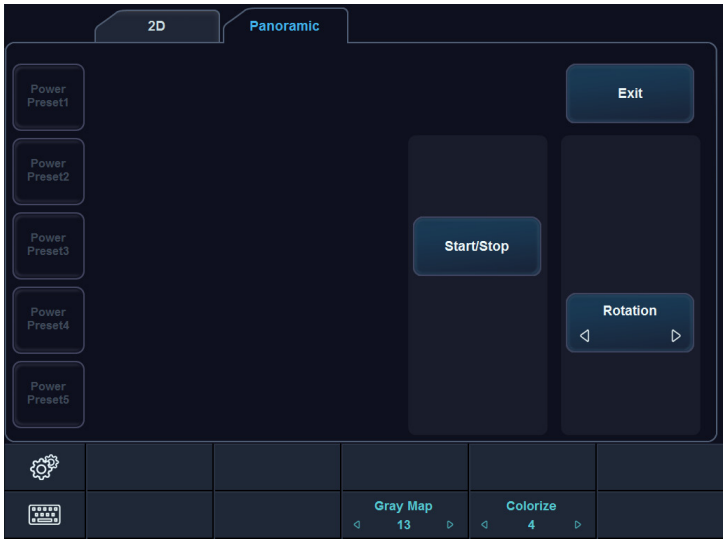
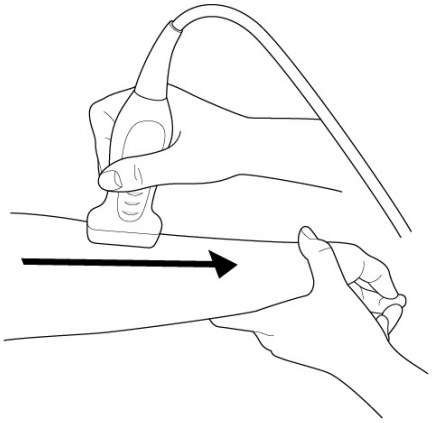


Figure 5-7 Panoramic imaging touch screen

General workflow

1. Apply the enough ultrasound gel along the entire area to be scanned.
2. Place the transducer on the desired scan area.
3. Select **Panoramic** on the touch screen to activate the Panoramic function.
   You can access the Panoramic setup mode, and the blue-colored ROI appears.
4. Press the **[Set]** key to start the image acquisition.
5. Move the transducer linearly along the scan path.



NOTE

To acquire an optimal image, move the transducer slowly and steadily.

6. If you restart the image acquisition, press the **[Set]** key again.
   You can access the Panoramic setup mode, and the blue-colored ROI appears.
7. When you have finished acquiring an image, press the **[Freeze]** key on the control panel.
8. To exit the Panoramic imaging mode, press the **[2D]** key or select **Exit** on the touch screen.

TIPS

For even movement,

- Make sure there is enough ultrasound gel along the scan path.
- Always move the transducer slowly and steadily.
- Do not lift the transducer from the skin surface during the scan.
- Always keep the transducer perpendicular to the skin surface. Do not rotate or tilt the transducer during the scan.
- Keep the motion within the same scan plane, if possible. Do not slide the transducer laterally.
- Deeper scans generally require reduced speed.

Viewing the panoramic image

To optimize the image, use the following options.

Table 5-1 Panoramic imaging options

Option	Description
Gray Map	Change the gray map. Rotate the **Gray Map** soft key to change the gray map of the 2D image.
Colorize	Colorize the 2D image. Rotate the **Colorize** soft key to change the color of the 2D image.

To zoom in the image,

– Rotate the **[Zoom]** key clockwise. And use **[Trackball]** to change the position of the magnified image.

To rotate the image,

– Select **<** or **>** of **Rotation** on the touch screen.

Performing a measurement

To perform a measurement,

– Press the **[Measure]** key on the control panel.

NOTE

2D measurement package is available.

Annotating the panoramic image

1. Press the **[Text]** key on the control panel to annotate an image.
   The comment library appears on the touch screen.
2. Select the desired comment on the touch screen, or type the desired comment using the QWERTY keyboard.
3. To activate Body Pattern, press the **[Body Pattern]** key on the control panel.
   A list of body patterns appears on the touch screen.
4. Select the desired body pattern on the touch screen.
   The body pattern with a transducer marker is shown on the screen.

Saving the panoramic image

When you have finished, press the **[P1]** key to save the image.

Needle Vision™ Plus

Needle Vision™ Plus uses integrated Beam Steering technology for increased needle visualization with maintaining excellent image quality and enhancing the needle brightness. With the needle enhancement feature, you can see the needle more easily during clinical procedure.

NOTE

Needle Vision™ Plus is an optional feature. For using this feature, you need an additional request to your local agent.

Needle Vision Plus™ display



Figure 5-8 Needle Vision™ Plus screen

Needle Vision™ Plus options

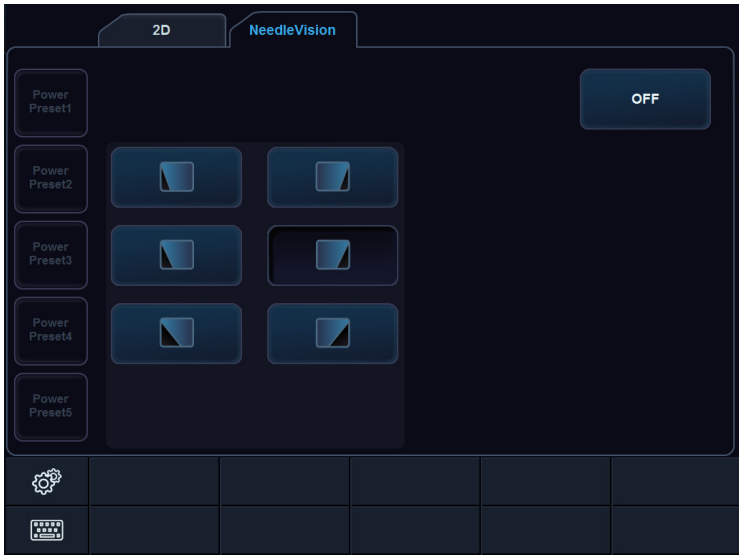


Figure 5-9 Needle Vision™ Plus touch screen

General workflow

To activate Needle Vision™ Plus,

1 Select **NeedleVision** on the touch screen.

NOTE

You can use user-defined key to activate Needle Vision™ Plus. To assign the Needle Vision™ Plus function to user-defined key, press the **[System Preset]** key and go to **User Setting** > **User Defined key** > **Assign User Key** or **Assign Numeric Key** and select the **Needle Vision™**.

2 Adjust the image parameters to obtain an optimized image.

3 To exit the Needle Visions™ Plus, select **OFF** on the touch screen.

Needle Vision™ Plus Options

The following table describes the Needle Vision™ Plus options.

Table 5-2 Needle Vision™ Plus options

Option	Description
L/R Flip	Flip the direction of beam steering horizontally. Select the left or right flip icon on the touch screen to flip the direction of beam steering. Value: Left, Right
Angle	Change the beem angle. Select the angle icon on the touch screen to change the angles. Value: Shallow, Medium, Steep

Elastography

Elastography is a non-invasive method in which images demonstrating elasticity characteristics of tissue are used to help detect or classify tumors. It shows the spatial distribution of tissue elasticity properties in a region of interest by estimating the strain before and after tissue distortion caused by external or internal forces.

NOTE

- Elastography is an optional feature. For using this feature, you need an additional request to your local agent.
- The transducers and applications that support Elastography are as follows:
  - Transducers : L3-12H, L3-12H^{WD}, L8-17H, IO8-17T, EV3-10T, EC3-10T, and VE3-10H
  - Applications: Thyroid, MSK, Breast, GYN, and Urology

Elastography display

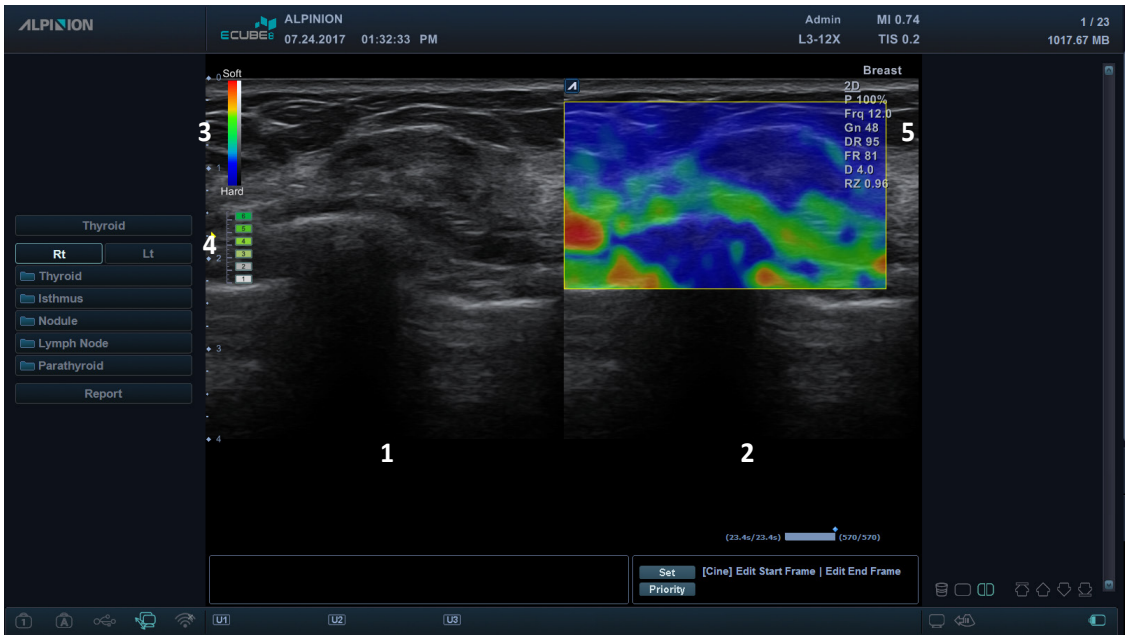


Figure 5-10 Elastography display

1	2D imaging	**4**	Quality bar
2	Elastography imaging	**5**	2D image info
3	Color bar		

Elastography options

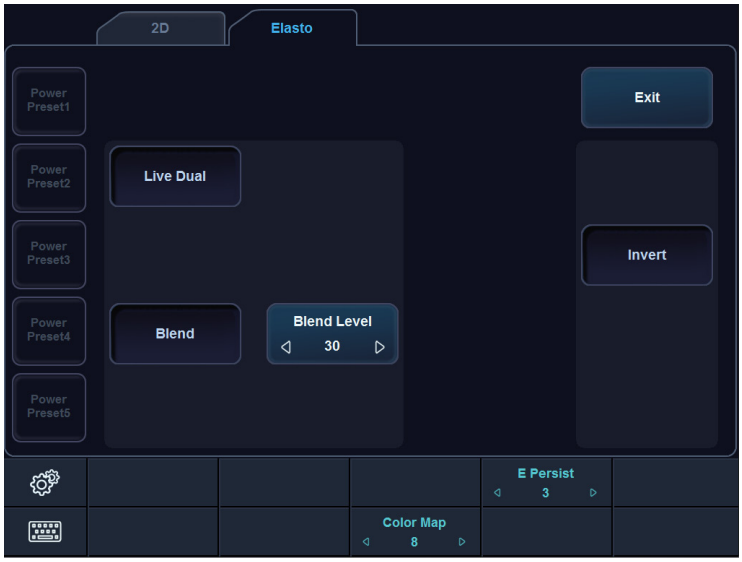


Figure 5-11 Elastography touch screen

General workflow

CAUTION

The results achieved in Elastography mode always depend on the accuracy of the procedure performed. Any clinically relevant decisions need to be verified with some other state of the art methods.

To activate Elastography,

1. Select **Elasto** on the touch screen.
   The system displays two images on the screen in a live, dual format. The left image is a 2D mode image with a region of interest (ROI). The right image is a 2D image with a corresponding ROI showing the elastogram.

   NOTE

   You can use user-defined key to activate Elastography. To assign the Elastography function to user-defined key, press the **[System Preset]** key and go to **User Setting** > **User Defined key** > **Assign User Key** or **Assign Numeric Key** and select the **Elasto**.

2. Perform the scan. Proper manual compression/decompression is displayed by the colored strain map.
3. Adjust the image parameters to obtain an optimized image.
4. When you have finished acquiring an image, press the **[Freeze]** key on the control panel.
5. Save the image if necessary.
6. To exit the Elastography mode, select **Exit** on the touch screen.

Optimizing the Elastography image

To optimize the image, use the following options.

Table 5-3 Elastography options

Option	Description
Invert	Invert the color bar. Select **Invert** on the touch screen to activate or deactivate the invert.
E Persist	Change the temporal averaging rate. (Value: 0 to 4) Rotate the **E Persist** soft key to adjust the persist function.
Blend/Blend Level	Blend 2D and E images to overlap with each other. (Value: 0 to 100) Select **Blend** on the touch screen to activate or deactivate the blend function, and then select **<** or **>** of **Blend Level** on the touch screen to adjust the intensity of blending.
Color Map	Change the type of color map. (Value: 0 to 12) Rotate the **Color Map** soft key to change the type of color map.

Color bar

The color bar indicates the stiffness of the tissue. The bottom of the color bar indicates that the target area is stiffer than the surrounding tissues, and the top of the color bar indicates that the target area is less stiff than the surrounding tissues.

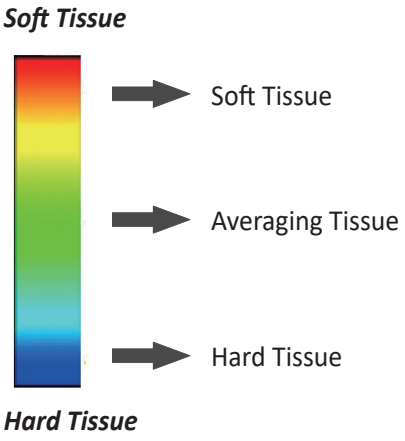


Figure 5-12 Color bar

Quality bar

The quality bar indicates the compression quality. The low section of the bar indicates inappropriate tissue deformation for a quality elastogram and the upper selection indicates appropriate tissue deformation for a quality elastogram.

TIPS

Elastography requires virtually no external compression for reproducible strain imaging results, but, exceptionally manual compression is needed to acquire Elasto images, if you exam a denser nodule.

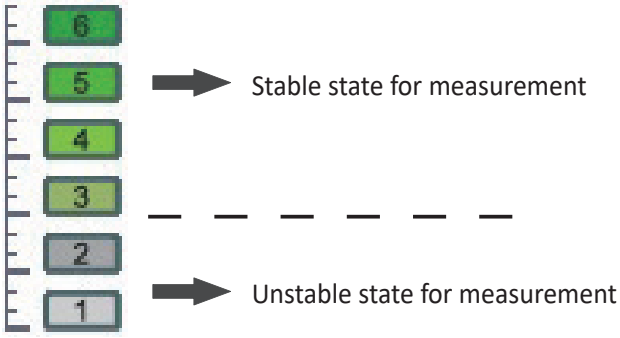


Figure 5-13 Compression quality bar

Elastography display layout

To change the Elasto display layout,

– Select **Live Dual** on the touch screen. The values are On and Off.

Elasto dual layout

The Elastogram and the 2D image are displayed side-by-side on the screen. The 2D image is shown on the left and an Elasto image is shown on the right.

Elasto single layout

The Elasto image is displayed alone on the screen.

Elasto Size Compare

Elasto Size Compare applies the measured data in 2D mode to Elastography mode. Size of lesion in 2D mode and Elastography mode can be compared to have more accurate diagnose result.

NOTE

Elasto Size Compare is only available to use on freezing in Elastography mode.

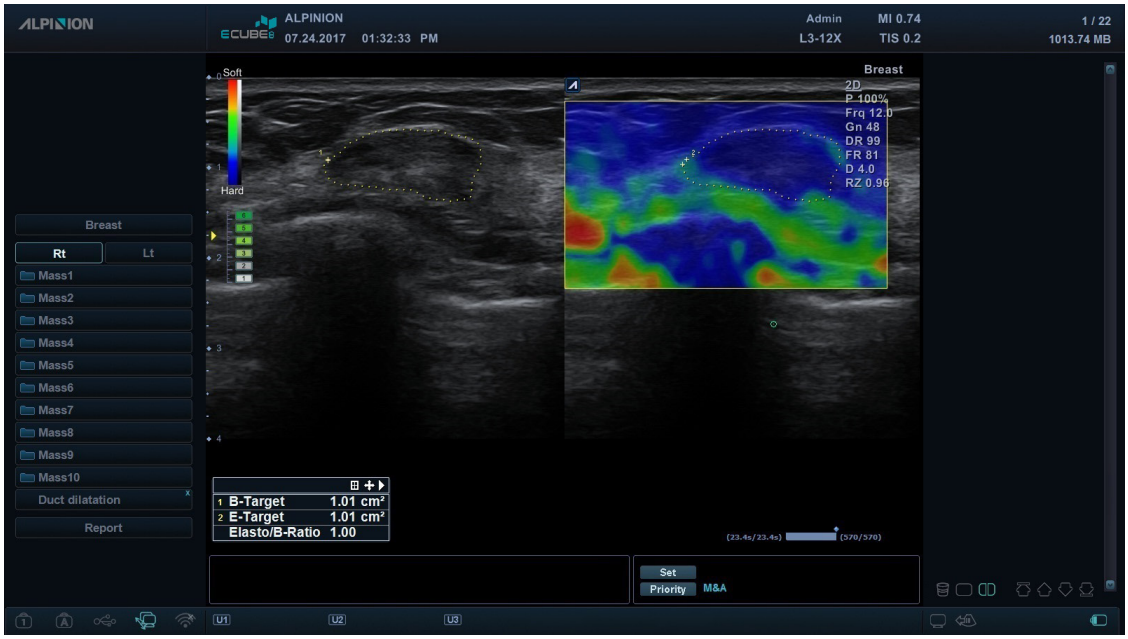


Figure 5-14 Elasto Size Compare display

1. Press the **[Measure]** key on the control panel.
2. Select **Elasto Size Compare** on the touch screen.
3. Use **[Trackball]** to move the marker to the start point on the 2D image, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
4. Use **[Trackball]** to move the marker to the end point, and press the **[Set]** key.
5. The copied caliper appears on the Elastography image area.
6. Use **[Trackball]** to move the marker of the copied start point to the desired position on the Elastography image, and press the **[Set]** key.
   The copied start point is fixed, and the copied end point appears.
7. Use **[Trackball]** to move the marker of the copied end point to the desired position on the Elastography image, and press the **[Set]** key.
8. The measured value is fixed. The two values and one ratio are shown on the ***Result*** window.

NOTE

Elasto Size Compare is not available through the factory default. To configure the Elasto Size Compare, press the **[System Preset]** key and go to **Measurement** > **Basic MEAS.** > **Elasto Size Compare**.

Elasto Strain Ratio

Elasto Strain Ratio provides quantitative information. It is calculated by comparing the strain of a lesion to the surrounding normal tissue. Soft tissue will have higher strain values than stiff tissue. It is displayed as a real-time color map of the relative elasticity.

NOTE

Elasto Strain Ratio is only available to use on freezing in Elastography mode.

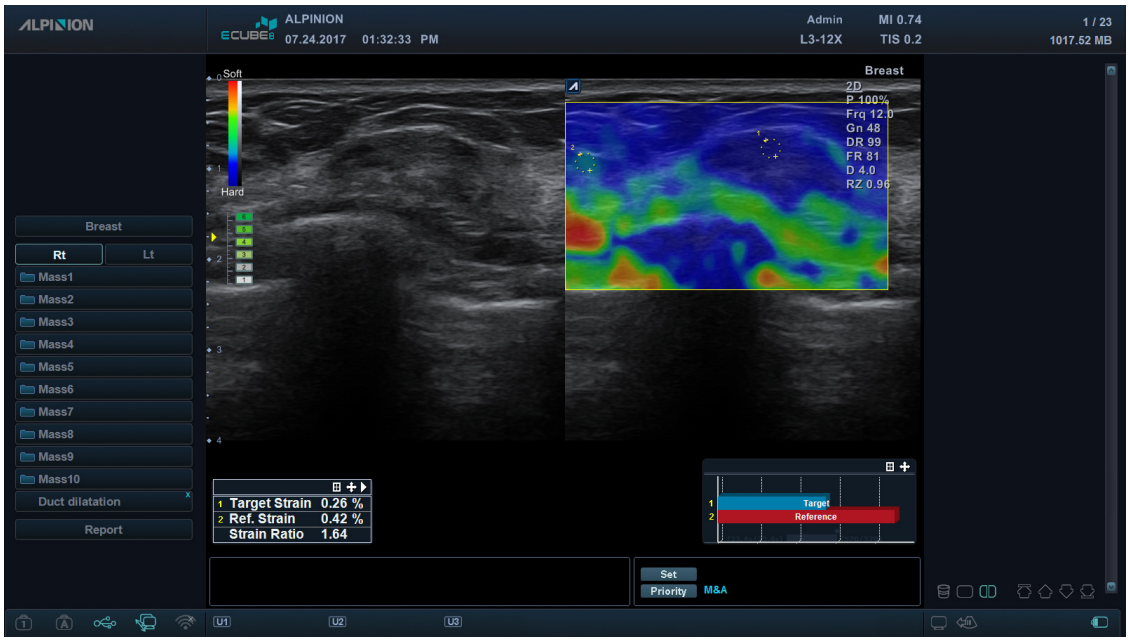


Figure 5-15 Elasto Strain Ratio display

1. Press the **[Measure]** key on the control panel.
2. Select **Elasto Strain Ratio** on the touch screen.
3. Use **[Trackball]** to move the marker to the start point on the Elastography image, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
4. Use **[Trackball]** to move the marker to the end point, and press the **[Set]** key.
   The target strain is shown on the ***Result*** window.
5. The copied caliper appears on the Elastography image area.
6. Use **[Trackball]** to move the marker of the copied caliper to the reference strain point on the Elastography image, and press the **[Set]** key.
   The reference strain is shown on the ***Result*** window.
7. The measured value is fixed. The strain ratio is shown on the ***Result*** window.

NOTE

Elasto Strain Ratio is not available through the factory default. To configure the Elasto Strain Ratio, press the **[System Preset]** key and go to **Measurement** > **Basic MEAS.** > **Elasto Strain Ratio**.

Strain bar graph

The target and reference bars in graph are used to represent the levels of strain values. It is easy to compare the strain values of target and reference with the strain bar graph.



Figure 5-16 Elastography strain bar graph

Stress Echo

WARNING

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

Stress Echo is an optional cardiac application for Stress Echocardiogram which is combined treadmill test/ pharmacologic agent with an echocardiogram.

The stress package provides protocol templates for exercise, as well as pharmacological stress examinations.

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.

To perform this function, you need to proceed the following procedure in serial order: Preacquisition, Acquisition, Selection, and Review modes. The following table describes how each mode takes a role:

Procedure	Description
Preacquisition	Select a protocol to use and ROI to define the image acquisition.
Acquisition	Acquire a stress image from the selected protocol.
Selection	Select images to be used for reviewing.
Review/Scoring	Review the selected images for comparison with the Wall Motion Scoring.

Protocol Editor

Protocol Editor allows you to create, edit, and delete stress echo protocols. When you create or edit a protocol, you can set the number of stage, the number of loops acquired for each view in the stage, and the standard views to include. You can define the stage type (continuous or non-continuous) and names for protocol/stage/view.

To access Protocol Editor,

– Click **Protocol Editor** on the ***Protocol Selection*** window.

– Press the **[System Preset]** key and go to **Advanced Cardiac** > **Protocol Editor**.



Figure 5-17 Protocol Editor

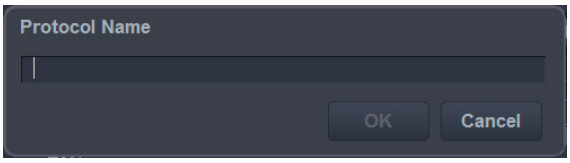
1	Protocols category	**3**	Views category (max. 7 views)
2	Stages category (max. 8 stages)		

Editing an existing protocol

1. Double-click a stage to edit from the stage list.
2. Change the stage settings and click **OK**.
3. To change the stage or view order, click **Up** or **Down** from the Stages or Views category.
4. To copy the protocol or stage, click **Copy** from the Protocols or Stages category.
5. To delete the protocol, stage, or view, click **Delete** from the corresponding category.
6. To save the changes, click **Save**.
7. When you have finished, click **Save & Exit** to exit from the ***Protocol Editor*** screen.

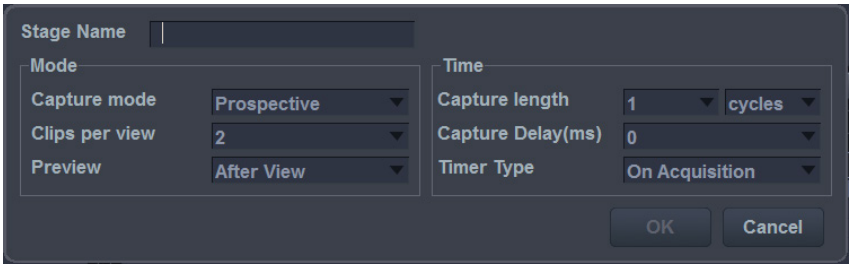
Creating a new protocol

1 On the Protocols category, click **Add** to create a new protocol and click **OK**.
If necessary, change the default protocol name.



2 From the Stages category, click **Add** to create a new stage and click **OK**.
If necessary, edit or select a name for the new stage (Baseline, Pre exercise, Low dose, Peak dose, Peak exercise, Post exercise, Recovery).

3 Set the following stage options:



- **Capture mode**: Define the type of Capture mode.
  - **Continuous**: Acquisition runs for a defined time period. During this time, all views in a stage are acquired.
  - **Prospective**: After starting the acquisition, the next loop is acquired for one view in a stage.
  - **Retrospective**: After starting the acquisition, the last loop is stored for one view in a stage.
- **Clips per view**: Define the clip number per each view (1–4 clips).
- **Preview**: Configure to preview the cine loop before storing (After View, After Stage, None).
- **Kind of Capture length**: Define the unit of the capture length (Cycles or Time). If you change the unit of the capture length to Time, you can operate the Stress Echo function with ECG deactivated.
- **Capture length**: Define the capture length (up to 3 cycles and 3000 ms).
- **Capture Delay(ms)**: Define the capture delay time.
- **Timer Type**: Define the timer type (On Entry, On Acquisition, None).

4 From the Views category, click **Add** to create a new view and click **OK**. (A2C, A3C, A4C, PLAX, PSAX, SAX-APEX, SAX-BASE)

5 To save the settings, click **Save**.

6 When you have finished, click **Save & Exit** to exit from the ***Protocol Editor*** screen.

Preacquisition

1. Activate the ECG function to acquire Stress Echo image clips.
2. On the touch screen, select **E-Tool** and then select **Stress Echo**.
   The ***Protocol Selection*** window appears.

   NOTE

   You can use user-defined key to activate Stress Echo. To assign the Stress Echo function to user-defined key, press the **[System Preset]** key and go to **User Setting** > **User Defined key** > **Assign User Key** or **Assign Numeric Key** and select the **StressEcho**.
3. Select the desired protocol by choosing the protocol name and click **OK**.
   The system displays the real-time imaging screen.

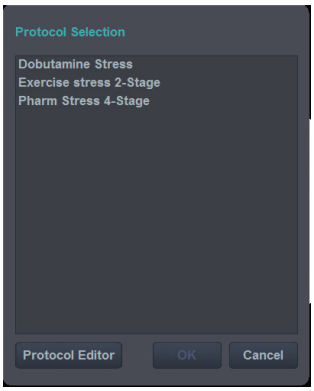


Image acquisition

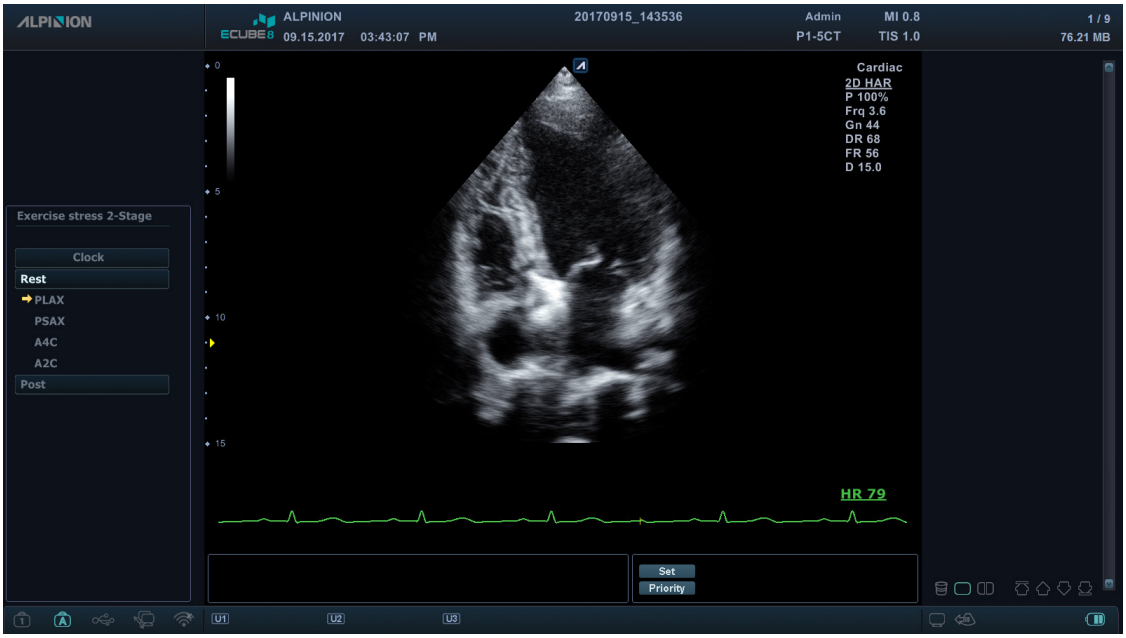


Figure 5-18 Stress Echo acquisition display

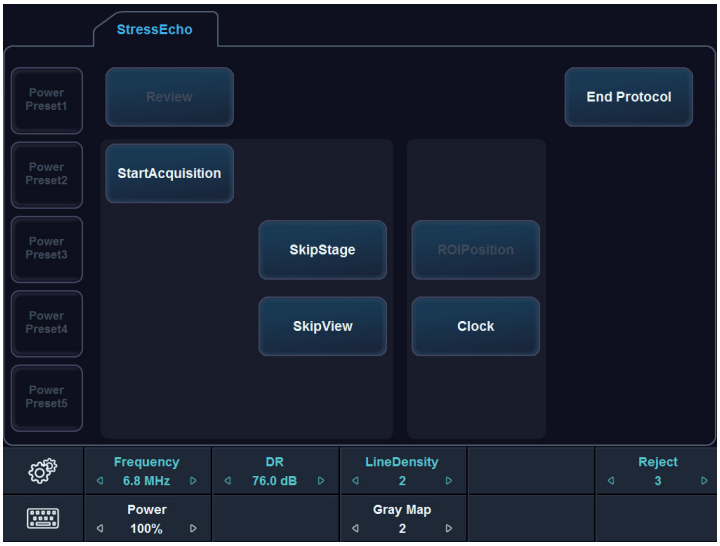


Figure 5-19 Stress Echo acquisition touch screen

The following table describes available acquisition menus on the touch screen.

Field	Descriptions
StartAcquisition	Start image acquisition.
SkipView	Select the next view in the current stage. You can cancel the view.
SkipStage	Select the next stage. You can cancel the stage.
ROIPosition	Adjust the ROI position during acquisition.
Clock	Display the elapsed time from the start of the stress exam.

1 If necessary, optimize the image by use the following options:

- **Frequency**: Adjust the operating frequency of the transducer.
- **DR (Dynamic Range)**: Adjust the dynamic range.
- **Line Density**: Optimizes 2D-mode frame rate or spatial resolution for the best possible image.
- **Reject**: Reduce noise in the image.
- **Power**: Control the amount of acoustic power.
- **Gray Map**: Adjust the gray map.

2 Select **Acquisition** on the touch screen. The ***Acquisition*** screen appears.

3 To start image acquisition, press the **[Freeze]** key on the control panel or select **StartAcquisition** on the touch screen.
The system displays the Protocol window(status bar) on the left of the screen, listing the phases for the selected protocol along with the first phase views. The system selects the first view for acquisition by default, indicating the selected view by placing an arrow mark ( ) to the left of the view name.

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

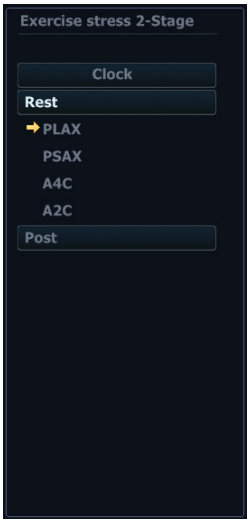
a. To start image acquisition, press the **[Freeze]** key on the control panel or select **StartAcquisition** on the touch screen. Saved views are marked with a green check mark ( ).

– If you select **After View** on the Stage category of the Protocol Editor to configure to preview the cine loop before storing, you can confirm image acquisition by selecting **Accept** on the touch screen before go to the next view.

NOTE

For more information about touch screen in Selection mode, see "Figure 5-21 Stress Echo selection touch screen" on page 5-34.

– If you select **After Stage** on the Stage category of the Protocol Editor, the system goes to the next view for acquisition by default.

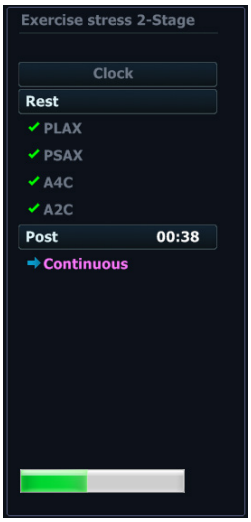


b. Repeat previous step until all required views are completed.

c. When image acquisition is completed for all views, the system switches to Selection mode.

5 If the protocol contains continuous stages, then proceed through each continuous stage according to the following instructions:

a. To start image acquisition, press the **[Freeze]** key on the control panel or select **StartAcquisition** on the touch screen. **Continuous** is shown in the status bar and the progress bar appears.



b. To stop capture, press the **[Freeze]** key or select **StopAcquisition** on the touch screen.

c. When image acquisition is completed for all views and continuous stages, the system automatically stops capturing and switches to Continuous Capture Selection mode.

Image selection

The selected clips are used for analysis in the review mode and wall motion scoring mode. Selection mode is used to select the best loops of the examination.

When the acquisition is ended, Selection mode is enabled automatically, and you can select the preferred loop for each view.

NOTE

If you want to set clips per view, press the **[System Preset]** key and go to **Advanced Cardiac** > **Protocol Editor** > select **Protocol** > double click **Stage** > change the Clips per view (1–4).

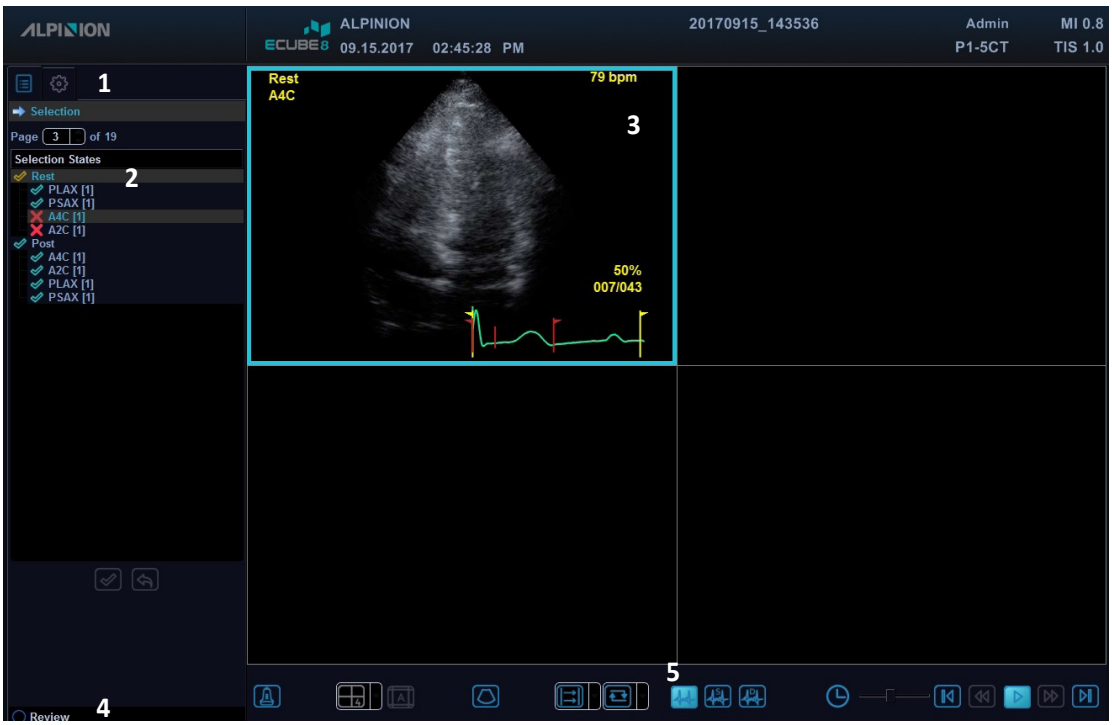


Figure 5-20 Stress Echo selection display

1	Protocol / Protocol Editor	**4**	Review
2	Selected Stage/View	**5**	Image Selection Controls (Icons)
3	Selected image(loop)		

On the ***Selection*** screen, the following icons are available:

Icon	Name	Description
	Enter Acquisition	Go to the Acquisition screen.
	Selection Layout	Select the image layout. (1X1, 2X1,2X2, 3X3, 4X3…)
	Auto layout	Provide the automatically optimized layout for your selected images.
	Show/Hide Overlays	Show or hide the overlaid window indicating the relevant stages or views.
	Dog-ear	Dog-ear the current image to scroll through other images.
	Sync Mode Selection	Free, Start, Align
	Playback Mode Selection	Loop, Once, Sweep
	Full R-R	Set the playback interval in a heart rate cycle.
	Systole Only Playback	
	Diastole Only Playback	
	Speed	Change the playback speed.
	First Previous Play/Pause Next Last	Move to the first loop. Move to the previous loop. Start or pause playback. Move to the next loop. Move to the last loop.

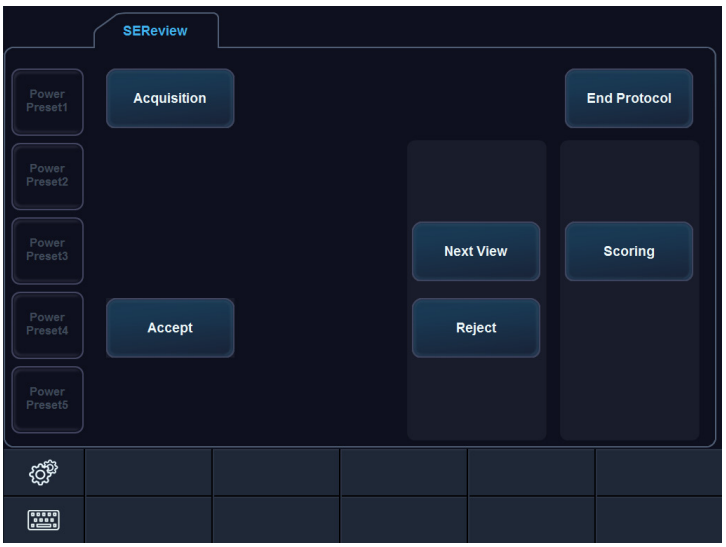


Figure 5-21 Stress Echo selection touch screen

The following table describes available selection menus on the touch screen.

Field	Descriptions
Acquisition	Go to the ***Acquisition*** screen. You can acquire image views until one stage is completed.
Accept	Accept the current view. The selected view is marked as a green-colored check icon.
Reject	Reject the current view. The selected view is marked as a red-colored arrow icon.

To select the preferred loops to assign to the stress protocol views,

1. On the ***Selection*** screen, use **[Trackball]** to select the desired view name.
2. Press the **[Set]** key. The selected view name is highlighted.
3. Use **[Trackball]** to select the desired loop to assign it to a particular view of the stress template.
4. Press **[Set]** key. The frame of the selected image is highlighted.
5. Repeat steps 1–4 to assign loops to the other views.
6. When image selection is completed, select **Review** on the left bottom of the screen to enter the Review mode.

Review and scoring (Wall Motion Scoring)

Review/WMS mode is used to evaluate clips for cardiac wall motion abnormalities. Different views from different stages are selected for comparison across a wide variety of combinations.

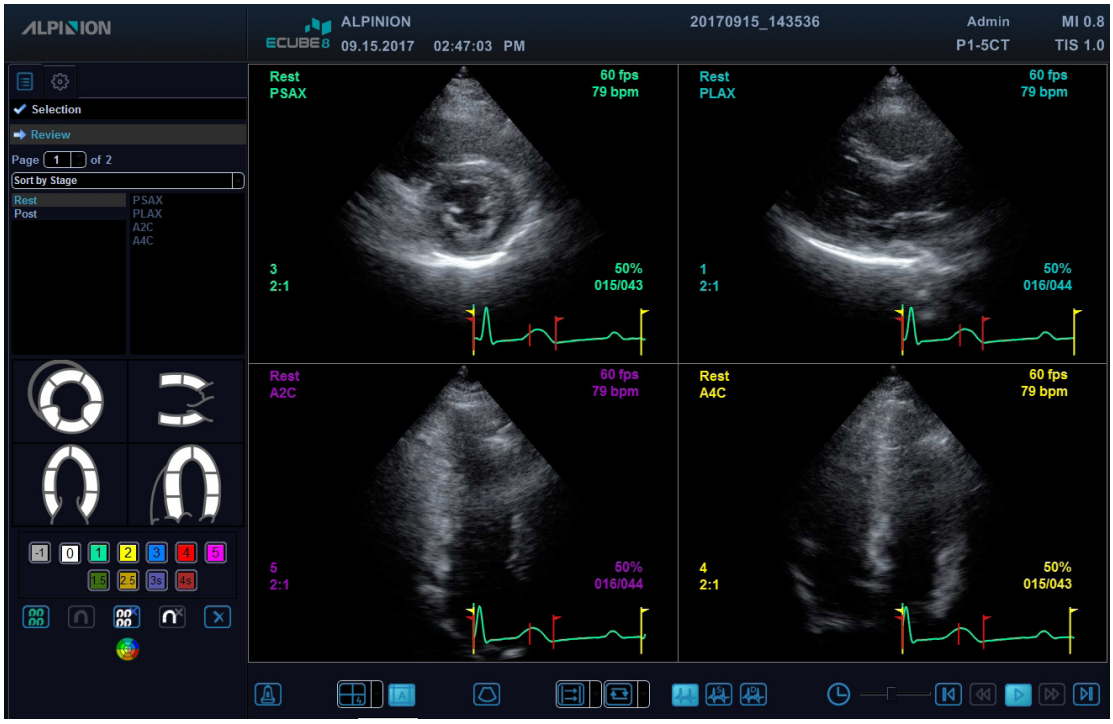


Figure 5-22 Stress Echo review display

On the ***Review*** screen, the following icons are available:

Icon	Name	Description
	Score point	Indicate the each segment's wall-motion score by color
	All Visible Loops Normal	Assign a normal wall motion score to all currently displayed loops.
	Selected Loop Normal	Scoring wall motions for the currently selected loops.
	Reset All Visible Loops Normal	Restore a normal wall motion score to all currently displayed loops.
	Reset Selected Loop Normal	Restore a normal wall motion score to the currently selected loops.
	Reset All View	Restore wall motion score to all views.
	Bull's eye	View the LV motion scoring diagram.

With scoring the wall motions, you can review and compare images between stages and views.

1 Select **Review** on the left bottom of the screen. The ***Review*** screen appears.

2 In Review mode, use the following options:

- **Sort by Stage**: Sort images by stage. Select the gray check box next to each required stage.
- **Sort by View**: Sort images by each image view. Select the gray check box next to each required view.
- **Compare**: Compare between the images. Select the gray check box next to each required stage or view.

NOTE

Shuffle mode is available. The system displays all loops that represent the selected stage or view.

3 Perform review and scoring the wall motion.

4 When you have finished, select **End Protocol** on the touch screen.
The ***Save*** window appears.

5 To save the result, select **Yes**. The selected loops and their wall-motion scores are saved.

6 To delete the result, select **Cancel**. All of the current results are deleted.

Scoring a LV wall motion

Left Ventricle Wall motion scoring (WMS) represents the score results as the Left Ventricle images. Abnormal motions are scored by colorizing the segments in the symbol.

1 Select a score point.

Score	Degree of abnormality of wall motion	Color
-1	Hyperkinesis	Gray
0	Not evaluated	Colorless
1	Normal	Green
1.5	Mild Hypokinesis	Blue-green
2	Moderate Hypokinesis	Yellow
2.5	Severe Hypokinesis	Lemon
3	Akinesis	Blue
3s	Akinesis with Scar	Purple
4	Dyskinesis	Red
4s	Dyskinesis with Scar	Scarlet
5	Aneurysm	Pink

2 Move **[Trackball]** to a segment in the scoring diagram and press the **[Set]** key.

3 The scored motion is colored and displayed in the relevant segment area in the diagram.

4 To score the relevant segments, repeat steps 1–3.

WMS report

In addition to the standard information included in the WMS report, you can include or exclude data to a specific stage. The WMS graphics of the each view on the report indicate the each segment's wall-motion score by color or degree of shading.

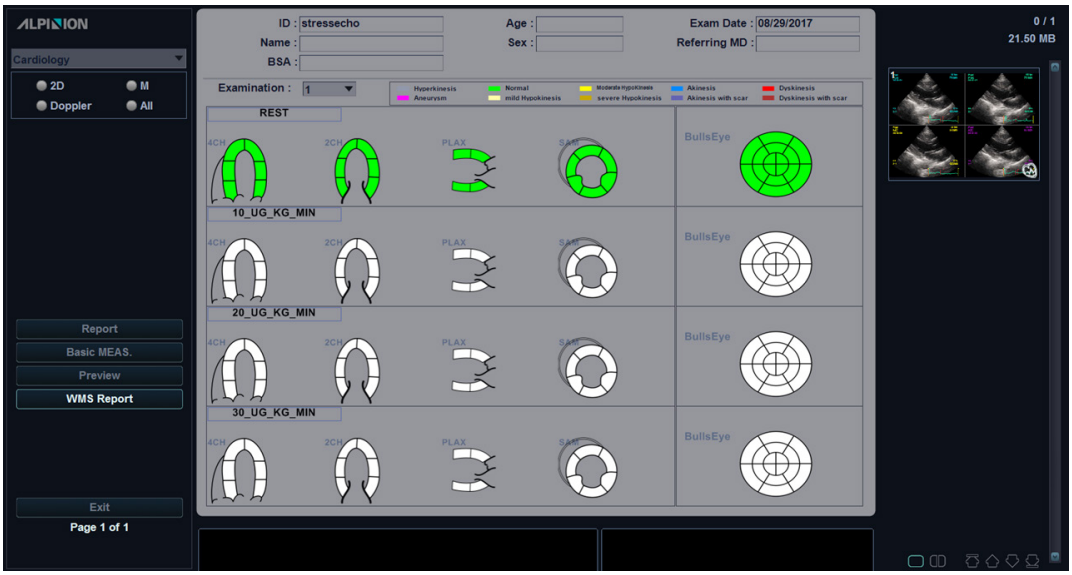


Figure 5-23 WMS report

To activate the WMS report,

1. Select **End Protocol** to exit Stress Echo and save the current results.
2. Press the **[Report]** key on the control panel. The ***Report*** screen appears.
3. Select **WMS Report** on the context menu.

To enter comments on the WMS report,

1. Select **Comment** on the touch screen. The ***Comment*** screen appears.
2. Enter comments in the ***Comments*** field.
3. When you have finished entering comments, select **Preview** on the context menu to preview comments. You can see comments in the ***Comments*** field.

To preview and print the WMS report,

1. From the ***Report*** screen, select **Preview** on the context menu.
2. Preview the report for the currently selected mode.
3. To print the report, select **Print** on the touch screen.

Reviewing a stored Stress Echo



Figure 5-24 Reviewing Stress Echo via E-view

To review a stored Stress Echo,

1. Press the **[E-view]** on the control panel.
2. To review the Stress Echo, select the image.
   The selected image is highlighted.

   NOTE

   The Stress Echo exam displays as a single image with a stress echo icon placed on the image.
3. Select **Review** on the touch screen.

Image Compression

The Stress-Echo supports a four-level image compression. (High, Medium, Low, Uncompressed).

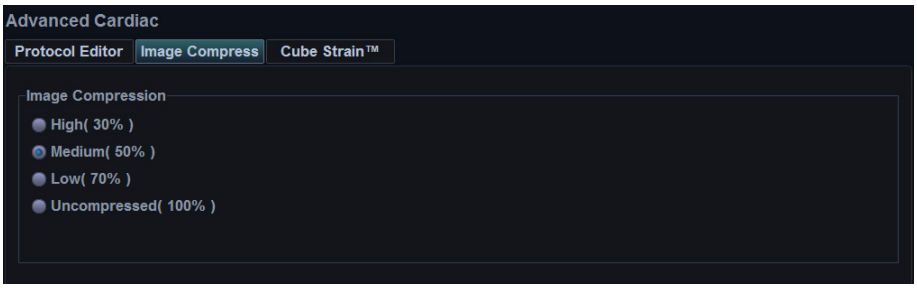


Figure 5-25 Image Compression

Cube Strain™

Cube Strain™ is an optional cardiac application that provides advanced motion and velocity information of the myocardial tissue. On a basis of 2D speckle tracking technology, the angle independent analysis of this function allows you to assess accurate strain and calculate strain rate of the myocardium, especially for fetal heart. With the enhanced graphic display, you can easily and quickly identify wall motion change.

Display icon

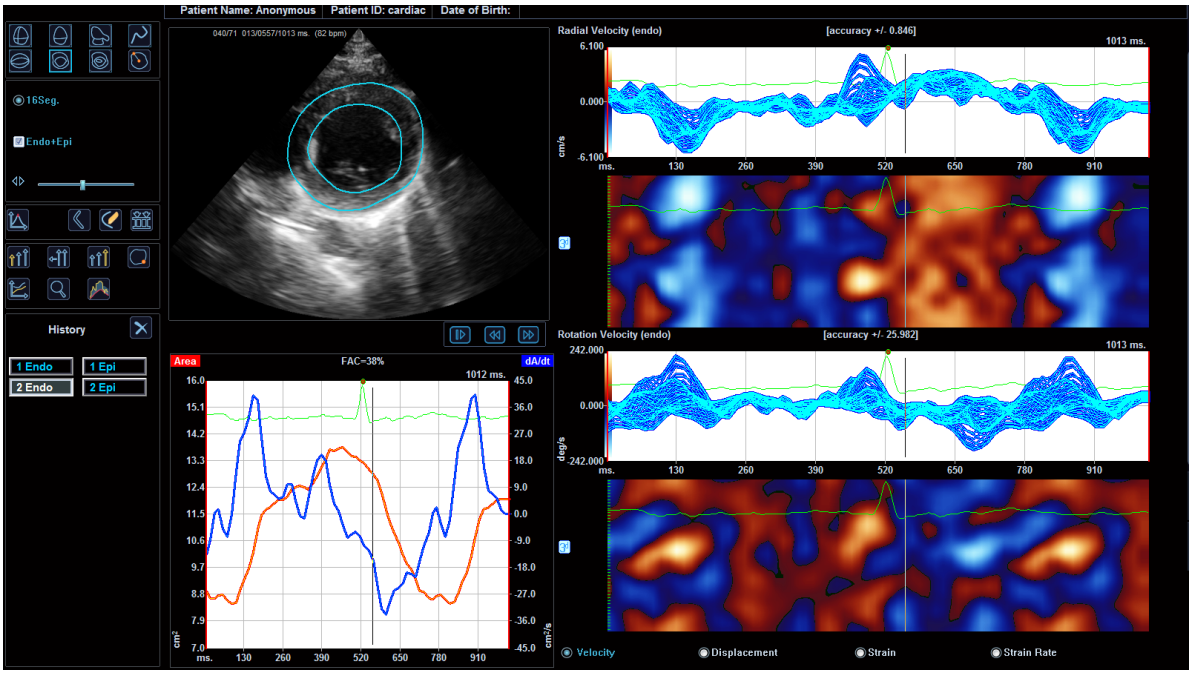


Figure 5-26 Cube Strain display

The following table describes the optional icons that you can use for the Cube strain™ function.

Icon	Name	Description
	4-chamber view	Apical 4-chamber projection
	2-chamber view	Apical 2-chamber projection
	Long axis view	Apical 3-chamber or long axis projection
	Free trace	Arbitrary curve for the endocardium. This is unavailable for Time-to-Peak analysis.
	Short axis mitral valve plane	Short axis projection at the level of the mitral valve

Icon	Name	Description
	Short axis papillary muscle plane	Short axis projection at the level of the papillary muscle
	Short axis apex	Short axis projection at the level of the apex
	Segment position	Set the position between anterior and anteroseptal segment.
	Gamma	Customize the gamma settings.
	Time-to-Peak analysis	Open the Time-to-Peak analysis screen.
	Start analysis	Start the velocity strain analysis.
	New trace	Start a new contour tracing.
	Edit trace	Change the location of the current contour.
	Sequence/M mode selection	Open the Sequence/M mode selection screen.
	Decrease vector size	Reduce the vector size of the 2D mode tile.
	Reset vector size	Reset the vector size of the 2D mode tile.
	Increase vector size	Enlarge the vector size of the 2D mode tile.
	Toggle contour/vector/ orbit line/2D mode	Select the icon until the display shows the desired function.
	Reset graph display	Reset the graph display to the default screen.
	Zoom in/out	Zoom in or out the 2D mode display.
	Filtered/Unfiltered plot	Set to display the filtered or unfiltered plot of graphs and parametric maps.
	M mode display	Set to display the M mode image on the graph.

Activating CUBE Strain™

To activate Cube Strain,

– On the touch screen, select **E-Tool** and then select **Cube Strain**.
The ***Sequence/M mode*** selection window appears.

NOTE

You can use user-defined key to activate Cube Strain. To assign the Cube Strain function to user-defined key, press the **[System Preset]** key and go to **User Setting** > **User Defined key** > **Assign User Key** or **Assign Numeric Key** and select the **Cube Strain™**.

Selecting an image

1. Adjust the dataset representation. If necessary, customize the gamma settings for the analysis.
2. Draw a straight line and define 2 or more points in the line. The background image of Anatomical M mode is automatically calculated.
3. Define the position of the R wave.
If the study has ECG data, the system automatically detects cardiac cycle, heart rate, and R wave position.
4. Select the first frame and last frame of the sequence, and select **Next >**.
5. Select the view type (4Ch, 3Ch, 2Ch, SAX MVf, SAX, SAX AP, Free Curve) and set the Endo+Epi options for the velocity strain analysis.

Contouring and starting analysis

1. Select a frame to be used for endocardial contour tracing.
2. Set the endocardial contour: Long axis type, short axis type, and free curve.
3. Select **Start Analysis** to start analysis. The system analyzes the velocity strain and shows the results on the contour, graph, and parametric map.
4. Click and hold the left mouse button, and drag the 3D image to rotate the image around its virtual center of gravity.
5. Select **Back**.
6. Select **Time-to-Peak Analysis** to go to the ***Time-to-Peak Analysis*** screen.
The system automatically starts analyzing and shows the segment values (depending on the selected view type) and graphs.

Ending an exam

1. When you have finished, press the **[Exit]** key on the control panel.
The ***Save*** window appears.
2. To save the results, click **Yes**.
The scan screen appears and you can see thumbnail images on the clipboard.

6

Managing Patient Information and Image

This chapter describes how to capture images.

Clipboard 6-2
E-view 6-4
DICOM Spooler 6-16
Printer 6-18
DVR 6-19

Clipboard

The clipboard shows captured ultrasound images for a quick review. Pressing the **[P1]** key captures an active image and displays a preview image on the clipboard. When reloading the previous study, the images belong to that study are shown on the clipboard.

Capturing onto the clipboard

Press the **[P1]** key to capture images onto the clipboard. You can see thumbnail images on the clipboard.

NOTE

The print key is programmable. You can assign the P1, P2, and P3 key functions in **User Setting > Print/Foot Switch**.

Reloading images from the clipboard

1. Press the **[Cursor]** key to obtain the cursor.
2. Move the cursor over the image you want to reload by using **[Trackball]** and press the **[Set]** key.
3. Press the **[Set]** key to reload the selected image on the full screen image.
   You can also double-click a thumbnail image to reload an image. To scroll the page, click the arrow mark of the scroll bar to move up and down.

Deleting images from the clipboard

1. Press the **[Cursor]** key to obtain the cursor.
2. Move the cursor over the image you want to delete by using **[Trackball]** and press the **[Set]** key.
3. Click the trash can icon ( ) on the bottom right.
4. When the confirmation dialog appears, click **Yes** to delete the image.

Saving images permanently

1. Press the **[E-view]** key on the control panel. The images on the clipboard appear expanded.
2. Use **[Trackball]** to select an image or multiple images and press the **[Set]** key.
   To select all images, select **Select All**. To select inverse images, select **Select Inverse**.
3. Select **Archive** on the touch screen to save the image(s).

Indices

- The number on the top left corner denotes the consecutive order for saving.
- Film symbol on the bottom right side denotes the CINE loop that is possible to post processing.
- On the top of the clipboard, the clipboard indicators show the total capacity and number of images.
- To delete the selected thumbnail image, click the trash can icon () on the bottom right.
- To change the clipboard window layout, click the single layout icon () or dual layout icon () on the bottom right.

E-view

The system provides the E-view feature that allows fast and easy image management. The E-view feature allows you to view the whole patient from local database or removable media, backup/restore, save as with PC friendly format and send DICOM images to remote server over the network. And it allows you to open an already existing patient exam.

CAUTION

You may lose patient information files such as patient's basic information and scanned images because of physical shocks to the product or internal errors. Therefore, you should back up patient's basic information and scanned images on a regular basis. See "Backup / Restore" on page 1-43 for more information. ALPINION MEDICAL SYSTEMS does not have the responsibility for data loss caused by the user's carelessness.

To activate the E-view feature,

– Press the **[E-view]** key on the control panel.

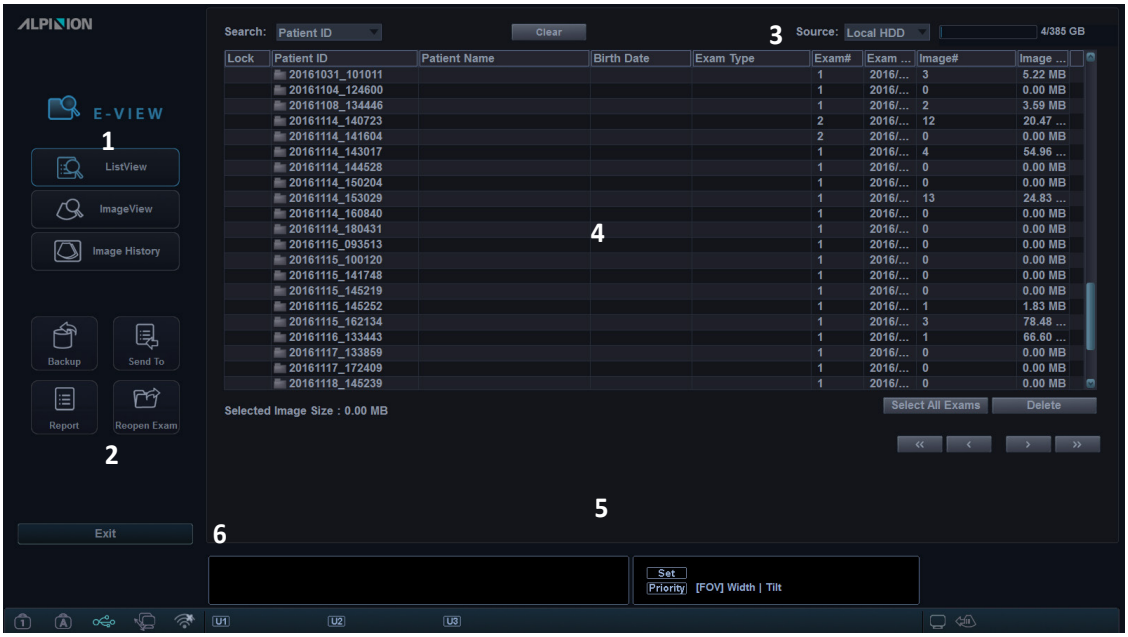


Figure 6-1 E-view display

1	Menu selection	**4**	Patient list/Study list
2	Function selection	**5**	Image area
3	Source information	**6**	Exit

List View

List View allows you to search and quick view for patients and studies from the local hard disk drive (HDD) or a removable media.

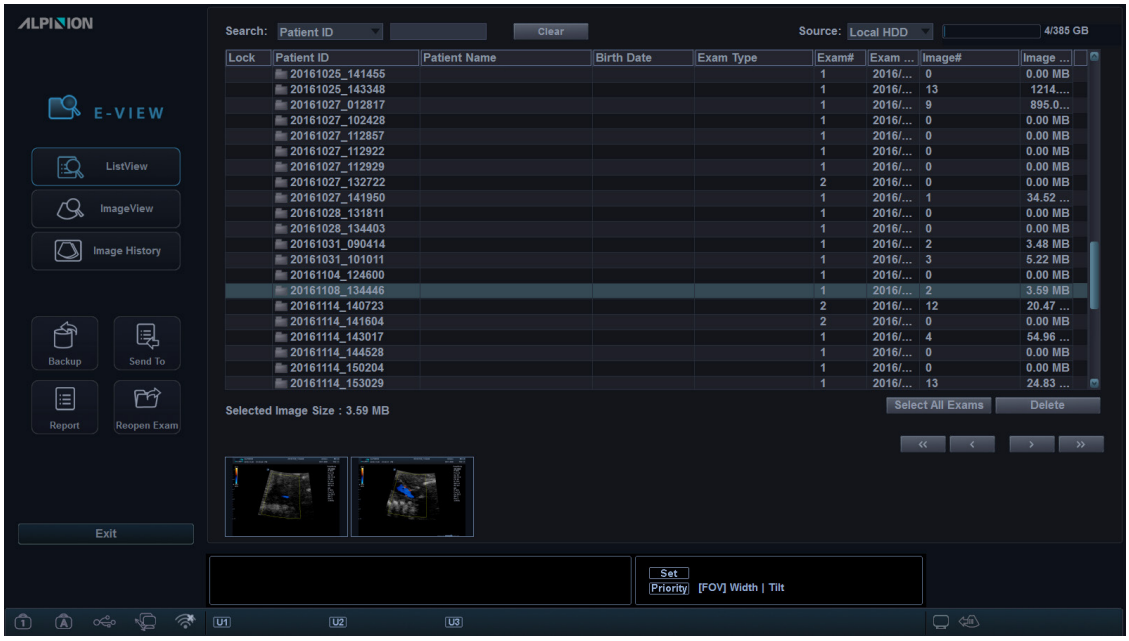


Figure 6-2 List View display

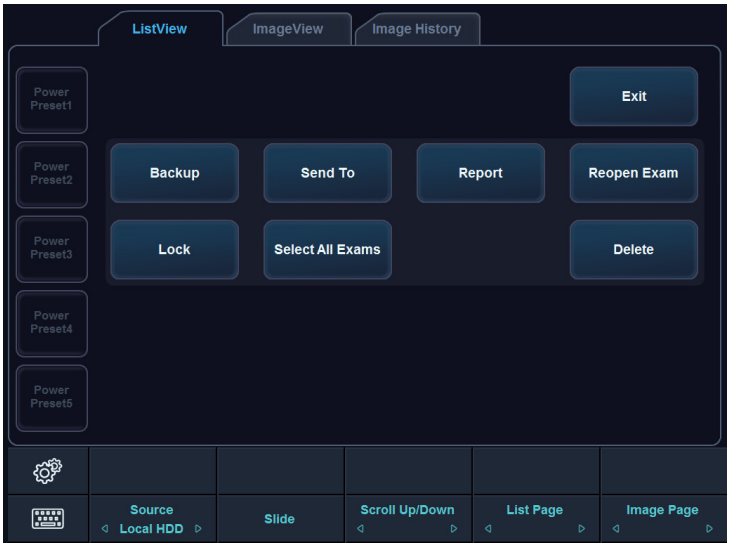


Figure 6-3 List View touch screen

To activate List View,

1. Select a source from the ***Source*** drop-down list.
2. To search patients by using the searching filter, select a search method from the ***Search*** drop-down list. Or, you can manually enter a keyword in the search area.
3. Select the desired patient from the patient list.

4 Use the following options:

- **Backup**: Export the patient information.
- **Send To**: Send the saved images through the network.
- **Report**: Access Worksheet page.
- **Reopen Exam**: Reopen an already existing exam.

Backup

To move patient(s) between compatible systems or to back up and restore, use **Backup** menu. You can use the following types of media for performing data backup: CD, DVD, USB HDD, USB flash drive.

NOTE

Make sure that your media is appropriate for exporting or importing images. If any problem occurs, eject the media and retry the task.

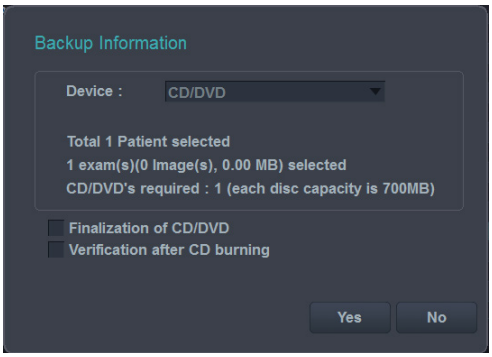
To export from the local HDD to a removable media,

1 Insert your removable media to the media tray properly.

2 Select **Local HDD** from the ***Source*** drop-down list.

3 Select the patient(s) from the patient list.

4 Select **Backup** on the touch screen, or select **Backup** on the function selection.
The dialog box appears.



5 Select a media from the ***Device*** drop-down list.

6 If you select **USB** or **USB HDD** from the ***Device*** drop-down list, you can enter the description such as information or comment.

7 If you select **CD/DVD** from the ***Device*** drop-down list, you can use the following options:

- **Finalization of CD/DVD**: Finalize the CD or DVD to prevent from further writing.
- **Verification after CD burning**: Verify your patient data in a CD or DVD after burning the CD or DVD.

8 Click **Yes**. The status information is displayed in the Backup Spooler during exporting files.

Backup Spooler

Backup spooler displays all backups which have been sent or which have been failed.

To enter the Backup spooler, press the **[DICOM Spool]** key on the QWERTY keyboard, and then select **Backup** on the touch screen. You can control or monitor backup jobs. From the Back spooler, you can retry, delete, or redirect job.

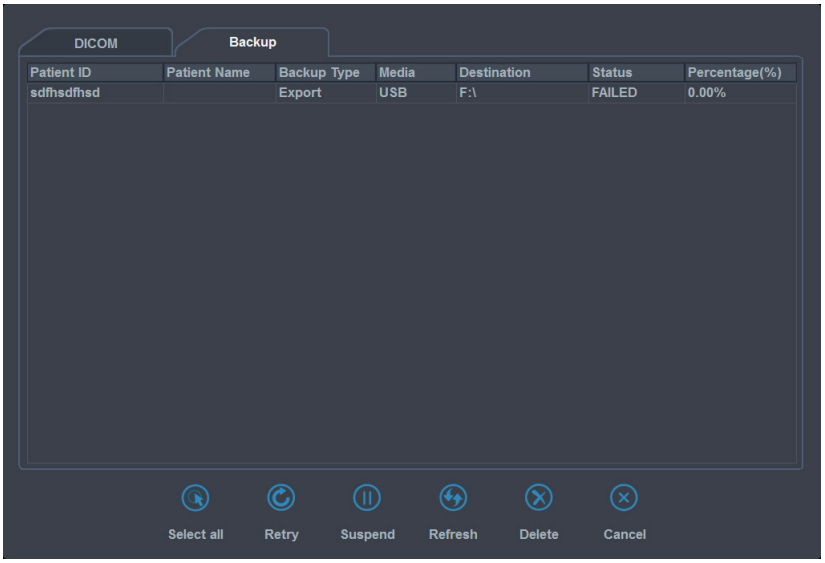
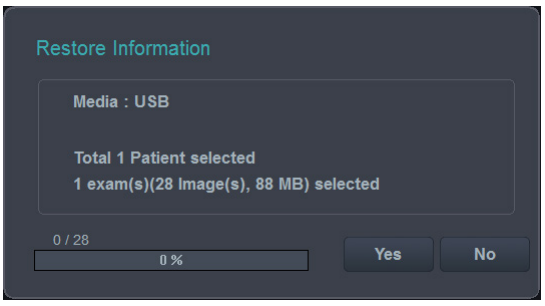


Figure 6-4 Backup spooler

To restore from a removable media to the local HDD,

1. Insert a media that contains patient data.
2. Select a removable media from the ***Source*** drop-down list.
3. Select the patient(s) from the patient list.
4. Click **Restore**. The progress bar appears while importing files.



5. To eject the removable media (for CD or DVD), press the **[Eject]** key on the QWERTY keyboard.

Send To

Send To allows you to save images or studies from your PC to a storage media such as CD, DVD, USB flash drive, USB hard disk, and network storage. Before saving, make sure that the removable media is placed in the right position.

CD/DVD, USB/USB HDD, Network

1. Select **Local HDD** from the ***Source*** drop-down list.
2. Select the patient(s) from the patient list.
3. Insert your removable media to the media tray properly.

   NOTE

   To configure the network storage, press the **[System Preset]** key and go to **Connectivity > General > Network Storage**.

4. Select **Send To** on the touch screen, or select **Send To** on the function selection.
   The dialog box appears.



5. Select a storage media type on the left of the dialog box.
6. Select a media from the ***Device*** drop-down list.

   NOTE

   If you select **USB**, **USB HDD**, or **Network Drive** from the ***Device*** drop-down list, you can add or delete folders by using the add folder icon ( ) or delete folder icon ( ).

7. If you select **CD/DVD**, **USB/USB HDD** or **Network**, you can use the following options:
   - **Generate DICOMDIR file**: Save the patient data as DICOMDIR file.
   - **Finalization of CD/DVD**: Finalize the CD or DVD to prevent from further writing.
   - **Verification after CD burning**: Verify your patient data in a CD or DVD after burning the CD or DVD.
8. The system automatically creates a file name.
   To change the file name, select the **Edit File Name** check box and enter a file name in the ***File Name*** field.

9 Select an image format in the ***Type*** field.
To save CINE images as a video file, skip to step 12.

Table 6-1 Image format

Format	Function
DCM	Save a still image as standard DICOM format. It is possible to specify compression type and quality.
BMP	Save a still image as BMP format.
JPEG	Save a still image as JPEG format. It is possible to specify compression type and quality.

NOTE

To view a DICOM format image on your PC, you need a dedicated DICOM viewer.

10 If you selected **DCM** in step 9, select a compression type in the ***Compression*** field.

11 If you selected **JPEG** in step 9, select an image quality in the ***Quality*** field.

12 Select a video file format.

- **2D Cine**: Save 2D CINE Images as WMV or AVI format.
- **4D Volume Cine(*AVI)**: Save 4D volume CINE images as AVI format.

13 When you have finished, click **Save**.

PACS

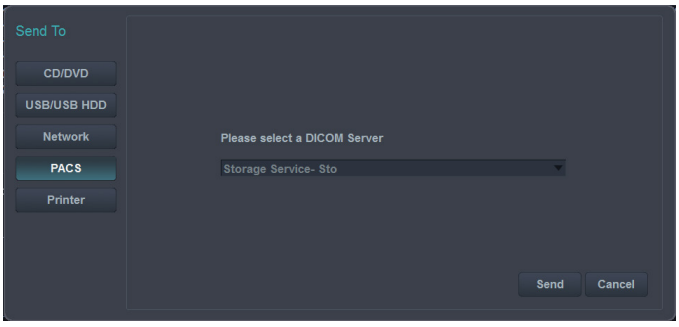
PACS allows you to transfer patient(s) data to the DICOM device such as DICOM storage or DICOM Print.

To send from the local HDD to a DICOM device,

1 Select **Local HDD** from the ***Source*** drop-down list.

2 Select the patient(s) from the patient list.

3 Select **Send To** on the touch screen, or select **Send To** on the function selection.
The dialog box appears.



4 Select **PACS** on the left of the dialog box.

5 Select a destination device from the ***DICOM Server*** drop-down list.

NOTE

You can configure the destination device. To configure, press the **[System Preset]** key and go to **Connectivity** > **Storage**.

6 Click **Send**. The progress bar appears during transferring files.

Printer

1 Select **Local HDD** from the ***Source*** drop-down list.

2 Select the patient(s) from the patient list.

3 Select **Send To** on the touch screen, or select **Send To** on the function selection.
The dialog box appears.



4 Select **Printer** on the left of the dialog box.

5 Select a standard (default) printer and set up the printing options.

NOTE

To configure the standard printer, press the **[System Preset]** key and go to **System** > **Peripheral** > **Standard Printer**.

6 When you have finished, click **Print**.
The selected printer prints out the selected image(s).

NOTE

To invert color between images and background, select the **Invert Image** check box.

Report

Report allows you to access Worksheet page. Press the **[Report]** key on the control panel.

Reopen Exam

Reopen Exam allows you to open an already existing exam. The reopened exam is now the current exam and can be closed by pressing the **[End Exam]**.

NOTE

You cannot reopen exams, which are older than 24 hours.

To open the selected exam,

1. Select the desired patient from the patient list.
2. Select **Reopen Exam** on the touch screen, or select **Reopen Exam** on the function selection. The scan screen appears.
3. Edit an image and save it.
4. To end the current exam, press the **[End Exam]**.

Image View

Image View allows you to view the selected images from list view. You can change the display layout.

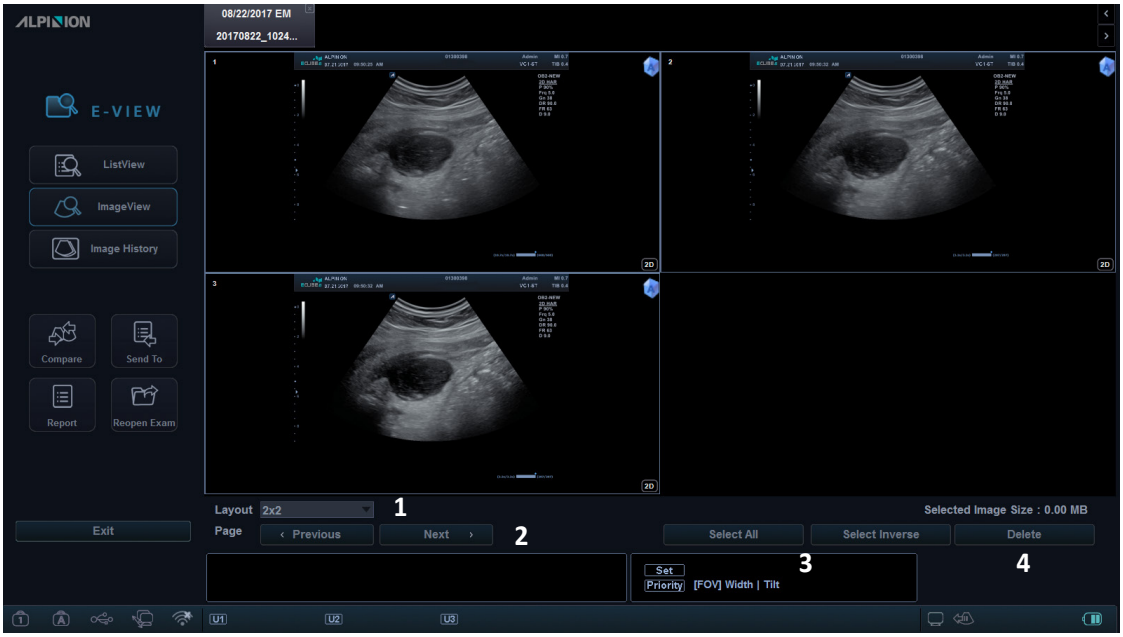


Figure 6-5 Image View display

1	Layout selection	**3**	Select All/Select Inverse
2	Page selection	**4**	Delete

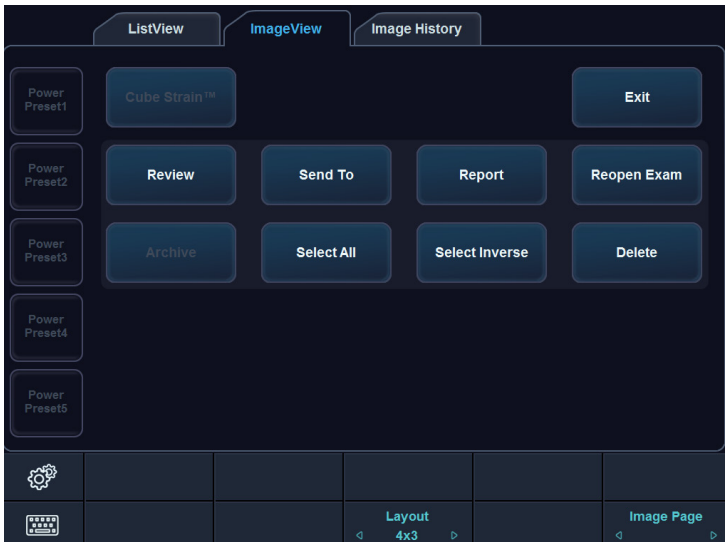


Figure 6-6 Image View touch screen

To activate Image View,

1. Select a source from the ***Source*** drop-down list.
2. To search patients by using the searching filter, select a search method from the ***Search*** drop-down list. Or, you can manually enter a keyword in the search area.
3. Select a desired patient from the patient list.
4. Select **ImageView** on the touch screen, or select **ImageView** on the menu selection.
5. Use the following options:
   - **Backup**: Export the patient information.
   - **Send To**: Send the saved images through the network.
   - **Report**: Access Worksheet page.
   - **Reopen Exam**: Reopen an already existing exam.

To review an image,

1. Select the desired image.
2. Select **Review** on the touch screen. The image is shown on the scan screen.

Image History

Image History allows you to review all previous studies for the selected patient. When you access Image History, the study information with the study date and location appears in a table.



Figure 6-7 Image History display

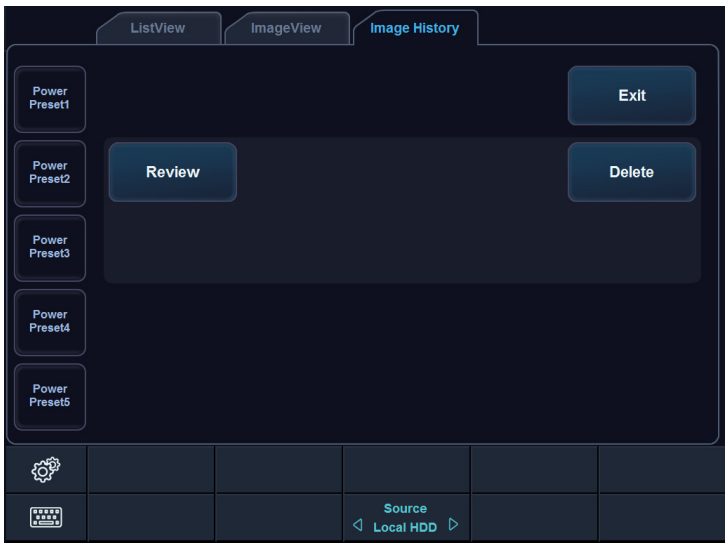


Figure 6-8 Image History touch screen

To activate Image History,

1. Insert a media that contains patient data, if necessary.
2. Select a source from the ***Source*** drop-down list.
3. To search patients by using the searching filter, select a search method from the ***Search*** drop-down list. Or, you can manually enter a keyword in the search area.
4. Select a desired patient from the patient list.
5. Select **Image History** on the touch screen, or select **Image History** on the menu selection.
   All of the studies for the selected patient are listed by chronological order.
6. Select an image in the desired study by using **[Trackball]**. The blue-colored frame appears on the selected image.
   To review multiple images between different studies, select desired images of the studies you want. You can select up to four images at one time.

   NOTE

   You can compare images by changing the image layout to dual imaging or quad imaging. Press the **[Dual]** key or **[Quad]** key on the control panel.
7. Select **Review** on the touch screen to review the image.
8. To delete the image, select **Delete** on the touch screen.
9. When you have finished, press the **[2D]** key to return to the scan mode.

Ending a study

To end a study immediately,

– Press the **[End Exam]** key on the control panel.

DICOM Spooler

DICOM spooler displays all DICOM transfers which have been sent or which have been failed.

On the QWERTY keyboard, press the **[DICOM Spool]** key to enter the DICOM spooler. You can control or monitor DICOM jobs. From the DICOM spooler, you can retry, delete, or redirect job.

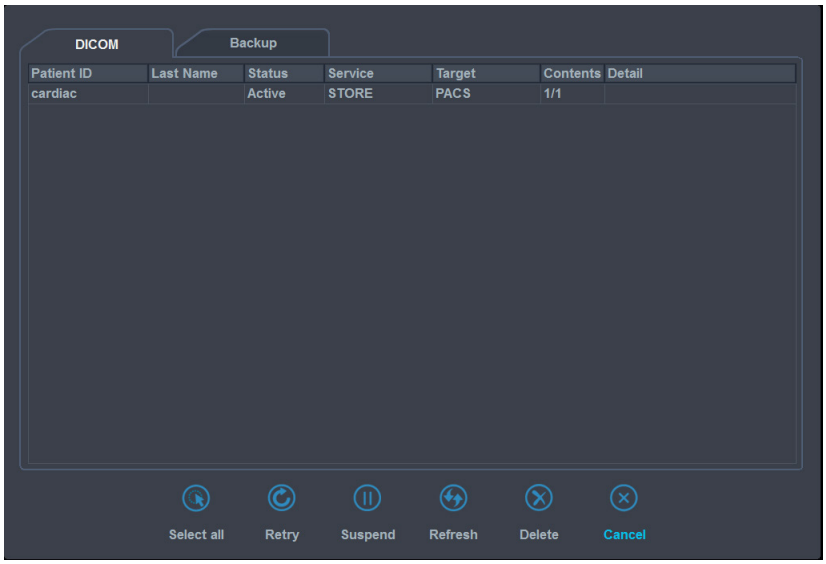


Figure 6-9 DICOM spooler

Table 6-2 DICOM job status

Job status	Description
Hold	Job process is on hold.
Pending	Job is currently sending and the system is waiting for the server's response.
Active	Job is in progress.
Failed	Job is failed to send.
Done	Job is sent successfully.

NOTE

When your system is connected to an MPPS* service, the following job status is available: In progress, Completed.

*Modality Performed Procedure Step (MPPS) is a DICOM service that enables you to notify the status information of a study to PACS.

Spooler options

On the DICOM spooler, you can use the following options:

Option	Description
Select All	Select all jobs in the DICOM spooler.
Retry	Retry sending the selected job.
Delete	Quit the selected job.
Suspend	Suspend the selected job.
Refresh	Refresh the spooler. The completed jobs are deleted from the spooler.
Cancel	Exit the DICOM spooler.

Printer

Connecting to a printer via USB connection

1. When the system power is off, connect a USB cable of the printer to the USB port at the rear of the system.
2. Press the **[Power On/Off]** key on the control panel.

   NOTE

   Do not disconnect the USB cable when the system power is on.
3. If necessary, install the printer driver.

   NOTE

   Only recommended printer drivers are installed as default. Refer to your printer manual for installation.
4. Set the print as default printer via **E-Tool** > **SystemPreset** > **System** > **Peripheral**.
5. To assign one of the print keys to printer via **E-Tool** > **SystemPreset** > **User Setting** > **Print/Foot Switch**.
6. From the printer list under **Standard Printer**, select a print to be assigned on the print key and click **>>** to add the printer device.

   CAUTION

   - Before powering on the system, connect the printer via the USB cable and turn the printer power on.
   - When you select “Cleanup Spooler jobs during boot up,” all jobs in queue will be deleted whenever system reboots.

Printing a report

1. On the touch screen, select **E-Tool** and go to **SystemPreset** > **System** > **Peripheral** > **Default Printer**.
2. Select a printer from the printer list.
3. When you have finished, click **Save & Exit** to save the changes.
4. Press the **[P1]** key on the control panel.

DVR

Selecting a DVR

To select the DVR,

1. Make sure that a DVR is connected to the system when the system power is off.
2. On the touch screen, select **E-Tool** and go to **SystemPreset** > **System** > **Peripheral** > **VCR**.
3. Select a DVR recorder from the list.
4. When you have finished, click **Save & Exit** to save the changes.

Using the DVR

Press the **[DVR]** key on the QWERTY keyboard. The soft menus for the DVR controls appear.

NOTE

Before recording, make sure that the DVR power is on and the media is played in the tray.

To record an image,

1. Insert a media into the recorder.
2. On the touch screen, select **Record** to start recording.
3. To pause recording, select **Pause**.
4. To resume recording, select **Record** again.
5. When you have finished, select **Stop** and then **Finalize**.

NOTE

You can also record an image by using the footswitch or the **[P1]** key on the control panel. To configure, press the **[System Preset]** key and go to **User Setting** > **Print/Foot Switch**.

7

Measurements and Reports

This chapter describes measurements, calculations and report functions.

Basics 7-2

Abdomen 7-34

Obstetrics 7-43

Gynecology 7-80

Cardiology 7-90

Vascular 7-126

Urology 7-139

Pediatrics 7-146

Small Parts 7-155

Breast 7-163

Musculoskeletal (MSK) 7-170

Emergency Medicine (EM) 7-175

Basics

Basic measurement operations

To begin the measurement,

1. On the control panel, press the **[Measure]** key.
2. Use **[Trackball]** to move the point.
3. Press the **[Set]** key to fix the point.

To modify a measurement,

1. Click the result value you want to change from the ***Result*** window. The caliper is activated.
2. Use **[Trackball]** to change the measurement value and press the **[Set]** key.
   - To switch the caliper mark of the current value, press the **[Measure]** key when the caliper is active.
   - To activate the caliper of another value, press the **[Priority]** key repeatedly until the desired value is highlighted.

To delete a measurement,

1. Click the result value you want to delete from the ***Result*** window. The caliper is activated.
2. Press the **[Clear]** key on the control panel.

To change a measurement preset, click the measurement preset you want to change.

To exit, press the **[Exit]** or **[2D]** key on the control panel.

Measurement menu display



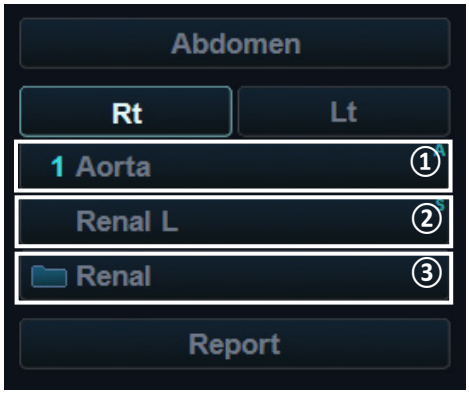
Figure 7-1 Measurement menu display

- **Basic measurement**: The basic measurement menus appear on the touch menu. Displaying the list of basic measurement depends on an active preset and imaging mode.

  NOTE

  To configure the basic measurements, press the **[System Preset]** key and go to **Measurement** > **Basic MEAS.**.

- **Labeled measurement**: The labeled measurement menus appear on the context menu. Displaying the list of labeled measurement depends on an active preset and imaging mode.



① Performed measurement

② Pre-selected measurement

③ Package measurement

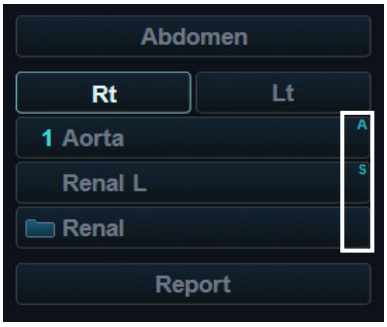
NOTE

- The result for measurement is shown on the ***Result*** window, ***Mini Report*** page, and ***Report*** page.
- After performing basic measurement, you can assign the measurement data to the labeled measurement menu.
- To configure the labeled measurements, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.**.

Direct key

With the Direct key feature, you can quickly access measurement menus by simply pressing alphanumeric keys on the QWERTY keyboard. There are total of 16 available keys: A, S, D, F, G, H, J, K, L, Z, Y, C, V, B, N, M

1. Press the **[Measure]** key on the control panel.
2. From the labeled measurement menu, press an alphanumeric key to access the menu you want. You can see the corresponding direct key on the right side of the menu.



3. Repeat step 2 until the desired menu appears.

Measurement result window

The ***Result*** window displays the measurement result. You can change the window status by selecting one of the following icons:

Table 7-1 Measurement result window

Icon	Description
	Change the background type (e.g. transparent or opaque) of the ***Result*** window.
	Change the position of the ***Result*** window.
	View the mini report.

Changing the Frame

Selecting **Cine** on the touch screen allows you to stop the measurement or change the frame without resetting the ***Result*** window.

1. Select **Cine** on the touch screen.
2. Move to the desired frame using **[Trackball]**.
3. Press the **[Measure]** key to perform the desired measurement.

Basic measurement unit

Table 7-2 Basic measurement unit

Mode	Measurement	Unit	Abbreviation
2D mode	Distance	centimeters	cm
	Area	centimeters^2	cm^2
	Circumference	centimeters	cm
	Angle	degree	deg
	%Stenosis	percent	%
	Volume	milliliter	ml
	Disk Volume	milliliter	ml
	Volume Flow Area	centimeters^2	cm^2
M mode	Distance	centimeters	cm
	Time	milliseconds	ms
	Slope	centimeters per second	cm/s
	%Stenosis	percent	%
	HR	beats per minute	bpm
D mode	Velocity	centimeters per second	cm/s
	PG	millimeters mercury	mmHg
	Time	millisecond	ms
	VTI	centimeters	cm
	Acceleration	centimeters per second^2	cm/s^2
	HR	beats per minute	bpm
	Volume Flow	Volume milliliter per minute	ml/min

Measurement formula

Table 7-3 Measurement formula

Mode	Measurement	Method	Formula
2D	Circumference	Ellipse	$C = 2\pi \times \sqrt{\frac{D1^2 + D2^2}{2}}$
	Area	Ellipse	A= π(D1)(D2)/4
	%Stenosis	2 Diameter 2 Area	%Steno= (1- min(D1, D2)/max(D1, D2))X100 %Steno= (1- min(A1, A2)/max(A1, A2)X100
	Volume	1 Distance 2 Distance 3 Distance Ellipse Distance + Ellipse	V= πD1³/6 V= D1X D2Xmin(D1, D2)Xπ/6 V= πD1XD2XD3/6 V= D1XD2Xmin(D1, D2)Xπ/6 V= πD1XD2XD3/6
	Disk Volume		$V = \sum_{m=1}^{20} \frac{\pi}{4} l_m^{\ 2} \times (\frac{D}{20})$
	Volume Flow Area		A=π/4XD2
M	Slope		S= (D1-D2)/ΔT
	HR		HR= Cycle number/ΔT*60
D	Acceleration		Accel= (V1-V2)/ΔT
	PI		PI= (PS-ED)/Vmean
	RI		RI= (PS-ED)/PS
	HR		HR= Cycle number/ΔT*60
	Volume Flow	Distance	Vol. Flow=AXTAmax (or TAmean)X60/ 1000 (A=π/4XD2)

Basic measurements

The basic measurements are available in the following imaging modes:

- 2D mode
- M mode
- Doppler mode

2D mode measurements

The basic 2D mode measurements include the following measurement parameters:

- Tissue depth
- Distance
- Circumference and Area
- Angle
- Volume
- Stenosis
- A/B Ratio
- Disk Volume
- Histogram
- Elasto Size Compare
- Elasto Strain Ratio
- Volume Flow Area

Tissue depth

Selecting this option in the system preset enables depth to be automatically measured when the first measurement marker appears on the image.

The ***Result*** window shows the distance from a point on the transducer-skin interface to the marker until the first marker is anchored.

NOTE

To configure the tissue depth, press the **[System Preset]** key and go to **Measurement** > **General** > **Tissue Depth display(2D,M)**.

Distance

- **1 Distance**
- **3 Lengths**
- **Trace**

NOTE

Measurement error is within 5% of the distance you measured for all transducers.

1 Distance

1. Select **Distance** on the touch screen. The start point appears.
2. Use **[Trackball]** to move the marker to the start point.
3. Press the **[Set]** key to fix the point. The end point, overlapping the start point, appears.
4. Use **[Trackball]** to move the marker to the end point, and press the **[Set]** key.
5. The measured value is fixed, and the distance (**D**) is shown on the ***Result*** window.

3 Lengths

1. Select **Distance** on the touch screen. The start point appears.
2. Draw three straight lines using **[Trackball]**, and press the **[Set]** key.
3. Move the fourth point, and then press the **[Set]** key.
4. The measured value is fixed, and three distances (**D1, D2, D3**) are shown on the ***Result*** window.

Trace

1. Select **Distance** on the touch screen. The start point appears.
2. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The end point appears.
3. Move the end point gradually along the circumference of the target object using **[Trackball]**.
4. When the start point and the end point are connected with a line, press the **[Set]** key to complete the measurement.
5. The measured value is fixed, and the distance (**D**) is shown on the ***Result*** window.

NOTE

To configure the distance, press the **[System Preset]** key and go to **Measurement** > **Basic MEAS.** > **Distance** > **Default method**.

Circumference and Area

- **Ellipse**
- **Trace**
- **Spline**

Ellipse

1. Select **Ellipse** on the touch screen. The start point appears.
2. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
3. Use **[Trackball]** to move the marker to the second point, and press the **[Set]** key. The ellipse appears.
4. Use **[Trackball]** to adjust the height of the ellipse, and press the **[Set]** key again.
   - To increase the height, move **[Trackball]** up and right.
   - To decrease the height, move **[Trackball]** down and left.
5. The measured value is fixed. The two diameters (**D1, D2**), the circumference (**C**), and the area (**A**) are shown on the ***Result*** window.

Trace

1. Select **Trace** on the touch screen. The start point appears.
2. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The end point appears.
3. Use **[Trackball]** to move the end point gradually along the circumference of the target object.
4. When the start point and the end point are connected with a line, press the **[Set]** key to complete the measurement.
5. The measured value is fixed. The circumference (**C**) and the area (**A**) are shown on the ***Result*** window.

Spline

1. Select **Spline** on the touch screen. The start point appears.
2. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The second point appears.
3. Set the third and subsequent points in the same way.
4. Press the **[Set]** key twice at the same point to fix the end point.
5. The measured value is fixed. The circumference (**C**) and area (**A**) are shown on the ***Result*** window.

Angle

- **3 Points**
- **2 Lines**
- **2 Lines (Axis)**
- **3 Lines(BA)**
- **3 Lines(AB)**

Angle 3 Points

1. Select **Angle** on the touch screen. The start point appears.
2. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
3. Use **[Trackball]** to move the marker to the second point.
4. Press the **[Set]** key. The third point appears.
5. Use **[Trackball]** to move the third point to the end point of the angle measurement.
6. Press the **[Set]** key. The angle between the two lines appears.
7. The angle (**Angle**) is shown on the ***Result*** window.

Angle 3 Lines

1. Select **Angle** on the touch screen. The start point appears.
2. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   TThe first point is fixed, and the second arrow-shaped point appears.
3. Use **[Trackball]** to move the marker to the second point.
4. Draw the baseline, and press the **[Set]** key to fix the baseline.
   The third point appears.
5. Draw the remaining two straight lines to cross the baseline as the same way. The α angle and β angle appear.
6. Press the **[Set]** key at the end point of the third straight line to fix the measured value.
   The two angles (**Alpha, Beta**) are shown on the ***Result*** window.



NOTE

To configure the angle, press the **[System Preset]** key and go to **Measurement** > **Basic MEAS.** > **Angle** > **Default method**.

%Stenosis

- **2 Distances**
- **2 Ellipses**
- **2 Traces**
- **Trace+Ellipse**
- **Ellipse+Trace**

Two diameters percent stenosis calculation

1. Select **%Stenosis** on the touch screen. The start point appears.
2. Measure the larger diameter (**D1**) of the stenosis using **[Trackball]**, and press the **[Set]** key.
3. Measure the smaller diameter (**D2**) of the stenosis using **[Trackball]**, and press the **[Set]** key.
4. The two diameters (**D1, D2**) and the diameter percent stenosis (**%Steno(Diam)**) are shown on the ***Result*** window.

Two ellipses percent stenosis calculation

1. Select **%Stenosis** on the touch screen. The start point appears.
2. Measure the outer area (**A1**) of the stenosis using **[Trackball]**, and press the **[Set]** key.
3. Measure the inner area (**A2**) of the stenosis using **[Trackball]**, and press the **[Set]** key.
4. The two ellipses (**A1, A2**) and the diameter percent stenosis (**%Steno(Area)**) are shown on the ***Result*** window.

NOTE

To configure the %Stenosis, press the **[System Preset]** key and go to **Measurement** > **Basic MEAS.** > **%Stenosis** > **Default method**.

Volume

- **1 Distance**
- **2 Distances**
- **3 Distances**
- **Ellipse**
- **Distance+Ellipse**

3 Distance volume

1. Select **Volume** on the touch screen. The start point appears.
2. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
3. Use **[Trackball]** to move the marker to the second point, and press the **[Set]** key again.
   The first distance is measured.
4. Measure the second and third distances in the same manner.
   When the three distances are measured, the volume is calculated.
5. The measured value is fixed. The three distances (**D1, D2, D3**) and the volume (**Vol**) are shown on the ***Result*** window.

NOTE

When you measure one distance (D1) and press the **[Clear]** key, the volume for D1 is calculated and shown on the ***Result*** window. For the volume of two distance (D2), measure one and two distances (D1, D2) and press the **[Clear]** key.

Ellipse

1. Select **Volume** on the touch screen. The start point appears.
2. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
3. Use **[Trackball]** to move the marker to the second point and press the **[Set]** key. The ellipse appears.
4. Use **[Trackball]** to adjust the height of the ellipse, and press the **[Set]** key again.
   - To increase the height, move **[Trackball]** up and right.
   - To decrease the height, move **[Trackball]** down and left.
5. The measured value is fixed. The two distances (**D1, D2**) and the volume (**Vol**) are shown on the ***Result*** window.

NOTE

To configure the volume, press the **[System Preset]** key and go to **Measurement** > **Basic MEAS.** > **Volume** > **Default method**.

Disk Volume

- **Trace**
- **Spline**

Trace

1. Select **DiskVolume** on the touch screen. The start point appears.
2. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
3. Use **[Trackball]** to create a trace of the structure with the second point.
4. Press the **[Set]** key to complete the trace.
   The start and end points of the trace are connected, and a line representing the long axis appears.
5. Press the **[Set]** key again. The volume is calculated.
6. The area (**A**), the circumference (**C**), the diameter (**D**), and the volume (**V**) are shown on the ***Result*** window.

Spline

1. Select **DiskVolume** on the touch screen. The start point appears.
2. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key. The second point appears.
3. Set the third and subsequent points in the same manner.
4. Press the **[Set]** key twice to complete the trace.
   The start and end points of the trace are connected, and a line representing the long axis appears.
5. Press the **[Set]** key again. The volume is calculated.
6. The area (**A**), the circumference (**C**), the diameter (**D**), and the volume (**V)** are shown on the ***Result*** window.

NOTE

To configure the disk volume, press the **[System Preset]** key and go to **Measurement** > **Basic MEAS.** > **Disk Volume** > **Default method**.

A/B Ratio

- **2 Distances**
- **2 Ellipses**
- **2 Traces**
- **Ellipse+Trace**
- **Trace+Ellipse**

Two diameters ratio

1. Select **A/B Ratio** on the touch screen. The start point appears.
2. Measure the first diameter (**D1**) of the ratio using **[Trackball]**, and press the **[Set]** key.
3. Measure the second diameter (**D2**) of the ratio using **[Trackball]**, and press the **[Set]** key.
4. The ratio is calculated. The two distances (**D1, D2**) and A/B ratio (**A/B Ratio**) are shown on the ***Result*** window.

Two ellipses ratio

1. Select **A/B Ratio** on the touch screen. The start point appears.
2. Measure the first area (**A1**) of the ratio using **[Trackball]**, and press the **[Set]** key.
3. Measure the second area (**A2**) of the ratio using **[Trackball]**, and press the **[Set]** key.
4. The ratio is calculated. The two ellipses (**A1, A2**) and A/B ratio (**A/B Ratio**) are shown on the ***Result*** window.

NOTE

To configure the A/B ratio, press the **[System Preset]** key and go to **Measurement** > **Basic MEAS.** > **A/B Ratio** > **Default method**.

Histogram

HIistogram is a function that the gray scale distribution within a marked Region of Interest (ROI) will be graphically displayed on the screen.

1. Select **Histogram** on the touch screen.
2. Use **[Trackball]** to move the caliper to the corner of the area where you want to measure the histogram.
3. Press the **[Set]** key.
4. Use **[Trackball]** to move the caliper diagonally to the opposite side of the area.
5. Press the **[Set]** key. The measured value is shown on the ***Histogram*** window.
   To view the histogram, go to the ***Histogram*** window.

NOTE

To configure the histogram, press the **[System Preset]** key and go to **Measurement** > **Basic MEAS.** > **Histogram**.

CAUTION

Do not change the gain control of the 2D image after performing the histogram measurement. Your change may not be applied on the histogram.

Elasto Size Compare

Elasto Size Compare applies the measured data in 2D mode to Elastography mode. Size of lesion in 2D mode and Elastography mode can be compared to have more accurate diagnose result.

NOTE

For details, see "Elasto Size Compare" on page 1-22.

Elasto Strain Ratio

Elasto Strain Ratio provides quantitative information. It is calculated by comparing the strain of a lesion to the surrounding normal tissue. Soft tissue will have higher strain values than stiff tissue. It is displayed as a real-time color map of the relative elasticity.

NOTE

For details, see "Elasto Strain Ratio" on page 1-23.

Volume Flow Area

- **Distance**

1. Select **Volume Flow Area** on the touch screen.
2. Use **[Trackball]** to move the marker to the start point.
3. Press the **[Set]** key to fix the point. The end point, overlapping the start point, appears.
4. Use **[Trackball]** to move the marker to the end point, and press the **[Set]** key.
5. The measured value is fixed, and the volume flow area is shown on the ***Result*** window.

NOTE

- To calculate the volume flow, you make Auto Trace or Semi Auto Trace measurement in Doppler mode.
- To configure the volume flow method, press the **[System Preset]** key and go to **Measurement** > **Advanced MEAS.** > **Vol.flow Method** and **Modify Calcs**.

M mode measurements

The basic M mode measurements include the following measurement parameters:

- Distance
- Time
- Slope
- %Stenosis
- Heart rate (HR)
- A/B Ratio

Distance

- **Distance**
- **3 Lengths**

1 Distance

1. Select **Distance** on the touch screen.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The measured value is fixed, and the distance (**D**) is shown on the ***Result*** window.

3 Lengths

1. Select **Distance** and then select **3 Lengths** on the touch screen.
   The start point appears.
2. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
3. Draw the first straight line using **[Trackball]**, and press the **[Set]** key.
4. Draw the second straight line using **[Trackball]**, and press the **[Set]** key.
5. Draw the third straight line using **[Trackball]**, and press the **[Set]** key to complete the measurement.
6. The measured value is fixed, and three distances (**D1**, **D2**, **D3**) are shown on the ***Result*** window.

NOTE

To configure the distance, press the **[System Preset]** key and go to **Measurement** > **Basic MEAS.** > **Distance** > **Default method**.

Time

1. Select **Time** on the touch screen.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The time interval between the two points appears. The time (**T**) is shown on the ***Result*** window.

Slope

1. Select **Slope** on the touch screen.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The oblique line is displayed, and the slope is calculated. The distance (**D**), time (**T**) and slope (**Slope**) are shown on the ***Result*** window.

%Stenosis

Two diameters percent stenosis calculation

1. Select **%Stenosis** on the touch screen.
   The vertical line and the horizontal line are perpendicular to each other.
2. Measure the larger vertical diameter (**D1**) of the stenosis using **[Trackball]**, and press the **[Set]** key.
3. Measure the smaller vertical diameter (**D2**) of the stenosis using **[Trackball]**, and press the **[Set]** key.
4. The diameters (**D1, D2**) and the diameter percent stenosis (**%Steno(Diam)**) are shown on the ***Result*** window.

NOTE

For diameter calculation, do not take a distance measurement from a longitudinal view. This may lead to an inaccurate assessment of %stenosis.

A/B Ratio

- **Distance**
- **Time**

Distance ratio

1. Select **A/B Ratio** and then select **Distance** on the touch screen. The start point appears.
2. The vertical line and the horizontal line are perpendicular to each other.
3. Measure the first vertical diameter (**D1**) of the ratio using **[Trackball]**, and press the **[Set]** key.
4. Measure the second vertical diameter (**D2**) of the ratio using **[Trackball]**, and press the **[Set]** key.
5. The ratio is calculated. The two distances (**D1, D2**) and A/B ratio (**Distance Ratio**) are shown on the ***Result*** window.

Time ratio

1. Select **A/B Ratio** on the touch screen. And select **A/B Ratio** and then select **Time** on the touch screen. The vertical line and the horizontal line are perpendicular to each other.
2. Measure the first horizontal diameter (**T1**) of the ratio using **[Trackball]**, and press the **[Set]** key.
3. Measure the second horizontal diameter (**T2**) of the ratio using **[Trackball]**, and press the **[Set]** key.
4. The ratio is calculated. The two distances (**T1, T2**) and A/B ratio (**Time Ratio**) are shown on the ***Result*** window.

NOTE

To configure the A/B ratio, press the **[System Preset]** key and go to **Measurement > Basic MEAS. > A/B Ratio > Default method**.

Heart Rate (HR)

1. Select **HR** on the touch screen.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The heart rate between the two points is calculated. The heart rate (**HR**) and time (**T**) are shown on the ***Result*** window.

NOTE

To configure the HR cycle, press the **[System Preset]** key and go to **Measurement** > **Advanced MEAS.** > **HR cycle**.

D mode measurements

The basic D mode measurements include the following measurement parameters:

- Velocity
- Time
- Acceleration
- Resistivity Index (RI)
- Pulsatility Index (PI)
- VTI
- Heart Rate (HR)
- A/B Ratio
- S/D Ratio
- AC/DC
- PHT
- Auto Calc
- Auto Trace/Semi Auto Trace/Trace

Velocity

1. Select **Velocity** on the touch screen.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
3. The measured value is fixed. The velocity (**Vel**) and pressure gradient (**PG**) are shown on the ***Result*** window.

Time

1. Select **Time** on the touch screen.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The time interval between the two points appears. The velocity (**Vel**) and time (**T**) are shown on the ***Result*** window.

Acceleration

1. Select **Acceleration** on the touch screen.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The oblique line is displayed, and the acceleration is calculated. The acceleration (**Accel**), the acceleration time (**AT**), and maximum velocity (**Vmax**) are shown on the ***Result*** window.

Resistivity Index (RI)

1. Select **RI** on the touch screen.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point and press the **[Set]** key again.
4. The end point is fixed, and the resistive index is calculated. The peak systolic velocity (**PS**), end diastolic velocity (**ED**), and resistivity index (**RI**) are shown on the ***Result*** window.

Pulsatility Index (PI)

1. Select **PI** on the touch screen.
   The vertical line and the horizontal line are perpendicular to each other.
2. Move the marker to the start point of the waveform using **[Trackball]**, and press the **[Set]** key.
   The end point appears.
3. Use **[Trackball]** to manually trace the waveform, and press the **[Set]** key.
4. The pulsatility index is calculated.
5. The peak systolic velocity (**PS**), end diastolic velocity (**ED**), minimum diastolic velocity (**MD**), the maximum time-average velocity (**TAmax**), the resistivity index (**RI**), the pulsatility index (**PI**), and systole/diastole ratio (**S/D**) are shown on the ***Result*** window.

Velocity-Time Integral (VTI)

1. Select **VTI** on the touch screen.
   The vertical line and the horizontal line are perpendicular to each other.
2. Move the marker to the start point of the waveform using **[Trackball]**, and press the **[Set]** key.
   The end point appears.
3. Use **[Trackball]** to trace one cycle of the waveform, and press the **[Set]** key.
4. The velocity-time integral is calculated. The minimum, maximum, mean velocities (**Vmin, Vmax, Vmean**) and maximum and mean pressure gradients (**PGmax, PGmean**) are shown on the ***Result*** window.

A/B Ratio

- **Velocity**
- **Time**

Velocity ratio

1. Select **A/B Ratio** on the touch screen. And select **A/B Ratio** and then select **Velocity** on the touch screen.
   The vertical line and the horizontal line are perpendicular to each other.
2. Measure the first point (**V1**) of the ratio using **[Trackball]**, and press the **[Set]** key.
3. Measure the second point (**V2**) of the ratio using **[Trackball]**, and press the **[Set]** key.
4. The ratio is calculated. The two velocities (**V1, V2**) and A/B ratio (**Velocity Ratio**) are shown on the ***Result*** window.

Time ratio

1. Select **A/B Ratio** on the touch screen. And select **A/B Ratio** and then select **Time** on the touch screen.
   The vertical line and the horizontal line are perpendicular to each other.
2. Measure the first time interval (**T1**) of the ratio using **[Trackball]**, and press the **[Set]** key.
3. Measure the second time interval (**T2**) of the ratio using **[Trackball]**, and press the **[Set]** key.
4. The ratio is calculated. The two time values (**T1, T2**) and A/B ratio (**Time Ratio**) are shown on the ***Result*** window.

NOTE

To configure the A/B ratio, press the **[System Preset]** key and go to **Measurement** > **Basic MEAS.** > **A/B Ratio** > **Default method**.

AC/DC

1. Select **AC/DC** on the touch screen.
   The vertical line and the horizontal line are perpendicular to each other.
2. Measure the first oblique line (**Accel**) of the slope using **[Trackball]**, and press the **[Set]** key.
3. Measure the second oblique line (**Decel.**) of the slope using **[Trackball]**, and press the **[Set]** key.
4. The ratio is calculated. The acceleration index (**Accel**), the acceleration time (**AT**), the deceleration index (**Decel.**), and deceleration time (**DT**) are shown on the ***Result*** window.

Heart Rate (HR)

1. Select **HR** on the touch screen.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The heart rate between the two points is calculated. The heart rate (**HR**) and time (**T**) are shown on the ***Result*** window.

NOTE

To configure the heart rate cycle, press the **[System Preset]** key and go to **Measurement** > **Advanced MEAS.** > **HR cycle**.

Auto Calc

1. In PW mode, select **Auto Calc** on the touch screen.
2. Select **Frozen** or **Live**.
3. If you select **Live**, the caliper and waveform trace automatically appear.
4. If you select **Frozen**, press the **[Freeze]** key on the control panel to freeze the image.
   The caliper and waveform trace automatically appear.
5. The calculated value is shown on the ***Result*** window.

Auto Calc options

- **Method**: Select a trace method for Doppler spectrum.
- **Direction**: Select a trace direction for Doppler spectrum.

NOTE

- To configure the auto trace options, press the **[Image Preset]** key and go to **General**.
- To measure the maximum velocity, select **Below** or **Above** for the trace direction.
- To edit the trace, use **[Trackball]**.

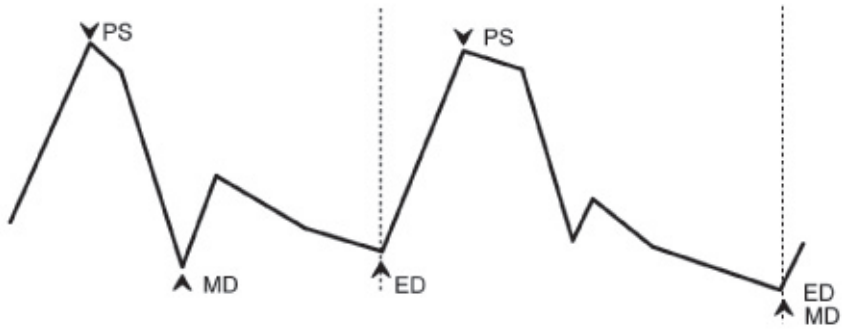


Figure 7-2 Doppler

Auto Trace

1. In PW mode, select the desired measurement item and then select **Auto Trace** on the touch screen.
   The Doppler spectrum is traced automatically and the results are displayed.
2. If necessary, adjust the calculation cycle using **[Trackball]** and the **[Measure]** key on the control panel.
   a. A green line appears at the right of the spectrum.
   b. Using **[Trackball]**, move the line and readjust the end cycle.
   c. Press the **[Measure]** key on the control panel.
   The line changes to gray.
   d. A green line appears at the left of the spectrum.
   e. Using **[Trackball]**, move the line and readjust the start cycle.
   f. Press the **[Set]** key on the control panel. The line changes to gray.
3. The calculated value is shown on the ***Result*** window.

NOTE

To configure the auto trace options, press the **[System Preset]** key and go to **Measurement** > **Advanced MEAS.** > **Modify Calcs** > **Auto Trace(Calc)**.

Semi Auto Trace

1. In PW mode, select the desired measurement item and then select **Semi Auto Trace** on the touch screen. The start point appears.
2. Use **[Trackball]** to move the marker to the start point of the waveform and press the **[Set]** key. The end point appears.
3. Use **[Trackball]** to trace one cycle of the waveform, and press the **[Set]** key.
4. The calculated value is shown on the ***Result*** window.

NOTE

To configure the semi auto trace, press the **[System Preset]** key and go to **Measurement** > **Advanced MEAS.** > **Modify Calc** > **Semi Auto Trace**.

Manual Trace

1. In PW mode, select the desired measurement item and then select **Trace** on the touch screen. The start point appears.
2. Use **[Trackball]** to move the marker to the start point of the waveform and press the **[Set]** key. The end point appears.
3. Use **[Trackball]** to trace one cycle of the waveform, and press the **[Set]** key.
4. The calculated value is shown on the ***Result*** window.

NOTE

To configure the manual trace, press the **[System Preset]** key and go to **Measurement** > **Advanced MEAS.** > **Modify Calc** > **Manual Trace**.

Report

The reports summarize the data obtained during the examination.

Saved reports are read-only. Therefore it is recommended that the data is carefully reviewed before the report is saved. Use the worksheet to facilitate the review and adjustment of data before generating a report. The completed report can be printed on a standard printer.

Report display



Figure 7-3 Report display

Report options



Figure 7-4 Report touch screen

Table 7-4 Report controls

Controls	Description
Report	Access Worksheet page.
Basic MEAS.	View a report of basic measurement.
Preview	Preview the report in print format.
Graph	Access OB Graph page (applies only to OB).
Anatomical Survey	Access Anatomical Survey page (applies only to OB).
Fetus Compare	Compare between fetuses by viewing measurement and calculation values.
2D/M/Doppler	View a report in a particular mode (2D, M, or Doppler).
All	View a report for more than one mode.
Comment	View or edit comments.
Delete Value	Delete measurement results.
Exclude Value	Exclude or include measurement results
Print	Prints out the report to the default printer.
Exit	Exit Report page.

Report operations

Viewing a report

1. Press the **[Report]** key on the control panel. You can also select **Report** on the context menu. You can view a report of labeled measurement.
2. To view a report of basic measurement, select **Basic MEAS.** on the touch screen.
3. To view a report by application or measurement mode, select an application or a mode from the corresponding list or field on the top left of the display.

   NOTE

   To view a report in a particular mode, select a mode (**2D, M**, or **Doppler**) on the touch screen. To view a report for more than one mode, select **All** on the touch screen.
4. When a report appears on the display, view the report information.
5. To view the next page of the report, rotate the **Select Page** soft key.
6. To exit the report, press the **[Exit]** key on the control panel. You can also select **Exit** on the touch screen.

Editing a report

To change the report data,

1. Move the cursor to the field that you want to change.
2. Press the **[Set]** key. The field is highlighted.
3. Enter a new data. You can enter data in the blank field.
   The entered data is changed to green and changed data is shown with an asterisk mark.

To erase measurement results,

1. Move the cursor to the field that you want to erase. The field is highlighted.
2. Select **Delete Value** to delete the data.
3. Press the **Delete All** soft key to delete all report values of the activated worksheet.
4. Press the **[Clear]** key to delete all report values of the reloaded study.

To exclude or include measurement results,

1. Move the cursor to the field that you want to exclude. The field is highlighted.
2. Select **Exclude Value** to exclude the data. The excluded data is displayed in white.
3. Select **Exclude Value** again to include the data that you previously excluded.

To change the value type,

1. Move the cursor to the **Method** column.
2. Press the **[Set]** key.
3. Select a value type of the measurement from the drop-down list (Last, Average, Maximum, and Minimum).

Adding a comment

1. Select **Comment** on the touch screen.
   You can view comments in the ***Exam Comments*** screen and ***Comments*** screen.
2. On the ***Comments*** screen, enter text by using the QWERTY keyboard.
3. To exit the comment, click **OK** or select **Comment** on the touch screen.

NOTE

On the ***Patient Registration*** screen, you can edit text in the ***Exam Comments*** field.

Previewing a report

To preview the report,

– Select **Preview** on the touch screen, or select **Preview** on the context menu.
  You can preview a report to be printed.

To add an image to the report,

1. Move the cursor to the desired image on the clipboard and press the **[Set]** key.
2. Move the cursor where the selected image is to be inserted and press the **[Set]** key.

To remove an image from the report,

– Move the cursor to the desired image on the report and select **Delete Image** on the touch screen.

To add image pages to the report,

– Select **Add Image Page** on the touch screen.

To delete image pages from the report,

– Select **Delete Image Page** on the touch screen.

NOTE

You cannot add more than 10 image pages to a report.

To export the report in PDF,

1. Select **PDF Export** on the touch screen. The dialog box appears.
2. Select a media from the ***Device*** field.
3. Enter a file name in the ***File Name*** field.
4. Click **Save**. The progress bar appears during exporting files.

Printing a report

To print a report via a standard printer,

– Select **Print** on the touch screen.

To capture the report screen,

– Press the **[P1]**, **[P2]**, or **[P3]** key on the control panel.

NOTE

- To configure a default standard printer, press the **[System Preset]** key and go to **System** > **Peripheral** > **Standard Printer**.
- The supported paper size for report is A4, Letter only.

Transferring a measured data

You can transfer a measured data via the RS232C port. This function is only available for OB and GYN reports, and anatomical survey.

1. Press the **[System Preset]** key and go to **System** > **Peripheral** > **RS232C** > **COM** > **Transfer Measurement**.
2. From the ***Report*** screen, select **Transfer** on the context menu.
   When the data is being transferred, the progress bar indicating the transfer appears on the display.

Measurement accuracy

The measurement values should always be accurate according to measuring caliper and point.

Despite the high technical accuracy of the scan geometry and the measuring system of the E-CUBE 8 expert equipment, one must, however, be aware of inaccuracies caused by the ultrasound beam properties and the physiological properties of the scanned structures, tissues and fluids.

For the reason of improved lateral resolution you should choose the proper scan head for the depth range of the structure to be measured.

Table 7-5 Measurement accuracy

Mode	Measurement	Accuracy
2D	Depth	±5 % or 1 mm
	Distance Axial Lateral (Linear) Lateral (Convex) Lateral (Sector)	 ±5 % or 1 mm ±5 % or 2 mm ±5 % or 4 mm ±5 % or 4 mm
	Circumference Ellipse Trace	 ±5 % or 1 mm ±10 % or 1 mm
	Area 2 Distance Ellipse Trace	 ±5 % or 1 mm^2 ±5 % or 1 mm^2 ±5 % or 1 mm^2
M	Time	±5 % or 10 ms
	Slope	±5 % or 1 mm/s
D	Velocity	±15 %
	Time	±5 % or 10 ms
	Doppler SV Position	±2 mm
CF	Velocity	±15 %

Calculation accuracy

Estimate the overall inaccuracy of a combined measurement and calculation by including the stated inaccuracy from the basic measurement accuracy statements.

Calculation formulas and databases are provided as a tool to assist the user, but should not be considered an undisputed database, in making a clinical diagnosis. The user is encouraged to research the literature and judge the equipment capabilities on an ongoing basis in order to assess its utility as a clinical tool.

Abdomen

Abdomen measurements and calculations

Abdomen measurement preset

- Abdomen
- Renal

To select a measurement preset,

1 Select **Measurement Preset** on the context menu.

2 Select **Abdomen** or **Renal** from the measurement preset list.

2D mode measurements

2D mode measurements display in the context menu and the abdomen report with measured result, when assigned.

Table 7-6 2D mode measurement (Abdomen)

Measurement	Description
Aorta	Aorta Diameter
Renal L	Renal Length
Renal	Renal Volume
Renal L	Renal Length
Renal H	Renal Height
Renal W	Renal Width
Renal Vol	Renal Volume
Aorta	Aorta
Renal A	Renal Artery
Hepatic A	Hepatic Artery
Portal V	Portal Vein
Splenic A	Splenic Artery
SMA	Superior Mesenteric Artery
IMA	Inferior Mesenteric Artery
Iliac A	Iliac Artery
Vessel	Vessel
Volume Flow Area	Volume Flow Area
%Stenosis	Stenosis

Measurement	Description
Volume	Volume
A/B Ratio	A/B Ratio

NOTE

To configure the 2D mode measurement, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Abdomen** > **2D** > **Default Measurement**.

Aorta Diameter

1. Select **Aorta** on the context menu. The start point appears.
2. Use **[Trackball]** to move the marker to the start point.
3. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
4. Use **[Trackball]** to move the marker to the end point.
5. To complete the measurement, press the **[Set]** key.
6. The measured value is fixed, and the aorta diameter (**Aorta**) is shown on the ***Result*** window.

Renal Length

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select **Renal L**. The start point appears.
3. Use **[Trackball]** to move the marker to the start point.
4. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
5. Use **[Trackball]** to move the marker to the end point.
6. To complete the measurement, press the **[Set]** key.
7. The measured value is fixed, and the renal length (**Rt** or **Lt Renal**) is shown on the ***Result*** window.

Renal Volume (1)

You can measure the length, width, and height for the left and right renal. Each measurement is a typical distance measurement made in appropriate scan plane.

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Renal** folder, and then select **Renal L**, **Renal H**, or **Renal W**. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key.
3. Perform the measurement of the second and third distance in the same manner (a-d).
4. When the length, width, and height measurement is completed, the renal volume is calculated.
5. The measured value is fixed, and the renal volume (**Rt** or **Lt Renal Vol**) is shown on the ***Result*** window.

Renal Volume (2)

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select **Renal Vol**. The start point appears.
3. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
4. Use **[Trackball]** to move the marker to the second point, and press the **[Set]** key again.
   The first distance is measured.
5. Measure the second and third distances in the same manner.
   When three distances are measured, the volume is calculated.
6. The measured value is fixed, and the renal volume (**Rt** or **Lt Renal Vol**) is shown on the ***Result*** window.

NOTE

- When you measure one distance (D1) and press the **[Clear]** key, the volume for D1 is calculated and shown on the ***Result*** window. For the volume of two distance (D2), measure one and two distances (D1, D2) and press the **[Clear]** key.
- To configure the renal volume method, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Abdomen** > **Renal Vol** > **Edit**.

M mode measurements

M mode measurements display in the context menu and the abdomen report with measured result, when assigned.

Table 7-7 M mode measurement (Abdomen)

Measurement	Description
HR	Heart Rate

NOTE

To configure the M mode measurement, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Abdomen** > **M** > **Default Measurement**.

Heart Rate (HR)

1. Select **HR** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The heart rate between the two points is calculated. The heart rate (**HR**) and time (**T**) are shown on the ***Result*** window.

NOTE

To configure the heart rate cycle, press the **[System Preset]** key and go to **Measurement** > **Advanced MEAS.** > **HR cycle**.

D mode measurements

D mode measurements are shown in the context menu and in the abdomen report with measured result, when assigned.

Table 7-8 D mode measurement (Abdomen)

Measurement	Description
Aorta	Aorta
Renal A	Renal Artery
Hepatic A	Hepatic Artery
IVC	Inferior Vena Cava
Hepatic V	Hepatic Vein
Mid HV	Middle Hepatic Vein
MPV	Main Portal Vein
Portal V	Portal Vein
Splenic A	Splenic Artery
Splenic V	Splenic Vein
SMA	Superior Mesenteric Artery
SMV	Superior Mesenteric Vein
IMA	Inferior Mesenteric Artery
Iliac A	Iliac Artery
Iliac V	Iliac Vein
Vessel	Vessel
Renal V	Renal Vein
HR	Heart Rate

NOTE

To configure the Doppler mode measurement, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Abdomen** > **Doppler** > **Default Measurement**.

To select a package measurement,

1. Select a package measurement folder.
2. Select the desired measurement from the measurement list.

In each package measurement for Doppler mode, you can use the following measurements.

- Auto Trace
- Semi Auto Trace
- Manual Trace
- Peak Systole (PS)
- End Diastole (ED)
- Minimum Diastole (MD)
- S/D or D/S Ratio (S/D or D/S)
- Pulsatility Index (PI)
- Resistive Index (RI)
- Maximum Time-Average Velocity (TAmax)
- Acceleration (Accel)
- Acceleration Time (AT)

NOTE

To configure the package measurements for D mode, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Abdomen** > **Doppler** > **Package measurement** (double-click) > a default measurement.

Peak Systole, End Diastole, or Minimum Diastole (PS, ED, or MD)

1. Select **PS**, **ED**, or **MD** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
3. The measured value is fixed, and the velocity (**PS**, **ED**, or **MD**) is shown on the ***Result*** window.

PS/ED or ED/PS Ratio

1. Select **S/D** or **D/S** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Measure the first point (**S** or **D**) of the ratio using **[Trackball]**, and press the **[Set]** key.
3. Measure the second point (**D** or **S**) of the ratio using **[Trackball]**, and press the **[Set]** key.
4. The ratio is calculated. The two velocities (**S**, **D**) and S/D or D/S ratio (**S/D** or **D/S**) are shown on the ***Result*** window.

Pulsatility Index (PI)

1. Select **PI** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move the marker to the start point of the waveform, and press the **[Set]** key.
   The end point appears.
3. Use **[Trackball]** to manually trace the waveform, and press the **[Set]** key.
4. The pulsatility index is calculated, and the pulsatility index (**PI**) is shown on the ***Result*** window.

Resistive Index (RI)

1. Select **RI** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The end point is fixed, and the resistive index is calculated. The resistivity index (**RI**) is shown on the ***Result*** window.

Maximum Time-Average Velocity (TAmax)

1. Select **TAmax** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move the marker to the start point of the waveform, and press the **[Set]** key.
   The end point appears.
3. Use **[Trackball]** to trace the maximum values of the desired portion for the spectrum.
4. To complete the measurement, press the **[Set]** key.
5. The maximum time-average is calculated. The maximum time-average (**TAmax**) is shown on the ***Result*** window.

Acceleration (Accel)

1. Select **Accel** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The oblique line is displayed and the acceleration is calculated. The acceleration (**Accel**) and the acceleration time (**AT**) are shown on the ***Result*** window.

Acceleration Time (AT)

1. Select **AT** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The time interval between the two points is displayed. The acceleration time (**AT**) is shown on the ***Result*** window.

Abdomen report

The Abdomen report has two sections of information:

- Patient information
- Measurement information

To start a report,

– Press the **[Report]** key on the control panel.

– Select **Report** on the context menu.

For report functions, see "Report" on page 7-27.

Patient information

- **ID**
- **Name**
- **Age**
- **Sex**
- **Exam date**
- **Referring MD**

NOTE

To edit the patient information, go to **Patient Registration**.

Measurement information

- **Value**: The measured value. If more than one measurement was made for an item, the system uses the specified method (average, maximum, minimum, or last) to determine this value. See also "Editing a report" on page 7-29.
- **1st–5th**: The five measurement values for each item are available. If you make more than five measurements, the report uses the last five.
- **Method**: This specifies the method used to calculate the measurement value listed in the value column. The method options are **Last**, **Aver**, **Max**, or **Min**.

NOTE

To configure the measurement value type, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Edit** > **Method**.

Obstetrics

Obstetric measurements and calculations

OB measurement preset

- OB1
- OB2/3
- Fetal Echo

To select a measurement preset,

1 Select **Measurement Preset** on the context menu.

2 Select **OB1**, **OB2/3**, or **Fetal Echo** from the measurement list.

2D mode measurements (OB1, OB2/3)

2D mode measurements are shown in the context menu and in the OB report with measured result, when assigned.

Table 7-9 2D mode measurement (OB)

Measurement	Description
Fetal Biometry	Fetal Biometry (Package)
BPD	Biparietal Diameter
HC	Head Circumference
AC	Abdominal Circumference
FL	Femur Length
Humerus	Humerus Length
AD	Abdominal Diameter
OFD	Occipito-frontal Diameter
APAD	Anteroposterior Abdominal Diameter
TAD	Transverse Abdominal Diameter
MAD	Middle Abdomen Diameter
FTA	Fetal Trunk Cross-Sectional Area
APTD	Antero-Posterior Trunk Diameter
TTD	Transverse Trunk Diameter
ThC	Thoracic Circumference
Early Gestation	Early Gestation (Package)
CRL	Crown-Rump Length

Measurement	Description
GS	Gestation Sac Length
YS	Yolk Sac Length
BPD	Biparietal Diameter
AC	Abdominal Circumference
FL	Femur Length
Auto NT	Nuchal Translucency Length
NB	Nasal Bone Length
IT	Intracranial Translucency
Fetal Long Bones	Fetal Long Bones (Package)
Humerus	Humerus Length
Radius	Radius Length
Ulna	Ulna Length
Tibia	Tibia Length
Fibula	Fibula Length
FL	Femur Length
CLAV	Clavicle Length
SL	Spinal Length
Fetal Cranium	Fetal Cranium (Pacakge)
CM	Cisterna Magna
BOD	Binocular Distance
Auto NT	Nuchal Translucency Length
NB	Nasal Bone Length
CEREB	Transverse Cerebellar Diameter
IOD	Inner Orbital Diameter
Va	Anterior Horn Lateral Ventricular Width
Vp	Posterior Horn Lateral Ventricular Width
HEM	Hemisphere Width
CSP	Cavum Septum Pellucidum
NF	Nuchal Fold
IT	Intracranial Translucency
Lat Vent	Lateral Ventricle
FMF angle	Frontomaxillary Facial Angle

Measurement	Description
Fetal Others	Fetal Others (Package)
Foot	Foot Length
Ear	Ear
Umbilical V	Umbilical Vein
MP	Middle Phalanx
Renal L	Renal Length
Renal AP	Renal Anterior-Posterior Diameter
Pelvis	Pelvis
Cardiac Axis	Cardiac Axis
Placenta Thick.	Placenta Thickness
AFI	Amniotic Fluid Index
Q1	Quadrant 1
Q2	Quadrant 2
Q3	Quadrant 3
Q4	Quadrant 4
MVP	Maximal Vertical Pocket
CTAR	Cardio-Thoracic Area Ratio (Package)
ThD ap	Anterior-Posterior Thoracic Diameter
ThD trans	Transverse Thoracic Diameter
HrtD ap	Anterior-Posterior Heart Diameter
HrtD trans	Transverse Heart Diameter
Thorax area	Thoracic Area
Heart area	Heart Area
Maternal Others	Maternal Others (Package)
Uterus	Uterus Volume
Ovary	Ovary Volume
Cervix L	Cervix Length
Placenta Thick.	Placenta Thickness
Fibroid	Fibroid
Cyst	Cyst
MSD	Mean Gestational Sac Diameter
LL	Liver Length

Measurement	Description
RL	Rib Length
Scapular	Scapular Length
SC	Splenic Circumference
FB	Fetal Bowel Diameter
OOD	Outer Orbital Diameter
HA	Head Area
AA	Abdominal Area
Umb. A Diam.	Umbilical Artery Diameter
APTD-TTD	Anteroposterior Trunk Diameter & Transverse
AxT	Anteroposterior Trunk Diameter multiplied Diameter
CTAR	Cardiothoracic Area Ratio
Ovary	Ovary Volume
Ovary L	Ovary Length
Ovary H	Ovary Height
Ovary W	Ovary Width
Ovary Vol	Ovary Volume

NOTE

To configure the default measurement for 2D mode, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **OB** > **2D** > **Default Measurement**.

2D mode measurements (Fetal Echo)

2D mode measurements are shown in the context menu and in the fetal heart report with measured result, when assigned.

Table 7-10 2D mode measurement (Fetal echo)

Measurement	Description
4 Chamber view	4 chamber view (Package)
Ventr. L	Ventricle Length
Ventr. W	Ventricle Width
Atrial L	Atrial Length
Atrial W	Atrial Width
Ventr. inl.	Ventricle Inlet Diameter
Ventr. Area	Ventricle Area
Wall Thick.	Wall thickness
Septum	Septum
TV orifice	Tricuspid Valve Orifice
MV orifice	Mitral Valve Orifice
Aortic Arch	Aortic Arch (Package)
Anulus	Anulus
Asc. aorta Diam.	Ascending Aorta Diameter
Desc. aorta Diam.	Descending Aorta Diameter
LVOT	Left Ventricular Outflow Tract (Package)
LVOT Diam.	Left Ventricular Outflow Tract Diameter
Outflow track	Outflow Track (Package)
PA	Pulmonary Artery
PV width	Pulmonary Valve width
Main PA	Main Pulmonary Artery
AV width	Aortic Valve width
Ao. root Diam.	Aortic Root Diameter
Ao. trunk Dim.	Aortic Trunk Diameter
Art. duct Diam.	Arterial Duct Diameter
RVOT	Right Ventricular Outflow Tract (Package)
RVOT Diam.	Right Ventricular Outflow Tract Diameter
Thorax	Thorax (Package)

Measurement	Description
Heart diagonally	Heart diagonally
Thorax diagonally	Thorax diagonally
Cardiac Circum.	Cardiac Circumference
Thoracic Circum.	Thorax Circumference
Heart Area	Heart area
Thorax Area	Thorax area
Cardiac Axis	Cardiac axis
Venous	Venous (Package)
SVC	Superior Vena Cava Diameter
IVC	Inferior Vena Cava Diameter
Heart	Heart (Package)
LA Diam.	Left Atrium Diameter
LA L	Left Atrium Length
LVLd-A4C	Left Ventricle - Diastolic major axis Dimension - Apical four chamber
LVLs-A4C	Left Ventricle - Systolic major axis Dimension - Apical four chamber
LVLd-A2C	Left Ventricle - Diastolic major axis Dimension - Apical two chamber
LVLs-A2C	Left Ventricle - Systolic major axis Dimension - Apical two chamber
LVOT Diam.	Left Ventricle Outflow Track - Cardiovascular Orifice Diameter
RA Diam.	Right Atrium Diameter
RA L	Right Atrium Length
RVAWd	Right Ventricle - Anterior Wall Diastolic Thickness
RV L	Right Ventricle Length
RVDd	Right Ventricle Diameter - End Diastole
RVDs	Right Ventricle Diameter - End Systole
RVOT Diam.	Right Ventricle Outflow Track - Cardiovascular Orifice Diameter
Teichholz	Left Ventricular Dimensions by Teichholz method (Package)
IVSd	Interventricular Septum - End Diastole
LVIDd	Left Ventricle Internal Dimension - End Diastole
LVPWd	Left Ventricle - Posterior Wall - End Diastole
IVSs	Interventricular Septum - End Systole
LVIDs	Left Ventricle Internal Dimension - End Systole
LVPWs	Left Ventricle Posterior Wall - End Systole

Measurement	Description
CT	Cardiothoracic Area Ratio (Package)
Cardiac Area	Cardiac Area
Thoracic Area	Thoracic Area
Arteries	Arteries Package
Ao. arch Diam.	Aortic Arch Diameter
Aorta Diam.	Aorta Diameter
Asc. aorta Diam.	Ascending Aorta Diameter
Thor. aorta Diam.	Thoracic Aorta Diameter
Trans. ao. arch Diam.	Transverse Aortic Arch Diameter
Duct. arch Diam.	Ductal Arch Diameter
DA Diam.	Ductus Arteriosus Diameter
Isthmus	Isthmus
PA Diam.	Pulmonary Artery Diameter
Lt. PA Diam.	Pulmonary Artery Diameter - Systole - Left
Rt. PA Diam.	Pulmonary Artery Diameter - Systole - Right
Umb. A Diam.	Umbilical Artery Diameter
Veins	Veins Package
SVC Diam.	Superior Vena Cava Diameter
IVC Diam.	Inferior Vena Cava Diameter
Lt. PV Diam.	Pulmonary Vein Diameter - left
Rt. PV Diam.	Pulmonary Vein Diameter - right
Umb. V Diam.	Umbilical Vein Diameter

Gestational Sac (GS)

1. Select **GS** on the context menu. The start point appears.
2. Use **[Trackball]** to move the marker to the start point.
3. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
4. Use **[Trackball]** to move the marker to the end point.
5. To complete the measurement, press the **[Set]** key.
6. The measured value is fixed, and the gestational sac length is shown on the ***Result*** window.

Abdominal Circumference (AC)

1. Select **AC** on the context menu. The start point appears.
2. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
3. Move the marker to the second point using **[Trackball]**. The ellipse appears.
4. Press the **[Set]** key. The end point appears.
5. Move the marker to the second point using **[Trackball]**, and press the **[Set]** key again.
6. The measured value is fixed, and the abdominal circumference is shown on the ***Result*** window.

NOTE

You can measure the abdominal circumference by using the trace. To change the measurement method, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **OB** > **2D** > **AC** > **Edit** > **Caliper Type**.

Biparietal Diameter (BPD)

1. Select **BPD** on the context menu. The start point appears.
2. Use **[Trackball]** to move the marker to the start point.
3. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
4. Use **[Trackball]** to move the marker to the end point.
5. To complete the measurement, press the **[Set]** key.
6. The measured value is fixed, and the biparietal diameter is shown on the ***Result*** window.

Head Circumference (HC), Occipito-frontal Diameter (OFD)

1. Select **HC** on the context menu. The start point appears.
2. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
3. Use **[Trackball]** to move the marker to the second point. The ellipse appears.
4. Press the **[Set]** key. The end point appears.
5. Use **[Trackball]** to move the marker to the second point, and press the **[Set]** key again.
6. The measured value is fixed. The head circumference and the occipito-frontal diameter are shown on the ***Result*** window.

NOTE

- To show or hide the OFD measurement, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **OB** > **2D** > **HC** > **Edit**. This setting is available only when you perform a HC measurement by using the ellipse.
- You can measure the head circumference by using the trace. To change the measurement method, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **OB** > **2D** > **HC** > **Edit** > **Caliper Type**.

Amniotic Fluid Index (AFI)

To calculate the amniotic fluid index, measure the four quadrants of the uterine cavity.

1. Select the **AFI** folder on the context menu.
2. Select **AFI-Q1**. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key. The first quadrant is completed.
3. Perform 1 distance measurement.
   The AFI sum for AFI-Q1 is automatically shown on the ***Result*** window.
4. Repeat step 3 to measure the second, third, and fourth quadrant (AFI-Q2, AFI-Q3, AFI-Q4).
5. The total sum of your AFI measurements is shown on the ***Result*** window.

Antero-Postero Trunk Diameter by Transverse Trunk Diameter (AxT)

1. Select **AxT** on the context menu. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key. The antero-postero trunk diameter (**APTD**) measurement is completed.
2. Perform the measurement of the transverse trunk diameter (**TTD**) measurement in the same manner (a-d).
3. When two distance measurements are completed, the measured value is fixed, and the measured value is shown on the ***Result*** window.

CTAR

1. Select **CTAR** on the context menu. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key. The first point is fixed, and the second point appears.
   b. Use **[Trackball]** to move the marker to the second point. The ellipse appears.
   c. Press the **[Set]** key. The end point appears.
   d. Use **[Trackball]** to move the marker to the second point and press the **[Set]** key again. The heart area (**Heart Area**) measurement is completed.
2. Perform the thoracic area (**Thorax Area**) measurement in the same manner (a-d).
3. When two ellipse measurements are completed, the measured value is fixed, and the measured value is shown on the ***Result*** window.

NOTE

The cardiothoracic area ratio measurement is available for the OB1 preset and OB2/3 presets (CTAR), and Fetal Echo preset (CT).

Femur Length (FL)

1. Select **FL** on the context menu. The start point appears.
2. Use **[Trackball]** to move the marker to the start point.
3. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
4. Use **[Trackball]** to move the marker to the end point.
5. To complete the measurement, press the **[Set]** key.
6. The measured value is fixed, and the femur length is shown on the ***Result*** window.

Spinal Length (SL)

1. Select **SL** on the context menu. The start point appears.
2. Use **[Trackball]** to move the marker to the start point.
3. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
4. Use **[Trackball]** to move the marker to the end point.
5. To complete the measurement, press the **[Set]** key.
6. The measured value is fixed, and the length of vertebrae is shown on the ***Result*** window.

Automatic Nuchal Translucency Diameter (Auto NT)

1. When examining the Nuchal Translucency Diameter, press the **[Freeze]** key on the control panel.
2. Press the **[Measure]** key on the control panel.
3. Select **Auto NT** on the context menu. The start point appears.
4. Use **[Trackball]** to move the marker to the start point.
5. To fix the point, press the **[Set]** key.
6. Use **[Trackball]** to move the marker to the end point, and press the **[Set]** key.
   The Nuchal Translucency Diameter is shown on the ***Result*** window.
7. To complete the measurement, press the **[Set]** key.
   The measured value is fixed.

NOTE

- To switch the caliper options between **Auto NT** and **Manual**, rotate the **Caliper** soft key.
- To adjust the NT position, rotate the **NT position** soft key.
- To adjust the method, rotate the **Method** soft key.

Left Ventricle – Teichholz Method

The followings are Teichholz measurements:

- **Teichholz – IVSd, LVIDd, LVPWd, IVSs, LVIDs, LVPWs**

1. Select the **Teichholz** folder on the context menu.
2. Select a Teichholz measurement on the context menu. The start point appears.
   a. Use **[Trackball]** to move the start point to the interventricular septum.
   b. To fix the point, press the **[Set]** key.
   c. As you move **[Trackball]**, the second point and a straight line appear on the display.
   d. Press the **[Set]** key. The first distance (**IVSd** or **IVSs**) measurement is fixed.
3. Perform the measurement of the second (**LVIDd** or **LVIDs**) and third (**LVPWd** or **LVPWs**) distance in the same manner (a-d).
4. After three length measurements are completed, the measured value is fixed, and the left ventricle dimension is shown on the ***Result*** window.

NOTE

When you select **Diastole** or **Systole**, you can perform the 3 length measurement with a straight line. Otherwise, when you select **IVS**, **LVID**, or **LVPW**, you can only perform 1 distance measurement.

2D mode calculations (OB1, OB2/3)

The calculation labels may not be available in the measurement menu. The system performs the calculations when the required measurements are made. The system also shows the calculated values in the measured results and transfers the values to the report.

Table 7-11 2D mode calculations (OB)

Calculation label	Description	Required measurements
EFW	Estimated Fetal Weight	The required measurements vary depending on the selected authors.
EFW GP	Estimated Fetal Weight - Growth Percentile	The values vary depending on the selected authors.
GA	Gestational ages by last menstrual period	Calculation from the LMP data
EDD	Estimated date of delivery by last menstrual period	Determined by LMP data
U/S GA	Gestational ages by ultrasound	Determined from all Fetal Age measurements and calculations
U/S EDD	Estimated date of delivery by ultrasound	Determined from all ultrasound measurements and calculations
CI	Cephalic Index	BPD OFD
HC/AC	Ratio of Head Circumference to Abdominal Circumference	HC AC
FL/BPD	Ratio of Femur Length to Biparietal Diameter	FL BPD
FL/AC	Ratio of Femur Length to Abdominal Circumference	FL AC
FL/HC	Ratio of Femur Length to Head Circumference	FL HC

2D mode calculations (Fetal Echo)

The calculation labels may not be available in the measurement menu. The system performs the calculations when the required measurements are made. The system also shows the calculated values in the measured results and transfers the values to the report.

Table 7-12 2D mode calculations (Fetal echo)

Calculation Label	Description	Required
Teichholz		
EDV	End Diastolic Volume	LVIDd
ESV	End Systolic Volume	LVIDs
SV	Stroke Volume	EDV, ESV
EF	Ejection Fraction	EDV, ESV
LV FS	Fractional Shortening	LVIDd, LVIDs
CT	Cardiothoracic Area Ratio	Cardiac Area, Thoracic Area
Thorax	Thorax	
CTR	Cardio-Thoracic Ratio	Heart diagonally, Thorax diagonally
CTCR	Cardio-Thoracic Circumference Ratio	Cardiac Circum., Thoracic Circum.
CTAR	Cardio-Thoracic Area Ratio	Heart area, Thorax Area

Define as:

- **Teichholz Method**

  EDV= $7x(LVIDd^3) / (2.4 + LVIDd)$

  ESV= $7x(LVIDs^3) / (2.4 + LVIDs)$

  SV= EDV – ESV

  EF= (EDV - ESV) / EDV

  FS= (LVIDd - LVIDs) / LVIDd

- **EFW Authors**

  Campbell (AC)

  Hadlock (AC, BPD)

  Hadlock 1 (AC, FL)

  Hadlock 2 (BPD, AC, FL)

  Hadlock 3 (HC, AC, FL)

  Hadlock 4 (BPD, HC, AC, FL)

  Hansmann (BPD, TTD)

  Merz (AC, BPD)

Osaka	(BPD, FTA, FL)
Persson	(BPD, MAD, FL)
Schild	(HC, AC, FL)
Shepard	(AC, BPD)
Shinozuka 1	(BPD, APTD, TTD, FL)
Shinozuka 2	(BPD, FL, AC)
Shinozuka 3	(BPD, APTD, TTD, SL)
Tokyo	(BPD, APTD, TTD, FL)

NOTE

- To change the default EFW author, press the **[System Preset]** key and go to **Measurement** > **OB MEAS.** > **EFW Formula**.
- If a measurement of EFW formula is not shown on the context menu, the EFW formula setting may not be affected. This setting is only available when you set the measurement for EFW formula as default.
- To add a measurement in the EFW formula as default, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **OB** > **Add measurement** (Insert).

Estimated Fetal Weight (EFW)

1. To measure estimated fetal weight, perform several OB measurements first.
2. EFW based on the measured values is calculated and the result is shown.

   NOTE

   The EFW calculation method (author) is selected from the EFW formula.
3. Perform the measurements required for EFW.
   When the measurements are completed, the EFW is automatically calculated.
4. The each measurement and the estimated fetal weight are shown on the ***Result*** window.

NOTE

EFW is not calculated and shown if the selected measurement is not performed.

Composite Gestational ages (GA) and estimated date of delivery (EDD) by ultrasound

When you perform the OB measurement, GA and EDD are calculated based on the measured values.

NOTE

To show or hide GA and EDD, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **OB** > **2D** > **Edit**.

M mode measurements (OB1, OB2/3)

M mode measurements are shown in the context menu and in the OB report with measured result, when assigned.

Table 7-13 M mode measurement (OB)

Measurement	Description
Generic	Generic (Package)
Dist	Distance
Slope	Slope
Time	Time
HR	Heart Rate
%Steno(Dist)	Two Distances Percent Stenosis
FHR	Fetal Heart Rate (Package)
FHR	Fetal Heart Rate
Atrial FHR	Atrial Fetal Heart Rate

NOTE

To configure the default measurement for M mode, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **OB** > **M** > **Default Measurement**.

Heart Rate (HR)

1. Select **HR** on the context menu. The start point appears.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The heart rate between the two points is calculated. The heart rate (**HR**) and time (**T**) are shown on the ***Result*** window.

NOTE

To configure the heart rate cycle, press the **[System Preset]** key and go to **Measurement** > **Advanced MEAS.** > **HR cycle**.

M mode measurements (Fetal Echo)

M mode measurements are shown in the context menu and in the fetal heart report with measured result, when assigned.

Table 7-14 M mode measurement (Fetal echo)

Measurement	Description
4 Chamber view	4-Chamber-view (Package)
Ventr. Dim.	Ventricle Dimension
Ventr. wall	Ventricle Wall
Atr. Dim.	Atrium Dimension
Septum	Septum Dimension
Biventric. inner	Biventricle inner Dimension
Biventric. outer	Biventricle outer Dimension
MV open exc.	Mitral Valve Open
TV open exc.	Tricuspid Value Open
Outflow track	Outflow Track (Package)
AV Diam.	Aortic Valve Diameter
PV Diam.	Pulmonary Valve Diameter
FHR	Fetal Heart Rate (Package)
FHR	Fetal Heart Rate
Atrial FHR	Atrial Fetal Heart Rate
Heart	Left Heart Package (Package)
LA Diam.	Left Atrium Diameter
AO Diam.	Aorta Diameter - Systole
LVET	Left Ventricle Ejection Time
DE Amp Slope	D-E wave Amplitude and Slope
EF Slope	E-F wave Slope
RADs	Right Atrium Diameter - Systole
RADd	Right Atrium Diameter - Diastole
RVAWd	Right Ventricle Anterior Wall Diameter - Diastole
RVAWs	Right Ventricle Anterior Wall Diameter - Systole
RV Diam.	Right Ventricle Diameter
PA Diam.	Pulmonary Artery Diameter

Measurement	Description
RVET	Right Ventricle Ejection Time
Teichholz	Left Ventricular Dimensions by Teichholz method (Package)
IVSd	Interventricular Septum - End Diastole
LVIDd	Left Ventricle Internal Dimension - End Diastole
LVPWd	Left Ventricle - Posterior Wall - End Diastole
IVSs	Interventricular Septum - End Systole
LVIDs	Left Ventricle Internal Dimension - End Systole
LVPWs	Left Ventricle Posterior Wall - End Systole

Diameter

The followings are distance measurements:

- **Heart – LA Diam., AO Diam., RADs, RADd, RVAWd, RVAWs, RV Diam., PA Diam.**

1. Select the **Heart** folder on the context menu.
2. Select a distance measurement on the context menu. The start point appears. The vertical line and the horizontal line are perpendicular to each other.
3. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key. The start point is fixed, and the end point appears.
4. Use **[Trackball]** to move the point, and press the **[Set]** key again.
5. The measured value is fixed, and the distance measurement is shown on the ***Result*** window.

Time

The followings are time measurements:

- **Heart – LVET, RVET**

1. Select the **Heart** folder on the context menu.
2. Select a time measurement on the context menu. The start point appears. The vertical line and the horizontal line are perpendicular to each other.
3. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key. The start point is fixed, and the end point appears.
4. Use **[Trackball]** to move the point, and press the **[Set]** key again.
5. The time interval between the two points appears. The time measurement is shown on the ***Result*** window.

Slope

The followings are distance measurements:

- **Heart – DE Amp Slope, EF Slope**

1. Select the **Heart** folder on the context menu.
2. Select **DE Amp Slope** or **EF Slope**. The start point appears.
   The vertical line and the horizontal line are perpendicular to each other.
3. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
4. Use **[Trackball]** to move the point, and press the **[Set]** key again.
5. When the oblique line appears, the slope is calculated, and the slope measurement is shown on the ***Result*** window.

Fetal Heart Rate

1. Select the **FHR** folder on the context menu.
2. Select **FHR**. The start point appears.
   The vertical line and the horizontal line are perpendicular to each other.
3. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
4. Use **[Trackball]** to move the point, and press the **[Set]** key again.
5. The heart rate between the two points is calculated, and the heart rate is shown on the ***Result*** window.

NOTE

To configure the heart rate cycle, press the **[System Preset]** key and go to **Measurement** > **Advanced MEAS.** > **HR cycle**.

Left Ventricle – Teichholz Method

The followings are Teichholz measurements:

- **Teichholz – IVSd, LVIDd, LVPWd, IVSs, LVIDs, LVPWs**

1. Select the **Teichholz** folder on the context menu.
2. Select a Teichholz measurement on the context menu. The start point appears.
   a. Move the start point to the interventricular septum by using the **[Trackball]**.
   b. To fix the point, press the **[Set]** key.
   c. As you move **[Trackball]**, the second point and straight line appear on the display.
   d. Press the **[Set]** key. The first distance (**IVSd** or **IVSs**) measurement is fixed.

3 Perform the measurement of the second (**LVIDd** or **LVIDs**) and third (**LVPWd** or **LVPWs**) distance in the same manner (a-d).

4 After three length measurements are completed, the measured value is fixed, and the left ventricle dimension is shown on the ***Result*** window.

NOTE

When you select **Diastole** or **Systole**, you can perform the 3 length measurement with a straight line. Otherwise, when you select **IVS**, **LVID**, or **LVPW**, you can only perform 1 distance measurement.

M mode calculations

The calculation labels may not be available in the measurement menu. The system performs the calculations when the required measurements are made. The system also shows the calculated values in the measured results and transfers the values to the report.

Table 7-15 M mode calculations (Fetal echo)

Calculation Label	Description	Required
Teichholz		
EDV	End Diastolic Volume	LVIDd
ESV	End Systolic Volume	LVIDs
SV	Stroke Volume	EDV, ESV
EF	Ejection Fraction	EDV, ESV
FS	Fractional Shortening	LVIDd, LVIDs

Define as:

- **Teichholz Method**

  $EDV = 7x(LVIDd^3) / (2.4 + LVIDd)$

  $ESV = 7x(LVIDs^3) / (2.4 + LVIDs)$

  $SV = EDV – ESV$

  $EF = (EDV - ESV) / EDV$

  $FS = (LVIDd - LVIDs) / LVIDd$

D mode measurements (OB1, OB2/3)

D mode measurements are shown in the context menu and in the OB report with measured result, when assigned.

Table 7-16 D mode measurement (OB)

Measurement	Description
Aorta	Aorta
Carotid	Carotid Artery
MCA	Middle Cerebral Artery
Umbilical A	Umbilical Artery
Uterine A	Uterine Artery
SMA	Superior Mesenteric Artery
Celiac A	Celiac Artery
Auto Trace	Auto Trace
Manual Trace	Manual Trace
PS	Peak Systole (PS) Velocity
ED	End Diastole (ED) Velocity
S/D	S/D Ratio
RI	Resistive Index (RI)
PI	Pulsatility Index (PI)
HR	Heart Rate
Ductus Ven	Ductus Venosus
IVC	Inferior Vena Cava
Manual Trace	Manual Trace
S	Ventricular Systole
D	Early Ventricular Diastole
a	Atrial Contraction
S.a.PLI	Preload Index
PI	Pulsatility Index
PVIV	Peak Velocity Index for Veins
HR	Heart Rate

NOTE

To configure the default measurement for Doppler mode, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **OB** > **Doppler** > **Default Measurement**.

To select a package measurement,

1 Select a package measurement folder.

2 Select a desired measurement from the measurement list.

In each Doppler package measurement, you can make the following measurements:

- Auto Trace
- Semi Auto Trace
- Manual Trace
- Peak Systole (PS)
- End Diastole (ED)
- Minimum Diastole (MD)
- S/D or D/S Ratio (S/D or D/S)
- Pulsatility Index (PI)
- Resistive Index (RI)
- Maximum Time-Average Velocity (TAmax)
- Acceleration (Accel)
- Acceleration Time (AT)

NOTE

To configure the default measurement for each package measurement, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **OB** >**Doppler** > a package measurement (double-click) > a default measurement.

Peak Systole, End Diastole or Minimum Diastole (PS, ED, or MD)

1 Select **PS**, **ED**, or **MD** on the context menu.
The vertical line and the horizontal line are perpendicular to each other.

2 Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.

3 The measured value is fixed, and the velocity (**PS**, **ED**, or **MD**) is shown on the ***Result*** window.

PS/ED or ED/PS Ratio

1 Select **S/D** or **D/S** on the context menu.
The vertical line and the horizontal line are perpendicular to each other.

2 Measure the start point (**S** or **D**) of the ratio using **[Trackball]**, and press the **[Set]** key.

3 Measure the second point (**D** or **S**) of the ratio using **[Trackball]**, and cpress the **[Set]** key.

4 The ratio is calculated. The two velocities (**S**, **D**) and S/D or D/S ratio (**S/D** or **D/S**) are shown on the ***Result*** window.

Pulsatility Index (PI)

1. Select **PI** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move the marker to the start point of the waveform, and press the **[Set]** key.
   The end point appears.
3. Use **[Trackball]** to manually trace the waveform.
4. To complete the measurement, press the **[Set]** key.
5. The pulsatility index is calculated and the pulsatility index (**PI)** is shown on the ***Result*** window.

Resistive Index (RI)

1. Select **RI** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. When the end point is fixed, the resistive index is calculated and the resistivity index (**RI**) is shown on the ***Result*** window.

Maximum Time-Average Velocity (TAmax)

1. Select **TAmax** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move the marker to the start point of the waveform, and press the **[Set]** key.
   The end point appears.
3. Use **[Trackball]** to trace the maximum value of the desired portion for the spectrum.
4. To complete the measurement, press the **[Set]** key.
5. The maximum time-average is calculated, and the maximum time-average (**TAmax**) is shown on the ***Result*** window.

Acceleration (Accel)

1. Select **Accel** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and then press the **[Set]** key again.
4. When the oblique line appears, the acceleration is calculated. The acceleration (**Accel**) and the acceleration time (**AT**) are shown on the ***Result*** window.

Acceleration Time (AT)

1. Select **AT** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The time interval between the two points appears. The acceleration time (**AT**) is shown on the ***Result*** window.

D mode measurements (Fetal Echo)

D mode measurements are shown in the context menu and in the fetal heart report with measured result, when assigned.

Table 7-17 D mode measurement (Fetal echo)

Measurement	Description
Tricuspid Valve	Tricuspid Valve
E-Wave	E-Wave (Early Filling) Velocity
A-Wave	A-Wave (Atrial Contraction) Velocity
Vmax regurg.	Maximum Velocity of Regurgitant Flow
Mitral Valve	Mitral Valve
E-Wave	E-Wave (Early Filling) Velocity
A-Wave	A-Wave (Atrial Contraction) Velocity
Vmax regurg.	Maximum Velocity of Regurgitant Flow
IVRT	Isovolumic Relaxation Time
Main Pulmonary A	Main Pulmonary Artery
Manual Trace	Manual Trace
Vmax	Maximum Velocity
TPV	Time to Peak Velocity
Aorta	Aorta
Manual Trace	Manual Trace
Manual Trace AoI	Aortic Isthmus(AoI) Manual Trace
Vmax	Maximum Velocity
TPV	Time to Peak Velocity
Vmax AoI	Aortic Isthmus(AoI) Maximal Velocity
Ductus Art.	Ductus Arteriosus
Auto Trace	Auto Trace

Measurement	Description
Manual Trace	Manual Trace
PS	Peak Systole (PS)
RI	Resistive Index (RI)
PS,ED RI,SD	PS,ED RI,SD
ED	End Diastole (ED)
PI	Pulsatility Index (PI)
TPV	Time to Peak Velocity
HR	Heart Rate
Umbilical V	Umbilical Vein
TAmax	Maximum Time-Average Velocity
Ductus Ven.	Ductus Venosus
Manual Trace	Manual Trace
S	Ventricular Systole Velocity
D	Early Ventricular Diastole Velocity
a	Atrial Contraction Velocity
S.a.PLI	Preload Index
PI	Pulsatility Index
PVIV	Peak Velocity Index for Veins
HR	Heart Rate
Pulmonary Valve	Pulmonary Valve
Manual Trace	Manual Trace
Vmax	Maximum Velocity
TPV	Time to Peak Velocity
Acc. Time	Acceleration Time
Eject. Time	Ejection Time
Aortic Valve	Aortic Valve
Manual Trace	Manual Trace
Vmax	Maximum Velocity
TPV	Time to Peak Velocity
Acc. Time	Acceleration Time
PR interval	P-R interval Time
Eject. Time	Ejection Time

Measurement	Description
FHR	Fetal Heart Rate
FHR	Fetal Heart Rate
LVOT	Left Ventricular Outflow Tract
Manual Trace	Manual Trace
Vmax	Maximum Velocity
PR interval	P-R interval Time
ICT	Isovolumic Contraction Time
Eject. Time	Ejection Time
IRT	Isovolumic Relaxation Time
RVOT	Right Ventricular Outflow Tract
Manual Trace	Manual Trace
Vmax	Maximum Velocity
ICT	Isovolumic Contraction Time
Eject. Time	Ejection Time
IRT	Isovolumic Relaxation Time
Pulmonary Vein	Pulmonary Vein
Vd	Diastolic Velocity
Vs	Systolic Velocity
A Rev.V	Atrial Reversal flow velocity
A Rev.Dur	Duration of Atrial Reversal flow velocity
Valves	Valves Package
MV E pt	Mitral Valve E point Velocity
MV A pt	Mitral Valve A point Velocity
AV Vmax	Aortic Valve Peak Velocity
PV Vmax	Pulmonary Valve Peak Velocity
FO	Foramen Ovale Velocity
Ventricles	Ventricles
IVCT	Isovolumetric Contraction Time
LVET	Left Ventricle Ejection Time
IVRT	Isovolumetric Relaxation Time
RVET	Right Ventricle Ejection Time
Arteries	Arteries Package

Measurement	Description
Asc. aorta Vmax	Ascending Aorta Velocity
Thor. aorta Vmax	Thoracic Aorta Velocity
Trans. ao. arch Vmax	Transversal Aortic Arch Velocity
DA Vmax	Ductus Arteriosus Velocity
PA Vmax	Pulmonary Artery Velocity
Umb. A Vmax	Umbilical Artery Velocity
Veins	Veins Package
SVC Vmax	Superior Vena Cava Velocity
IVC Vmax	Inferior Vena Cava Velocity
Lt. PV Vmax	Pulmonary Vein left Velocity
Rt. PV Vmax	Pulmonary Vein right Velocity
Umb. V Vmax	Umbilical Vein Velocity

Velocity

The followings are velocity measurements:

- **Valves – MV E pt, MV A pt, AV Vmax, PV Vmax, FO**
- **Arteries – Asc. aorta Vmax, Thor. aorta Vmax, Trans. ao. arch Vmax, DA Vmax, PA Vmax, Umb. A Vmax**
- **Veins – SVC Vmax, IVC Vmax, Lt. PV Vmax, Rt. PV Vmax, Umb. V Vmax**

1. Select a velocity measurement on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The measured value is fixed, and the velocity is shown on the ***Result*** window.

Time

The followings are time measurements:

- **Ventricles – IVCT, LVET, IVRT, RVET**

1. Select a time measurement on the context menu. The start point appears.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The time interval between the two points appears and the time measurement is shown on the ***Result*** window.

D mode calculations

The calculation labels may not be available in the measurement menu. The system performs the calculations when the required measurements are made. The system also shows the calculated values in the measured results and transfers the values to the report.

Table 7-18 D mode calculations

Calculation label	Description	Required measurements
E/A	Mitral Valve E point /A point Ratio	MV E pt MV A pt
TEI-I	TEI Index (Index of Myocardial Performance of Left Ventricle)	IVCT IVRT LVET

Define as:

TEI-I = (IVCT+IVRT)/LVET

OB report

To start a report,

– Press the **[Report]** key on the control panel.

– Select **Report** on the context menu.

Report functions

– See "Report" on page 7-27 for more information.

– To select CUA or AUA for gestational age, rotate the **Select AUA/CUA** soft key.

NOTE

To configure the default ultrasound age type, press the **[System Preset]** key and go to **Measurement** > **OB MEAS.** > **Default US Age Type(Hadlock)** > **AUA** or **CUA**.

– To select the fetus A, B, C, or D, rotate the **Fetus A** soft key. This function is for a multi-gestational patient.

The OB report has three sections of information:

- Patient information
- Measurement information
- Calculation information

Patient information

- **ID**
- **Name**
- **Age**
- **Exam date**
- **Referring MD**
- **LMP** or **IVF**
- **GA(LMP)** or **GA(IVF)**, **EDD(LMP)** or **EDD(IVF)**
- Determined from LMP or IVF data
- **GA(AUA)** or **GA(CUA)**, **EDD(AUA)** or **EDD(CUA)**: If this field is checked, the system uses the measurement to calculate the ultrasound age.
  - AUA: Average Ultrasound age, regression calculation
  - CUA: Composite Ultrasound age, an arithmetric average
- **Fetus**: For a multi-gestational patient, select a fetus (A, B, C, D) in this field.

NOTE

To edit the patient information, go to **Patient Registration**.

Measurement information

- **Value**: The measured value. If more than one measurement was made for an item, the system uses the specified method (average, maximum, minimum, or last) to determine this value. See also "Editing a report" on page 7-29.
- **1st–3rd**: The three measurement values for each item are available. If you make more than three measurements, the report uses the last three.
- **GA**: GA is calculated based on the measured values for the fetus. “##” appears when any of the values is out of range.
- **GP**: The growth percentile of each measurement. The GP value is calculated by selecting LMP and AUA.
- **Range**: The typical range of fetal age for this measurement.

  NOTE

  The GA range may not be shown when the range of OB reference (author) is set to none (unavailable).

- **Method**: This specifies the method used to calculate the measurement value listed in the value column. The method options are **Last**, **Aver**, **Max**, or **Min**.

NOTE

To configure the default method for the measurement value, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Edit** > **Method**.

Calculation information

- **EFW**: Show the parameters used to calculate EFW. This is followed by the calculation result.
- **EFW GP**: Show the source used to calculate EFW GP. This is followed by the growth percentile. When you enter LMP, you can check the EFW GP value and reference (Hadlock, Brenner, Williams, Pittaluga).
- **Ratio**: The remaining calculation information shows ratios for several measurements.
- **CI** (Cephalic index): The value calculated by measuring BPD and OFD is displayed.
  - AC/HC
  - FL/BPD
  - FL/HC
  - FL/AC
- **EFW Range**: The GP value is calculated by selecting LMP and AUA.

Fetal heart report

To view a report,

1. Select a package measurement folder.
2. Select a desired package measurement.

   NOTE

   If any measurement is performed, it is shown as a check mark (☑) next to the package measurement.

3. When the labeled measurements appear, you can create, edit, or delete values in a cell. You can also change the method item.

The fetal heart report has two sections of information:

- Patient information
- Measurement information

Patient information

The patient information about the fetal heart report is the same as the OB report. See "Patient information" on page 7-70.

Patient information

- **Value**: The measured value. If more than one measurement was made for an item, the system uses the specified method (average, maximum, minimum, or last) to determine this value. See also "Editing a report" on page 7-29.
- **1st–5th**: The five measurement values for each item are available. If you make more than five measurements, the report uses the last five and the oldest value is automatically deleted.
- **Method**: This specifies the method used to calculate the measurement value listed in the value column. The method options are **Last**, **Aver**, **Max**, or **Min**.

NOTE

To set the selected method as default, press the **Save As Default** soft key. To set a method to be used for all measurements in the current measurement preset, press the **Factory Default** soft key.

OB graph

The OB graph shows curve graphs and bar graphs that indicate predicate fetal growth patterns according to the selected reference (author) for a measurement or calculation.

OB graph allows you to access the fetal growth curve compared to a normal growth curve. When a patient has completed data from the previous studies, you can use the graph to look at fetal trending.

For multi-gestational patients, you can compare the growth on the graphs.

Fetal growth – references

Table 7-19 Fetal growth (reference)

Display item name	Description	Reference (Author) name
EFW	Estimated Fetal Weight	Brenner, Doubilet, Hadlock, Hansmann, Hansmann 86, Hobbins/Persutte, JSUM2001, Osaka, Persson Tokyo/Shinozuka, Tokyo, Williams, Yarkoni, Kiserud, EIK-NE2007, Marsal, Pittaluga
AC	Abdominal Circumference	ASUM, CFEF, Chitty, Hadlock, Hansmann, Jeanty, JSUM, Kurmanavicius, Lessoway, Merz, Nicolaides, Shinozuka, Tokyo, Kiserud, Verburg
AFI	Amniotic Fluid Index	Moore
APAD	Anteroposterior Abdominal Diameter	Merz
APTD	Anteroposterior Trunk Diameter	Hansmann
AxT	Anteroposterior Trunk Diameter multiplied by Transverse Trunk Diameter	Shinozuka, Tokyo
BOD	Binocular Distance	Jeanty
BPD	Biparietal Diameter	ASUM, CFEF, Chitty, Hadlock, Hansmann, Jeanty, JSUM, Kurmanavicius, Lessoway, Marsal, Merz, Nicolaides, Osaka, Sabbagha, Shinozuka, Tokyo, EIK-NES 2007, Kiserud, Verburg
CLAV	Clavicle Length	Yarkoni
CM	Cisterna Magna	Nicolaides
CRL	Crown-Rump Length	ASUM, Hadlock, Hansmann, JSUM, Marsal, Osaka, Robinson, Shinozuka, Tokyo
FL	Femur Length	ASUM, CFEF, Chitty, Hadlock, Hansmann, Jeanty, JSUM, Kurmanavicius, Lessoway, Marsal, Merz, Nicolaides, O'Brien, Osaka, Shinozuka, Tokyo, Warda, EIK-NES 2007, Kiserud, Verburg
FTA	Fetal Trunk Cross-Sectional Area	Osaka
Fibula	Fibula Length	Jeanty

Display item name	Description	Reference (Author) name
GS	Gestation Sac Length	Hellman, Rempen
HC	Head Circumference	ASUM, CFEF, Chitty, Hadlock, Hansmann, Jeanty, Kurmanavicius, Lessoway, Merz, Nicolaides, Kiserud, Verburg
Humerus	Humerus Length	ASUM, Jeanty, Merz, Osaka
SL	Spinal Length	Tokyo
MCA PI	Middle Cerebral Artery Pulsatility Index	Bahlman, JSUM, Schaffer
MCA PS	Middle Cerebral Artery Peak Systole Velocity	Mari
MCA RI	Middle Cerebral Artery Resistive Index	Bahlman, JSUM, Schaffer
MAD	Middle Abdomen Diameter	EIK-NES, Kurmanavicius, EIK-NES 2007, Kiserud
MSD	Mean Gestational Sac Diameter	Hellman, Rempen
OFD	Occipito-frontal Diameter	ASUM, Hansmann, Jeanty, Kurmanavicius, Merz, Nicolaides
Radius	Radius Length	Jeanty, Merz
TAD	Transverse Abdominal Diameter	CFEF, Merz
CEREB	Transverse Cerebellar Diameter	GoldStein, Hill, Nicolaides, Verburg
Tibia	Tibia Length	Jeanty, Merz
TTD	Transverse Trunk Diameter	Hansmann
Ulna	Ulna Length	Jeanty, Merz
UmbArt PI	Umbilical Artery Pulsatility Index	JSUM, Merz, Schaffer
UmbArt RI	Umbilical Artery Resistive Index	JSUM, Kurmanavicius, Merz, Schaffer
AO PI	Aorta Pulsatility Index	Schaffer
AO RI	Aorta Resistive Index	Schaffer
Uterine A PI	Uterine Artery Pulsatility Index	Schaffer
Uterine A RI	Uterine Arte Resistive Index	Schaffer
CI	Cephalic Index	Hadlock
HC/AC	HC and AC ratio Ratio of Head Circumference to Abdominal Circumference	Campbell
FL/BPD	Ratio of Femur Length to Biparietal Diameter	Hohler, Kiserud
FL/AC	Ratio of Femur Length to Abdominal Circumference	Hadlock
FL/HC	Ratio of Femur Length to Head Circumference	Hadlock

Fetal growth curve graphs

To start a curve graph,

– Select **Graph** on the context menu.

– While viewing the OB report, select **Graph** on the context menu.

To view a curve graph,

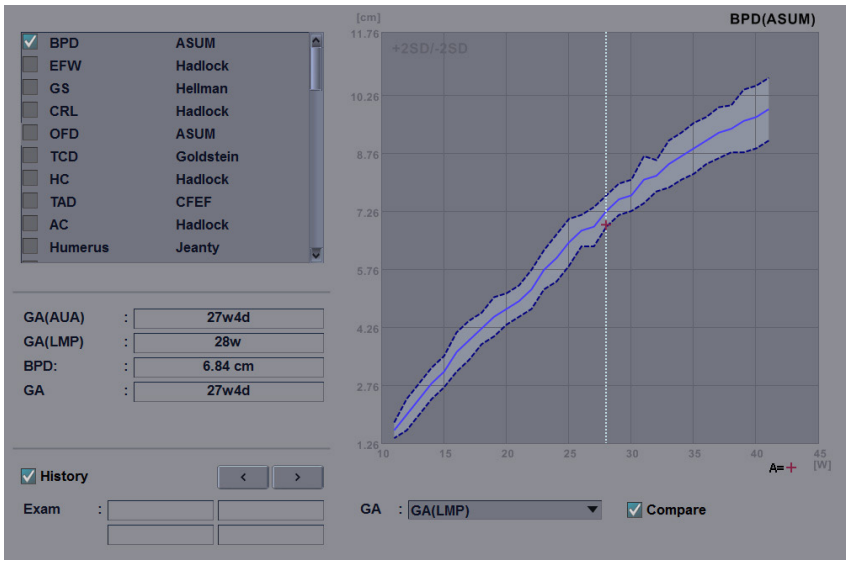


Figure 7-5 Curve graph

- The horizontal axis shows the fetal age in weeks. This age is determined by the entry data on the **Patient Registration**. The vertical axis shows one of the followings:
  – For measurements: mm or cm
  – For ratios: percent
  – For fetal weight: gram
- The fetal growth graph shows the following information for the selected measurement:
  – The normal fetal growth curve
  – The standard deviations or relevant percentiles
  – The gestational age of the fetus, using patient data and ultrasound age (vertical dotted line)
  – The current ultrasound measurement data, where the fetus is on the growth curve (symbol)
- On the left of the fetal growth graph, the following additional information appears:
  – **GA(AUA)** or **GA(CUA)**: The system allows you to use the composite ultrasound age (CUA) or average ultrasound age (AUA). Rotate the **Select AUA/CUA** soft key to select a gestational age.
  – **GA(LMP)** or **GA(IVF)**: This data is determined by the LMP (or IVF) data on the **Patient Registration**.
  – **GA**: This data is calculated based on the measured values for the fetus.

To select a measurement,

1. The system shows a list of fetal growth measurements.
2. The graph list is shown by the order of measurements you performed recently. The check mark () is shown next to the measurement that has measured values.
3. To select a specific measurement, use **[Trackball]** to move to the measurement field and press the **[Set]** key.
4. To scroll through all fetal growth curve graphs, rotate the **Select Graph** soft key.

To change the reference author,

1. Use **[Trackball]** to move the cursor to the reference, and press the **[Set]** key.
2. Select a reference from the drop-down list, and press the **[Set]** key again.

To view fetus trending on graphs,

- The system automatically finds the data based on the previous studies.
- When you select the **History** check box, the previous and current data are shown on the graph. The previous data is shown as the same symbol with the current data. You can check the fetal trend on the graph.

To view multiple fetuses data on graphs,

- You can view multiple gestational data on fetal growth curve graphs.
- When you select the **Compare** check box, the multiple gestational data is shown on the current graph.
- You can specify the maximum of four fetuses (A, B, C, or D). The specified fetuses are shown as different symbols and colors.

NOTE

To configure the fetus number, go to **Patient Registration** > **OB exam information** > **Fetus #**.

To view a quad graph,

You can view four graphs at the same page. Press the **Quad** soft key. The measured values and references are shown at the left of the graph.

To change each graph in the quad view,

1. Use **[Trackball]** to move the cursor to the change graph icon (), and press the **[Set]** key.
2. Select a measurement from the measurement list, and press the **[Set]** key. The graph is changed.

Fetal growth bar graphs

To start a bar graph,

– While viewing the OB graph, press the **Bar** soft key.

To view a curve graph,

– The horizontal axis shows the gestational weeks.
– The blue vertical line shows the gestational age (GA) by the LMP data.
– The blue dotted vertical line shows the CUA (or AUA) by the current measured values.
– To select a gestational age, rotate the **Select AUA/CUA** soft key.
– The yellow symbol mark (+) shows the ultrasound GA for each measurement.
– The blue rectangle shows the normal age range for the measurement.

NOTE

You cannot view the fetal trending or multiple fetus data on the bar graph.

Anatomical survey

To start the anatomical survey,

– While viewing the OB report, select **Anatomical Survey** on the touch screen.

NOTE

The patient specific contents input on the ***Anatomical Survey*** page are returned to the factory default settings after starting a new patient.

Anatomical survey lists

Table 7-20 Anatomical survey lists

List	Descriptive data	Options
Head	Lateral Ventricle, Cerebellum Cist. magma, Orbits, Face, Nose / Lips, Palate, NT	(Blank), Normal
Heart	4-Chamber, LVOT, RVOT, 3-Vessel, Aortic Arch, Cardiac Axis, Cardiac Rhythm	(Blank), Normal
Spine	C-Spine, T-Spine, L-Spine, Sacrum	(Blank), Normal
Chest	Diaphragm, Lungs	(Blank), Normal
Abdomen	Abdominal Wall, Stomach, Kidneys, Bladder, Cord Insertion, Genitalia	(Blank), Normal
Limbs	Arms, Legs, Hands, Feet	(Blank), Normal
Description	Fetal Position	Vertex, Breech, Transverse
	Placenta Location	Anterior, Posterior, Fundal, Lateral, Previa
	Placenta Grade	0, 1, 2, 3
	Umbilical Cord	Normal, 2-vessel, Nuchal Cord
	Amniotic Fluid	Normal, Oligohydramnios, Polyhydramnios
Biophysical profile	Fetal Movements	0, 1, 2
	Fetal Breathing	0, 1, 2
	Fetal Tone	0, 1, 2
	Reactive NST (Reactive non-stress test)	0, 1, 2
	Amniotic Fluid	0, 1, 2
	Score	The system totals five data to calculate a score for the biophysical profile.
Diagnosis	Free Text	(Blank)

- To set all values in the list as default, select **Default**.
- To clear all values in the list, select **Clear**.
- To edit the lists in anatomical survey, use **[Trackball]** to move the cursor to the descriptive data field and press the **[Set]** key. The data field is highlighted, and you can enter the anatomy name.
- To save the data as default, press the **Save As Default** soft key.
- To set the anatomical survey list as default, press the **Factory Default** soft key.
- To clear all input data in the option fields, press the **Clear All** soft key.

Fetus compare

You can compare between fetuses by viewing measurement and calculation values. While viewing the OB report, select **Fetus Compare** on the touch screen. The measurement and calculation values for each fetus are shown on the display.

Gynecology

Gynecology measurements and calculations

GYN measurement preset

- GYN
- Follicle

To select a measurement preset,

1. Select **Measurement Preset** on the context menu.
2. Select the **GYN** or **Follicle** folder from the measurement list.

2D mode measurements

2D mode measurements are shown in the context menu and in the GYN report with measured result, when assigned.

Table 7-21 2D mode measurement (GYN)

Measurement	Description
Endo Thick.	Endometrium Thickness
Cervix L	Cervix Length
Follicle	Follicle Volume
Follicle # 1–30	Measurements of the left and right ovarian follicle
Uterus	Uterus Volume
Uterus L	Uterus Length
Uterus H	Uterus Height
Uterus W	Uterus Width
Ovary	Ovary Volume
Ovary L	Ovary Length
Ovary H	Ovary Height
Ovary W	Ovary Width
Bladder	Bladder Volume
Bladder L	Bladder Length
Bladder H	Bladder Height
Bladder W	Bladder Width
Uterus Vol	Uterus Volume
Ovary Vol	Ovary Volume

Measurement	Description
Bladder Vol	Bladder Volume
Fibroid	Follicle Volume
Fibroid # 1–15	Measurements of the left and right ovarian follicle
Pelvic Floor	Pelvic Floor
Detrusor wall thick.	Detrusor wall thickness
Urethral rotation	Urethral rotation
Uterine desc.max	Uterine descent max
Re.amp.desc.max	Rectal ampulla descent max
Rectocele depth	Bladder neck descent
Bladder neck rest	Bladder neck rest
Bladder neck stress	Bladder neck stress
Bladder desc.max	Bladder descent max
Levator hiat.stress	Levator hiatus stress
Residual urine	Residual urine
Uterine A	Uterine Artery
Uterine A Diam.	Uterine Artery Diameter
Volume Flow Area	Volume Flow Area
Ovarian A	Ovarian Artery
Volume Flow Area	Volume Flow Area

NOTE

To configure the 2D mode measurements, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **GYN** > **2D** > **Default Measurement**.

Endometrium Thickness

1. Select **Endo Thick.** on the context menu. The start point appears.
2. Use **[Trackball]** to move the marker to the start point.
3. To fix the point, press the **[Set]** key.
   The end point, overlapping the start point, appears.
4. Use **[Trackball]** to move the marker to the end point.
5. To complete the measurement, press the **[Set]** key.
6. The measured value is fixed, and the endometrium thickness (**Endo Thick.**) is shown on the ***Result*** window.

Follicle Volume

You can make the ovary follicle volume from one, two, or three distance measurements.

1 Distance Volume

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Follicle** folder. The start point appears.
3. Use **[Trackball]** to move the marker to the start point.
4. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
5. Use **[Trackball]** to move the marker to the end point.
6. To complete the measurement, press the **[Set]** key.
7. The measured value is fixed, and the follicle volume (**Rt** or **Lt Fo-Vol**) is shown on the ***Result*** window.

2 Distances Volume

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Follicle** folder. The start point appears.
   a. Move the marker to the start point using **[Trackball]**.
   b. To fix the point, press the [**Set]** key. The end point, overlapping the start point, appears.
   c. Move the marker to the end point using **[Trackball]**.
   d. To complete the measurement, press the **[Set]** key.
3. Perform the measurement of the second distance in the same manner (a-d).
4. When the second distances are measured, press the **[Set]** key.
5. The measured value is fixed, and the follicle volume (**Rt** or **Lt Fo-Vol**) is shown on the ***Result*** window.

3 Distances Volume

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Follicle** folder. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key.
3. Perform the measurement of the second and third distance in the same manner (a-d). When three distances are measured, the volume is calculated.
4. The measured value is fixed, and the follicle volume (**Rt** or **Lt Fo-Vol**) is shown on the ***Result*** window.

NOTE

- When you measure one distance (D1) and press the **[Clear]** key, the volume for D1 is calculated and shown on the ***Result*** window. For the volume of two distance (D2), measure one and two distances (D1, D2) and press the **[Clear]** key.
- To configure the follicle volume method, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Follicle** > **Edit**.

Ovary Volume (1)

You can measure the length, width, and height for the left and right ovaries. Each measurement is a typical distance measurement made in appropriate scan plane.

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Ovary** folder, and then select **Ovary L**, **Ovary W**, or **Ovary H**. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key.
3. Perform the measurement of the second and third distance in the same manner (a-d).
4. After completing the length, width, and height measurement, the ovary volume is calculated.
5. The measured value is fixed, and the ovary volume (**Rt** or **Lt Ovary Vol**) is shown on the ***Result*** window.

Ovary Volume (2)

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select **Ovary Vol**. The start point appears.
3. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
4. The first point is fixed, and the second point appears.
5. Use **[Trackball]** to move the marker to the second point, and press the **[Set]** key again. The first distance is measured.
6. Measure the second and third distances in the same manner.
7. When three distances are measured, the volume is calculated.
8. The measured value is fixed, and the ovary volume (**Rt** or **Lt Ovary Vol**) is shown on the ***Result*** window.

NOTE

- When you measure one distance (D1) and press the **[Clear]** key, the volume for D1 is calculated and shown on the ***Result*** window. For the volume of two distance (D2), measure one and two distances (D1, D2) and press the **[Clear]** key.
- To configure the ovary volume method, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Ovary Vol** > **Edit**.

M mode measurements

M mode measurements display in the context menu and the GYN report with measured result, when assigned.

Table 7-22 M mode measurement (GYN)

Measurement	Description
Ovarian	Ovarian (Package)
Time	Time
Vessel Diam.	Vessel Diameter
%Steno(Dist)	Two Distances Percent Stenosis
HR	Heart Rate
Uterine	Uterine (Package)
Time	Time
Vessel Diam.	Vessel Diameter
%Steno(Dist)	Two Distances Percent Stenosis
HR	Heart Rate
FHR	Fetal Heart Rate (Package)
FHR	Fetal Heart Rate
Atrial FHR	Atrial Fetal Heart Rate

NOTE

To configure the M mode measurement, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **GYN** > **M** > **Default Measurement**.

Heart Rate (HR)

1. Select **HR** on the context menu. The start point appears.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The heart rate between the two points is calculated. The heart rate (**HR**) and time (**T**) are shown on the ***Result*** window.

NOTE

To configure the heart rate cycle, press the **[System Preset]** key and go to **Measurement** > **Advanced MEAS.** > **HR cycle**.

D mode measurements

D mode measurements are shown in the context menu and in the GYN report with measured result, when assigned.

Table 7-23 D mode measurement (GYN)

Measurement	Description
Aorta	Aorta
Umbilical A	Umbilical Artery
Placenta	Placenta
Des. aorta	Descending Aorta
Uterine A	Uterine Artery
Ovarian A	Ovarian Artery
MCA	Middle Cerebral Artery
Vessel	Vessel
FHR	Fetal Heart Rate
HR	Heart Rate

NOTE

To configure the D mode measurement, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **GYN** > **Doppler** > **Default Measurement**.

To select a package measurement,

1. Select a package measurement folder.
2. Select a desired measurement from the measurement list.

In each package measurement for Doppler mode, you can use the following measurements:

- Auto Trace
- Semi Auto Trace
- Manual Trace
- Peak Systole (PS)
- End Diastole (ED)
- Minimum Diastole (MD)
- S/D or D/S Ratio (S/D or D/S)
- Pulsatility Index (PI)
- Resistive Index (RI)
- Maximum Time-Average Velocity (TAmax)
- Acceleration (Accel)
- Acceleration Time (AT)

NOTE

To configure the default package measurement for Doppler mode, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **GYN** > **Doppler** > **Package measurement** > a default measurement.

Peak Systole, End Diastole, or Minimum Diastole (PS, ED, or MD)

1. Select **PS**, **ED**, or **MD** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
3. The measured value is fixed, and the velocity (**PS**, **ED**, or **MD**) is shown on the ***Result*** window.

PS/ED or ED/PS Ratio

1. Select **S/D** or **D/S** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Measure the first point (**S** or **D**) of the ratio using **[Trackball]**, and press the **[Set]** key.
3. Measure the second point (**D** or **S**) of the ratio using **[Trackball]**, and press the **[Set]** key.
4. The ratio is calculated. The two velocities (**S**, **D**) and S/D or D/S ratio (**S/D** or **D/S**) are shown on the ***Result*** window.

Pulsatility Index (PI)

1. Select **PI** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move the marker to the start point of the waveform, and press the [Set] key.
   The end point appears.
3. Use **[Trackball]** to manually trace the waveform, and press the **[Set]** key.
4. The pulsatility index is calculated, and the pulsatility index (**PI**) is shown on the ***Result*** window.

Resistive Index (RI)

1. Select **RI** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The end point is fixed and the resistive index is calculated. The resistivity index (**RI**) is shown on the ***Result*** window.

Maximum Time-Average Velocity (TAmax)

1. Select **TAmax** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move the marker to the start point of the waveform, and press the [Set] key.
   The end point appears.
3. Use **[Trackball]** to trace the maximum values of the desired portion for the spectrum.
4. To complete the measurement, press the **[Set]** key.
5. The maximum time-average is calculated. The maximum time-average (**TAmax**) is shown on the ***Result*** window.

Acceleration (Accel)

1. Select **Accel** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The oblique line is displayed and the acceleration is calculated. The acceleration (**Accel**) and the acceleration time (**AT**) are shown on the ***Result*** window.

Acceleration Time (AT)

1. Select **AT** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The time interval between the two points is displayed. The acceleration time (**AT**) is shown on the ***Result*** window.

GYN / Follicle report

The GYN and Follicle report has two sections of information:

- Patient information
- Measurement information

To start a report,

– Press the **[Report]** key on the control panel.

– Select **Report** on the context menu.

For report functions, see "Report" on page 7-27.

Patient information

- **ID**
- **Name**
- **Age**
- **Exam date**
- **Referring MD**
- **LMP**
- **Day of Cycle**
- **Gravida**
- **Para**
- **Expected Ovul**
- **Ectopics**
- **Aborta**

NOTE

To edit the patient information, go to **Patient Registration**.

Measurement information

- **Value**: The measured value. If more than one measurement was made for an item, the system uses the specified method (average, maximum, minimum, or last) to determine this value. See also "Editing a report" on page 7-29.
- **1st–5th**: The five measurement values for each item are available. If you make more than five measurements, the report uses the last five.
- **Method**: This specifies the method used to calculate the measurement value listed in the value column. The method options are **Last**, **Aver**, **Max**, or **Min**.

NOTE

To configure the default method for the measurement value, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Edit** > **Method**.

Cardiology

Cardiology measurements and calculations

Cardiology measurement preset

- Cardiology

2D mode measurements

2D mode measurements are shown in the context menu and in the cardiology report with measured result, when assigned.

Table 7-24 2D mode measurement (Cardiology)

Measurement	Description
Ao/LA	Aortic Valve/Left Atrium Package
RV Dm	Right Ventricle Diameter
Ao Dm	Aortic Diameter
LA Dm	Left Atrium Diameter
ACS	Aortic Valve Cusp Separation
LA Vol(Diam)	Left Atrium Package
LA Dm ant-post	Left Atrium Anterior-Posterior Left Atrium Diameter
LA Dm sup-inf	Left Atrium Superior-inferior Left Atrium Diameter
LA Dm med-lat	Left Atrium Mid– lateral Left Atrium Diameter
Aorta Diam	Aorta Package
Ao SV Dm	Aorta - Sinus of Valsalva Diameter
Ao ST Dm	Aorta – Sino-tubular junction Diameter
Ao ASC Dm	Aorta – Ascending Diameter
Ao Arch Dm	Aorta – Arch Diameter
Ao Desc Dm	Aorta – Descending Diameter
Ao Ring Dm	Aorta – Annulus Diameter
Pul.Diam	Pulmonary Artety Package
MPA	Main Pulmonary Artery Diameter
LPA	Left Pulmonary Artery Diameter
RPA	Right Pulmonary Artery Diameter
LUPV	Left Upper Pulmonic Vein
LLPV	Left Lower Pulmonic Vein

Measurement	Description
RUPV	Right Upper Pulmonic Vein
RLPV	Right Lower Pulmonic Vein
VenaCava	Vena Cave Package
IVC Dm	Inferior Vena Cave Diameter
IVC Inspir.	Inferior Vena Cave- Inspiration Diameter
IVC Expir.	Inferior Vena Cave- Expiration Diameter
SVC Dm	Superior Vena Cave Diameter
SVC Inspir.	Superior Vena Cave- Inspiration Diameter
SVC Expir.	Superior Vena Cave- Expiration Diameter
RV	Right Ventricle Package
RVIDd Mid	Mid- Right Ventricle Diameter - End Diastole
RVIDd Base	Base- Right Ventricle Diameter - End Diastole
RVL	Right Ventricle Length - End Diastole
Simpson BP	Left Ventricular Volume by Simpson method (Biplane)
EDV4	Left Ventricle End Diastolic Volume (Apical four chamber)
ESV4	Left Ventricle End Systolic Volume (Apical four chamber)
EDV2	Left Ventricle End Diastolic Volume (Apical two chamber)
ESV2	Left Ventricle End Systolic Volume (Apical two chamber)
HR	Heart Rate
Simpson SP	Left Ventricular Volume by Simpson method (Single plane)
EDV4	Left Ventricle End Diastolic Volume (Apical four chamber)
ESV4	Left Ventricle End Systolic Volume (Apical four chamber)
EDV2	Left Ventricle End Diastolic Volume (Apical two chamber)
ESV2	Left Ventricle End Systolic Volume (Apical two chamber)
HR	Heart Rate
Modified Simpson	Modified Simpson method
LVLd Apical	Left ventricular long-axis length at end diastole
LVAd sax MV	Left ventricular short-axis area at the level of the mitral valve at end diastole
LVAd sax PM	Left ventricular short-axis area at the level of the papillary muscle at end diastole
LVLs Apical	Left ventricular long-axis length at end systole
LVAs sax MV	Left ventricular short-axis area at the level of the mitral valve at end systole
LVAs sax PM	Left ventricular short-axis area at the level of the papillary muscle at end systole

Measurement	Description
HR	Heart Rate
Area Length	Left Ventricular Volume by Area-Length method
LVAd 4	Left Ventricle End Diastolic Area (Apical four chamber)
LVAs 4	Left Ventricle End Systolic Area (Apical four chamber)
LVAd 2	Left Ventricle End Diastolic Area (Apical two chamber)
LVAs 2	Left Ventricle End Systolic Area (Apical two chamber)
HR	Heart Rate
Teichholz	Left Ventricular Dimensions by Teichholz method
RVAWd	Right Ventricle Anterior Wall -End Diastole
RVDd	Right Ventricle Diameter - End Diastole
IVSd	Interventricular Septum - End Diastole
LVIDd	Left Ventricle Internal Dimension - End Diastole
LVPWd	Left Ventricle - Posterior Wall - End Diastole
IVSs	Interventricular Septum - End Systole
LVIDs	Left Ventricle Internal Dimension - End Systole
LVPWs	Left Ventricle Posterior Wall - End Systole
HR	Heart Rate
LV Mass T-E	Left Ventricle Mass by Truncated Ellipse
LVA Epi	Left Ventricle End Diastolic Epicardial Area at the Papillary Muscle level
LVA Endo	Left Ventricle End Diastolic Endocardial Area at the Papillary Muscle level
a	Left Ventricle Semi-major Axis Diastolic Dimension
d	Left Ventricle Truncated Semi-major Axis Diastolic Dimension
LV Mass A-L	Left Ventricle Mass by Area-Length method
LVAd Epi	Left Ventricle End Diastolic Epicardial Area at the Papillary Muscle level
LVAd Endo	Left Ventricle End Diastolic Endocardial Area at the Papillary Muscle level
LVLd	Left Ventricle Length- End Diastole
LVAs Epi	Left Ventricle End Systolic Epicardial Area at the Papillary Muscle level
LVAs Endo	Left Ventricle End Systolic Endocardial Area at the Papillary Muscle level
LVLs	Left Ventricle Length- End Systole
LA Vol(A-L)	Left Atrium Volume by Area-Length method
LA (A4C)	Left Atrium End Systolic Area-Length (Apical four chamber)
LA (A2C)	Left Atrium End Systolic Area-Length (Apical two chamber)

Measurement	Description
LA Vol(Simp)	Left Atrium Volume by Simpson method (Biplane)
ESV4	Left Atrium End Systolic Volume (Apical four chamber)
ESV2	Left Atrium End Systolic Volume (Apical two chamber)
RA Vol(A-L)	Right Ventricular Volume by Area-Length method
RA A4C	Right Ventricular End Systolic Area-Length (Apical four chamber)
RA Vol(Simp)	Right Ventricular Volume by Simpson method (Single Plane)
RA Vol(Simp)	Right Ventricular End Systolic Volume (Apical four chamber)
TV	Tricuspid Valve Package
TR VC Dm	Vena Contracta Diameter
PISA	Proximal Isovelocity Surface Area
AR Radius	Aortic Regurgitation Radius
AR Aliasing Vel.	Aortic Regurgitation Aliasing Velocity
MR Radius	Mitral Regurgitation Radius
MR Aliasing Vel.	Mitral Regurgitation Aliasing Velocity
TR Radius	Tricuspid Regurgitation Radius
TR Aliasing Vel.	Tricuspid Regurgitation Aliasing Velocity
PR Radius	Pulmonary Regurgitation Radius
PR Aliasing Vel.	Pulmonary Regurgitation Aliasing Velocity
MV	Mitral Valve Package
EPSS	Point Septal Separation
MV Dm	Mitral Valve Diameter
LVOT Dm	Left Ventricular Outflow Track Diameter
MV Area	Mitral Valve Area
MR VC Dm	Vena Contracta Diameter
MR Jet Area	Mitral Regurgitant Jet Area
AV	Aortic Valve Package
AV Area	Aortic Valve Area
LVOT Dm	Left Ventricular Outflow Track Diameter
AR VC Dm	Vena Contracta Diameter
AR Jet Area	Aortic Regurgitant Flow jet
PV	Pulmonary Valve Package
PV Dm	Pulmonary Valve Diameter

Measurement	Description
Subvalvaular Dm	Subvalvaular Diameter
Supravalvular Dm	Supravalvualr Diameter
RVOT Dm	Right Ventricular Outflow Track Diameter
Qp/Qs	
LVOT Dm	Left Ventricular Outflow Track Diameter
RVOT Dm	Right Ventricular Outflow Track Diameter

NOTE

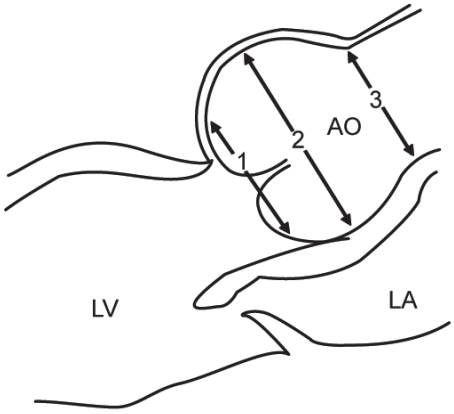
To configure the default measurement for 2D mode, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Cardiology** > **2D** > **Default Measurement**.

Aortic Root Diameter

To measure the aortic root diameters,

- **Ao ST Dm**
- **Ao SV Dm**
- **Ao Ring Dm**

1. Select the **Aorta Diam** folder on the context menu.
2. Select **Ao ST Dm**, **AO SV Dm**, or **Ao Ring Dm**. The start point appears.
3. Use **[Trackball]** to move the marker to the start point.
4. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
5. Use **[Trackball]** to move the marker to the end point.
6. To complete the measurement, press the **[Set]** key.
7. The measured value is fixed, and the diameter measurement is shown on the ***Result*** window.



① Aortic Annulus – Ring Diameter

② Aortic Sinuses of Valsalva Diameter

③ Aortic Tubular Junction Diameter

Valve Area (Trace)

To measure the valve area,

- **MV Area**
- **AV Area**

1. Select the **MV** or **AV** folder on the context menu.
2. Select **MV Area** or **AV Area**. The start point appears.
3. Use **[Trackball]** to move the marker to the start point.
4. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
5. Use **[Trackball]** to move the marker to the end point. A line shows the traced area.
6. To complete the measurement, press the **[Set]** key.
7. The measured value is fixed, and the valve area measurement is shown on the ***Result*** window.

Right Atrium – Single Plane Simpson's Method

This method allows you to calculate the volume of the right atrium on the four chamber cross-sectional image. **RA Vol(Simp)** indicates the Simpson measurement.

1. During a Cardiology study, freeze a 4 chamber cross-sectional image.
2. Press the **[Measure]** key on the control panel.
3. Select the **RA Vol(Simp)** folder on the context menu.
4. Select **RA Vol(Simp)**. The start point appears.
5. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
6. Use **[Trackball]** to create a trace of the structure with the second point, and press the **[Set]** key.
7. When the start and end points are connected and a line representing the long axis is shown, press the **[Set]** key again.
8. The measured value is fixed, and the measured value is shown on the ***Result*** window.

Right Ventricle Diameter

The followings are right ventricle measurements:

- **RVIDd Mid**
- **RVIDd Base**
- **RVL**

1. Select the **RV** folder on the context menu.
2. Select **RVIDd Mid**, **RVIDd Base**, or **RVL**. The start point appears.
3. Use **[Trackball]** to move the marker to the start point.
4. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
5. Use **[Trackball]** to move the marker to the end point.
6. To complete the measurement, press the **[Set]** key.
7. The measured value is fixed, and the Right Ventricle diameter measurement is shown on the ***Result*** window.

Left Atrium – Biplane Area Length Method

This method allows you to calculate the volume of the left atrium on the two chamber and four chamber cross-sectional images. The followings are area length measurements:

- **LA A4C**
- **LA A2C**

1. During a Cardiology study, freeze 4 chamber or 2 chamber cross-sectional images.
2. Use **[Trackball]** to scroll through Cine images.
3. From the frame image of the end diastole, press the **[Measure]** key on the control panel.
4. Select the **LA Vol(A-L)** folder on the context menu.
5. Select **LA A4C** or **LA A2C**. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
      The first point is fixed, and the second point appears.
   b. Use **[Trackball]** to create a trace of the structure with the second point, and press the **[Set]** key.
6. The measured value is fixed, and the measured value is shown on the ***Result*** window.

NOTE

When the length is measured in both the 4 chamber and 2 chamber cross-sectional views, the shortest value is used in the Area Length formula.

Left Ventricle – Teichholz Method

The followings are Teichholz measurements:

- **Diastole – IVSd, LVIDd, LVPWd**
- **Systole – IVSs, LVIDs, LVPWs**

1. Select the **Teichholz** folder on the context menu.
2. Select **Diastole** or **Systole**. The start point appears.
   a. Use **[Trackball]** to move the start point to the interventricular septum.
   b. To fix the point, press the **[Set]** key.
   c. As you move **[Trackball],** the second point and straight line appear on the display.
   d. Press the **[Set]** key. The first distance (**IVSd** or **IVSs**) measurement is fixed.
3. Perform the measurement of the second (**LVIDd** or **LVIDs**) and third (**LVPWd** or **LVPWs**) distance in the same manner (a-d).
4. After three length measurements are completed, the measured value is fixed, and the left ventricle dimension is shown on the ***Result*** window.

NOTE

When you select **Diastole** or **Systole**, you can perform the 3 length measurement with a straight line. Otherwise, when you select **IVS**, **LVID**, or **LVPW**, you can only perform 1 distance measurement.

Left Ventricle – Biplane Simpson's Method

This method allows you to calculate the volume of the left ventricle on two chamber and four chamber cross-sectional images. The followings are Simpson BP measurements:

- **EDV2**
- **ESV2**
- **EDV4**
- **ESV4**

1. During a Cardiology study, freeze a 4 chamber or 2 chamber cross-sectional images.
2. Use **[Trackball]** to scroll through Cine images.
3. From the frame image of the end diastole, press the **[Measure]** key on the control panel.
4. Select the **Simpson BP** folder on the context menu.
5. Select **EDV4** or **EDV2**. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key. The first point is fixed, and the second point appears.
   b. Use **[Trackball]** to create a trace of the structure with the second point, and press the **[Set]** key.
   c. When the start and end points are connected and a line representing the long axis is shown, press the **[Set]** key again. The volume is calculated.
6. Press the **[Exit]** key.
7. Use **[Trackball]** to scroll through Cine images.
8. From the End systole frame image, press the **[Measure]** key on the control panel.
9. Select the **Simpson BP** folder on the context menu.
10. Select **ESV4** or **ESV2**.
11. Perform the measurement of the disk volume in the same manner (a-c).
12. When the volume trace is completed, the measured value is fixed, and the measured value is shown on the ***Result*** window.

Regurgitation Flow – Jet Area

1. While performing a Cardiology study in Color Flow mode, press the **[Freeze]** key to freeze an image.
2. Press the **[Measure]** key on the control panel.
3. Select the **AV** or **MV** folder on the context menu.
4. Select **AR Jet Area** or **MR Jet Area**. The start point appears.
5. Use **[Trackball]** to move the marker to the start point.
6. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
7. Use **[Trackball]** to move the marker to the end point. A line shows the traced regurgitant jet area.
8. To complete the measurement, press the **[Set]** key.
9. The measured value is fixed, and the regurgitant jet area is shown on the ***Result*** window.

Regurgitation Flow – Vena Contracta Diameter

The followings are Vena Contracta measurements:

- **AR VC Dm**
- **MR VC Dm**

1. While performing a Cardiology study in Color Flow mode, press the **[Freeze]** key to freeze an image.
2. Use **[Trackball]** to scroll to the largest diameter of the vena contracta.
3. Press the **[Measure]** key on the control panel.
4. Select the **AV** or **MV** folder on the context menu.
5. Select **AR VC Dm** or **MR VC Dm**. The start point appears.
6. Use **[Trackball]** to move the marker to the start point.
7. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
8. Use **[Trackball]** to move the marker to the end point.
9. To complete the measurement, press the **[Set]** key.
10. The measured value is fixed, and the vena contracta diameter is shown on the ***Result*** window.

2D mode calculations

The calculation labels may not be available in the measurement menu. The system performs the calculations when the required measurements are made. The system also shows the calculated values in the measured results and transfers the values to the report.

Table 7-25 2D mode calculations (Cardiology)

Calculation Label	Description	Required
Ao/LA	Aortic Valve/Left Atrium Package	
Ao/LA	Aortic Valve / Left Ventricle Ratio	Ao Dm, LA Dm
LA/Ao	Left Artrium / Aortic Valve Ratio	Ao Dm, LA Dm
LA Vol(Diam)	Left Atrium Package	
LA Vol		LA Dm apt-post, LA Dm sup-inf, LA Dm med-lat
LA Vol. index		LA Vol, BSA
Area Length,	Area Length method,	
Simpson Method	Simpson's method of Disk volume	
EDV	End Diastolic Volume	LVLd, LVAd
ESV	End Systolic Volume	LVLs, LVAs
SV	Stroke Volume	EDV, ESV
CO	Cardiac Output	EDV, ESV, HR
EF	Ejection Fraction	EDV, ESV
SI	Stroke Index	EDV, ESV, BSA
CI	Cardiac Index	EDV, ESV, HR, BSA
Teichholz	Teichholz method	
EDV	End Diastolic Volume	LVIDd
ESV	End Systolic Volume	LVIDs
SV	Stroke Volume	EDV, ESV
CO	Cardiac Output	EDV, ESV, HR
EF	Ejection Fraction	EDV, ESV
FS	Fractional Shortening	LVIDd, LVIDs
SI	Stroke Index	EDV, ESV, BSA
CI	Cardiac Index	EDV, ESV, HR, BSA
LV(s) Mass	Left Ventricular Mass	IVS(d, s), LVID(d, s), LVPW(d, s)
LV(s) Mass-c	Left Ventricular Mass Corrected	IVS(d, s), LVID(d, s), LVPW(d, s)
LV(s) Mass index	Left Ventricular Mass Index	IVS(d, s), LVID(d, s), LVPW(d, s), BSA

Calculation Label	Description	Required
LV(s) Mass-c index	Left Ventricular Mass Corrected Index	IVS(d, s), LVID(d, s), LVPW(d, s), BSA
LV Mass T-E	Left Ventricle Mass by Truncated Ellipse	
LV Mass(T-E)	Left ventricular mass using a Truncated Ellipse	LVA Epi, LVA Endo, a, d
LV Mass index	Left Ventricular Mass Index	LV Mass(T-E), BSA
LV Mass A-L	Left Ventricle Mass by Area-Length method	
LV(d,s) Mass(A-L)	Left ventricular mass using a Area-Length method	LVA(d,s) Epi, LVA(d,s) Endo, LVL(d,s)
LV(d,s) Mass index	Left Ventricular Mass Index	LV(d,s) Mass(A-L) BSA
PISA	Proximal Isovelocity Surface Area	
Flow Rate	Peak Instantaneous Flow Rate	Radius, Aliasing Vel
ERO	Effective Regurgitant Orifice	Radius, Aliasing Vel, Vmax

Define as:

- **Area Length Method**

  EDV =(8/(3π))xLVAd² / LVLd

  ESV =(8/(3π))xLVAs² / LVLs

- **Simpson's Method**

$$EDV = \frac{\pi}{4} \times \sum_{i=1}^{n=20} (a_i \times b_i) \times \frac{LVLD}{20}$$

$$ESV = \frac{\pi}{4} \times \sum_{i=1}^{n=20} (a_i \times b_i) \times \frac{LVLD}{20}$$

  a_i : Radius of the i-th ellipse (2CH)

  b_i : Radius of the i-th ellipse (4CH)

- **Teichholz Method**

  $EDV = 7x(LVIDd^3) / (2.4 + LVIDd)$

  $ESV = 7x(LVIDs^3) / (2.4 + LVIDs)$

  $SV = EDV – ESV$

  $CO = SVxHR$

  $EF = (EDV - ESV) / EDV$

  $FS = (LVIDd - LVIDs) / LVIDd$

  $SI = SV / BSA$

  $CI = CO / BSA$

  NOTE

  BSA is automatically calculated when you enter the height and weight of a patient from the ***Patient Registration*** screen.

  $LV\ Mass = 1.04x\{(IVSd + LVIDd + LVPWd)^3 - (LVIDd)^3\}$

  $LV\ Mass\text{-}c = 0.8xLV\ Mass+0.6$

  $LV\ Mass\ Index = LV\ Mass / BSA$

- **PISA**

  $Flow\ Rate = 2\pi xRadius^2xAliasing\ Vel$

  NOTE

  When you select **Aliasing Vel(edit)** on the context menu, you can edit the velocity value by entering it on the color bar.

AO/LA Ratio

1. Select the **Ao/LA** folder on the context menu.
2. Select **Ao Dm**. The start point appears.
   a. Move the marker to the start point using **[Trackball]**.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key.
3. The aortic valve diameter is fixed.
4. Select **LA Dm**.
5. Perform the measurement of the left atrium diameter in the same manner (a-d).
6. When two diameter measurements are completed, the measured value is fixed, and the ratio is shown on the ***Report*** or ***Mini Report*** page.

Left Ventricular Mass – Area Length Method

The followings are LV Mass measurements:

- **LVAd Epi, LVAs Epi**
- **LVAd Endo, LVAs Endo**
- **LVLd, LVLs**

1. Select **LV Mass A-L** folder on the context menu.
2. Select the **LVAd Epi** or **LVAs Epi**. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point and press the **[Set]** key. The first point is fixed, and the second point appears.
   b. Use **[Trackball]** to create a trace of the epicardial area with the second point and press the **[Set]** key. The measured value is fixed.
3. Select **LVAd Endo** or **LVAs Endo**.
4. Perform the measurement of the endocardial area in the same manner (a-b).
5. Select **LVLd** or **LVLs**. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key.
6. When two area measurements and one diameter are completed, the measured value is fixed, and the LV mass is shown on the ***Report*** or ***Mini Report*** page.

M mode measurements

M mode measurements are shown in the context menu and in the cardiology report with measured result, when assigned.

Table 7-26 M mode measurement (Cardiology)

Measurement	Description
Teichholz	Left Ventricular Dimensions by Teichholz method
RVAWd	Right Ventricle Anterior Wall -End Diastole
RVDd	Right Ventricle Diameter - End Diastole
IVSd	Interventricular Septum - End Diastole
LVIDd	Left Ventricle Internal Dimension - End Diastole
LVPWd	Left Ventricle - Posterior Wall - End Diastole
IVSs	Interventricular Septum - End Systole
LVIDs	Left Ventricle Internal Dimension - End Systole
LVPWs	Left Ventricle Posterior Wall - End Systole
LVET	Left Ventricular Ejection Time
HR	Heart Rate
Ao/LA	Aortic Valve/Left Atrium Package
RV Dm	Right Ventricular Diameter
LA Dm	Left Atrial Diameter
Ao Dm	Aortic Diameter
ACS	Aortic Cusp Separation
LVET	Left Ventricle Ejection Time
LVPEP	Left Ventricle Pre-Ejection Period
MV	Mitral Valve Package
CE Exc	Excursion E wave
CA Exc	Excursion A wave
DE Exc/slope	Excursion D wave / D-E point Slope
EPSS	E Point Septal Separation
EF slope	E-F point Deceleration Slope
RV	Right Ventricle Package
RV Dm	Right Ventricular Diameter – End Diastole
RVOT Dm	Right Ventricular Outflow Track Diameter
RVET	Right Ventricular Ejection Time

Measurement	Description
RVPEP	Right Ventricular Pre-ejection Period
TAPSE	Tricuspid Annular Plane Systolic Excursion
Pul.Vein	Pulmonary Vein Package
Pul.Vein Dm	Pulmonary Vein Diameter

NOTE

To configure the default measurement for M mode, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Cardiology** > **M** > **Default Measurement**.

Diameter

The followings are distance measurements:

- **Ao/LA – RV Dm, LA Dm, Ao Dm, ACS**
- **MV – CE Exc, CA Exc, EPSS**
- **RV – RV Dm, RVOT Dm, TAPSE**

1. Select a distance measurement on the context menu. The start point appears.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The measured value is fixed, and the distance measurement is shown on the ***Result*** window.

Time

The followings are time measurements:

- **Ao/LA, Teichholz, RV – LVET, RVET**
- **Ao/LA, RV – LVPEP, RVPEP**

1. Select a time measurement on the context menu. The start point appears.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and then press the **[Set]** key again.
4. The time interval between the two points appears and the time measurement is shown on the ***Result*** window.

Slope

The followings are distance measurements:

- **MV – DE Exc/slope, EF slope**

1. Select the **MV** folder on the context menu.
2. Select **DE Exc/slope** or **EF slope**. The start point appears.
   The vertical line and the horizontal line are perpendicular to each other.
3. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
4. Use **[Trackball]** to move the point, and press the **[Set]** key again.
5. The oblique line is displayed and the slope is calculated. The slope measurement is shown on the ***Result*** window.

Heart Rate (HR)

1. Select the **Teichholz** folder on the context menu.
2. Select **HR**. The start point appears.
   The vertical line and the horizontal line are perpendicular to each other.
3. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
4. Use **[Trackball]** to move the point, and press the **[Set]** key again.
5. The heart rate between the two points is calculated, and the heart rate is shown on the ***Result*** window.

Left Ventricle – Teichholz Method

The followings are Teichholz measurements:

- **Diastole – IVSd, LVIDd, LVPWd**
- **Systole – IVSs, LVIDs, LVPWs**

1. Select the **Teichholz** folder on the context menu.
2. Select **Diastole** or **Systole**. The start point appears.
   a. Use **[Trackball]** to move the start point to the interventricular septum.
   b. To fix the point, press the **[Set]** key.
   c. As you move **[Trackball],** the second point and straight line appear on the display.
   d. Press the **[Set]** key. The first distance (**IVSd** or **IVSs**) measurement is fixed.
3. Perform the measurement of the second (**LVIDd** or **LVIDs**) and third (**LVPWd** or **LVPWs**) distance in the same manner (a-d).
4. When three length measurements are completed, the measured value is fixed, and the left ventricle dimension is shown on the ***Result*** window.

NOTE

When you select **Diastole** or **Systole**, you can perform the 3 lengths measurement with a straight line. When you select **IVS**, **LVID**, or **LVPW**, you can perform the 1 distance measurement.

M mode calculation

The calculation labels may not be available in the measurement menu. The system performs the calculations when the required measurements are made. The system also shows the calculated values in the measured results and transfers the values to the report.

Table 7-27 M mode calculations (Cardiology)

Calculation Label	Description	Required
Ao/LA	Aortic Valve/Left Atrium Package	
Ao/LA	Aortic Valve/ Left Ventricle Ratio	Ao Dm, LA Dm
LA/Ao	Left Ventricle/ Aortic Valve Ratio	Ao Dm, LA Dm
LVSTI	Left Ventricular Systolic Time Intervals	LVPEP, LVET
MV	Mitral Valve Package	
CA/CE	Amplitude A wave/ Amplitude E wave Ratio	CA Exc, CE Exc
RV	Right Ventricle Package	
RVSTI	Right Ventricular Systolic Time Intervals	RVPEP, RVET
Teichholz	Teichholz Method	
EDV	End Diastolic Volume	LVIDd
ESV	End Systolic Volume	LVIDs
SV	Stroke Volume	EDV, ESV
CO	Cardiac Output	EDV, ESV, HR
EF	Ejection Fraction	EDV, ESV
FS	Fractional Shortening	LVIDd, LVIDs
SI	Stroke Index	EDV, ESV, BSA
CI	Cardiac Index	EDV, ESV, HR, BSA
LV(s) Mass	Left Ventricular Mass	IVS(d, s), LVID(d, s), LVPW(d, s)
LV(s) Mass-c	Left Ventricular Mass Corrected	IVS(d, s), LVID(d, s), LVPW(d, s)
LV(s) Mass index	Left Ventricular Mass Index	IVS(d, s), LVID(d, s), LVPW(d, s), BSA
LV(s) Mass-c index	Left Ventricular Mass Corrected Index	IVS(d, s), LVID(d, s), LVPW(d, s), BSA
mVcf	Mean Velocity of Circumferential Fiber Shortening	LVIDd, LVIDs, LVET
RWT	Relative Wall Thickness	LVPWd, LVIDd

Define as:

LVSTI= LVPEP/LVET

Teichholz Method

EDV= 7x(LVIDd^3) / (2.4 + LVIDd)

ESV= 7x(LVIDs^3) / (2.4 + LVIDs)

SV= EDV – ESV

CO= SV x HR

EF= (EDV - ESV) / EDV

FS= (LVIDd - LVIDs) / LVIDd

SI= SV / BSA

CI= CO / BSA

NOTE

BSA is automatically calculated when you enter the height and weight of a patient from the ***Patient Registration*** screen.

LV Mass= 1.04x{(IVSd + LVIDd + LVPWd)^3 - (LVIDd)^3}

LV Mass-c= 0.8xLV Mass+0.6

LV Mass index= LV Mass / BSA

mVcf= (LVIDd-LVIDs)/(LVIDdxLVET)

D mode measurements

D mode measurements are shown in the context menu and in the cardiology report with measured result, when assigned.

Table 7-28 D mode measurement (Cardiology)

Measurement	Description
TV	Tricuspid Valve Package
TV VTI	Tricuspid Valve Velocity Time Integral
TV Vmax	Tricuspid Valve Peak Velocity
TV E Vel.	Tricuspid Valve E point Velocity
TV A Vel.	Tricuspid Valve A point Velocity
RVET	Right Ventricular Ejection Time
TCO	Tricuspid Valve Close-Open Duration Time
TV Dec. Time	Tricuspid Valve Deceleration Time
TR dP/dt	Tricuspid Regurgitation Rate of change of pressure over time
TR VTI	Tricuspid Regurgitation Velocity Time Integral
TR Vmax	Tricuspid Regurgitation Peak Velocity
RAP(edit)	Right Atrium Pressure Selection (edit)
Pul.Vein	Pulmonary Vein Package
P Vein S	Pulmonary Vein Systolic Peak Velocity
P Vein D	Pulmonary Vein Diastolic Peak Velocity
P Vein A	Pulmonary Vein Atrial Contraction Reversal Peak Velocity
Pul. A Dur.	Pulmonary Vein a wave Duration Time
TDI	Left Ventricle Tissue Doppler Imaging
MV E Vel.	Mitral Valve E point Velocity
Sep E'	Septal TDI E point Velocity
Sep A'	Septal TDI A point Velocity
Sep S'	Septal TDI S point Velocity
Sep AR/DR	Mitral Lateral Annulus E wave Acceleration & Deceleration Time and Slope
Lat E'	Lateral TDI E point Velocity
Lat A'	Lateral TDI A point Velocity
Lat S'	Lateral TDI S point Velocity
Lat AR/DR	Mitral Medial Annulus E wave Acceleration & Deceleration Time and Slope
RV E'	Right Ventricle TDI E point Velocity

Measurement	Description
RV A'	Right Ventricle TDI A point Velocity
RV S'	Right Ventricle TDI S point Velocity
TV E	Tricuspid Valve E point Velocity
TV E'	Tricuspid Valve TDI E point Velocity
Sep E' VTI	Septal TDI E point Velocity Time Integral
Sep A' VTI	Septal TDI A point Velocity Time Integral
Lat E' VTI	Lateral TDI E point Velocity Time Integral
Lat A' VTI	Lateral TDI A point Velocity Time Integral
Sep E'(T)	Septal TDI E point (Time)
Sep S'(T)	Septal TDI S point (Time)
Lat E'(T)	Lateral TDI E point (Time)
Lat S'(T)	Lateral TDI S point (Time)
Sep IVRT	Septal Isovolumetric Relaxation Time
Sep IVCT	Septal Isovolumetric Contraction Time
Lat IVRT	Lateral Isovolumetric Relaxation Time
Lat IVCT	Lateral Isovolumetric Contraction Time
AV	Aortic Valve Package
AV VTI	Aortic Valve Velocity Time Integral
LVOT VTI	Left Ventricular outflow Track Velocity Time Integral
AV Vmax	Aortic Valve Maximum Velocity
LVOT Vmax	Left Ventricular outflow Track Maximum Velocity
IVCT	Isovolumetric Contraction Time
IVRT	Isovolumetric Relaxation Time
LVET	Left Ventricular Ejection Time
MCO	Mitral Valve Close-Open Duration Time
HR	Heart Rate
AR PHT	Aortic Regurgitant Flow Pressure Half Time
AR VTI	Aortic Regurgitant Flow Velocity Time Integral
AR Decel Slope	Aortic Regurgitant Flow Deceleration Time and Slope
PV	Pulmonary Valve Package
PV VTI	Pulmonary Valve Track Velocity Time Integral
PV Vmax	Pulmonary Valve Peak Velocity

Measurement	Description
PV Acc Time	Pulmonary Valve Acceleration Time and Slope
RVOT VTI	Right Ventricular outflow Track Velocity Time Integral
RVOT Vmax	Right Ventricular outflow Track Maximum Velocity
RVET	Right Ventricular Ejection Time
HR	Heart Rate
PR VTI	Pulmonary Regurgitation Velocity Time Integral
PR Vmax	Pulmonary Regurgitation Peak Velocity
PR EDV	Pulmonary Regurgitation End Diastole Velocity
Qp/Qs	Shunts
LVOT VTI	Left Ventricular Outflow Track Velocity Time Integral
Systemic HR	Systemic Heart Rate
RVOT VTI	Right Ventricular Outflow Track Velocity Time Integral
Pulmonic HR	Pulmonic Heart Rate
PISA	Proximal Isovelocity Surface Area
AR VTI	Aortic Regurgitant Flow Velocity Time Integral
AR Aliasing Vel.	Aortic Regurgitation Aliasing Velocity
MR VTI	Mitral Regurgitant Flow Velocity Time Integral
MR Aliasing Vel.	Mitral Regurgitation Aliasing Velocity
TR VTI	Tricuspid Regurgitant Flow Velocity Time Integral
TR Aliasing Vel.	Tricuspid Regurgitation Aliasing Velocity
PR VTI	Pulmonary Regurgitant Flow Velocity Time Integral
PR Aliasing Vel.	Pulmonary Regurgitation Aliasing Velocity
MV	Mitral Valve Package
E Dur	Mitral Valve E wave Duration Time
A Dur	Mitral Valve A wave Duration Time
MV E/A Vel.	Mitral Valve E point/A point Ratio
MV E Vel.	Mitral Valve E point Velocity
MV Dec Time	Mitral Valve Deceleration Time
MV A Vel.	Mitral Valve A point Velocity
MVA(PHT)	Mitral Valve Area (Pressure Half Time)
MV VTI	Mitral Valve Velocity Time Integral
LVOT VTI	Left Ventricular outflow Track Velocity Time Integral

Measurement	Description
IVCT	Isovolumetric Contraction Time
IVRT	Isovolumetric Relaxation Time
LVET	Left Ventricular Ejection Time
MCO	Mitral Valve Close-Open Duration Time
Sep E'	Septal TDI E point Velocity
Sep A'	Septal TDI A point Velocity
Sep S'	Septal TDI S point Velocity
HR	Heart Rate
MR Vmax	Mitral Regurgitation Peak Velocity
MR dP/dt	Mitral Regurgitation Rate of change of pressure over time

NOTE

To configure the default measurement for Doppler mode, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Cardiology** > **Doppler** > **Default Measurement**.

Velocity

The followings are velocity measurements:

- **MV – MV E Vel., MV A Vel., Sep E', Sep A', Sep S', MR Vmax**
- **AV – AV Vmax, LVOT Vmax**
- **TV – TV Vmax, TV E Vel., TV A Vel., TR Vmax**
- **PV – PV Vmax, RVOT Vmax, PR Vmax, PR EDV**
- **Pul.Vein – P Vein S, P Vein D, P Vein A**
- **TDI – MV E Vel., Sep E', Sep A', Sep S', Lat E', Lat A', Lat S', RV E', RV A', RV S', TV E, TV E'**

1. Select a velocity measurement on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
3. The measured value is fixed, and the velocity is shown on the ***Result*** window.

Time

The followings are time measurements:

- **MV – E Dur, A Dur, IVCT, IVRT, LVET, MCO**
- **AV – IVCT, IVRT, LVET, MCO**
- **TV – RVET, TCO**
- **Pul.Vein – Pul. A Dur.**
- **TDI –Sep E'(T), Sep S'(T), Lat E'(T), Lat S'(T)**
- **PV – RVET**

1. Select a time measurement on the context menu. The start point appears.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The time interval between the two points appears, and the time measurement is shown on the ***Result*** window.

VTI

The followings are velocity-time integral measurements:

- **TV – TV VTI, TR VTI**
- **AV – AV VTI, AR VTI**
- **PV – PV VTI, RVOT VTI, PR VTI**
- **PISA – AR VTI, MR VTI, TR VTI, PR VTI**
- **MV – MV VTI, LVOT VTI**
- **TDI – Sep E' VTI, Sep A' VTI, Lat E' VTI, Lat A' VTI**

1. Select a velocity-time integral measurement on the context menu. The start point appears.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move the marker to the start point of the waveform, and press the **[Set]** key.
   The end point appears.
3. Use **[Trackball]** to trace the waveform one cycle.
4. To complete the measurement, press the **[Set]** key.
5. The velocity-time integral is calculated, and the velocity-time integral is shown on the ***Result*** window.

Heart Rate (HR)

1. Select **HR** on the context menu. The start point appears.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The heart rate between the two points is calculated, and the heart rate is shown on the ***Result*** window.

D mode calculation

The calculation labels may not be available in the measurement menu. The system performs the calculations when the required measurements are made. The system also shows the calculated values in the measured results and transfers the values to the report.

Table 7-29 D mode calculations (Cardiology)

Calculation Label	Description
MV	Mitral Valve
E/A	Mitral Valve E point /A point Ratio
MV Vmean	Mitral Valve Mean Velocity
MV PGmax	Mitral Valve Maximum Pressure Gradient
MV PGmean	Mitral Valve Mean Pressure Gradient
MVA(VTI)	Mitral Valve Area-Velocity Time Integral
LV MPI	Left Ventricle Index of Myocardial Performance
SV	Stroke Volume
CO	Cardiac Output
SI	Stroke Index
CI	Cardiac Index
MV E/E'(S)	Mitral Valve E point/Mitral Annulus Ea point Ratio
MR PGmax	Mitral Regurgitation Maximum Pressure Gradient
MR dP/dt	Mitral Regurgitation dP/dt derived from velocity
AV	Aortic Valve
AV Vmean	Aortic Valve Mean Velocity
AV PGmax	Aortic Valve Maximum Pressure Gradient
AV PGmean	Aortic Valve Mean Pressure Gradient
LVOT Vmean	Left Ventricular outflow Track Mean Velocity
LVOT PGmax	Left Ventricular outflow Track Maximum Pressure Gradient

Calculation Label	Description
LVOT PGmean	Left Ventricular outflow Track Mean Pressure Gradient
AVA(VTI)	Aortic Valve Area-Velocity Time Integral
AVA(Vmax)	Aortic Valve Area- Maximum Velocity
AVA index(VTI)	Aortic Valve Area index by Velocity Time Integral
AVA index(Vmax)	Aortic Valve Area index by Maximum Velocity
SV	Stroke Volume
CO	Cardiac Output
SI	Stroke Index
CI	Cardiac Index
Qp/Qs	Pulmonary Valve Cardiac Output / Aortic Valve Cardiac Output Ratio
Qp-Qs	Pulmonary Valve Cardiac Output - Aortic Valve Cardiac Output
LV MPI	Left Ventricle Index of Myocardial Performance
TV	Tricuspid Valve
TV Vmean	Tricuspid Valve Mean Velocity
TV PGmax	Tricuspid Valve Maximum Pressure Gradient
TV PGmean	Tricuspid Valve Mean Pressure Gradient
E/A	Tricuspid Valve E point /A point Ratio
RV MPI	Tricuspid Valve-Right Ventricle Index of Myocardial Performance
TR Vmean	Tricuspid Valve Regurgitation Flow - Mean Velocity
TR PGmax	Tricuspid Valve Regurgitation Flow - Maximum Pressure Gradient
TR PGmean	Tricuspid Valve Regurgitation Flow - Mean Pressure Gradient
RVSP	Right Ventricular Systolic Pressure
PV	Pulmonary Valve
PV Vmean	Pulmonary Valve Mean Velocity
PV PGmax	Pulmonary Valve Maximum Pressure Gradient
PV PGmean	Pulmonary Valve Mean Pressure Gradient
RVOT Vmean	Right Ventricular outflow Track Mean Velocity
RVOT PGmax	Right Ventricular outflow Track Maximum Pressure Gradient
RVOT PGmean	Right Ventricular outflow Track Mean Pressure Gradient
PVA(VTI)	Pulmonary Valve Area-Velocity Time Integral
PVA(Vmax)	Pulmonary Valve Area-Maximum Velocity
PVA index(VTI)	Pulmonic Valve Area index by Velocity Time Integral

Calculation Label	Description
PVA index(Vmax)	Pulmonic Valve Area index by Maximum Velocity
SV	Stroke Volume
CO	Cardiac Output
SI	Stroke Index
CI	Cardiac Index
Qp/Qs	Pulmonary Valve Cardiac Output/ Aortic Valve Cardiac Output Ratio
Qp-Qs	Pulmonary Valve Cardiac Output - Aortic Valve Cardiac Output
PISA	Proximal Isovelocity Surface Area
RV	Regurgitation Volume Flow
TDI	Tissue Doppler Imaging
E'/A'(S)	Left Ventricular Early Diastolic Velocity / Atrial Systolic Velocity Ratio
MV E/E'(S)	Mitral Valve E point/Mitral Annulus Ea point Ratio
E'/A'(L)	Left Ventricular Early Diastolic Velocity / Atrial Systolic Velocity Ratio
MV E/E'(L)	Mitral Valve E point/Mitral Annulus Ea point Ratio
TV E/RV E'	Tricuspid Valve E point / Right Ventricle TDI E point Ratio
TV E/E'(R)	Tricuspid Valve E point / Right Ventricle TDI E point Ratio

Define as:

PGmax= $4V^2$

MVA(PHT)= 220/MV PHT

MVA(VTI)= πx(LVOT Dm/2/10)^{2}xLVOT VTI / MV VTI

AVA(VTI)= πx(LVOT Dm/2/10)^{2}xLVOT VTI / AV VTI

LVIMP= (MV C-Odur – LVET) / LVET

LV MPI= (MV C-Odur – LVET) / LVET

RV MPI= (TV C-Odur – RVET) / RVET

dP/dt=32 / dtx1000

EO Area=2 πxRadius^{2}xAliasing Vel / Vmax (Regurgitation flow)

Flow Vol= EO AreaxVTI (Regurgitation flow)

- **Mitral Valve**

  SV= πxMV Dm^2 / 4xMV VTI

- **Aortic Valve**

  SV= πxLVOT Dm^2 / 4xLVOT VTI

- **Pulmonary Valve**

  SV= πxPV Dm^2 / 4xPV VTI

  CO= SVxHR

  SI= SV / BSA

  CI= CO / BSA

- **Pressure Gradient – PGmax, PGmean**

  The maximum pressure gradient is calculated from a maximum velocity using a velocity measurement method or from the tracing waveform.

  The mean pressure gradient is calculated from the mean velocity using the trace measurement method.

Valve Area by Pressure Half Time (PHT)

- **MV – MVA(PHT)**
- **AV – AR PHT**

1. Select the **MV** or **AV** folder on the context menu.
2. Select **MVA(PHT)** or **AR PHT**. The start point appears.
   The vertical line and the horizontal line are perpendicular to each other.
3. Use **[Trackball]** to move the point to the e-wave velocity of the mitral valve, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
4. Use **[Trackball]** to move the point to the half point of the PHT, and press the **[Set]** key again.
5. The measured value is calculated, and the mitral valve area is shown on the ***Result*** window.

Valve Area by the Continuity Equation (VTI)

You can measure the mitral valve area and aortic valve area by using the velocity-time integral (VTI) of the Continuity Equation.

1. During a Cardiology study in 2D mode, press the **[Freeze]** key to freeze an image.
2. Use **[Trackball]** to scroll to the largest LVOT diameter.
3. Press the **[Measure]** key on the control panel.
4. Select the **MV**, **AV**, or **PV** folder on the context menu.
5. Select **LVOT Dm** or **RVOT Dm**. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key. The measured value is fixed.
6. During a Cardiology study in D mode, freeze the Doppler spectrum.
7. Press the **[Measure]** key on the control panel.
8. Select the **MV, AV**, or **PV** folder on the context menu.
9. Select **LVOT VTI** or **RVOT VTI**. The start point appears.
   a. The vertical line and the horizontal line are perpendicular to each other.
   b. Use **[Trackball]** to move the marker to the start point of the waveform, and press the **[Set]** key. The end point appears.
   c. Use **[Trackball]** to trace one cycle of the waveform.
   d. To complete the measurement, press the **[Set]** key. The measured value is fixed.
10. Perform the measurement of the second VTI (**MV VTI, AV VTI,** or **PV VTI**) in the same manner (a-c).
11. After one diameter and two VTI are completed, the measured value is calculated and the mitral or aortic valve area is shown on the ***Result*** window, ***Report*** page, and ***Mini Report*** page.

dP/dt

1. Select the **MV** folder on the context menu.
2. Select **MR dP/dt**. The start point appears.
   The vertical line and the horizontal line are perpendicular to each other.
3. The horizontal line indicating regurgitation velocities of 1m/s and 3m/s.
4. Move the marker to the start point using **[Trackball]** where the MR jet intersects the reference line at a velocity of 1m/s, and then press the **[Set]** key.
   The end point appears.
5. Use **[Trackball]** to move the marker to the start point where the MR jet intersects the reference line at a velocity of 3m/s, and then press the **[Set]** key.
6. The measured value is fixed, and the value for dP/dt is shown on the ***Result*** window, ***Report*** page, and ***Mini Report*** page.

Cardiology report

To start a report,

– Press the **[Report]** key on the control panel.

– Select **Report** on the context menu.

For report functions, see "Report" on page 7-27.

The cardiology report has two sections of information:

- Patient information
- Measurement information

Patient information

- **ID**
- **Name**
- **Age**
- **Sex**
- **Exam date**
- **Referring MD**
- **BSA**

NOTE

To edit the patient information, go to **Patient Registration.**

Measurement information

- **Value**: The measured value. If more than one measurement was made for an item, the system uses the specified method (average, maximum, minimum, or last) to determine this value. See also "Editing a report" on page 7-29.
- **1st–5th**: The five measurement values for each item are available. If you make more than five measurements, the report uses the last five and the oldest value is automatically deleted.
- **Method**: This specifies the method used to calculate the measurement value listed in the value column. The method options are **Last**, **Aver**, **Max**, or **Min**.

NOTE

To configure the measurement value type, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Edit** > **Method**.

WMS report

To start a report,

– Press the **[Report]** key on the control panel.

– Select **WMS Report** on the context menu.

NOTE

You can view the WMS report after performing and saving the Stress echo function.

To view more studies, use the combo box or the **Exam** soft key.

To view another stage, select **Next Stage**.

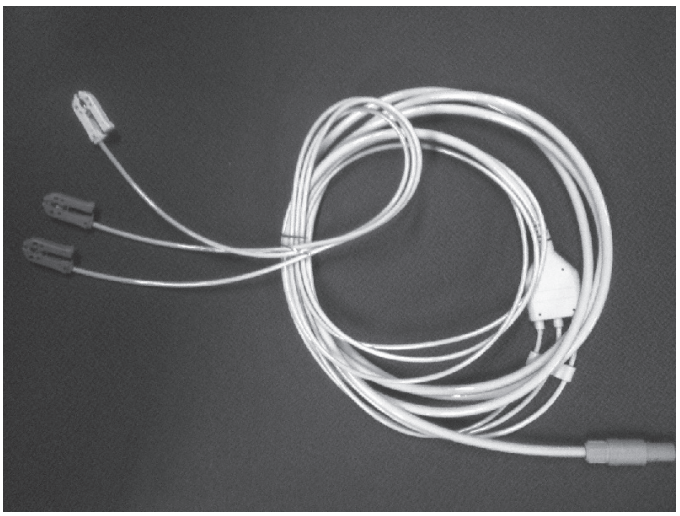
Electrocardiograph (ECG)

ECG is an optional function that provides physiological trace by obtaining ECG signals. While scanning a cardiac image in M or Doppler mode, you can view the systolic and diastolic point on the ECG line of the display. This helps you study an image and perform a measurement correctly.

ECG cable

The optional ECG cable consists of two different cables: One end is for the system cable, the other end is for the electrode cable. The electrode cable has a three-pronged electrode connector for connecting to your patient's body.

There are two types of electrode cables. Depending on your country, the colors and names defined on each cable connector may be different:



- **Standard IEC(I) type: European standard**
  - **L**: Yellow-colored connector, means “Left arm”
  - **R**: Red-colored connector, means ““Right arm”
  - **F**: Green-colored connector, means “Left leg”
  - **N** : Black-colored connector, means “Right leg”

- **AHA(A) type: American standard**
  - **RA**: White-colored connector, means “Right arm”
  - **LA**: Black-colored connector, means “Left arm”
  - **LL**: Red-colored connector, means “Left leg”
  - **RL** : Green-colored connector, means “Right leg”

Connecting an ECG cable

1. Connect the system cable into the ECG port on the lower right side of the system.
2. Hook up 3 stick-on electrodes (disposable) to each connector of the electrode cable until they click into place.
3. Attach the each connector of the electrode cable to the corresponding body parts.

Activating ECG

1. To set the application(s) to show or hide the ECG on the screen, press the **[System Preset]** key and go to **User Setting** > **Application** > **ECG Display.**
2. Select the application(s) you want.
3. When you have finished, click **Save & Exit** to save the changes and return to the scan mode.
   The ECG trace is activated, and the **ECG** tab is displayed on the touch screen.
4. Select the **ECG** tab to activate ECG mode, and adjust the parameters to obtain an optimized image.

ECG optimization controls

In ECG mode, you can use the ECG options on the touch screen.



Figure 7-6 ECG mode trouch screen

The following ECG options are available:

Option	Descriptions
Time Trig.	Set to show a frozen image each time you specified in **Delay Time**. If this option is activated, **ECG Trig**. is automatically set to none.
ECG Trig.	Select an active ECG trigger. You can activate both two triggers at the same time.
ECG Display	Activate the ECG display.
ECG Invert	Invert the current ECG trace.
Sweep Speed	Change the speed of the ECG trace.
Delay Time	Set the time delay of the ECG trigger.
Trig. Period	Set the cycle number of the ECG trigger.
Heart Cycles	Display the ECG trace and Heart Rate on the screen.
ECG Gain	Adjust the amplitude of the ECG trace.
ECG Pos.	Adjust the vertical position of the ECG trace.

Vascular

Vascular measurements and calculations

Vascular measurement preset

- Carotid
- Upper Extremities Arteries (UEA)
- Upper Extremities Veins (UEV)
- Lower Extremities Arteries (LEA)
- Lower Extremities Veins (LEV)
- TCD
- Renal
- Aorta Iliac
- Mesenteric
- Bypass Graft

To select a measurement preset,

1. Select **Measurement Preset** on the context menu.
2. Select a measurement preset from the measurement preset list.

2D mode measurements

2D mode measurements are shown in the context menu and in the vascular report with measured result, when assigned.

Table 7-30 2D mode measurement (Vascular)

Measurement	Description
Carotid	Carotid Artery
CCA	Common Carotid Artery
ICA	Internal Carotid Artery
ECA	External Carotid Artery
Vert. A	Vertebral Artery
Bulb	Carotid Bulb
UEA	Upper Extremities Arteries
Subclav. A	Subclavian A
Axill. A	Axillary Artery
Basilar A	Basilar Artery
Brach. A	Brachial Artery

Measurement	Description
DBA	Deep Brachial Artery
Basilic A	Basilic Artery
Radial A	Radial Artery
Ulnar A	Ulnar Artery
SPA	Superficial Palmar Arch
Innom. A	Innominate Artery
UEV	Upper Extremities Veins
IJV	Internal Jugular Vein
Subclav. V	Subclavian Vein
Ceph. V	Cephalic Vein
Axill. V	Axillary Vein
Brach. V	Brachial Vein
DBV	Deep Brachial Vein
Basilic V	Basilic Vein
Radial V	Radial Vein
Ulnar V	Ulnar Vein
Innom. V	Innominate Vein
LEA	Lower Extremities Arteries
CIA	Common Iliac Artery
EIA	External Iliac Artery
IIA	Internal Iliac Artery
CFA	Common Femoral Artery
DFA	Deep Femoral Artery
SFA	Superficial Femoral Artery
Pop. A	Popliteal Artery
PTA	Posterior Tibial Artery
ATA	Anterior Tibial Artery
Peron. A	Peroneal Artery
DPA	Dorsalis Pedis Artery
Prof. A	Profunda Femoris Artery
LEV	Lower Extremities Veins
CIV	Common Iliac Vein

Measurement	Description
EIV	External Iliac Vein
IIV	Internal iliac vein
CFV	Common Femoral Vein
DFV	Deep Femoral Vein
SFV	Superficial Femoral Vein
GSV	Great Saphenous Vein
LSV	Lesser Saphenous Vein
Pop. V	Popliteal Vein
PTV	Posterior Tibial Vein
ATV	Anterior Tibial Vein
Peron. V	Peroneal Vein
Prof. V	Profunda Femoris Vein
TCD	Transcranial Doppler
MCA	Middle Cerebral Artery
ACA	Anterior Cerebral Artery
PCA P1	Posterior Celebral Artery P1 segment
PCA P2	Posterior Celebral Artery P2 segment
Vert. A	Vertebral Artery
Basilar A	Basilar Artery
ICA	Internal Carotid Artery
PComA	Posterior Communicating Artery
AComA	Anterior Communicating Artery
Renal	Renal
Renal A	Renal Artery
Renal V	Renal Vein
Segm. A	Segmental Artery
Interlob. A	Interlobar Artery of Kidney
Arcuate A	Arcuate Artery of the Kidney
Aorta Iliac	Aorta Iliac
Renal A	Renal Artery
CFA	Common Femoral Artery
Mesenteric	Mesenteric

Measurement	Description
Abd. Aorta	Aorta
Celiac A	Celiac Artery
SMA	Superior Mesenteric Artery
IMA	Inferior Mesenteric Artery
Hepatic A	Common Hepatic Artery
Portal V	Portal Vein
Splenic A	Splenic Artery
Bypass Graft	Bypass Graft
Straight Gft	Straight Graft
Loop Gft	Loop Graft
Cimino Gft	Cimino Graft
Comp Gft	Comp Graft

NOTE

To configure the default measurement for 2D mode, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Vascular** > **2D** > **Default Measurement**.

To select a package measurement,

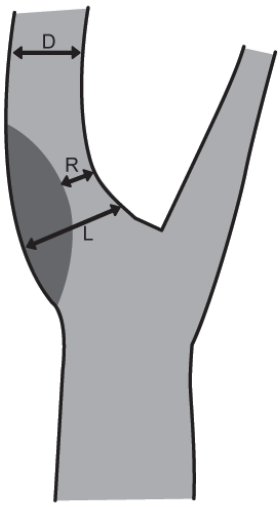
1. Select a package measurement folder.
2. Select the desired measurement from the measurement list.

In each package measurement, you can use the following measurements:

- Diameter (Diam)
- Area
- %Stenosis-Diameter (%Steno(Diam) and %Steno(Diam) dist)
- %Stenosis-Area (%Steno(Area))
- Pre-Stent Diameter (Pre-Stent Diam.)
- In-Stent Diameter (In-Stent Diam.)
- Post-Stent Diameter (Post-Stent Diam.)
- Auto IMT
- Volume Flow Area

%Stenosis (Diameter)

1. Select **%Steno(Diam)** or **%Steno(Diam) dist** on the context menu. The start point appears.
2. Measure the larger diameter (**D1**) of the stenosis using **[Trackball]**, and press the **[Set]** key.
3. Measure the smaller diameter (**D2**) of the stenosis using **[Trackball]**, and press the **[Set]** key.
4. The two diameters percent stenosis (**%Steno Diam** or **%Steno dist**) are automatically shown on the ***Result*** window.



ESCT method= (L-R)/Lx100 %, N/ASCET method= (D-R)/Dx100 %

- %Steno(Diam): Stenosis Local Gradient Diameter (%), ESCT (European Carotid Surgery Trial) method
- %Steno(Diam) dist: Stenosis Distal Gradient Diameter (%), NASCET (North American Symptomatic Carotid Surgery Trial) method

%Stenosis (Area)

1. Select **%Steno(Area)** on the context menu. The start point appears.
2. Measure the outer area (**A1**) of the stenosis using **[Trackball]**, and press the **[Set]** key.
3. Measure the inner area (**A2**) of the stenosis using **[Trackball]**, and press the **[Set]** key.
4. The two diameters percent stenosis (**%Steno Area**) are automatically shown on the ***Result*** window.

IMT measurements

IMT allows you to automatically measure the intima-media thickness of the wall in the carotid artery. When you place the start and end points in a line, the system shows the mean, max, standard deviation and quality index.

NOTE

You can use this feature only with linear transducer.

For optimal recognition and results, it is recommended to follow the conditions below:

- Acquire a central plane through the vessel
- Frequency range between 7 MHz and 12 MHz
- Imaging depth between 30 mm and 45 mm
- Optimize the gain control
- Minimize artifacts in the lumen of the vessel

To perform an IMT measurement,

1. While scanning a carotid artery, press the **[Freeze]** key on the control panel.
2. Press the **[Measure]** key and select **Auto IMT** in the labeled measurement menu. The start point appears.
3. From the point of the arterial branch about 5 mm away, draw a straight line of 10 mm by using **[Trackball]**. The end point appears.



4. Use **[Trackball]** to move the marker to the end point, and press the **[Set]** key.
5. The system calculates the measured value and shows the Mean, Max, Distance, and QI on the ***Result*** window.

NOTE

You can view more measurement information including standard deviation in the ***Report*** or ***Mini Report*** page.

To analyze an IMT measurement,

1. Click **IMT Analysis** on the ***Report*** page.
2. Select a measurement graph from the graph list, or from the soft key menu.
3. Set the measurement options by using the soft key menu (IMT Measurement, Side, Location).

M mode measurements

M mode measurements are shown in the context menu and in the vascular report with measured result, when assigned.

Table 7-31 M mode measurement (Vascular)

Measurement	Description
HR	Heart Rate

NOTE

To configure the default measurement for M mode, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Vascular** > **M** > **Default Measurement**.

Heart Rate (HR)

1. Select **HR** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The heart rate between the two points is calculated. The heart rate (**HR**) and time (**T**) are shown on the ***Result*** window.

NOTE

To configure the heart rate cycle, press the **[System Preset]** key and go to **Measurement** > **Advanced MEAS.** > **HR cycle**.

D mode measurements

D mode measurements are shown in the context menu and in the vascular report with measured result, when assigned.

Table 7-32 D mode measurement (Vascular)

Measurement	Description
PS	Peak Systole (PS) Velocity
ED	End Diastole (ED) Velocity
MD	Minimum Diastole (MD)
S/D	S/D Ratio
PI	Resistive Index (RI)
RI	Pulsatility Index (PI)
TAmax	Maximum Time-Average Velocity (TAmax)
VTI	Velocity Time Integral (VTI)
Vmax Pre, Vmax Intra	Maximum Velocity
Vmax Pre-Stent, Vmax In-Stent, Vmax Post-Stent	Stent Maximum Velocity
Ved Pre-Stent, Ved In-Stent, Ved Post-Stent	Stent Minimum Velocity

NOTE

To configure the default measurement for Doppler mode, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Vascular** > **Doppler** > **Default Measurement**.

To select a package measurement,

1. Select a package measurement folder.
2. Select a desired measurement from the measurement list.

In each package measurement, you can use the following measurements:

- Peak Systole (PS)
- End Diastole (ED)
- Minimum Diastole (MD)
- S/D Ratio (S/D)
- Pulsatility Index (PI)
- Resistive Index (RI)
- Maximum Time-Average Velocity (TAmax)
- Velocity Time Integral (VTI)
- Maximum Velocity (Vmax Pre, Vmax Intra)
- Stent Maximum Velocity (Vmax Pre-Stent, Vmax In-Stent, Vmax Post-Stent)
- Stent Minimum Velocity (Ved Pre-Stent, Ved In-Stent, Ved Post-Stent)

Velocity

1. Select a labeled measurement for velocity on the context menu. The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
3. The measured value is fixed, and the velocity is shown on the ***Result*** window.

PS/ED Ratio

1. Select **S/D** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Measure the first point (**S**) of the ratio using **[Trackball]**, and press the **[Set]** key.
3. Measure the second point (**D**) of the ratio using **[Trackball]**, and press the **[Set]** key.
4. The ratio is calculated. The two velocities (**S, D**) and S/D ratio (**S/D**) are shown on the ***Result*** window.

Pulsatility Index (PI)

1. Select **PI** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move the marker to the start point of the waveform, and press the **[Set]** key.
   The end point appears.
3. Use **[Trackball]** to manually trace the waveform, and press the **[Set]** key.
4. The pulsatility index is calculated, and the pulsatility index (**PI**) is shown on the ***Result*** window.

Resistive Index (RI)

1. Select **RI** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The end point is fixed, and the resistive index is calculated. The resistivity index (**RI**) is shown on the ***Result*** window.

Maximum Time-Average Velocity (TAmax)

1. Select **TAmax** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move the marker to the start point of the waveform, and press the **[Set]** key.
   The end point appears.
3. Use **[Trackball]** to trace the maximum values of the desired portion for the spectrum.
4. To complete the measurement, press the **[Set]** key.
5. The maximum time-average is calculated. The maximum time-average (**TAmax**) is shown on the ***Result*** window.

D mode calculations

The calculation labels may not be available shown in the measurement menu. The system performs the calculations when the required measurements are made. The system also shows the calculated values in the measured results and transfers the values to the report.

Table 7-33 D mode calculations (Vascular)

Calculation	Description	Required
PVR	Peak Velocity Ratio	Vmax Pre-Stent Vmax In-Stent
%Steno PVR	Stenosis using the peak velocity ratio	Vmax Pre-Stent Vmax In-Stent
SD	Peak Systole Velocity/End diastole Velocity Ratio	PS, ED
ICA ED/CCA ED	Internal Carotid Artery– End diastole Velocity Ratio / Common Carotid Artery – End diastole Velocity	CCA (ED) ICA (ED)
ICA PS/CCA PS	Internal Carotid Artery – Peak Systole Velocity / Common Carotid Artery – Peak Systole Velocity	CCA (PS) ICA (PS)
Bulb PS/CCA PS	Bulb – Peak Systole Velocity / Common Carotid Artery – Peak Systole Velocity	Bulb (PS) CCA (PS)
Bulb ED/CCA ED	Bulb – End diastole Velocity Ratio / Common Carotid Artery – End diastole Velocity	Bulb (ED) CCA (ED)
Volume Flow	Volumetric Blood Flow	TAmax (or TAmean) Volume Flow Area

NOTE

To configure the default measurement for Doppler mode, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Vascular** > **Doppler** > **Default Measurement**.

Define as:

PVR = Vmax (Stenosis intra) / Vmax (Stenosis pre)

%Steno PVR = 1-(1/PVR)

Vascular report

The vascular report has two sections of information:

- Patient information
- Measurement information

To start a report,

– Press the **[Report]** key on the control panel.

– Select **Report** on the context menu.

For report functions, see "Report" on page 7-27.

Patient information

- **ID**
- **Name**
- **Age**
- **Sex**
- **Exam date**
- **Referring MD**

NOTE

To edit the patient information, go to **Patient Registration**.

Measurement information

- **Value**: The measured value. If more than one measurement was made for an item, the system uses the specified method (average, maximum, minimum, or last) to determine this value. See also "Editing a report" on page 7-29.
- **1st–5th**: The five measurement values for each item are available. If you make more than five measurements, the report uses the last five and the oldest value is automatically deleted.
- **Method**: This specifies the method used to calculate the measurement value listed in the value column. The method options are **Last**, **Aver**, **Max**, or **Min**.

Vascular summary

To start a summary,

– Select **Summary** on the context menu.

Patient information

- **ID**
- **Name**
- **Age**
- **Sex**
- **Exam date**
- **Referring MD**

NOTE

To edit the patient information, go to **Patient Registration**.

Measurement information

On the ***Summary*** page, the result values are shown on the each side (left, right), if the measurement includes the both side values.

NOTE

You cannot edit the result values on the ***Summary*** page.

Calculation information

The calculation information is shown on the bottom of the ***Summary*** page. The following information is available: ICA PS/CCA PS, ICA ED/CCA ED, Bulb PS/CCA PS, Bulb ED/CCA ED

Urology

Urology measurements and calculations

Urology measurement preset

- Urology
- Bladder
- Scrotum

To select a measurement preset,

1 Select **Measurement Preset** on the context menu.

2 Select **Urology**, **Bladder**, or **Scrotum** from the measurement preset list.

2D mode measurements

2D mode measurements are shown in the context menu and in the urology report with measured result, when assigned.

Table 7-34 2D mode measurement (Urology)

Measurement	Description
Renal L	Renal Length
Renal	Renal Volume
Renal L	Renal Length
Renal H	Renal Height
Renal W	Renal Width
Bladder	Bladder Volume
Bladder L	Bladder Length
Bladder H	Bladder Height
Bladder W	Bladder Width
Testicle	Testicle Volume
Testicle L	Testicle Length
Testicle H	Testicle Height
Testicle W	Testicle Width
Prostate	Prostate Volume
Prostate L	Prostate Length
Prostate H	Prostate Height
Prostate W	Prostate Width

Measurement	Description
Residual	Residual Volume
Pre L	Pre Bladder Length
Pre H	Pre Bladder Height
Pre W	Pre Bladder Width
Post L	Post Bladder Length
Post H	Post Bladder Height
Post W	Post Bladder Width
Pre Vol	Pre Bladder Volume
Post Vol	Post Bladder Volume
Void Vol	Void Volume (Difference between Pre and Post Volume)
Renal Vol	Renal Volume
Bladder Vol	Bladder Volume
Testicle Vol	Testicle Volume
Prostate Vol	Prostate Volume

NOTE

To configure the default measurement for 2D mode, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Urology** > **2D** > **Default Measurement**.

Renal Volume (1)

You can measure the length, width, and height for the left and right renal. Each measurement is a typical distance measurement made in the appropriate scan plane.

1. Select the **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Renal** folder, and then select **Renal L**, **Renal H**, or **Renal W**. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key.
3. Perform the measurement of the second and third distance in the same manner (a-d).
4. When the length, width, and height measurement are completed, the renal volume is calculated.
5. The measured value is fixed, and the renal volume (**Rt** or **Lt Renal Vol**) is shown on the ***Result*** window.

Renal Volume (2)

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select **Renal Vol**. The start point appears.
3. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
4. Use **[Trackball]** to move the marker to the second point, and press the **[Set]** key again.
   The first distance is measured.
5. Measure the second and third distances in the same manner.
   When three distances are measured, the volume is calculated.
6. The measured value is fixed, and the renal volume (**Rt** or **Lt Renal Vol**) is shown on the ***Result*** window.

NOTE

- When you measure one distance (D1) and press the **[Clear]** key, the volume for D1 is calculated and shown on the ***Result*** window. For the volume of two distance (D2), measure one and two distances (D1, D2) and press the **[Clear]** key.
- To configure the renal volume method, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Urology** > **Renal Vol** > **Edit**.

Bladder Volume (1)

You can measure the length, width, and height of the bladder. Length is measured in the sagittal plane. Width and height are measured in the axial plane.

1. Select the **Bladder** folder on the context menu.
2. Select **Bladder L**, **Bladder H**, or **Bladder W**. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key.
3. Perform the measurement of the second and third distance in the same manner (a-d).
4. When the length, width, and height measurements are completed, the bladder volume is calculated.
5. The measured value is fixed, and the bladder volume (**Bladder Vol**) is shown on the ***Result*** window.

Bladder Volume (2)

1. Select **Bladder Vol** on the context menu. The start point appears.
2. Use **[Trackball]** to move the marker to the start point, press the **[Set]** key.
   The first point is fixed, and the second point appears.
3. Use **[Trackball]** to move the marker to the second point, and press the **[Set]** key again.
   The first distance is measured.
4. Measure the second and third distances in the same manner.
   When three distances are measured, the volume is calculated.
5. The measured value is fixed, and the bladder volume (**Bladder Vol**) is shown on the ***Result*** window.

NOTE

- When you measure one distance (D1) and press the **[Clear]** key, the volume for D1 is calculated and shown on the ***Result*** window. For the volume of two distance (D2), measure one and two distances (D1, D2), and press the **[Clear]** key.
- To configure the bladder volume method, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Urology** > **Bladder Vol** > **Edit**.

2D mode calculations

NOTE

The calculation labels are not shown in the measurement menu.

The system performs the calculations when the required measurements are made. The system also shows the calculated values in the measured results and transfers the values to the report.

Table 7-35 2D mode calculations (Urology)

Calculation label	Description	Required measurements
PSAD	Prostatic Specific Antigen Density	PSA Prostate Volume
PPSA(1)	Predicted Prostate Specific Antigen	PPSA Coefficient (1) Prostate Volume
PPSA(2)	Predicted Prostate Specific Antigen	PPSA Coefficient (2) Prostate Volume

Define as:

PSAD = PSA / Prostate Vol

PPSA = Prostate Vol × PPSA Coefficient

NOTE

If you enter the value of PSA and PPSA Coefficient on the Urology Patient Registration, PSAD and PPSA are automatically calculated.

Prostate Volume (1)

You can measure the length, width, and height of the prostate. Length is measured in the sagittal plane. Width and height are measured in the axial plane.

1. Select the **Prostate** folder on the context menu.
2. Select **Prostate L**, **Prostate H**, or **Prostate W**. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key.
3. Perform the measurement of the second and third distance in the same manner (a-d).
4. When the length, width, and height measurements are completed, the prostate volume is calculated.
5. The measured value is fixed. The prostate volume (**Prostate Vol)** and calculations (**PSAD** and **PPSA**) are shown on the ***Result*** window.

Prostate Volume (2)

1. Select **Prostate Vol** on the context menu. The start point appears.
2. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
3. Use **[Trackball]** to move the marker to the second point, and press the **[Set]** key again.
   The first distance is measured.
4. Measure the second and third distances in the same manner.
   When three distances are measured, the volume is calculated.
5. The measured value is fixed, and the prostate volume (**Prostate Vol)** is shown on the ***Result*** window.

NOTE

- When you measure one distance (D1) and press the **[Clear]** key, the volume for D1 is calculated and shown on the ***Result*** window. For the volume of two distance (D2), measure one and two distances (D1, D2), and press the **[Clear]** key.
- To configure the prostate volume method, press the **[System Preset**] key and go to **Measurement** > **Labeled MEAS.** > **Urology** > **Prostate Vol** > **Edit**.

M mode measurements

M mode measurements are shown in the context menu and in the urology report with measured result, when assigned.

Table 7-36 M mode measurement (Urology)

Measurement	Description
HR	Heart Rate

NOTE

To configure the default measurement for M mode, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Urology** > **M** > **Default Measurement**.

Heart Rate (HR)

1. Select **HR** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The heart rate between the two points is calculated. The heart rate (**HR**) and time (**T**) are shown on the ***Result*** window.

NOTE

To configure the heart rate cycle, press the **[System Preset]** key and go to **Measurement** > **Advanced MEAS.** > **HR cycle**.

D mode measurements

D mode measurements are shown in the context menu and in the urology report with measured result, when assigned.

Table 7-37 D mode measurement (Urology)

Measurement	Description
Vessel	Vessel
HR	Heart Rate

NOTE

To configure the default measurement for Doppler mode, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Urology** > **Doppler** > **Default Measurement**.

Urology report

The urology report has two sections of information:

- Patient information
- Measurement information

To start a report,

– Press the **[Report]** key on the control panel.

– Select **Report** on the context menu.

For report functions, see "Report" on page 7-27.

Patient information

- **ID**
- **Name**
- **Age**
- **Sex**
- **Exam date**
- **Referring MD**
- **PSA**
- **PPSA Coef(1)**
- **PPSA Coef(2)**

NOTE

To edit the patient information, go to **Patient Registration**.

Measurement information

- **Value**: The measured value. If more than one measurement was made for an item, the system uses the specified method (average, maximum, minimum, or last) to determine this value. See also "Editing a report" on page 7-29.
- **1st–5th**: The five measurement values for each item are available. If you make more than five measurements, the report uses the last five.
- **Method**: This specifies the method used to calculate the measurement value listed in the value column. The method options are **Last**, **Aver**, **Max**, or **Min**.

NOTE

To configure the default method for the measurement value, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Edit** > **Method**.

Pediatrics

Pediatrics measurements and calculations

Pediatrics measurement preset

- Abdomen
- Hip joint

To select a measurement preset,

1. Select **Measurement Preset** on the context menu.
2. Select **Abdomen** or **Hip Joint** from the measurement preset list.

2D mode measurements

2D mode measurements are shown in the context menu and in the pediatrics report with measured result, when assigned.

Table 7-38 2D mode measurement (Pediatrics)

Measurement	Description
Aorta	Aorta Diameter
Renal L	Renal Length
Renal	Renal Volume
Renal L	Renal Length
Renal H	Renal Height
Renal W	Renal Width
Renal Vol	Renal Volume
Hip	Hip Angle
Hip(BA)	The system calculates and shows angles β and α.
Hip(AB)	The system calculates and shows angles α and β.

NOTE

To configure the default measurement for 2D mode, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Pediatrics** > **2D** > **Default Measurement**.

Renal Volume (1)

You can measure the length, width, and height of the left and right renal. Each measurement is a typical distance measurement made in the appropriate scan plane.

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Renal** folder, and then select **Renal L**, **Renal H**, or **Renal W**. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key.
3. Perform the measurement of the second and third distance in the same manner (a-d).
4. When the length, width, and height measurements are completed, the renal volume is calculated.
5. The measured value is fixed. The renal volume (**Rt** or **Lt Renal Vol**) is shown on the ***Result*** window.

Renal Volume (2)

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select **Renal Vol**. The start point appears.
3. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
4. Use **[Trackball]** to move the marker to the second point, and press the **[Set]** key again.
   The first distance is measured.
5. Measure the second and third distances in the same manner.
   When three distances are measured, the volume is calculated.
6. The measured value is fixed, and the renal volume (**Rt** or **Lt Renal Vol**) is shown on the ***Result*** window.

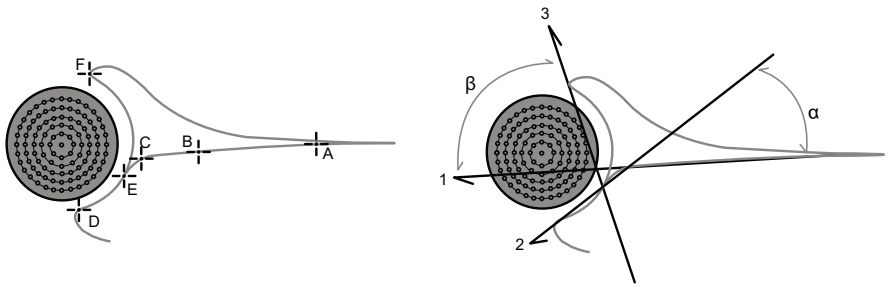
NOTE

- When you measure one distance (D1) and press the **[Clear]** key, the volume for D1 is calculated and shown on the ***Result*** window. For the volume of two distance (D2), measure one and two distances (D1, D2), and press the **[Clear]** key.
- To configure the renal volume method, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Pediatrics** > **Renal Vol** > **Edit**.

Hip Joint (BA)

The hip angle (α, β) between three lines is calculated. The first line is the baseline. The second line establishes the beta angle (β). The third line establishes the alpha angle (α).

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Hip** folder, and then select **Hip(BA)**.
   The first distance measurement (baseline) is already selected.
3. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
4. Use **[Trackball]** to move the marker to the second point, and press the **[Set]** key again.
   The baseline is completed.
5. Perform the measurement for the second (β) and third (α) distances.
6. When all of the three lines are measured, the hip angle is calculated.
7. The measured value is fixed. The hip angles (**Rt** or **Lt**, **Alpha** and **Beta**) are shown on the ***Result*** window.



- To define the baseline, point **a** and **b**.
- To define the α angle line, point **c** and **d**.
- To define the β angle line, point **e** and **f**.

Hip Joint (AB)

The hip angle (α, β) between three lines is calculated. The first line is the baseline. The second line establishes the alpha angle (α). The third line establishes the beta angle (β).

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Hip** folder, and then select **Hip(AB)**.
   The first distance measurement (baseline) is already selected.
3. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
4. Use **[Trackball]** to move the marker to the second point, and press the **[Set]** key again.
   The baseline is completed.
5. Perform the measurement for the second (α) and third (β) distances.
6. When all of the three lines are measured, the hip angle is calculated.
7. The measured value is fixed. The hip angles (**Rt** or **Lt**, **Alpha** and **Beta**) are shown on the ***Result*** window.

M mode measurements

M mode measurements are shown in the context menu and in the pediatrics report with measured result, when assigned.

Table 7-39 M mode measurement (Pediatrics)

Measurement	Description
HR	Heart Rate

NOTE

To configure the default measurement for M mode, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Pediatrics** > **M** > **Default Measurement**.

Heart Rate (HR)

1. Select **HR** on the context menu. The start point appears.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The heart rate between the two points is calculated. The heart rate (**HR**) and time (**T**) are shown on the ***Result*** window.

NOTE

To configure the heart rate cycle, press the **[System Preset]** key and go to **Measurement** > **Advanced MEAS.** > **HR cycle**.

D mode measurements

D mode measurements are shown in the context menu and in the pediatrics report with measured result, when assigned.

Table 7-40 D mode measurement (Pediatrics)

Measurement	Description
Aorta	Aorta
Renal A	Renal Artery
CHA	Hepatic Artery
IVC	Inferior Vena Cava
Hepatic V	Hepatic Vein
Mid HV	Middle Hepatic Vein
MPV	Main Portal Vein
Portal V	Portal Vein
Splenic A	Splenic Artery
Splenic V	Splenic Vein
SMA	Superior Mesenteric Artery
SMV	Superior Mesenteric Vein
IMA	Inferior Mesenteric Artery
Iliac A	Iliac Artery
Iliac V	Iliac Vein
Vessel	Vessel
HR	Heart Rate

NOTE

To configure the default measurement for Doppler mode, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Pediatrics** > **Doppler** > **Default Measurement**.

To select a package measurement,

1. Select a package measurement folder.
2. Select a desired measurement from the measurement list.

In each package measurement for Doppler mode, you can use the following measurements:

- Auto Trace
- Semi Auto Trace
- Manual Trace
- Peak Systole (PS)
- End Diastole (ED)
- Minimum Diastole (MD)
- S/D or D/S Ratio (S/D or D/S)
- Pulsatility Index (PI)
- Resistive Index (RI)
- Maximum Time-Average Velocity (TAmax)
- Acceleration (Accel)
- Acceleration Time (AT)

NOTE

To configure the default package measurement for Doppler mode, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Pediatrics** > **Doppler** > **Package measurement** > desired default measurements.

Peak Systole, End Diastole or Minimum Diastole (PS, ED, or MD)

1. Select **PS**, **ED**, or **MD** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
3. The measured value is fixed, and the velocity (**PS**, **ED**, or **MD**) is shown on the ***Result*** window.

PS/ED or ED/PS Ratio

1. Select **S/D** or **D/S** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Measure the first point (**S** or **D**) of the ratio using **[Trackball]**, and press the **[Set]** key.
3. Measure the second point (**D** or **S**) of the ratio using **[Trackball]**, and press the **[Set]** key.
4. The ratio is calculated. The two velocities (**S**, **D**) and S/D or D/S ratio (**S/D** or **D/S**) are shown on the ***Result*** window.

Pulsatility Index (PI)

1. Select **PI** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move the marker to the start point of the waveform, and press the **[Set]** key.
   The end point appears.
3. Use **[Trackball]** to manually trace the waveform.
4. To complete the measurement, press the **[Set]** key.
5. The pulsatility index is calculated, and the pulsatility index (**PI**) is shown on the ***Result*** window.

Resistive Index (RI)

1. Select **RI** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The end point is fixed and the resistive index is calculated. The resistivity index (**RI**) is shown on the ***Result*** window.

Maximum Time-Average Velocity (TAmax)

1. Select **TAmax** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move the marker to the start point of the waveform, and press the **[Set]** key.
   The end point appears.
3. To trace the maximum value of the desired portion for the spectrum, use **[Trackball]**.
4. To complete the measurement, press the **[Set]** key.
5. The maximum time-average is calculated. The maximum time-average (**TAmax**) is shown on the ***Result*** window.

Acceleration (Accel)

1. Select **Accel** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The oblique line is displayed and the acceleration is calculated. The acceleration (**Accel**) and the acceleration time (**AT**) are shown on the ***Result*** window.

Acceleration Time (AT)

1. Select **AT** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The time interval between the two points appears. The acceleration time (**AT**) is shown on the ***Result*** window.

Pediatrics report

The pediatrics report has two sections of information:

- Patient information
- Measurement information

To start a report,

– Press the **[Report]** key on the control panel.

– Select **Report** on the context menu.

For report functions, see "Report" on page 7-27.

Patient information

- **ID**
- **Name**
- **Age**
- **Sex**
- **Exam date**
- **Referring MD**

NOTE

To edit the patient information, go to **Patient Registration**.

Measurement information

- **Value**: The measured value. If more than one measurement was made for an item, the system uses the specified method (average, maximum, minimum, or last) to determine this value. See also "Editing a report" on page 7-29.
- **1st–5th**: The five measurement values for each item are available. If you make more than five measurements, the report uses the last five.
- **Method**: This specifies the method used to calculate the measurement value listed in the value column. The method options are **Last**, **Aver**, **Max** or **Min**.

NOTE

To configure the default method for the measurement value, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Edit** > **Method**.

Small Parts

Small parts measurements and calculations

Small parts measurement preset

- Thyroid
- Testicle

To select a measurement preset,

1 Select **Measurement Preset** on the context menu.

2 Select **Thyroid** or **Testicle** from the measurement preset list.

2D mode measurements

2D mode measurements are shown in the context menu and in the small parts report with measured result, when assigned.

Table 7-41 2D mode measurement (Small parts)

Measurement	Description
Thyroid Vol	Thyroid Volume
Testicle Vol	Testicle Volume
Thyroid	Thyroid Volume
Thyroid L	Thyroid Length
Thyroid H	Thyroid Height
Thyroid W	Thyroid Width
Testicle	Testicle Volume
Testicle L	Testicle Length
Testicle H	Testicle Height
Testicle W	Testicle Width
Isthmus	Testicle Volume
Isthmus H	Isthmus Height
Nodule	Nodule Volume
Nodule # 1–10	Measurements of the left and right Thyroid Nodule
Lymph Node	Lymph Node Volume
Lymph Node # 1–10	Measurements of the Lymph Node
Parathyroid	Parathyroid Volume
Parathyroid # 1–4	Measurements of the left and right Parathyroid

NOTE

To configure the default measurement for 2D mode, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Small Parts** > **2D** > **Default Measurement**.

Thyroid Volume (1)

You can measure the length, width, and height for the left and right thyroid. The each measurement is a typical distance measurement made in the appropriate scan plane.

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Thyroid** folder, and then select **Thyroid L**, **Thyroid H**, or **Thyroid W**. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key.
3. Perform the measurement of the second and third distance in the same manner (a-d).
4. When the length, width, and height measurements are completed, the thyroid volume is calculated.
5. The measured value is fixed, and the thyroid volume (**Rt** or **Lt Thyroid Vol**) is shown on the ***Result*** window.

Thyroid Volume (2)

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select **Thyroid Vol**. The start point appears.
3. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
4. Use **[Trackball]** to move the marker to the second point, and press the **[Set]** key again.
   The first distance is measured.
5. Measure the second and third distances in the same manner.
   When three distances are measured, the volume is calculated.
6. The measured value is fixed, and the thyroid volume (**Rt** or **Lt Thyroid Vol**) is shown on the ***Result*** window.

NOTE

- When you measure one distance (D1) and press the **[Clear]** key, the volume for D1 is calculated and shown on the ***Result*** window. For the volume of two distance (D2), measure one and two distances (D1, D2), and press the **[Clear]** key.
- To configure the thyroid volume method, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Small Parts** > **Thyroid Vol** > **Edit**.

Testicle Volume (1)

You can measure the length, width, and height of the scrotum. Length is measured in the sagittal plane. Width and height are measured in the axial plane.

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Testicle** folder, and then select **Testicle L**, **Testicle H**, or **Testicle W**. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key.
3. Perform the measurement of the second and third distance in the same manner (a-d).
4. When the length, width, and height measurements are completed, the testicle volume is calculated.
5. The measured value is fixed, and the testicle volume (**Rt** or **Lt Testicle Vol**) is shown on the ***Result*** window.

Testicle Volume (2)

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select **Testicle Vol**. The start point appears.
3. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
4. Use **[Trackball]** to move the marker to the second point, and press the **[Set]** key again.
   The first distance is measured.
5. Measure the second and third distances in the same manner.
   When three distances are measured, the volume is calculated.
6. The measured value is fixed, and the testicle volume (**Rt** or **Lt Testicle Vol**) is shown on the ***Result*** window.

NOTE

- When you measure one distance (D1) and press the **[Clear]** key, the volume for D1 is calculated and shown on the ***Result*** window. For the volume of two distance (D2), measure one and two distances (D1, D2), and press the **[Clear]** key.
- To configure the testicle volume method, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Small Parts** > **Testicle Vol** > **Edit**.

M mode measurements

M mode measurements are shown in the context menu and in the small parts report with measured result, when assigned.

Table 7-42 M mode measurement (Small parts)

Measurement	Description
Distance	Distance
Time	Time
Slope	Slope
HR	Heart Rate

NOTE

To configure the default measurement for M mode, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Small Parts** > **M** > **Default Measurement**.

Distance

1. Select **Distance** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The measured value is fixed, and the distance (**D**) is shown on the ***Result*** window.

Time

1. Select **Time** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The time interval between the two points appears. The time (**T**) is shown on the ***Result*** window.

Slope

1. Select **Slope** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The oblique line is displayed, and the slope is calculated. The distance (**D**), time (**T**) and slope (**Slope**) are shown on the ***Result*** window.

Heart Rate (HR)

1. Select **HR** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The heart rate between the two points is calculated. The heart rate (**HR**) and time (**T**) are shown on the ***Result*** window.

NOTE

To configure the heart rate cycle, press the **[System Preset]** key and go to **Measurement** > **Advanced MEAS.** > **HR cycle**.

D mode measurements

D mode measurements are shown in the context menu and in the small parts report with measured result, when assigned.

Table 7-43 D mode measurement (Small parts)

Measurement	Description
Thyroid Flow	Thyroid Flow
Testicle Flow	Testicle Flow
HR	Heart Rate

NOTE

To configure the default measurement for Doppler mode, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Small Parts** > **Doppler** > **Default Measurement**.

Small parts report

The small parts report has three sections of information:

- Patient information
- Measurement information
- Thyroid analysis

To start a report,

– Press the **[Report]** key on the control panel.

– Select **Report** on the context menu.

For report functions, see "Report" on page 7-27.

Patient information

- **ID**
- **Name**
- **Age**
- **Sex**
- **Exam date**
- **Referring MD**

NOTE

To edit the patient information, go to **Patient Registration**.

Measurement information

- **Value**: The measured value. If more than one measurement was made for an item, the system uses the specified method (average, maximum, minimum, or last) to determine this value. See also "Editing a report" on page 7-29.
- **1st–5th**: The five measurement values for each item are available. If you make more than five measurements, the report uses the last five.
- **Method**: This specifies the method used to calculate the measurement value listed in the value column. The method options are **Last**, **Aver**, **Max**, or **Min**.

NOTE

To configure the default method for the measurement value, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Edit** > **Method**.

Thyroid analysis

To start the thyroid anaysis,

– While viewing the thyroid report, select **Analysis** on the context menu.

NOTE

The patient specific contents input on the ***Analysis*** page are returned to the factory default settings after starting a new patient.

Analysis lists

Table 7-44 Thyroid nodule analysis lists

List	Descriptive data	Options
Position	Superior Anterior	
	Superior Posterior	
	Medium Anterior	
	Medium Posterior	
	Inferior Anterior	
	Inferior Posterior	
	Isthmus	
Shape	Round	
	Wider than tall	
	Taller than wide	
	Irregular	
Composition	Solid	
	Predominately Solid	
	Predominately Cystic	
	Cystic	
	Spongiform	
Echogenecity	Markedly Hypoechoic	
	Hypoechoic	
	Isoechoic	
	Hyperechoic	
Echotexture	Homogeneous	
	Heterogeneous	

List	Descriptive data	Options
Calcifications	Absent	
	Micro Ca++	
	Macro Ca++	
	Peripheral rim Ca++	
Margin	Well-defined	Regular, Irregular
	Ill-defined	Regular, Irregular
Halo sign	Absent	
	Complete	Thin, Thick
	Partial	Thin, Thick
Vascularity	Absent	
	Perinodular	
	Peri-Intranodular	
Lymph Nodes	Normal	
	Suspect	Intramammary, Axillary
Elasticity Assessment	Soft	
	Intermediate	
	Hard	
Measurement	Strain Ratio	
Assessment		

Breast

Breast measurements and calculations

2D mode measurements

2D mode measurements are shown in the context menu and in the breast report with measured result, when assigned.

Table 7-45 2D mode measurement (Breast)

Measurement	Description
Mass# 1–10	Measurements of the left and right breast mass
Mass L	Mass Length
Mass H	Mass Height
Mass W	Mass Width
Mass Nip-Mass D	Mass Nipple Mass Diameter
Mass Skin-Mass D	Mass Skin Mass Diameter
Mass Vol	Mass Volume
Duct Dilatation	Duct Dilatation

NOTE

To configure the default measurement for 2D mode, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Breast** > **2D** > **Default Measurement**.

Mass Volume

You can make the breast mass volume from one, two, or three distance measurements.

1 Distance Volume

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Mass** folder. The start point appears.
3. Use **[Trackball]** to move the marker to the start point.
4. To fix the point, press the **[Set]** key. The end point, overlapping the start point appears.
5. Use **[Trackball]** to move the marker to the end point.
6. To complete the measurement, press the **[Set]** key.
7. The measured value is fixed, and the mass volume (**Rt** or **Lt Mass Vol**) is shown on the ***Result*** window.

2 Distances Volume

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Mass** folder. The start point appears.
   a. Move the marker to the start point using **[Trackball]**.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Move the marker to the end point using **[Trackball]**.
   d. To complete the measurement, press the **[Set]** key.
3. Perform the measurement of the second distance in the same manner (a-d).
4. When the second distances are measured, press the **[Set]** key.
5. The measured value is fixed, and the mass volume (**Rt** or **Lt Mass Vol**) is shown on the ***Result*** window.

3 Distances Volume

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Mass** folder. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key.
3. Perform the measurement of the second and third distance in the same manner (a-d). When three distances are measured, the volume is calculated.
4. The measured value is fixed, and the mass volume (**Rt** or **Lt Mass Vol**) is shown on the ***Result*** window.

NOTE

To configure the Mass volume method, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Breast** > **Edit**.

M mode measurements

M mode measurements are shown in the context menu and in the breast report with measured result, when assigned.

Table 7-46 M mode measurement (Breast)

Measurement	Description
Distance	Distance
Time	Time
Slope	Slope
HR	Heart Rate

NOTE

To configure the default measurement for M mode, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Breast** > **M** > **Default Measurement**.

Distance

1. Select **Distance** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The measured value is fixed, and the distance (**D**) is shown on the ***Result*** window.

Time

1. Select **Time** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The time interval between the two points appears. The time (**T**) is shown on the ***Result*** window.

Slope

1. Select **Slope** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The oblique line is displayed, and the slope is calculated. The distance (**D**), time (**T**) and slope (**Slope**) are shown on the ***Result*** window.

Heart Rate (HR)

1. Select **HR** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The heart rate between the two points is calculated. The heart rate (**HR**) and time (**T**) are shown on the ***Result*** window.

NOTE

To configure the heart rate cycle, press the **[System Preset]** key and go to **Measurement** > **Advanced MEAS.** > **HR cycle**.

D mode measurements

D mode measurements are shown in the context menu and in the breast report with measured result, when assigned.

Table 7-47 D mode measurement (Breast)

Measurement	Description
Breast Flow	Breast Flow
HR	Heart Rate

NOTE

To configure the default measurement for Doppler mode, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Breast** > **Doppler** > **Default Measurement**.

Breast report

The breast report has three sections of information:

- Patient information
- Measurement information
- Breast analysis

To start a report,

– Press the **[Report]** key on the control panel.

– Select **Report** on the context menu.

For report function, see "Report" on page 7-27.

Patient information

- **ID**
- **Name**
- **Age**
- **Sex**
- **Exam date**
- **Referring MD**

NOTE

To edit the patient information, go to **Patient Registration**.

Measurement information

- **Value**: The measured value. If more than one measurement was made for an item, the system uses the specified method (average, maximum, minimum, or last) to determine this value. See also "Editing a report" on page 7-29.
- **1st–5th**: The five measurement values for each item are available. If you make more than five measurements, the report uses the last five.
- **Method**: This specifies the method used to calculate the measurement value listed in the value column. The method options are **Last**, **Aver**, **Max**, or **Min**.

NOTE

To configure the default method for the measurement value, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Edit** > **Method**.

Breast analysis

To start the breast anaysis,

– While viewing the breast report, select **Analysis** on the context menu.

NOTE

The patient specific contents input on the ***Analysis*** page are returned to the factory default settings after starting a new patient.

Analysis lists

Table 7-48 Breast mass analysis lists

List	Descriptive data	Options
Position	(0–12):(00,30) o'clock	
Shape	Round	
	Oval	
	Irregular	
Orientation	Wider than tall	
	Taller than wide	
Margin	Circumscribed	
	Not circumscribed	Indistinct, Angular, Microlobulated, Spiculated
Echo Pattern	Anechoic	
	Hyperechoic	
	Complex cystic and solid	
	Hypoechoic	
	Isoechoic	
	Heterogeneous	
Posterior Features	No posterior feature	
	Enhancement	
	Shadowing	
	Combined pattern	
Calcifications	Not Present	
	Macro Ca++	
	Micro Ca++ in a mass	
	Micro Ca++ outside of a mass	
	Intraductal Ca++	

List	Descriptive data	Options
Associated Features	Architectural distortion	(Blank)
	Duct change	
	Skin thickening	
	Skin retraction	
	Edema	
Vascularity	Not present	
	Vessels in rim	
	Internal vascularity	
Lymph Nodes	Normal	
	Suspect	Intramammary, Axillary
Elasticity Assessment	Soft	
	Intermediate	
	Hard	
Measurement	Strain Ratio	
	RI	< 0.70, ≥ 0.70
BI-RADS Category		0, 1, 2, 3, 4, 5, 6
Assessment		

Musculoskeletal (MSK)

MSK measurements and calculations

2D mode measurements

2D mode measurements are shown in the context menu and in the MSK report with measured result, when assigned.

Table 7-49 2D mode measurement (MSK)

Measurement	Description
Volume	Volume
Hip(BA)	The system calculates and shows angles β and α.
Hip(AB)	The system calculates and shows angles α and β.

NOTE

To configure the default measurement for 2D mode, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **MSK** > **2D** > **Default Measurement**.

Volume

You can make the volume from one, two, or three distance measurements.

1 Distance Volume

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Volume**. The start point appears.
3. Use **[Trackball]** to move the marker to the start point.
4. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
5. Use **[Trackball]** to move the marker to the end point.
6. To complete the measurement, press the **[Set]** key.
7. The measured value is fixed, and the volume (**Rt** or **Lt Vol**) is shown on the ***Result*** window.

2 Distances Volume

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Volume**. The start point appears.
   a. Move the marker to the start point using **[Trackball]**.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point appears.
   c. Move the marker to the end point using **[Trackball]**.
   d. To complete the measurement, press the **[Set]** key.
3. Perform the measurement of the second distance in the same manner (a-d).
4. When the second distances are measured, press the **[Set]** key.
5. The measured value is fixed, and the volume (**Rt** or **Lt Vol**) is shown on the ***Result*** window.

3 Distances Volume

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select the **Volume**. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key.
3. Perform the measurement of the second and third distance in the same manner (a-d).
4. When three distances are measured, the volume is calculated.
5. The measured value is fixed, and the volume (**Rt** or **Lt Vol**) is shown on the ***Result*** window.

NOTE

To configure the volume method, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **MSK** > **Edit**.

Hip(BA)

The hip angle (α, β) between three lines is calculated. The first line is the baseline. The second line establishes the beta angle (β). The third line establishes the alpha angle (α).

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select **Hip(BA)**. The first distance measurement (baseline) is already selected.
3. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
4. Use **[Trackball]** to move the marker to the second point, and press the **[Set]** key again. The baseline is completed.
5. Perform the measurement for the second (β) and third (α) distances.
6. When all of the three lines are measured, the hip angle is calculated.
7. The measured value is fixed. The hip angles (**Rt** or **Lt**, **Alpha** and **Beta**) are shown on the ***Result*** window.

Hip(AB)

The hip angle (α, β) between three lines is calculated. The first line is the baseline. The second line establishes the alpha angle (α). The third line establishes the beta angle (β).

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select **Hip(AB)**. The first distance measurement (baseline) is already selected.
3. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
4. Use **[Trackball]** to move the marker to the second point, and press the **[Set]** key again. The baseline is completed.
5. Perform the measurement for the second (α) and third (β) distances.
6. When all of the three lines are measured, the hip angle is calculated.
7. The measured value is fixed. The hip angles (**Rt** or **Lt**, **Alpha** and **Beta**) are shown on the ***Result*** window.

M mode measurements

M mode measurements are shown in the context menu and in the MSK report with measured result, when assigned.

Table 7-50 M mode measurement (MSK)

Measurement	Description
HR	Heart Rate

NOTE

To configure the default measurement for M mode, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **MSK** > **M** > **Default Measurement**.

Heart Rate (HR)

1. Select **HR** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The heart rate between the two points is calculated. The heart rate (**HR**) and time (**T**) are shown on the ***Result*** window.

NOTE

To configure the heart rate cycle, press the **[System Preset]** key and go to **Measurement** > **Advanced MEAS.** > **HR cycle**.

D mode measurements

D mode measurements are shown in the context menu and in the MSK report with measured result, when assigned.

Table 7-51 D mode measurement (MSK)

Measurement	Description
Vessel	Vessel
HR	Heart Rate

NOTE

To configure the default measurement for Doppler mode, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **MSK** > **Doppler** > **Default Measurement**.

MSK report

The MSK report has two sections of information:

- Patient information
- Measurement information

To start a report,

– Press the **[Report]** key on the control panel.

– Select **Report** on the context menu.

For report functions, see "Report" on page 7-27.

Patient information

- **ID**
- **Name**
- **Age**
- **Sex**
- **Exam date**
- **Referring MD**

NOTE

To edit the patient information, go to **Patient Registration**.

Measurement information

- **Value**: The measured value. If more than one measurement was made for an item, the system uses the specified method (average, maximum, minimum, or last) to determine this value. See also "Editing a report" on page 7-29.
- **1st–5th**: The five measurement values for each item. If you make more than five measurements, the report uses the last five.
- **Method**: This specifies the method used to calculate the measurement value listed in the value column. The method options are **Last**, **Aver**, **Max**, or **Min**.

NOTE

To configure the default method for the measurement value, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Edit** > **Method**.

Emergency Medicine (EM)

EM measurements and calculations

2D mode measurements

2D mode measurements are shown in the context menu and in the EM report with measured result, when assigned.

Table 7-52 2D mode measurement (EM)

Measurement	Description
Aorta	Aorta
Renal L	Renal Length
Bladder	Bladder Volume
Bladder L	Bladder Length
Bladder H	Bladder Height
Bladder W	Bladder Width
Bladder Vol	Bladder Volume

NOTE

To configure the default measurement for 2D mode, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **EM** > **2D** > **Default Measurement**.

Aorta Diameter

1. Select **Aorta** on the context menu. The start point appears.
2. Use **[Trackball]** to move the marker to the start point.
3. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
4. Use **[Trackball]** to move the marker to the end point.
5. To complete the measurement, press the **[Set]** key.
6. The measured value is fixed, and the aorta diameter (**Aorta**) is shown on the ***Result*** window.

Renal Length

1. Select **Rt** (right) or **Lt** (left) on the context menu.
2. Select **Renal L**. The start point appears.
3. Use **[Trackball]** to move the marker to the start point.
4. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
5. Use **[Trackball]** to move the marker to the end point.
6. To complete the measurement, press the **[Set]** key.
7. The measured value is fixed, and the renal length (**Rt** or **Lt Renal L**) is shown on the ***Result*** window.

Bladder Volume (1)

You can measure the length, width, and height of the bladder. Length is measured in the sagittal plane. Width and height are measured in the axial plane.

1. Select the **Bladder** folder on the context menu.
2. Select **Bladder L**, **Bladder H**, or **Bladder W**. The start point appears.
   a. Use **[Trackball]** to move the marker to the start point.
   b. To fix the point, press the **[Set]** key. The end point, overlapping the start point, appears.
   c. Use **[Trackball]** to move the marker to the end point.
   d. To complete the measurement, press the **[Set]** key.
3. Perform the measurement of the second and third distance in the same manner (a-d).
4. When the length, width, and height measurements are completed, the bladder volume is calculated.
5. The measured value is fixed, and the bladder volume (**Bladder Vol**) is shown on the ***Result*** window.

Bladder Volume (2)

1. Select **Bladder Vol** on the context menu. The start point appears.
2. Use **[Trackball]** to move the marker to the start point, and press the **[Set]** key.
   The first point is fixed, and the second point appears.
3. Use **[Trackball]** to move the marker to the second point, and press the **[Set]** key again.
   The first distance is measured.
4. Measure the second and third distances in the same manner.
   When three distances are measured, the volume is calculated.
5. The measured value is fixed, and the bladder volume (**Bladder Vol**) is shown on the ***Result*** window.

NOTE

- When you measure one distance (D1) and press the **[Clear]** key, the volume for D1 is calculated and shown on the ***Result*** window. For the volume of two distance (D2), measure one and two distances (D1, D2), and press the **[Clear]** key.
- To configure the bladder volume method, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **EM** > **Bladder Vol** > **Edit**.

M mode measurements

M mode measurements are shown in the context menu and in the EM report with measured result, when assigned.

Table 7-53 M mode measurement (EM)

Measurement	Description
%Stenosis	Two Diameters Percent Stenosis
A/B Ratio	Two Diameters Ratio
HR	Heart Rate

NOTE

To configure the default measurement for M mode, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **EM** > **M** > **Default Measurement**.

%Stenosis (Diameter)

1. Select **%Stenosis** on the context menu. The start point appears.
2. Measure the larger diameter (**D1**) of the stenosis using **[Trackball]**, and press the **[Set]** key.
3. Measure the smaller diameter (**D2**) of the stenosis using **[Trackball]**, and press the **[Set**] key.
4. The two diameters percent stenosis (**%Steno(Diam)**) are shown on the ***Result*** window.

A/B Ratio (Diameter)

1. Select **A/B Ratio** on the context menu. The start point appears.
2. Measure the first diameter (**A**) of the ratio using **[Trackball]**, and press the **[Set]** key.
3. Measure the second diameter (**B**) of the ratio using **[Trackball]**, and press the **[Set]** key.
4. The ratio is calculated and two diameters ratio (**A/B Ratio**) are shown on the ***Result*** window.

Heart Rate (HR)

1. Select **HR** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The heart rate between the two points is calculated. The heart rate (**HR**) and time (**T**) are shown on the ***Result*** window.

NOTE

To configure the heart rate cycle, press the **[System Preset]** key and go to **Measurement** > **Advanced MEAS.** > **HR cycle**.

D mode measurements

D mode measurements are shown in the context menu and in the EM report with measured result, when assigned.

Table 7-54 D mode measurement (EM)

Measurement	Description
Aorta	Aorta
Renal A	Renal Artery
SMA	Superior Mesenteric Artery
IMA	Inferior Mesenteric Artery
IVC	Inferior Vena Cava
Uterine A	Uterine Artery
Ovarian A	Ovarian Artery
Vessel	Vessel
HR	Heart Rate

NOTE

To configure the default measurement for Doppler mode, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **EM** > **Doppler** > **Default Measurement**.

To select a package measurement,

1. Select a package measurement folder.
2. Select the desired measurement from the measurement list.

In each package measurements for Doppler mode, you can use the following measurements:

- Auto Trace
- Semi Auto Trace
- Manual Trace
- Peak Systole (PS)
- End Diastole (ED)
- Minimum Diastole (MD)
- S/D or D/S Ratio (S/D or D/S)
- Pulsatility Index (PI)
- Resistive Index (RI)
- Maximum Time-Average Velocity (TAmax)
- Acceleration (Accel)
- Acceleration Time (AT)

NOTE

To configure the default package measurement for Doppler mode, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **EM** > **Doppler** > **Package measurement** > a default measurement.

Peak Systole, End Diastole or Minimum Diastole (PS, ED, or MD)

1. Select **PS**, **ED**, or **MD** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
3. The measured value is fixed, and the velocity (**PS**, **ED**, or **MD**) is shown on the ***Result*** window.

PS/ED or ED/PS Ratio

1. Select **S/D** or **D/S** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Measure the first point (**S** or **D**) of the ratio using **[Trackball]**, and press the **[Set]** key.
3. Measure the second point (**D** or **S**) of the ratio using **[Trackball]**, and press the **[Set]** key.
4. The ratio is calculated. The two velocities (**S**, **D**) and S/D or D/S ratio (**S/D** or **D/S**) are shown on the ***Result*** window.

Pulsatility Index (PI)

1. Select **PI** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move the marker to the start point of the waveform, and press the **[Set]** key.
   The end point appears.
3. Use **[Trackball]** to manually trace the waveform.
4. To complete the measurement, press the **[Set]** key.
5. The pulsatility index is calculated, and the pulsatility index (**PI**) is shown on the ***Result*** window.

Resistive Index (RI)

1. Select **RI** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again. The end point is fixed.
4. The resistive index is calculated, and the resistivity index (**RI**) is shown on the ***Result*** window.

Maximum Time-Average Velocity (TAmax)

1. Select **TAmax** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move the marker to the start point of the waveform, and press the **[Set]** key.
   The end point appears.
3. Use **[Trackball]** to trace the maximum value of the desired portion for the spectrum.
4. To complete the measurement, press the **[Set]** key.
5. The maximum time-average is calculated, and the maximum time-average (**TAmax)** is shown on the ***Result*** window.

Acceleration (Accel)

1. Select **Accel** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The oblique line is displayed and the acceleration is calculated. The acceleration (**Accel**) and the acceleration time (**AT**) are shown on the ***Result*** window.

Acceleration Time (AT)

1. Select **AT** on the context menu.
   The vertical line and the horizontal line are perpendicular to each other.
2. Use **[Trackball]** to move to the point of intersection, and press the **[Set]** key.
   The start point is fixed, and the end point appears.
3. Use **[Trackball]** to move the point, and press the **[Set]** key again.
4. The time interval between the two points appears. The acceleration time (**AT**) is shown on the ***Result*** window.

EM report

The EM report has two sections of information:

- Patient information
- Measurement information

To start a report,

– Press the **[Report]** key on the control panel.

– Select **Report** on the context menu.

For report functions, see "Report" on page 7-27.

Patient information

- **ID**
- **Name**
- **Age**
- **Sex**
- **Exam date**
- **Referring MD**

NOTE

To edit tahe patient information, go to **Patient Registration**.

Measurement information

- **Value**: The measured value. If more than one measurement was made for an item, the system uses the specified method (average, maximum, minimum, or last) to determine this value. See also "Editing a report" on page 7-29.
- **1st–5th**: The five measurement values for each item are available. If you make more than five measurements, the report uses the last five.
- **Method**: This specifies the method used to calculate the measurement value listed in the value column. The method options are **Last**, **Aver**, **Max**, or **Min**.

NOTE

To configure the default method for the measurement value, press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS.** > **Edit** > **Method**.

8

Transducer and Biopsy

This chapter describes the transducer overview and biopsy preparations.

Transducer 8-2

Biopsy 8-7

Transducer Accessories 8-18

Transducer

The ultrasound system uses transducers to obtain graphic data of the human body and then displays it on the screen. Always use application-specific transducers in order to obtain the best quality images. It is also important to use a preset that is best suited to the particular organ being scanned.

Transducer components

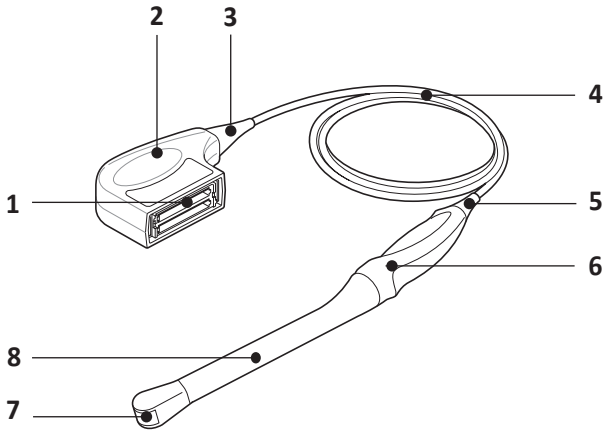


Figure 8-1 Transducer components

No.	Component	No.	Component
1	Connector electrical contacts	**5**	Transducer strain relief
2	Connector housing	**6**	Transducer handle
3	Connector strain relief	**7**	Transducer lens
4	Transducer cable	**8**	Transducer neck

Compatible Transducers

The following transducers are compatible with the E-CUBE 8 ultrasound system:

NOTE

The manual refers to transducers that can be connected to the system. It might be possible that some transducers or applications are not available in some countries.

Table 8-1 Compatible transducers

Transducer	Type	Application	Biopsy Guide
 L3-12H	**Linear**	Abdomen, Pediatric, Small Parts, Musculoskeletal (MSK), Vascular, Emergency Medicine (EM)	• L3-12 Biopsy Starter Kit • Multi-angle
 L3-12T	**Linear**	Abdomen, Pediatric, Small Parts, Musculoskeletal (MSK), Vascular, Emergency Medicine (EM)	• L3-12 Biopsy Starter Kit • Multi-angle
 L3-12H^{WD}	**Linear**	Abdomen, Pediatric, Small Parts, Musculoskeletal (MSK), Vascular, Emergency Medicine (EM)	
 L8-17H	**Linear**	Abdomen, Pediatric, Small Parts, Musculoskeletal (MSK), Vascular, Emergency Medicine (EM)	
 IO3-12	**Linear**	Small Parts, Musculoskeletal (MSK), Vascular, Emergency Medicine (EM)	
 IO8-17T	**Linear**	Intra-operative, Pediatric, Small Parts, Musculoskeletal (MSK), Vascular, Emergency Medicine (EM)	

Transducer	Type	Application	Biopsy Guide
 C1-6CT	**Convex**	OB, GYN, Abdomen, Pediatric, Musculoskeletal (MSK), Urology, Emergency Medicine (EM)	• SC1-6 Biopsy Starter kit • Multi-angle
 C5-8NT	**Convex**	OB, Pediatric, Abdomen, Cardiac, Emergency Medicine (EM)	
 SC1-4H	**Convex**	OB, Abdomen, Pediatric, Musculoskeletal (MSK), Vascular, Urology, Emergency Medicine (EM)	• SC1-6 Biopsy Starter Kit • Multi-angle
 SC1-4HS	**Convex**	OB, Abdomen, Pediatric, Musculoskeletal (MSK), Vascular, Urology, Emergency Medicine (EM)	• SC1-4HS Biopsy Starter Kit • Multi-angle
 SC1-6H	**Convex**	OB, Abdomen, Pediatric, Musculoskeletal (MSK), Vascular, Urology, Emergency Medicine (EM)	• SC1-6 Biopsy Starter Kit • Multi-angle
 P1-5CT	**Sector Phased**	Abdomen, Pediatric, TCD (Transcranial), Cardiac, Emergency Medicine (EM)	
 SP3-8T	**Sector Phased**	Abdomen, Pediatric, TCD (Transcranial), Cardiac, Emergency Medicine (EM)	
 E3-10	**Endocavity**	OB, GYN, Urology, Emergency Medicine (EM)	• E3-10 Disposable Needle Guide • E3-10 Reusable Needle Guide

Transducer	Type	Application	Biopsy Guide
 EC3-10T	**Endocavity**	OB, GYN, Urology, Emergency Medicine (EM)	• EN3-10 Disposable Needle Guide • EN3-10 Reusable Needle Guide
 EV3-10T	**Endocavity**	OB, GYN, Urology, Emergency Medicine (EM)	• EN3-10 Disposable Needle Guide • EN3-10 Reusable Needle Guide
 VC1-6T	**Volume Convex**	OB, GYN, Abdomen, Pediatric, Urology, Emergency Medicine (EM)	
 VE3-10H	**Volume Endocavity**	OB, GYN, Urology, Emergency Medicine (EM)	• VE3-10H Disposable Needle Guide • VE3-10H Reusable Needle Guide
 CW2.0	**Pencil Doppler**	Cardiac	
 CW5.0	**Pencil Doppler**	Cardiac	

Transducer- specific features

Table 8-2 Transducer feature

Feature / Model	Harmonics (THI)	Speckle Reduction Imaging (SRI)	Multi-beam	Biopsy	4D	Easy 3D	Virtual Convex	Spatial Compounding
C1-6CT	o	o	o	o	x	x	x	o
C5-8NT	o	o	o	x	x	x	x	o
SC1-4H	o	o	o	o	x	x	x	o
SC1-4HS	o	o	o	o	x	x	x	o
SC1-6H	o	o	o	o	x	x	x	o
CW2.0	x	x	x	x	x	x	x	x
CW5.0	x	x	x	x	x	x	x	x
EV3-10T	o	o	o	o	x	x	x	o
EC3-10T	o	o	o	o	x	x	x	o
E3-10	o	o	o	o	x	x	x	o
L3-12H	o	o	o	o	x	x	o	o
L3-12T	o	o	o	o	x	x	o	o
L3-12H^{WD}	o	o	o	x	x	x	o	o
L8-17H	o	o	o	x	x	x	o	o
IO3-12	o	o	o	x	x	x	o	o
IO8-17T	o	o	o	x	x	x	o	o
SP3-8T	o	o	o	x	x	x	x	x
P1-5CT	o	o	o	x	x	x	x	x
VE3-10H	o	o	o	o	o	o	x	o
VC1-6T	o	o	o	x	o	o	x	o

Biopsy

A biopsy is a medical procedure that obtains a tissue sample of a very specific area of the body for diagnostic testing. The transducer and the biopsy kit are used together when conducting a biopsy with the ultrasound system.

Using ultrasound for needle placement assures accuracy of the cell retrieval by verifying the exact site of biopsy and minimizes the risk to the patient.

Biopsy kit components

The biopsy kit components vary depending on the transducer type. The components are as following:

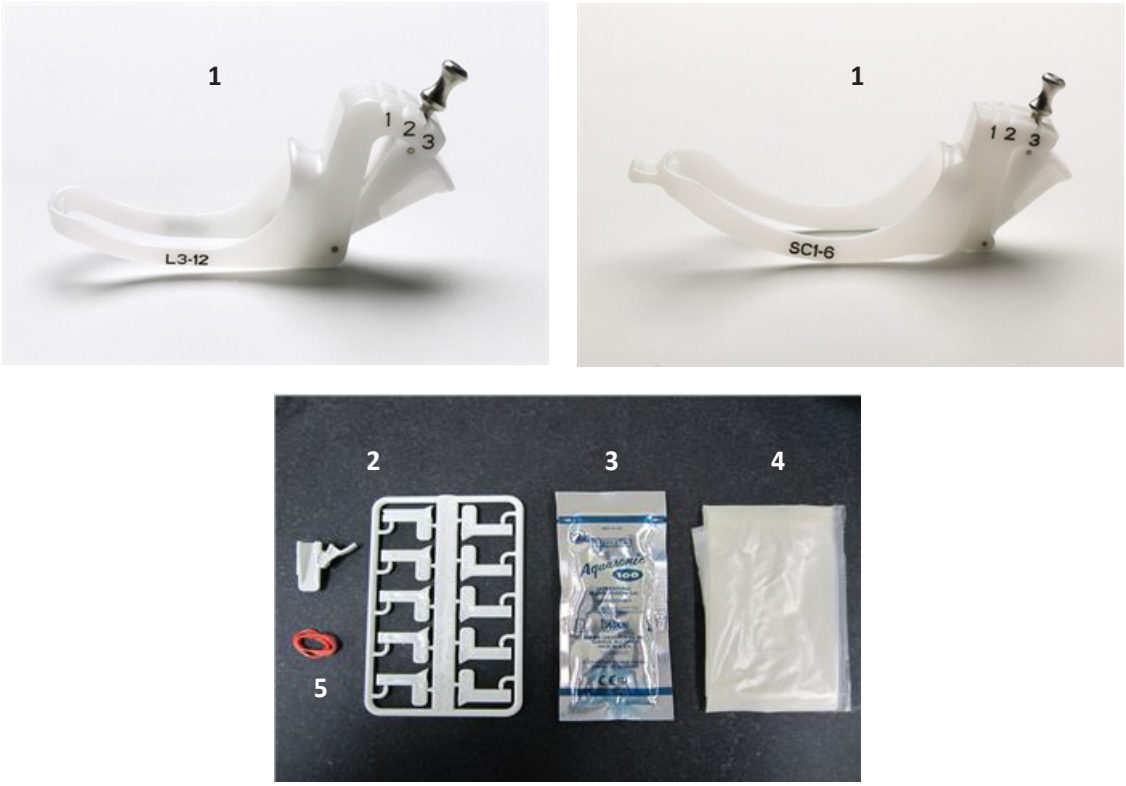


Figure 8-2 Biopsy starter kit

No.	Component	No.	Component
1	Needle guide bracket	**4**	Sheath
2	Needle guide & Needle barrel	**5**	Rubber band
3	Gel		

NOTE

The biopsy starter kit can be purchased from ALPINION MEDICAL SYSTEMS.

Precautions concerning the use of biopsy procedure

WARNING



- Do not freeze the image during a biopsy procedure. The image must be live to avoid a positioning error. Biopsy guidezones are intended to assist the user in determining optimal transducer placement and approximate the needle path. However, actual needle movement is likely to deviate from the guideline. Always monitor the relative positions of the biopsy needle and the subject mass during the procedure.
- Biopsy procedures should not be used for In vitro fertilization (IVF), Chronic villus sampling (CVS), and Percutaneous umbilical blood sampling (PUBS).

CAUTION



- The use of biopsy devices and accessories that have not been evaluated for use with this equipment may not be compatible and could result in injury.
- The invasive nature of biopsy procedures requires proper preparation and technique to control infection and disease transmission. Equipment must be cleaned as appropriate for the procedure prior to use.
  - Follow the transducer cleaning and disinfection procedures and precautions to properly prepare the transducer.
  - Follow the manufacturer's instructions for the cleaning of biopsy devices and accessories.
  - Use protective barriers such as gloves and transducer sheaths.
  - After use, follow proper procedures for decontamination, cleaning, and waste disposal.
- Improper cleaning methods and the use of certain cleaning and disinfecting agents may cause damage to the plastic components that will degrade imaging performance or increase the risk of electric shock. For details, see "Transducer Safety Information" on page 1-7.
- A biopsy must only be performed by physicians with adequate experiences under all circumstances the necessary safety precautions and sterility measures have to be respected.

The biopsy guidezone display

WARNING

- Do not freeze the image during a biopsy procedure. The image must be live to avoid a positioning error.
- The biopsy guidelines that display on the system monitor are not intended as an absolute reference. It is the user's responsibility to verify correct positioning of the needle during a biopsy procedure.

The biopsy guidezone represents a path of the needle. Colored markers in each dotted guideline show the actual increments in the area of the anatomy.

- Yellow marker is represented by 1 cm increment of the needle depth.
- Blue marker is represented by 5 cm increment of the needle depth.

NOTE

When **Enable 0.5cm markers** in Image Preset is selected, each yellow maker represents 0.5 increment.

The display should be carefully monitored during a biopsy for any needle deviation from the center line and the guidezone. The biopsy guidezone appears along with image adjustments such as image invert, rotation, zoom, and depth change.

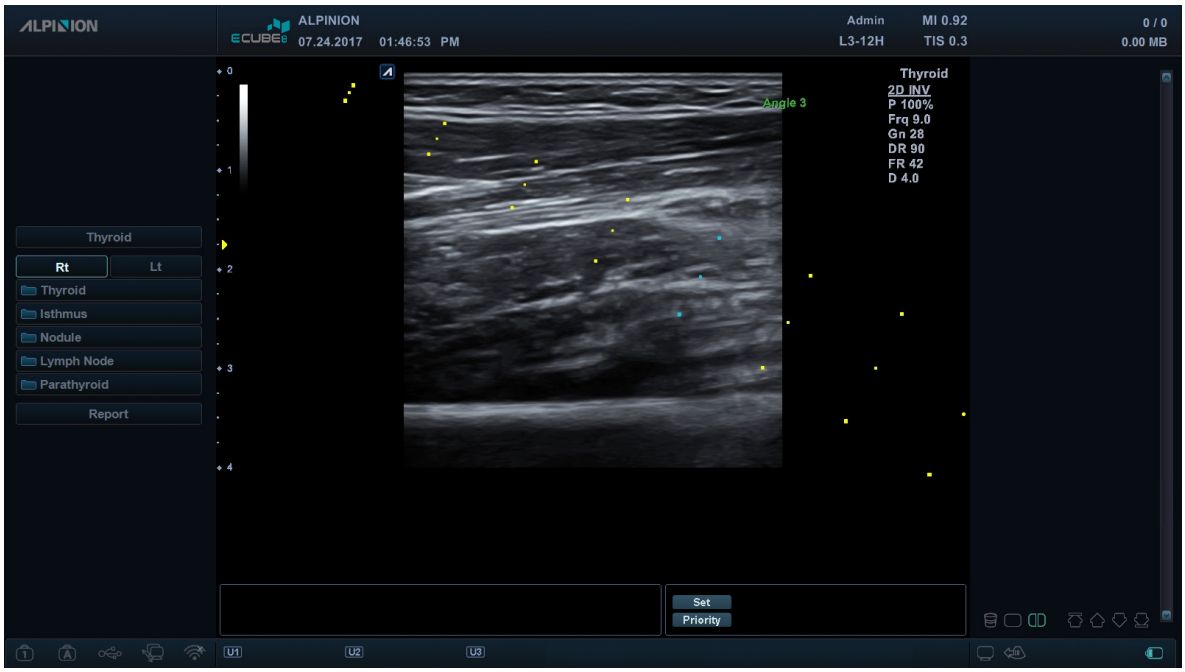


Figure 8-3 Biopsy guidezone

Preparing the biopsy guide attachment

The each transducer (convex, sector, and linear transducers) has the optional biopsy guide attachment. The guide consists of a non-disposable bracket to attach to the transducer, disposable needle clip to attach to the bracket, sheath, coupling gel, and disposable needle guide. The disposable needle guides are available for a variety of needle sizes.

NOTE

Please refer to the manufacturer's instructions included in the biopsy kit.

The following table shows the multi-angle biopsy guide availability for transducers.

Table 8-3 Multi-angle biopsy guide

Transducer	Multi-angle support	Angle 1 (Target depth)	Angle 2 (Target depth)	Angle 3 (Target depth)
C1-6CT	O	4 cm	7cm	10 cm
L3-12H	O	1.5 cm	2.3 cm	3.5 cm
L3-12T	O	1.5 cm	2.3 cm	3.2 cm
SC1-4H	O	4 cm	7 cm	10 cm
SC1-6H	O	4 cm	7 cm	10 cm
SC1-4HS	O	4 cm	7 cm	10 cm

Assembling the multi-angle biopsy guide

WARNING

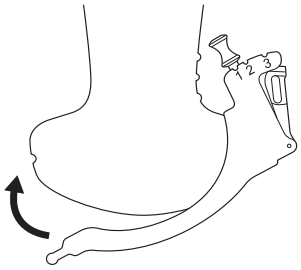
DO NOT attempt to use the biopsy bracket and needle guide until the manufacturer's instructions, provided with the biopsy bracket and needle guide in the kit, have been read and thoroughly understood.

NOTE

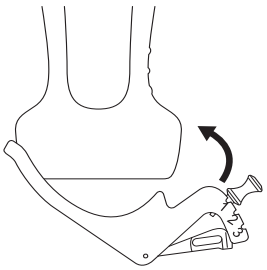
For detailed information on a biopsy guide, please contact the manufacturer(CIVCO) of the biopsy guide.

1. Scan the patient and identify the target for biopsy. Move the transducer to locate the target to the center of the image. Enable the system biopsy guidezone and try guidezone angles 1 to 3 to decide the best angle setting for the needle path.
2. Prepare the appropriate biopsy guide bracket by matching the transducer label on the bracket with the transducer to be used.
3. Orient the guide bracket toward the orientation mark of the transducer, and then attach the bracket by sliding it over the end of the transducer until it clicks in place.

Convex transducer



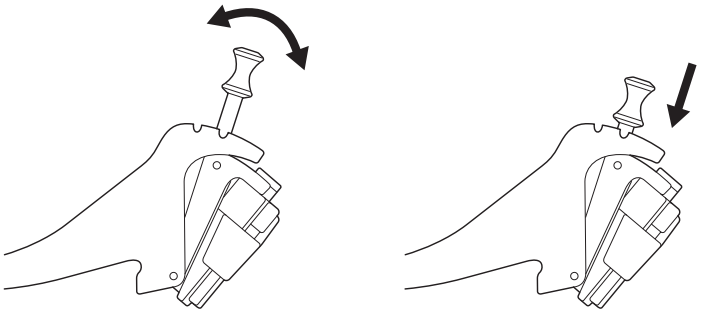
Linear transducer



NOTE

Depending on the transducer you are using, attaching the guide bracket may be different. Refer to the manufacturer's instruction included in the biopsy kit.

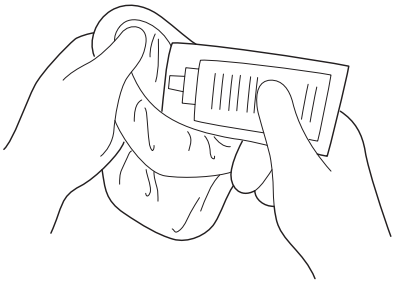
4. Pull up the knob to release to move the needle guide attachment. Align the knob with a desired angle position (angle 1, 2, or 3) and push the knob down to secure the angle position.



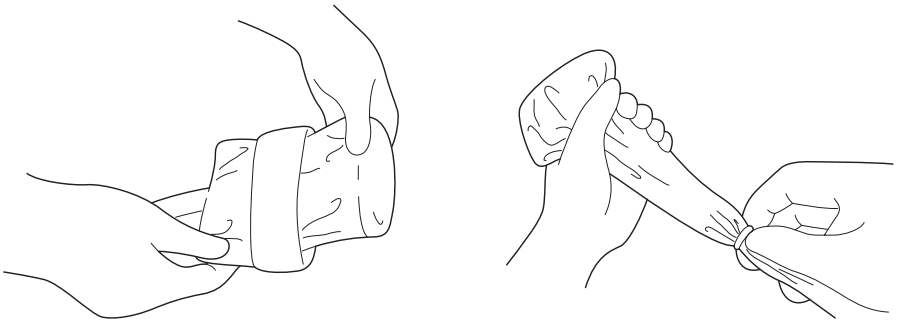
CAUTION

Hold the bracket in place on the transducer when pushing the knob to secure the angle position of the needle guide attachment. Excessive force may cause the bracket to release from the transducer.

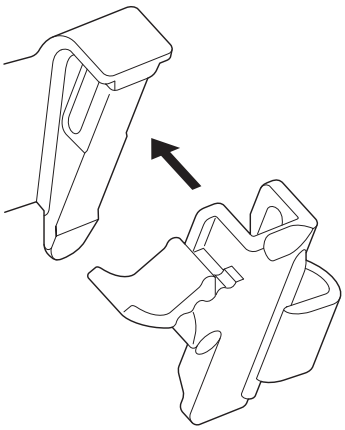
5 Place the ultrasound gel inside a sanitary sheath.



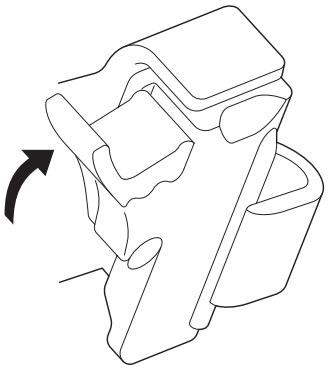
6 Cover the transducer and biopsy bracket with the sanitary sheath. Use the rubber bands to tighten the sheath.



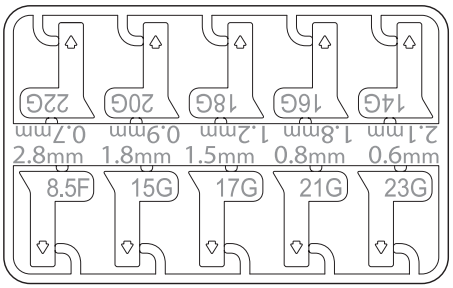
7 Snap the needle guide onto the biopsy guide bracket.



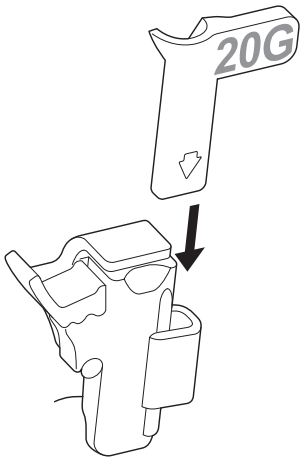
8 Push the locking mechanism towards the bracket to secure the lock. Make sure that the needle guide is firmly attached to the bracket.



9 Select a desired size of the needle barrel from the plastic tree. Twist the needle barrel back and forth to remove it.



10 Place the needle barrel into the needle guide until it clicks into place.



CAUTION

Before performing a biopsy, ensure that all guide parts are seated properly.

Assembling the single-angle biopsy guide

WARNING

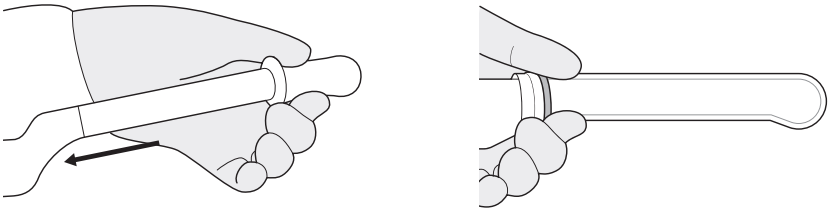
DO NOT attempt to use the needle guide until the manufacturer's instructions, provided with the needle guide in the kit, have been read and thoroughly understood.

NOTE

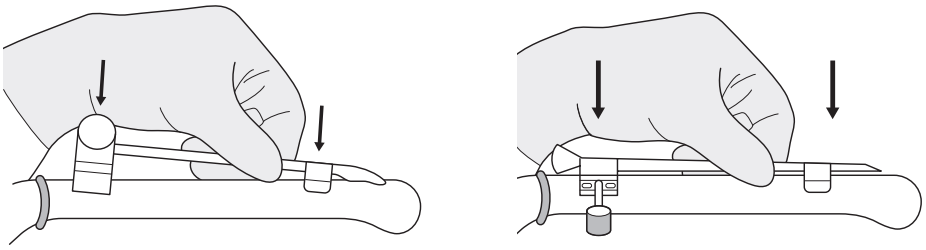
For detailed information on a biopsy guide, please contact the manufacturer(Aspen Surgical Products, Inc.) of the biopsy guide.

Reusable biopsy guide (Metal)

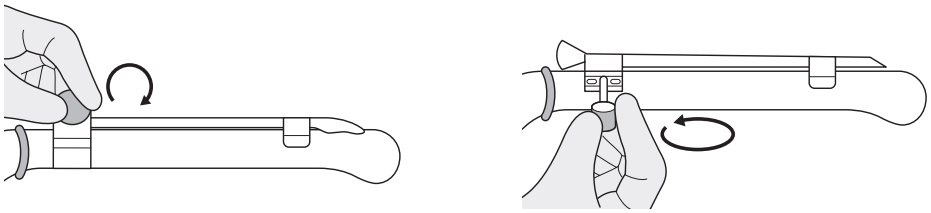
1 Place the ultrasound gel inside the sheath and/or on the transducer scanning surface. Place the transducer sheath over the transducer and secure the sheath with bands.



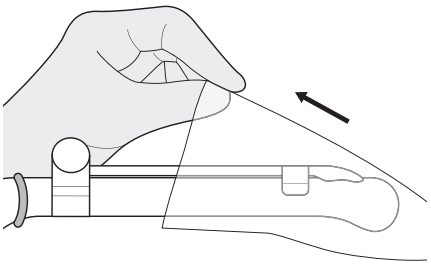
2 Place the needle guide (styles vary) onto the transducer as shown.



3 Make sure the needle guide is securely attached to the transducer.

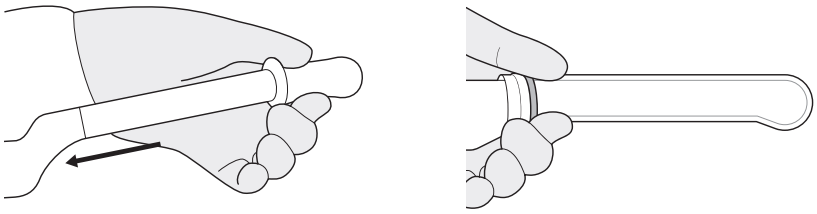


4 Place the second sheath over the transducer and needle guide. Secure the sheath with bands.

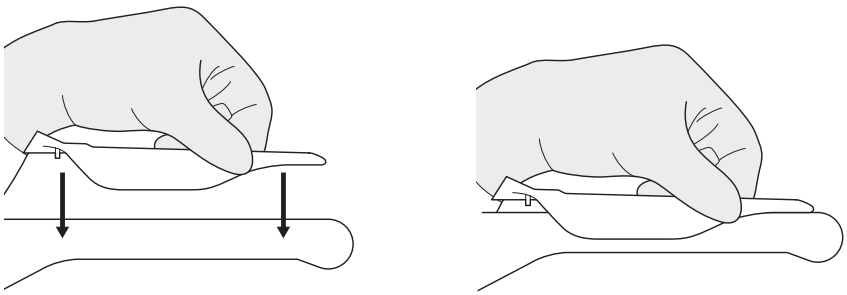


Disposable biopsy guide (Plastic)

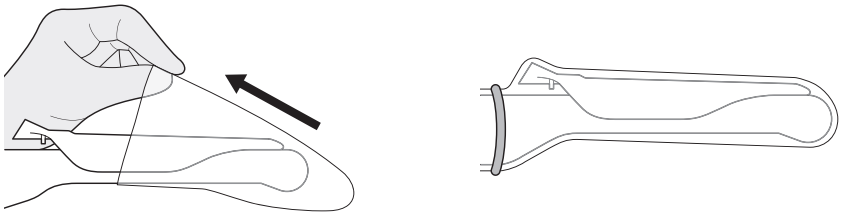
1 Place the ultrasound gel inside the sheath and/or on the transducer scanning surface.
Place the transducer sheath over the transducer and secure the sheath with bands.



2 Place the needle guide onto the transducer and snap into position.
Make sure the needle guide is securely attached to the transducer.



3 Place the second sheath over the transducer and needle guide. Secure the sheath with bands.



Verifying the biopsy needle path

WARNING

- The biopsy guidelines that display on the system monitor are not intended as an absolute reference. It is the user's responsibility to verify correct positioning of the needle during a biopsy procedure.
- The path of the needle must display within the guideline. Do not use a needle guide if the path of the needle is not accurately displayed by the on-screen guidelines.

Before performing any patient procedure using a biopsy guide, you must verify that the path of the needle is accurately displayed by the on-screen guidelines.

1. Attach the biopsy guide to the transducer.
2. Set the system to the depth of the intended puncture procedure.
3. Immerse the head of the transducer into the water and insert the needle into the needle guide.
4. Verify that the path of the needle displays according to the guidelines shown on the screen.
5. If the needle image is out of the guideline, check the needle guide or the needle guide bracket.

Performing the biopsy procedure

WARNING

- Biopsy procedure must be performed on a live image to avoid positioning error.
- Before starting a biopsy, make sure that all patient information is entered and the study is saved.

CAUTION

- The biopsy guidelines that display on the system monitor are not intended as an absolute reference. It is the user's responsibility to verify correct positioning of the needle during an out-of-plane biopsy procedure.
- When performing an out-of-plane biopsy, i.e. without a biopsy guide, it is the user's responsibility to use appropriate equipment. Ensure that the needle (especially the needle tip) is always visible in the ultrasound image during the whole biopsy procedure.
- Always only use basic modes when performing an out-of-plane biopsy.

When the biopsy guide assembly is completed, perform the following biopsy procedure.

1. Scan an image. When you find a target image, place the target in the middle of the guidezone.

   NOTE

   Enabling Color Flow mode would allow for visualization of vascular structure around the area to take a biopsy.

2. When the target image is prepared, press the **[Biopsy]** key once, twice, or three times on the QWERTY keyboard that corresponds to the selected angle. The biopsy guidezone appears on the display.

   – Press the key once for angle 1.

   – Press the key twice for angle 2.

   – Press the key three times for angle 3.

CAUTION

Ensure that the selected angle on the biopsy guide corresponds to the selected guide line of the guidezone.

3 Place the needle in the guide line between the needle barrel and the needle guide. Direct it into the area of interest.

CAUTION

Always use a straight, new and sterile needle for each biopsy procedure.

NOTE

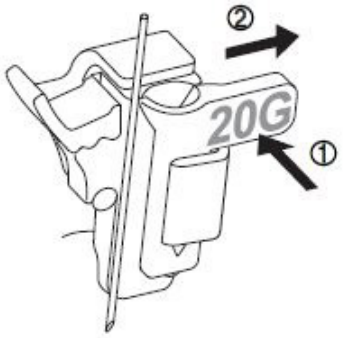
To configure the biopsy guidezone settings, press the **[Image Preset]** key and go to **General**.

Releasing the needle

After performing a biopsy, release the needle from a transducer and an assembly by following the procedure.

1 Push the knob portion of the sleeve in the direction of the arrow ①.
The needle is released from the assembly.

2 Push the transducer and assembly in the direction of the arrow ② to remove the needle.



Transducer Accessories

Transducer sheath

Transducer sheaths help to prevent contamination from blood or body fluids during the examination, operation, or biopsy. Sheaths should be used for clinical application that may indicate the need for such care, and during endocavity scanning; during biopsy or puncture procedures; or when scanning patients with open wounds.

WARNING

- Always keep sheaths in a sterile state.
- Sheaths are disposable. Do not reuse them.
- If sheaths are torn or soiled after use, clean and disinfect the transducer.
- Some sheaths contain natural rubber latex and talc, which can cause allergic reactions in some individuals.

CAUTION

- Make sure that you do not use an expired sheath.
- Using pre-lubricated condoms as a sheath might damage the transducer.

Applying the sheath

WARNING

After placing the sheath over the transducer, visually inspect the sheath to ensure there are no defects. Do not use the sheath if it has any holes or tears.

1. Remove the packaging and unfold the transducer sheath.
2. Before applying any ultrasound gel to the sheath, remove any powder in the sheath by rinsing with water.
3. Apply a water-based ultrasound gel to the inside of the sheath and onto the face of the transducer.
4. Hold the transducer by the cable relief and unroll the sheath onto the transducer.
   If necessary, cover the transducer cable as well.
5. Pull the transducer sheath tightly over the face of the transducer to remove wrinkles.
6. Secure the sheath to the transducer housing or cable relief with the adhesive tapes or elastic bands provided.
   If necessary, secure the sheath to the transducer and the transducer cable.

Disposing the sheath

While wearing protective gloves, remove the transducer sheath from the transducer and dispose of it according to medical regulations for biohazardous waste.

Ultrasound Gel

The ultrasound gel helps to transfer the sound waves into the body during the examination.

Using appropriate ultrasound gels may cause damage to the transducer. To prevent transducer damage, only use ultrasound gels approved or recommended by ALPINION. Refer to Download Center on website (http://www.alpinion.com/web/support/download.asp) for the latest list of compatible ultraound gels.

WARNING

- Do not use mineral oil, lubricant oil, oil-based lotions, or other non-approved materials, as they may cause damage to the transducer. Using damaged or defective transducer could cause electric shock in users or patients.
- Do not use ultrasound gels that contain the following contents:
  - Oils such as mineral oil, cooking oil, gasoline, solvents, rust inhibitors, lanolin, paraffin-based grease, ester and excessive silicon-based release agent
  - Alcohols such as acetone, methanol, plasticizer (dioctylphtalate) or denatured alcohols
  - Glacial acetic acid and iodine
  - All types of lotions or gels that contain aromatic substances

9

Preset

This chapter describes the preset features that you can configure the default settings of your system.

System Preset 9-2

Image Preset 9-47

System Preset

In each preset menu, you can configure different default settings for its submenus.

System Preset display

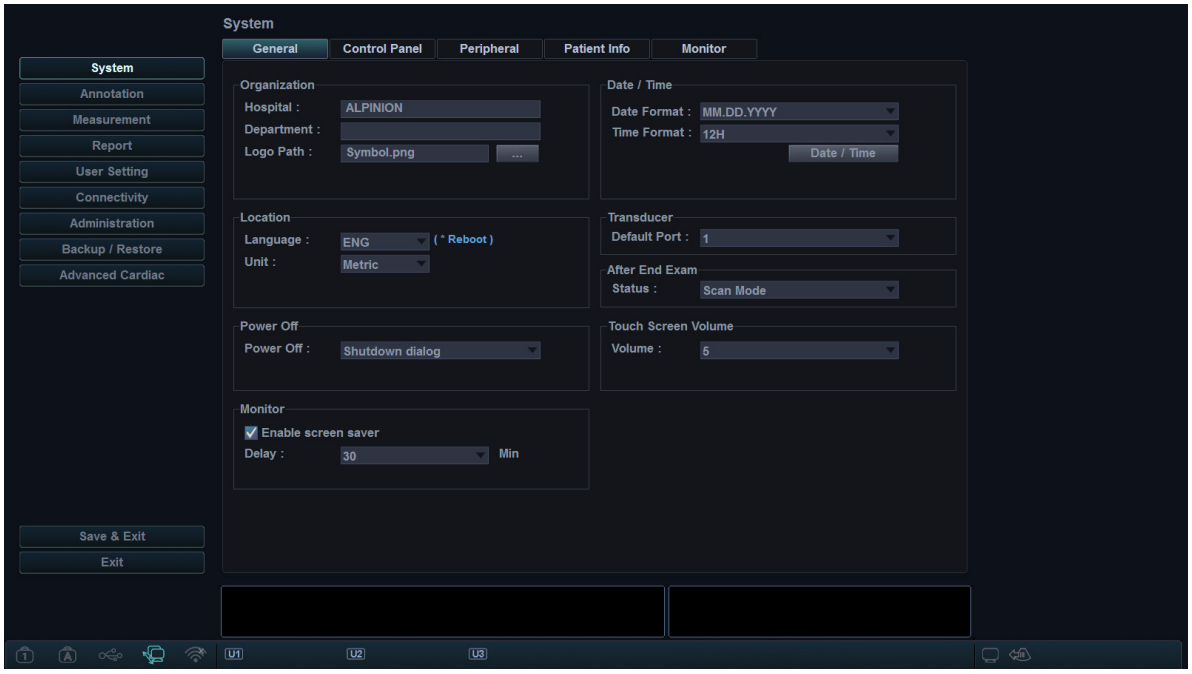


Figure 9-1 System preset display

System Preset menus

To access preset menus, select the desired menu on the touch screen.

NOTE

After changing some preset menus, you may need to reboot the system.



Figure 9-2 System preset touch screen

Table 9-1 System preset menu

Preset menu	Description
System	Customize the system configurations such as general settings, control panel, peripheral, patient info, and monitor calibration.
Annotation	Customize the comment and body pattern settings.
Measurement	Customize the labeled measurement for each study and create a new measurement and OB table.
Report	Customize the report and report print settings.
User Setting	Customize the user-defined settings.
Connectivity	Customize the DICOM device and service.
Administration	Create a user ID, activate the service browser, and view the option information.
Backup / Restore	Back up and restore data, and perform full backup for image data.
Advanced Cardiac	Customize the settings for the Stress echo and Cube strain™ functions.

General workflow

To enter the System Preset menu,

1. Press the **[System Preset]** key on the QWERTY keyboard.
2. To scroll through the current page, press the **Navigate** soft key.
3. To exit the menu, click **Save & Exit** or **Exit**. You can also press the **[System Preset]** or **[2D]** key.

To change the settings in System Preset,

1. Press the **[System Preset]** key on the QWERTY keyboard.
2. Select a desired menu from the left side of the display.
3. Use **[Trackball]** to select the menu tab you want.
4. Change the settings for the selected menu.
5. When you have finished, click **Save & Exit** to save the changes and return to the scan mode.

NOTE

- To restore the settings on the current menu screen, click **Reset Default**.
- To restore all settings of the system preset, click **Reset Default All**.

System

The **System** menu contains the following submenus:

- General
- Control Panel
- Peripheral
- Patient Info
- Monitor

General

The **General** menu allows you to configure the general system settings such as hospital, time and date, and screen saver.

Organization

- **Hospital**: Enter a hospital name.
- **Department**: Enter a department name.
- **Logo Path**: Import a hospital logo to be shown on the top of the display.

To import a hospital logo from a USB drive,

1. Insert a USB driver that stores a hospital logo to the system.
2. Click … to find the file path.
3. When the file selection dialog box appears, select the logo file you want.
4. Click **OK**.

NOTE

- The supported file formats are BMP, PNG, and JPG only.
- You may not import a hospital logo from a CD or DVD.

Location

- **Language**: Change the display language.

  NOTE

  After changing the language, you need to reboot the system.

- **Unit**: Select a measurement unit, **Metric** or **US**. When you select **US**, all units are changed from centimeter to inch.

Power Off

- **Power Off**: Set how the system powers off when you press the **[Power On/Off]** key.
  - **Shutdown dialog**: Set to show the shutdown dialog box.
  - **Immediately**: Set to power off immediately.

Monitor

- **Enable screen saver**: Set to activate Screen saving mode.
- **Delay**: Specify the time of inactivity.

Date / Time

- **Date Format**: Select a desired date format.
- **Time Format**: Select a desired time format.

To change the current date and time,

1. Click **Date / Time** under **Time Format**.
2. Click the **Date and Time** tab.
3. Click **Change date and time...** to change the current date and time. ***Date and Time Settings*** screen appears.
4. Change the current date and time.
5. Click **OK** to save the changes.

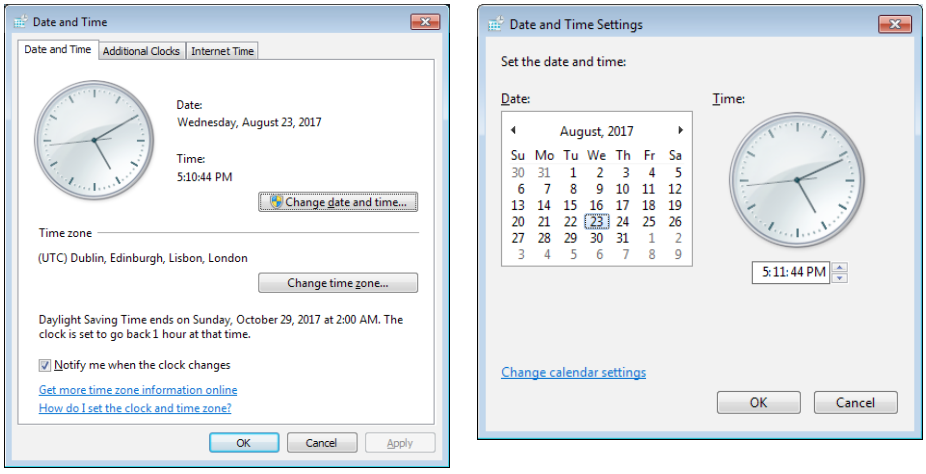


Figure 9-3 Date and Time

To change the time zone,

1. Click **Date / Time** under **Time Format**.
2. Click the **Date and Time** tab.
3. Click **Change time zone...** to change the time zone.
   Time Zone Settings screen appears.
4. Select your time zone from the drop-down list.
5. To set Daylight Savings Time (DST), select the **Automatically adjust clock for daylight saving changes** check box.
6. Click **OK** to save the changes.

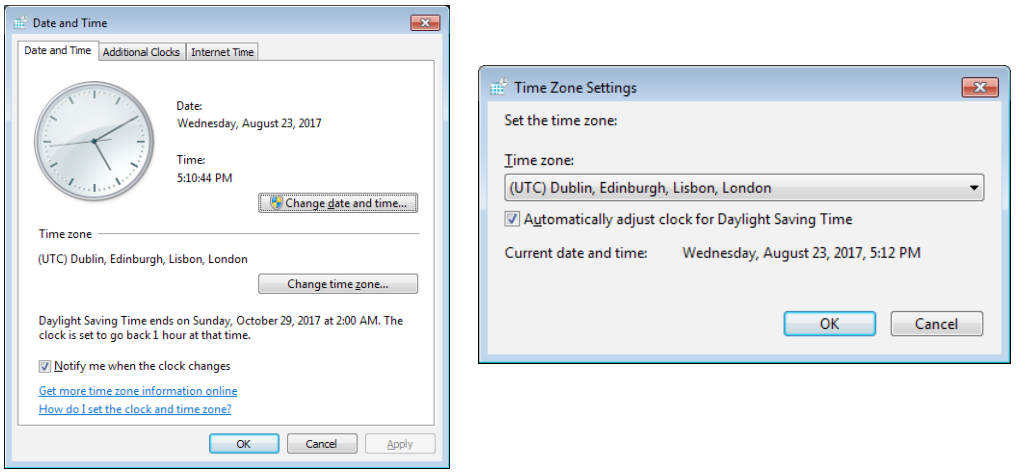


Figure 9-4 Time zone

Transducer

- **Default Port**: Select a default transducer port when the system powers on.

After End Exam

- **Status**: Set to return to scan mode or go to Patient Registration when you press the **[End Exam]** key.

Touch Screen Volume

- **Volume**: Adjust the volume of the touch screen.

Control Panel

The **Control Panel** menu provides options for trackball and the control panel keys.

Trackball

- **Trackball Travel Speed**: Change the trackball speed (Slow, Medium, Fast).
- **Trackball Cine Speed**: Change the speed for scrolling through Cine sequences (Slow, Medium, Fast).

Key

- **Application**: Select a default application that is used for the selected function on freezing.
- **Active Function on Freeze 2D**: Select a function (Cine, Measurement, Body pattern, Arrow) to be activated after freezing an image in 2D mode. The selected function automatically activates when you press the **[Freeze]** key.
- **Active Function on Freeze M**: Select a function (Cine, Measurement, Body pattern, Arrow) to be activated after freezing an image in M mode. The selected function automatically activates when you press the **[Freeze]** key.
- **Active Function on Freeze D**: Select a function (Cine, Measurement, Body pattern, Arrow) to be activated after freezing an image in Doppler mode. The selected function automatically activates when you press the **[Freeze]** key.
- **Backlight Intensity**: Set the brightness of the key backlight (High, Low, Off).
- **CCW Depth Control**: Set to operate the **[Depth]** key when you rotate the key counter-clockwise.
- **Switch the Cursor and Set Keys**: Switch the key function between the **[Cursor]** key and **[Set]** key.
- **Switch Dual(Quad) and P2(P3)**: Switch the key function between the **[Dual]** key and **[P2]** key, or between the **[Quad]** key and **[P3]** key.

Audio

- **'Beep' sound only when the 'P1,P2,P3'key are Pressed**: Set to play a beep when you press the **[P1]**, **[P2]**, and **[P3]** keys.

Peripheral

The **Peripheral** menu provides peripheral options for VCR, standard printer, and RS232C port.

NOTE

To configure the printer key function, go to **User Setting** > **Print/Foot Switch**.

VCR

- **Video Format**: Select a video format (NTSC or PAL).
- **VCR**: Select a VCR type.

Standard Printer(Report Only)

- **Default Printer**: Select a default standard printer that is used for printing reports and images.
- **Printer Paper**: Select a printing paper for the default printer.
- **Refresh**: Set the system to automatically refresh the printer list when you add a new printer. Select this option after installing a new printer is completed.

Printer Setting

- **Add Printers...**: Add a new printer driver via USB serial port or Ethernet interface. Selecting this option activates Windows Add Printer wizard.
- **Cleanup Printer Jobs in Queue When System Bootup**: Set to clear all printer jobs in queue when your system reboots.
- : Click the setting icon to manage the printer list.

RS232C

- **COM**: Select a RS232C port setting, **DVR Control** or **Transfer Measurement**.

Patient Info

The **Patient Info** menu provides useful options related to patient management and E-view, and allows you to configure the patient banner display option.

Patient Information

- **Hide Patient Information**: Select to hide patient information on patient banner.
- **Patient Banner Line1**: Select the patient information to display patient banner line1 from the drop-down list.
- **Patient Banner Line2**: Select the patient information to display patient banner line2 from the drop-down list.

Patient Package Option

- **Auto ID Generation**: Set the system to automatically create a new patient ID when you select **New Patient**.
- **Auto Search for Patient**: Set the system to automatically search for the patient data when you enter the first letter of a patient ID in the ***Patient ID*** field.
- **Auto Logon**: Set the system to log on automatically.
- **Auto Archiving Patient Data**: Set the system to save the current patient data to archive automatically.
- **Use Birthdate**: Set the system automatically to enter an age when you enter a patient's birthdate.
- **Default Layout**: Select a default image layout.
- **Quick Worklist**: Select to activate the worklist automatically when you activate the **Patient Registration**.
- **Keep last sorting method in patient list**: Select to display the last sorting method on the ***Patient Package List*** screen.
- **Keep the last Column width of Patient List**: Select to save the last column width when you change the column width of the patient list.
- **Auto Query for Worklist**: Select to activate queries automatically when you activate the worklist.

Archive Option

Select an archive to be used for saving data when you select **End Study**. You can also add and remove a storage media such as DICOM device, USB flash drive, USB hard disk, or Network storage.

NOTE

The default archive **"Local Archive"** cannot be deleted.

Monitor

The **Monitor** menu allows you to adjust the display pattern using gray bars and color bars. After the monitor adjustment, you need to check your peripherals. To adjust the monitor, see "Adjusting the Monitor and Touch Screen" on page 1-6.

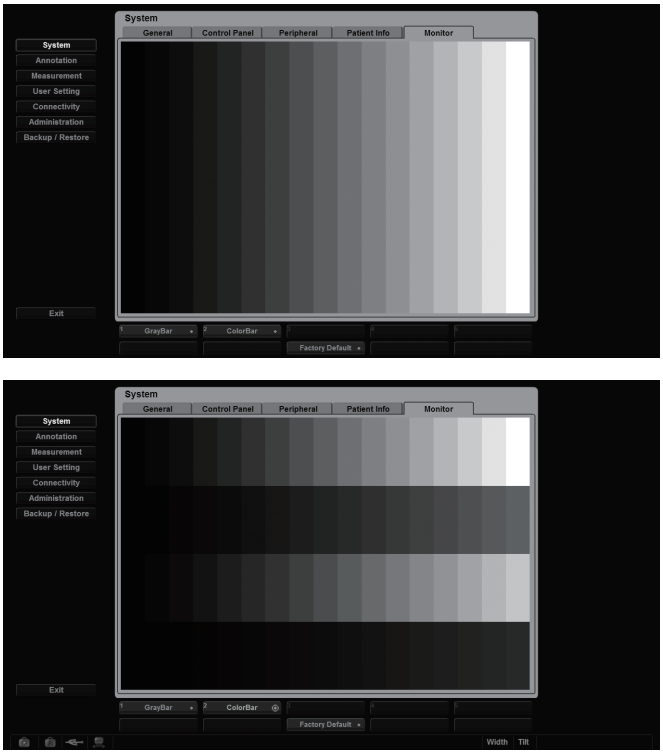


Figure 9-5 Gray & Color bars

NOTE

After adjusting the monitor settings, you may need to verify the peripheral functions, such as standard printer and DVR.

Annotation

The **Annotation** menu allows you to specify body pattern/text options and to define body pattern/text libraries on the context menu. The following menus are available: General, Body Pattern, and Text.

General

The **General** menu allows you to configure the text and body options.

Text Preset

- **Font Color**: Select a font color for comment.
- **Keep arrow's head position when trackball is moving**: Set to fix the direction of the pointer head when you move **[Trackball]**. When this option is not selected, the direction of the pointer head changes with the movement of **[Trackball]**.
- **Erase Text when image is unfrozen**: Set to erase all comments on the display when you press the **[Freeze]** key to return to the scan mode.
- **Erase Text when entering M mode or PW mode**: Set to erase all comments on the display when you enter M mode or PW mode.
- **Erase Text when entering Dual or Quad mode**: Set to erase all comments on the screen when the display is changed to the dual or quad layout screen.
- **Replace the Text**: Set to type over existing comments.

Body Pattern Preset

- **Erase bodypattern when image is unfrozen**: Set to erase the body pattern on the display when you press the **[Freeze]** key to return to the scan mode.
- **Copy to active side in multiple image**: Set to copy the body pattern on the selected image in the dual or quad layout screen.
- **Set as default position when Bodypattern is moved**: Set to show the last position movement of the body pattern when you press the **Move Pattern** soft key.

BodyPattern

The **BodyPattern** menu allows you to define and change body pattern libraries. The left side of the Body Pattern menu shows all available body pattern libraries, and the right side shows the specific body patterns for the selected library. Once you have defined body patterns for a library, they are shown on the touch screen display of Body Pattern.

NOTE

To specify the default library per each preset, go to **User Setting** > **Annotation**.

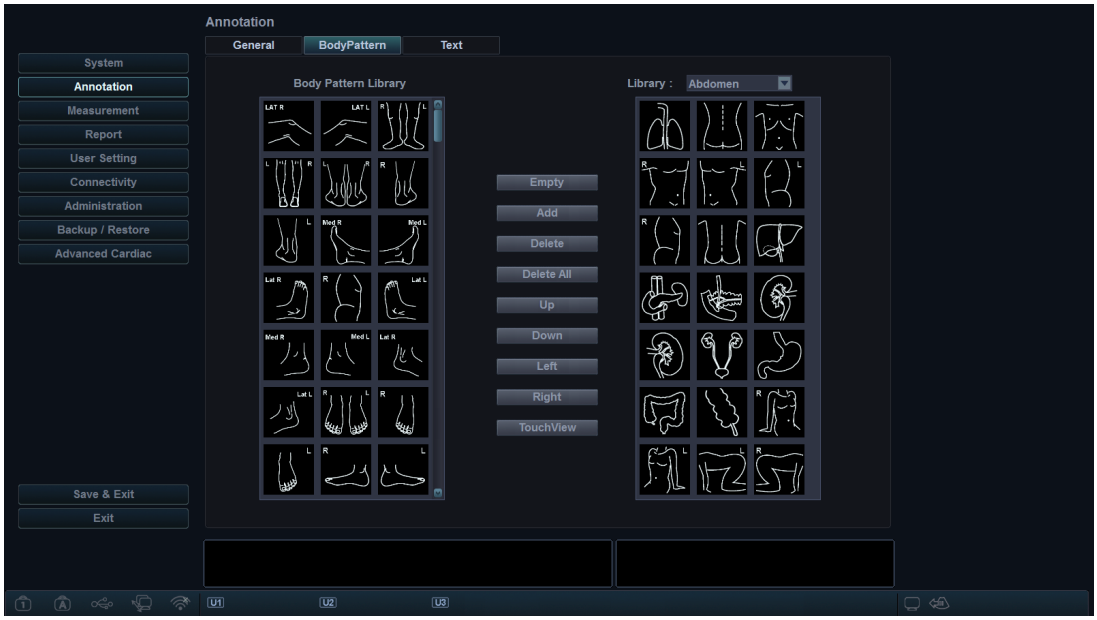


Figure 9-6 Body pattern libraries

To add a body pattern,

1. Select the library you want to add a body pattern from the library list.
2. Use **[Trackball]** to select a body pattern, and press the **[Set]** key twice or click **Add**.
   The body pattern is shown on the bottom of the library.
3. To change the position of the body pattern, select the body pattern and click **Up/Down/Left/Right**.
4. Click **Empty** to make an empty space on the touch screen.
5. Click **TouchView** to review the applied body marker on the touch screen.
6. Press the **Save** soft key and then click **Yes** to save the changes.

To delete a body pattern,

1. Select the library you want to delete a body pattern from the library list.
2. Use **[Trackball]** to select a body pattern, and press the **[Set]** key.
3. Click **Delete** to delete the body pattern.
4. Press the **Save** soft key and then click **Yes** to save the changes.

To change the location of a body pattern,

1. Select the library you want from the library list.
2. Use **[Trackball]** to select a body pattern, and press the **[Set]** key.
3. Click **Up**, **Down**, **Left**, or **Right** to change the location of the body pattern.
4. Press the **Save** soft key and then click **Yes** to save the changes.

Text

The **Text** menu allows you to change and define the text libraries. The left side of the Text menu shows all available text libraries, and the right side shows the specific text for the selected library. For each library, you can define up to one column with twenty three rows. The defined text is shown on the context menu of the text mode.

To add a text,

1. Select the library you want from the library list.
   The system shows all texts saved in the library.
2. Use **[Trackball]** to select a text, and press the **[Set]** key.
   The text is shown on the bottom of the library.
3. Click **Add** to add the selected text.
4. To change the text position, select the text and click **Up** or **Down**.
5. Click **Empty** to make an empty space on the touch screen.
6. Click **TouchView** to review the applied text on the touch screen.
7. Press the **Save** soft key and then click **Yes** to save the changes.

To create a new text,

1. On the ***New Text*** field, press the **[Set]** key.
2. Enter a new text and click **Add**.
   The new text is shown on the bottom right of the library.

To delete a text,

1. Select the library you want from the library list.
2. Use **[Trackball]** to select a text and press the **[Set]** key.
3. Click **Delete** to delete the text.
4. Press the **Save** soft key and then click **Yes** to save the changes.

To change the text location,

1. Select the library you want from the library list.
2. Use **[Trackball]** to select a text and press the **[Set]** key.
3. Click **Up** or **Down** to change the text location.
4. Press the **Save** soft key and then click **Yes** to save the changes.

Measurement

The **Measurement** menu allows you to specify measurement and calculation preset.

General

The **General** menu allows you to define the cursor and result window settings.

General

- **Repeat Measurement**: Set to repeat the measurement.
  - **Repeat**: The selected measurement on the context menu is repeated.
  - **None**: The measurement is not repeated.
  - **Default Measurement**: The basic measurement is repeated (e.g. Distance).
- **Tissue Depth display(2D,M)**: Set to show the tissue depth (depth from the transducer surface) when moving the measurement cursor in 2D or M mode.

Caliper

- **Caliper Type**: Select a caliper type (Number or Symbol).
- **Caliper Size**: Select a caliper size (Normal or Large).
- **Caliper Color**: Select a color for the fixed measurement cursor.
- **Caliper Line Width**: Select a line width of the caliper (Thin, Normal, or Thick).
- **Caliper Easy Guide**: Select to activate Caliper Easy Guide while performing the measurement.
- **Ellipse cross line display**: Set to show the cross line for ellipse.
- **Caliper line display**: Set to show the caliper line when measurement is completed.
- **D mode caliper cross line display**: Set to show the cross line of the caliper in D mode.
- **M mode caliper cross line display:** Set to show the cross line of the caliper in M mode.

Result Window

- **Format**: Select a window format (Wide or Narrow).
- **Direction**: Select a window direction (Top down or Bottom up).
- **Font Color**: Select a font color.
- **Position 2D**: Select a default position of the result window in 2D mode (Left Top, Left Bottom, Right Top, or Right Bottom).
- **Position TimeLine**: Select a default position of the result window in M and PW modes (Left Top, Left Bottom, Right Top, or Right Bottom).
- **Transparency**: Set to show the window background transparent or opaque.

Basic MEAS.

The **Basic MEAS.** menu shows all settings for the basic measurement in each application. Depending on the application, available settings may vary. You can define the basic measurement and default method for each basic measurement. You can control basic measurement by using the soft keys in each measurement mode.

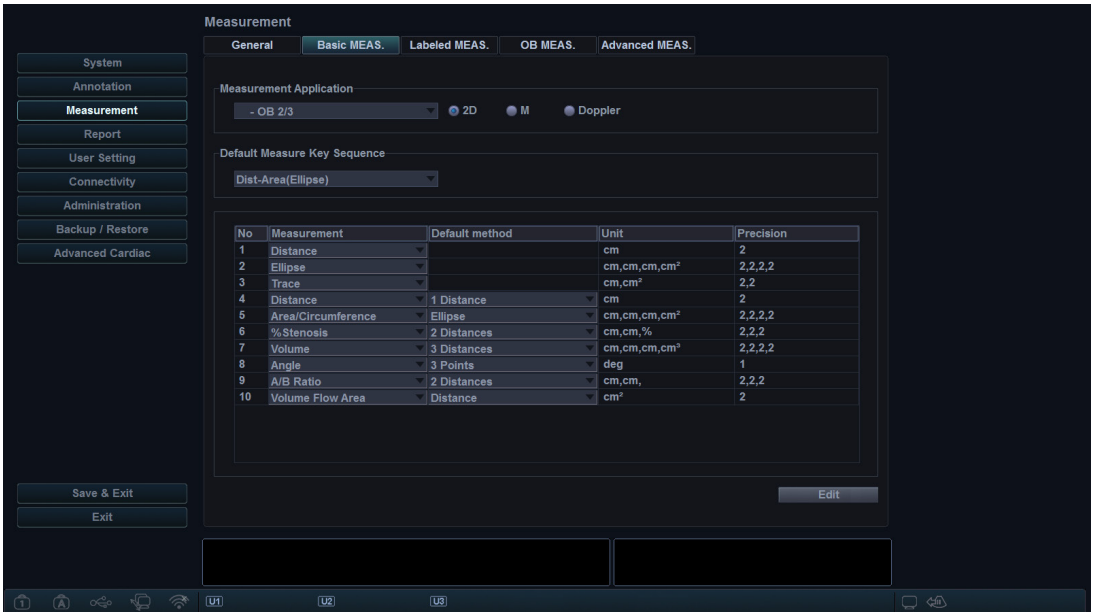


Figure 9-7 Basic measurement display

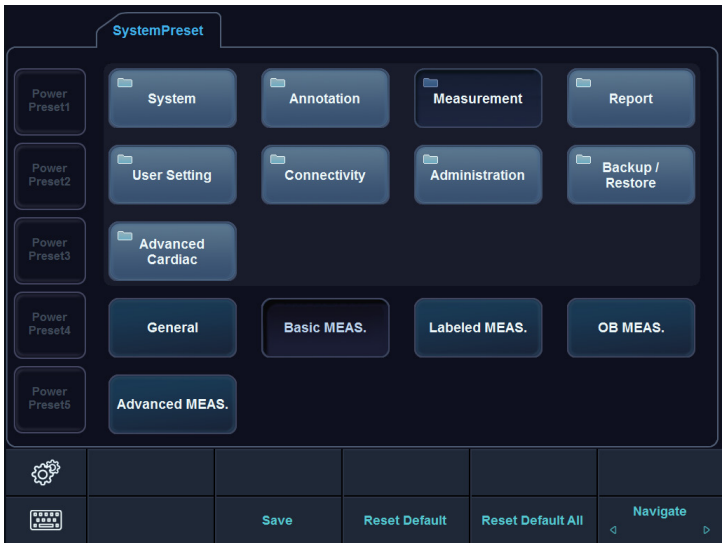


Figure 9-8 Basic measurement touch screen

1 Select a measurement application.

2 Select a measurement mode (**2D**, **M**, or **Doppler**). The basic measurement entries of the selected measurement mode appear on the table.

NOTE

The order of the basic measurement is the same as on the soft key menu.

3 Specify **Default Measure Key Sequence**.
For example) OB1, M mode: Select 2 Sequences (Distance, Time) or 3 Sequences (Distance, Time, Slope).

4 When you select **Distance**, **Time** for 2 Sequences, the distance caliper will be shown by pressing the **[Measure]** key once. The time caliper will be shown by pressing the **[Measure]** key twice.

Labeled MEAS.

The **Labeled MEAS.** menu shows all settings for the labeled measurement. You can control labeled measurement using the context menu in the measurement mode.

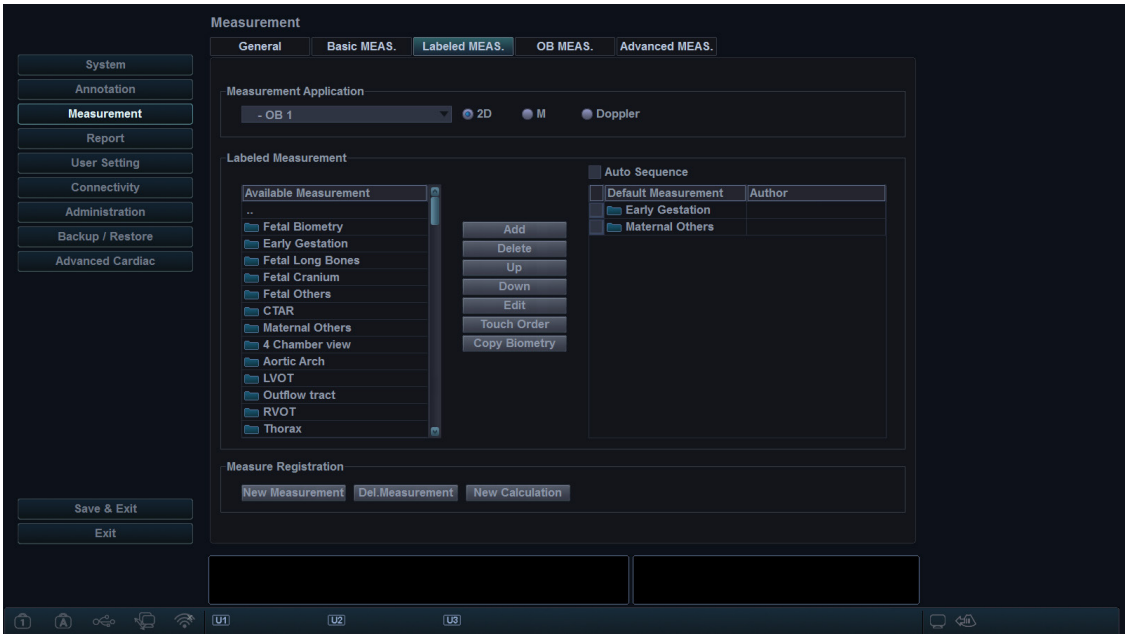


Figure 9-9 Labeled measurement display



Figure 9-10 Labeled measurement touch screen

1 Select a measurement application from the drop-down list.

2 Select a measurement mode (**2D**, **M**, or **Doppler**).

3 All of the available measurement lists appears on the left of the measurement window. The default measurements are shown on the context menu.

4 To add a measurement to the context menu, select a measurement from the ***Available Measurement*** list and click **Add**.

5 To delete a measurement from the context menu, select a measurement from the ***Default Measurement*** list and click **Delete**.

6 To change the order of a measurement from the context menu, select a measurement from the ***Default Measurement*** list and click **Up** or **Down**.

7 To enable automatic sequence measurement, select **Auto Sequence**.

NOTE

You can change the author in the OB measurement.

Creating a new measurement

To create a new measurement entry,

1 Click **New Measurement**.

2 Specify the following measurement information.

- **Measurement Name**: Enter a measurement name. Make sure that the measurement name is unique.
- **Measurement Type**: Select a measurement type among Distance, Area, Angle, Volume, and Disk volume from the drop-down list.
- **Caliper Type**: Select a caliper type from the drop-down list.
- **Parameter**: Set to show Parameter, Parameter Type, Unit, Precision and Method. You can modify Unit, Precision and Method by changing them from the drop-down list.

NOTE

Depending on the measurement mode, available measurement types and caliper types may differ.

3 To save the settings, click **OK** and then **Yes**.
You can see the new measurement in the ***Available Measurement*** list.

Creating a new parameter

To create a new parameter on a defined measurement,

1. Click **New Parameter**.
2. Specify the following parameter information.
   - **Parameter Name**: Enter a parameter name.
   - **Formula**: Enter a calculation formula and click **Check** to verify that the syntax is correct.
   - **Display Unit**: Select a display unit from the drop-down list.
   - **Display Precision**: Select a display precision from the drop-down list.

   NOTE
   When you input parameters, suitable unit should be considered for calculation.
3. To save the settings, click **OK** and then **Yes**.

Creating a new calculation

To create a new calculation,

1. Click **New Calculation**.
2. Specify the following calculation information.
   - **Calculation Name**: Enter a calculation name. Make sure that the calculation name is unique.
   - **Formula**: Enter a calculation formula and click **Check** to verify that the syntax is correct.
   - **Display Unit**: Select a display unit from the drop-down list.
   - **Display Group**: Select a display group from the drop-down list. The display group is shown on the ***Report*** page.
   - **Display Precision**: Select a display precision from the drop-down list.
   - **Measurement**: Select a measurement from the drop-down list.

   NOTE
   When you input parameters, suitable unit should be considered for calculation.
3. To save the settings, click **OK** and then **Yes**.

Editing a measurement

To edit a customized measurement,

1. Select a measurement from the list and click **Edit** or double-click the measurement.
   The ***Edit Measurement*** window appears on the screen.
2. Add or change the measurement by using **New Parameter** and **Edit Parameter**, and then change Unit, Precision and Method for report.
3. Click **OK** and then **Yes** to save your changes.

   NOTE
   The default measurements cannot be edited.

Editing a parameter

To edit the customized parameter,

1. Select a parameter from the list and click **Edit Parameter**.
   The ***Edit Parameter*** window appears on the screen.
2. Change the formula and output format such as Method, Unit, and Precision.
3. Click **OK** and then **Yes** to save your changes.

Editing a calculation

To edit a customized calculation,

1. Select a calculation from the list and click **Edit** or double-click the calculation.
   The ***Edit Calculation*** window appears on the screen.
2. Add or change the calculation by using **New Parameter** and **Edit Parameter**, and then change Unit, Precision and Method.
3. Click **OK** and then **Yes** to save your changes.

Deleting a measurement

To delete a measurement entry,

1. Select a customized measurement from the ***Available Measurement*** list.
2. Click **Del.Measurement**.

Deleting a parameter

To delete a customized parameter,

1. Select a parameter from the list.
2. Click **Delete Parameter**.

Deleting a calculation

To delete a customized calculation,

1. Select a customized calculation from the ***Available Measurement*** list.
2. Click **Del.Measurement**.

NOTE

The default calculations cannot be edited or deleted.

Setting up the automatic sequence for EFW

The automatic sequence feature allows you to perform EFW measurements in sequence.

1. Press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS**.
2. Select an OB application from the ***Available Measurement*** list.
3. Select an EFW folder and click **Add**.
4. Double-click the selected measurement.
5. Select the **Auto Sequence** check box on the top of the ***Default Measurement*** list.

Arranging measurements on the touch screen

To reposition the default measurements on the touch screen,

1. Press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS**.
2. Click **Touch Order**. The ***Touch Order*** dialog box appears.
   You can see all default measurements on the touch screen.
3. Select a measurement you want to move on the touch screen grid.
4. Select an empty space on the touch screen grid to which you want to move.
5. To save the changes, click **Save**.

Creating new biometry measurement

To see the different authors' measurement based on same biometry,

1. Press the **[System Preset]** key and go to **Measurement** > **Labeled MEAS**.
2. Select a biometry measurement from the ***Available Measurement*** list.
3. Click **Copy Biometry**.
   You can see the copied measurement item in the ***Default Measurement*** list.
4. To save the changes, click **Save**.

OB MEAS.

The **OB MEAS.** menu allows you to define default OB presets such as OB type and OB graph. You can also register a user-defined OB table.

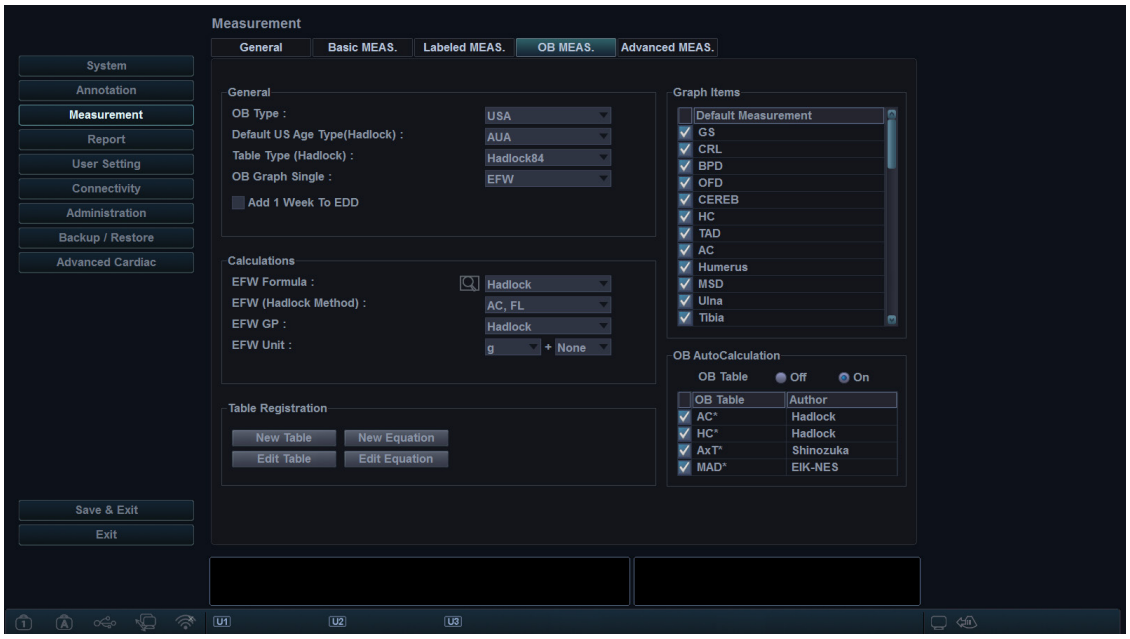


Figure 9-11 OB measurement display

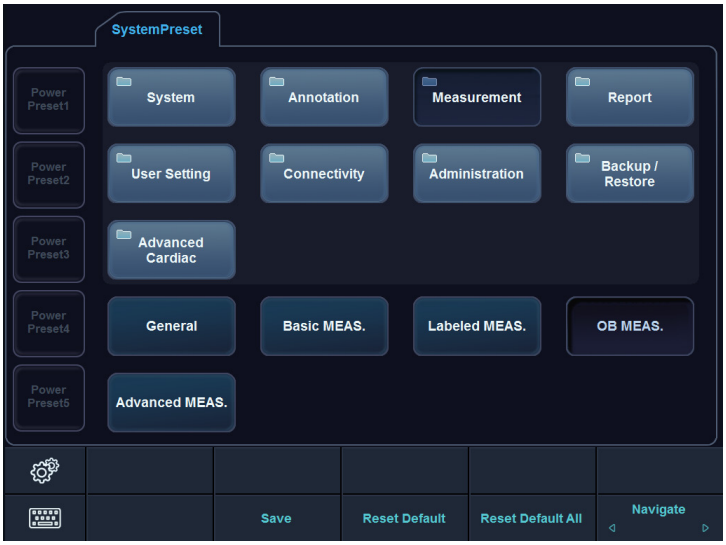


Figure 9-12 OB measurement touch screen

General

- **OB Type**: Select an OB type (USA, Europe, Tokyo, Osaka or ASUM) from the drop-down list for the measurement and calculation. The default measurement list may differ depending on the selected OB type.
- **Default US Age Type(Hadlock)**: Select CUA (Composite Ultrasound Age) or AUA (Average Ultrasound Age).
- **Table Type (Hadlock)**: Select Hadlock82 or Hadlock84 for OB table.
- **OB Graph Single**: Select EFW or Last for displaying OB graph as default.
- **Add 1 Week to EDD**: Set to add additional week to estimate the date of delivery.

Calculations

- **EFW GP**: Select an author name to calculate EFW GP (Estimated Fetal Weight Growth Percentile).
- **EFW Formula**: Select Hadlock, Campbell, Hansmann, Merz, Osaka, Persson, Schild, Shepard, Shinosuka1, Shinosuka2, Shinosuka3, or Tokyo.
- **EFW (Hadlock Method)**: Select (HC, AC), (AC, FL), (AC, BPD), (AC, BPD, FL), (AC, FL, HC), or (AC, BPD, FL, HC).
- **EFW Unit**: Change the measurement unit for EFW.

Table Registration_Creating a new OB table

To create a new OB table,

1. Click **New Table**.
2. Enter an author name.

   NOTE

   Author name always should be unique.
3. Select options in the ***Biometry*** and ***Ref. Author*** fields.
4. Select **Fetal Age** or **Fetal Growth**.
5. When you selected **Biometry** and **Ref. Author**, the pre-defined values are shown on the table, and you can edit the table value. When you selected **None** from **Ref. Author**, the table will be reset.
6. Select **SD Format** for a deviation type.
7. Select **Input Unit** for input and **Output Unit** for output.
8. Enter **Min**, **Max**, and **Interval** for range. The system creates default values on the table automatically. For the other options, you can manually enter or edit the values.
9. To enter the value, move the cursor to the desired field and press the **[Tab]** key.
   - To move the row, click → or →. You can also press the **[Enter]** key to move to the next row.
   - To move to the column, click ↑ or ↓.

10 To add additional line, click **Insert**.

11 To delete a line, click **Delete**.

12 To clear all values, click **Clear All**.

13 When you have finished, click **OK** and then **Yes** to save your changes.

NOTE

You can import an OB table template as an Excel file which is created by PC.

Table Registration_Editing an OB table

To edit an OB table,

Once you have created your own table, you can edit the table by clicking **Edit Table**. You can only edit the table values, not the table type. The editing table procedure is the same as **New Table**.

NOTE

The default tables and equations cannot be edited.

Table Registration_Creating new OB equation

To create new equation,

1 Click **New Equation**.

2 Enter an author name.

NOTE

Author name should always be unique.

3 Select an option in the ***Biometry*** field.

4 Select **Fetal Age** or **Fetal Growth** for equation type.

5 To make a formula, select formula components from the ***Inputs*** and ***Operators*** fields, and enter a formula in the formula field.

6 Click **Check** to test the formula. If there are no errors, the “Syntax OK!” appears. If any error occurs on the formula, an error message appears in the formula field.

7 Specify the input range for the ***Min*** and ***Max*** fields.

8 Click **OK** and then **Yes** to save your changes.

Table Registration_Editing OB equation

Once you have created your own equation, you can edit the equation by selecting **Edit Equation**. The editing equation procedure is the same as **New Equation**.

Available operators for equation

The following table shows available operators for using equation.

Table 9-2 Equation operator

Operator	Definition
+	Addition
-	Subtraction
*	Multiplication
/	Division
( )	Parenthesis
^	Caret
sqrt	Square root
pi	Pi
log	Logarithm
ln	Natural logarithm
exp	Exponential
abs	Absolute value

- **OB AutoCalculation:** Set to perform the automatic OB calculation. Select the **OB Table** check box to select the OB calculations (AC*, HC*, AxT*, MAD*).

Advanced MEAS.

The **Advanced MEAS.** menu allows you to define application parameters, especially the Doppler measurement.

Measurement Application

Select an application to be defined.

Application Settings

- **HR Cycle**: Select a heart rate cycle (1-10).
- **HR Method(ECG)**: Select HR Method (Manual or Automatic).
- **Default Location**: Select a default location for the selected application (Off, Prox, Mid, or Dist).
- **Default Side**: Select a default side (Left or Right).
- **Keep Result Window**: Set to show the previous results of the measurements you performed on the ***Result*** window (Auto/On/Off). If you select **Auto**, the previous result for volume measurement is shown on the ***Result*** window. If you select **On**, the previous result for labelled measurement is shown on the ***Result*** window.
- **PI Calc Method**: Select a parameter (ED or MD) to calculate PI (Pulsatility Index).
- **RI Calc Method**: Select a parameter (ED or MD) to calculate RI (Resistivity Index).
- **Default Touch Menu**: Select a default touch menu (Basic Measurement or Labeled Measurement) to display on the touch screen.
- **Volume Flow Method**: Select a parameter (TAmax or TAmean) to calculate Volume Flow.

Measurement Unit

- **Distance**: Configure the unit of measurement for all distances at one time (cm, cm^2, cm^3 or mm, mm^2, mm^3).
- **Velocity**: Configure the unit of measurement for all velocities at one time (cm/s, m/s, or mm/s).

Modify Calcs

- **Manual Trace**: Select the measurements to perform the manual calculation for the selected application.
- **Auto Trace(Calc):** Select the measurements to perform the automatic calculation for the selected application.
- **Semi Auto Trace**: Select the measurements to perform the semiautomatic calculation for the selected application.

NOTE

To set up the Auto trace direction, Auto trace method, and Auto trace sensitivity, go to **Image Preset** > **General**.

Report

The **Report** menu allows you to specify report and report print preset.

Print

Print Logo

Change the logo image when you print the report.

Print Section

Set the print section for each application.

Print Header & Footer

Set the options for print header and footer.

– Select the **Different First Page** check box to set the header and footer for the first page differently.

Patient Info

Patient Info Section

Customize the Patient Information section for each application.

Preview Section

Preview the Patient Information section.

User Setting

The **User Setting** menu allows you to configure application specific setting and to configure programmable keys such as P1, P2, P3, user-defined keys, and hot key.

Application

The **Application** menu allows you to specify the default application to be shown when the system starts up. You can also configure the default settings of transducer.

Annotation

The **Annotation** menu allows you to specify the default body pattern library to be shown in the **Body Pattern** menu. You can also specify the default text library to be shown when you use comments.

Measurement

The **Measurement** menu allows you to specify the default package measurement to be shown when you use the measurement.

User Defined Key

The **User Defined Key** menu allows you to specify user-defined keys. To assign functions onto numeric keys (0-9), select the **Enable Hot Key** check box and assign a key function. The following table shows the functions that you can assign for available keys.

Table 9-3 User-defined key

Key / Function Key	User key (1–3)	Numeric key (0–9)
Power Preset	O	O
Transducer Port 1	O	O
Transducer Port 2	O	O
Transducer Port 3	O	O
Transducer Port 4	O	O
DPDI	O	O
TDI	O	O
SRI	O	O
Spt.Comp	O	O
Virtual	O	O
L/R Flip	O	O
U/D Flip	O	O
Quick Angle	O	O
Auto Calc	O	O
Simultaneous	O	O
Full D	O	O
Full M	O	O
Biopsy	O	O
Single	O	O
Needle Vision™	O	O
Quick ID	O	O
Arrow	O	O
Clear All	O	O
User(P4)	O	O
User(P5)	O	O
Initial	O	O
End Exam	O	O

Function Key \ Key	User key (1–3)	Numeric key (0–9)
DVR	O	O
Rec/Pause	O	O
Cube Strain™ data Storage	O	O
Eject	O	O
Cube View™	O	O
3D	O	O
4D	O	O
Elasto	O	O
StressEcho	O	O
Cube Strain™	O	O

NOTE

*__Power Preset__ allows you to quickly change the transducer and its preset.

Print/Foot Switch

The **Print/Foot Switch** menu allows you to define the optional footswitch and the print keys.

To assign print keys,

1. Select a print key (**P1**, **P2**, **P3, User(P4)**, or **User(P5)**) on the upper side of the display.
2. Select the device you want to add under the device category on the left side of the page.
3. Click **>>** on the middle of the display.
4. To configure the multiple devices to the each print key, select devices as many as you want from the corresponding device categories.

Print key functions

You can set the print keys to perform the following functions.

1. **Image Type**: Set the print key to save an image to the clipboard. When you press the **[P1]** key, the current image is moved to the clipboard. The image format depends on the saving option and current status (live or frozen).

Table 9-4 Store format option

Option	Descriptions
Image Type	Select a saving area (Single, Cine, Screen capture(Whole), Screen capture(Diagnostic)).

2. **Standard Printer**: Set the print key to print the image via the standard printer. You can also print an image via other printers.

Table 9-5 Print option

Option	Descriptions
Printer Direction	Select a printing direction (Landscape or Portrait).
Printer Area	Select a printing area (Whole Screen, Diagnostic, or Full Diagnostic).
Printer Quality	Select a printing quality (Default, Low, Medium, or High).
Printer Paper	Select a printer paper.
Enable Video Invert	Set to print an image or the background in black.
Hide image parameter when image printed	Set to print an image with the image parameter hidden.

3. **DICOM Server**: Set the print key to send an image to a DICOM device. To configure the DICOM settings, go to **System Preset** > **Connectivity** > **Storage** or **Print**.
4. **Network Storage & Media** : Set the print key to send an image to network storage, USB flash drive, USB hard disk. To configure the network storage setting, go to **System Preset** > **Connectivity** > **General** > **Network Storage**.

Footswitch functions

To assign functions for the each pedal of the footswitch, select a function from the corresponding list (**Right**, **Center**, **Left**). The following functions are available:

• Freeze	• M Mode
• P1	• PW Mode
• P2	• Update
• P3	• Simultaneous
• Single	• Measure
• Dual	• End Exam
• Quad	• Rec/Pause
• CF Mode	• Transducer Port 1–4
• PD Mode	

Connectivity

The **Connectivity** preset allows you to configure the network connection and DICOM protocols. DICOM is an abbreviation of Digital Imaging and Communications in Medicine. This is a standard protocol for handling, storing, printing, and transmitting information in medical imaging. Using the DICOM option, you can send or print images after connecting the system and PACS.

NOTE

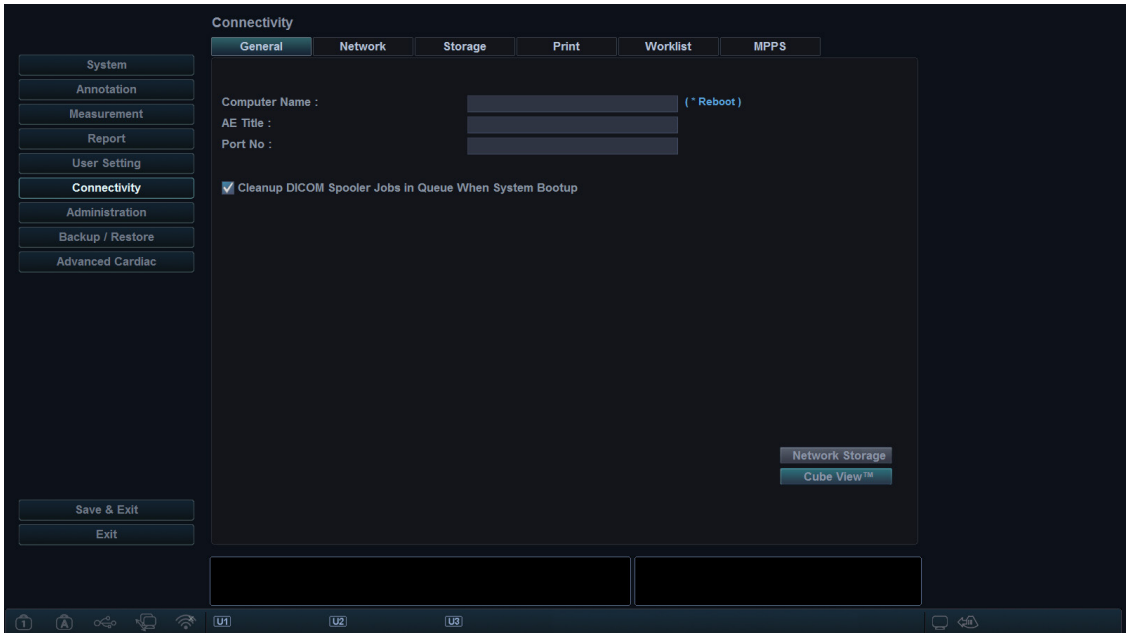
- DICOM is an optional service. To use this service, you need DICOM installation.
- To enter the connectivity screen, you must log in as an administrator.

General

The **General** menu allows you to configure the general network connection settings such as computer name, AE title, and port number.

NOTE

To set up Internet Protocol, contact your hospital's network administrator.



To configure the general network connection settings,

1. Enter a computer name in the ***Computer Name*** field.
2. Enter an Application Entity (AE) title in the ***AE Title*** field.
3. Enter a port number of your system in the ***Port No*** field.
   - **Cleanup DICOM Spooler jobs in Queue when System Bootup**: Set to delete all DICOM jobs in queue when system reboots.
4. Press the **Save** soft key and then click **Yes** to save the changes.
5. Reboot your system.

Network

The **Network** menu allows you to set up Internet protocol. You need a separate IP address for your system.

NOTE

To set up Internet Protocol, contact your hospital's network administrator.

Local Area

Specify the following IP address settings:

- **DHCP**: Select the DHCP option for a dynamic IP address.
- **Use Following IP Address**: Select this option to use a static IP address.
  - **IP Address**: Enter an IP address.
  - **Subnet Mask**: Enter the subnet mask.
  - **Default Gateway**: Enter the default gateway address.
  - **Preferred DNS Server**: Enter the preferred DNS server.
  - **Alternate DNS Server**: Enter the alternate DNS server.
  - **Network Speed**: Select the network speed.

Wireless

To connect to the wireless network,

1. Specify the IP address settings.

   NOTE

   The IP address settings are the same as the ones in Local Area menu.

2. Select the desired SSID from the ***Wireless search*** list.
3. Click **Connect**.
4. Enter a password and click **OK**.

You can see the connection status of wireless network by checking the icon in the status bar.

Table 9-6 Wireless Network connection status

Icon	Description
	Disconnected to the USB Wireless module.
	Connected to the USB Wireless module but disconnected to the wireless network.
	Successfully connected to the wireless network.

Commonly used service parameters

There are certain parameters that may need to be set up for each service. The parameters are described on the following service.

NOTE

- DICOM is an optional service. To use this service, you need DICOM installation.
- To enter the connectivity screen, you must log in as an administrator.

- DICOM Storage
- DICOM Storage Commitment
- DICOM Print
- DICOM Worklist
- DICOM MPPS

Setting

- **Name**: Enter a description for each service.
- **AE Title**: Enter the Application Entity (AE) title of this service.
- **Port No**: Enter a port number of the service.
- **Retry**: Enter a maximum number of retry when the system fails to connect to a destination device.
- **Retry Interval(s)**: Set the time interval of retry.
- **Timeout(s)**: Set the period of timeout when the retry connection is over.

Verify

1. Select a destination.
2. Click **Verify** to start verification. When the verification is completed, the one of the following icons is shown.

Table 9-7 DICOM verification

Icon	Description
	Successfully connected
	Failed in connection
	In progress

View

View allows you to view the connectivity architecture of your system such as configured DICOM service and network structured tree.

Storage

The **Storage** menu allows you to send images with DICOM standard format to view or interpret in PACS. In this menu, you can add, edit, and remove a DICOM storage service and configure the service properties.

To add a DICOM storage device,

1. Click **New**.
2. Enter a name of the DICOM storage device in the ***Destination Name*** field.
3. Enter a device's IP address in the ***IP Address*** field.
4. Enter the Application Entity (AE) title for a device in the ***AE Title*** field.
5. Enter a port number in the ***Port No*** field.
6. Click **Verify** to confirm the connection.
7. Click **OK**.

To remove a DICOM storage device,

1. Select the destination name that you want to remove.
2. Click **Remove**.
3. Click **Yes** to confirm.

Properties

- **Enable Structure Report:** Set to send a report with images.
- **Enable Raw data of Compact 3D/4D (Image-Arena™)**: Set to send a 3D/4D image with raw data for Image Arena™.
- **Enable Multiframe**: Set to save multi-frame Cine images in the DICOM storage.
- **Compression**: Select a default compression type.
- **Quality**: Select a default image quality.
- **Monochrome**: Set to send images in monochrome. If you select **Monochrome or Color**, you will be asked every time to determine sending images in monochrome or color.
- **Commitment**: Set to receive notification from PACS when a study has been transferred successfully. When this option is enabled, you can specify the following information:
  - **Properties**: Select an associated storage.
  - **Accepter**: Specify the accepter's settings such as AE title, port number, and timeout.

Network Storage

The **Network Storage** menu allows you to customize options for sending backup data to Shared directory. You can add and edit a network storage device.

To enter the **Network Storage** menu,

– Go to **General** menu and click **Network Storage** on the bottom right of the display.

To add a network storage device,

1. Click **New**.
2. Enter a name of the network storage device in the ***Destination Name*** field.
3. Enter a shared directory path for the device in the ***Shared Dir*** field.
4. Enter an ID of the device in the ***ID*** field.
5. Enter a password of the device in the ***Password*** field.
6. Select a device that is connected to the intra network driver.
7. Click **Verify** to verify the network connection.

To delete a network storage device,

1. Select the destination name that you want to delete.
2. Click **Remove**.
3. Press the **Save** soft key.

Properties

- **Type**: Select an image format to save images to network storage (JPEG, BMP).
- **2D Cine**: Save 2D Cine images as WMV format.
- **4D Volume Cine(*AVI)**: Save 4D volume images as AVI format.

Cube View™

The **Cube View™** menu allows you to set up the network options for accessing to the Cube View Control Server. You can add and edit a Cube View Control server device.

To enter the **Cube View™** menu,

– Go to **General** menu and click **Cube View™** on the bottom right of the display.

To add a Control Server device,

1. Click **New**.
2. Enter a name of the Cube View Control Server device in the ***Destination Name*** field.
3. Enter an IP address of the Cube View Control Server device in the ***IP Address*** field.
4. Enter a Port number of the Cube View Control Server device in the ***Port No*** field.
5. Enter an access ID of Cube View Client in the ***ID*** filed.
6. Enter a password of Cube View Client in the ***Password*** field.
7. Click **Verify** to verify the Cube View Control Server connection.

To delete a Cube View Control Server device,

1. Select the destination name that you want to delete.
2. Click **Remove**.
3. Press the **Save** soft key.

Properties

- **Compression**: Select an image compression type. (Lossy, Lossless)
- **Quality**: If you selected **LOSSY** in the ***Compression*** field, select compressibility.
- **Enable Adjust Quality**: Set whether to adjust a compression format and an image quality in ***Client*** field.

Print

The **Print** menu provides an ability to send and receive ultrasound image data via DICOM printers.

Properties

- **Format**: Select a printing format that determines the number of images to be printed out in one page.
- **Priority**: Select the printing job priority (HIGH, MED, or LOW).
- **Medium**: Select a printing medium (CLEAR FILM, PAPER, or BLUE FILM).
- **Copies**: Select the number of copies.
- **Orientation**: Select a printing direction (LANDSCAPE or PORTRAIT).
- **Film Size**: Select the dimensions of the film size such as 81NX101N and 101NX121N.
- **Film Destination**: Select the film destination (MAGAZINE or PROCESSOR).
- **Magnification**: Select how the print magnifies the image to fit it onto the film.
  - **REPLICATE**: Interpolate pixels are copied of adjacent pixels.
  - **BILINEAR**: Interpolate pixels are created by bilinear interpolations between the adjacent pixels.
  - **CUBIC**: Interpolate pixels are created by cubic interpolations between the adjacent pixels.
  - **NONE**: No interpolation
- **Trim**: Set to show the trim box around images on the film (YES or NO).
- **Empty Image**: Set how to show empty images (BLACK or WHITE).
- **Color**: Select a color type (COLOR or GRAY).
- **Min Density**: Enter the minimum density level of the film.
- **Max Density**: Enter the maximum density level of the film.
- **Config. information**: Enter a name of the specified image quality setting.
- **Film Session Label**: Enter an organization name to be shown on the film label.
- **Smoothing Type**: Select the printer's magnification interpolation for the output.
- **Border**: Select a border area between the images of the film (BLACK or WHITE).

Worklist

The **Worklist** menu provides a list of patients sorted by query parameters. The **Search Criteria** menu allows you to define specific search parameters for the system to use when querying the patient archive.

To add a worklist,

1. Click **New**.
2. Enter a name of the DICOM storage device in the ***Destination Name*** field.
3. Enter a device's IP address in the ***IP Address*** field.
4. Enter the Application Entity (AE) title for a device in the ***AE Title*** field.
5. Enter a port number in the ***Port No*** field.
6. Click **Verify** to confirm the connection.
7. Click **OK**.

To remove a worklist,

1. Select the destination name that you want to remove.
2. Click **Remove**.
3. Click **Yes** to confirm.

Search Criteria

- **DICOM Tag**: Select information type that you want to define for search parameters such as Modality and Referring Physician's name.
- **Value**: Enter the value of the selected tag item.
- **Add to list**: Add tag and value to the list of search criteria.
- **Remove**: Remove tag and value to the list of search criteria.
- **Clear**: Clear all tags from the list.

MPPS

The **MPPS** menu provides a notifying function that the procedure information of the current study is transferred to PACS while performing a study.

Administration

The **Administration** menu contains the following submenus:

- Service
- Users
- Options
- System Info
- Patient Data

Service

To activate the service browser, click **Service Station**. The Windows login screen appears. For more information, see the ***Service Manual***.

Users

The **Users** menu allows you to define the user settings.

To set the system to log on automatically,

– Select the **System Auto Login** check box.

To create a user ID,

1. Click **New**.
2. Enter a user ID in the ***ID*** field. You can enter up to 16 characters.
3. Enter the patient information using the alphanumeric keyboard.
4. Enter a new password in the ***New Password*** field.
5. Enter the new password again in the ***Confirm*** field.
6. Click **OK** to save your settings.

NOTE

- Use alphanumeric keys only for the user ID. Do not enter symbols such as asterisk (*), question mark (?), and slash (/).
- After saving, you can edit all information except for the user ID.

To delete a user ID,

1. Select a user ID from the user list by using **[Trackball]**.
2. Click **Delete**.
3. Click **Yes** to save the changes.

To change the password,

1. Select a user ID from the user list by using **[Trackball]**.
2. Click **Password**.
3. Enter the current password in the ***Old Password*** field.
4. Enter a new password in the ***New Password*** field.
5. Enter the new password again in the ***Confirm*** field.
6. Click **OK** to save the changes.

Options

The **Options** menu allows you to view the status of optional functions that require license keys to be installed. The followings show the current status of the selected function.

- **Demo.**: The option is activated for a certain period that the manufacturer specified.
- **Activated**: The option is activated for 3 months after the activation.
- **Invalid**: The option is not installed.
- **Permanent**: The option is installed permanently.

To add or delete a license key, go to **Service Station**.

System Info

The **System Info** menu allows you to view the current software and hardware versions of your system.

Patient Data

The **Patient Data** menu allows you to delete the patient data for a specified period.

- **Delete include Patient Information**: Set to delete the patient information when you delete the patient data for a specified period.

Backup / Restore

The **Backup / Restore** menu allows you to back up and restore the user data. You may lose user settings or patient information files such as patient's basic information and scanned images because of physical shocks to the product or internal errors. Therefore, you should back up user settings and patient information data on a regular basis.

The following submenus are available:

- User Backup
- Image Backup
- Full Backup

You can select a storage media (CD, DVD, USB flash drive, USB hard disk, and network storage) to perform the backup.

NOTE

To save images permanently, avoid using the local hard disk. Regularly back up the image archive to a storage media.

CAUTION

Follow the suggested backup procedure in the manual. ALPINION MEDICAL SYSTEMS does not have the responsibility for data loss caused by the user's carelessness.

User Backup

You can use a CD, DVD, and USB flash drive for user preset backup.

The **User Backup** menu allows you to back up the each preset data. To select all user-defined presets, select the **User Defined Configuration** check box.

- **Image Preset**: Set to back up or restore the Image preset only.
- **Service**: Set to back up or restore the Service preset only.
- **Measurement**: Set to back up or restore the Measurement preset only.
- **Annotation**: Set to back up or restore the Text and Body Pattern preset only.
- **Connectivity**: Set to back up or restore the Connectivity preset only.
- **Report**: Set to back up or restore the Report only.
- **Others**: Set to back up or restore other presets such as System and User settings.

To back up the user preset data,

1. Insert a blank media properly on your system.
2. Select a media from the ***Media*** drop-down list.
3. If you select **USB** from the ***Media*** drop-down list, enter the description in the ***Description*** field.
4. Select the user preset you want to back up.
5. Click **Backup** to start backup. The backup procedure begins.
6. After the backup is completed, the last backup time and date appear next to the preset category.

To restore the user preset data,

NOTE

Make sure that the software version of the data is the same as the system's software version. If NOT, you may not perform the restoration.

1 Insert a media on your system.

2 Select the user preset(s) you want to restore.
If your media is USB flash drive, select the user preset(s) you want to restore from the backup list.

3 Click **Restore** to start restoring. The restore procedure begins.

Image Backup

The **Image Backup** menu allows you to perform image backup using a storage media. Select your memory storage such as CD, DVD, USB flash drive, USB hard disk, and network storage.

CAUTION

- While restoring Image Archive data, some existing database may be overwritten on the local hard disk and you may not be able to restore the old data. Make sure that you use the appropriate media before the restoration proceeds.
- Before restoring Image Archive, make sure that the software version is the same or compatible with the current system. The system may not proceed restoring if the version is different.
- Do NOT turn the system off while backup is in progress. You may lose your image data.

NOTE

Use **Restore** on **E-view** to restore image data.

Media

- **Media**: Select your default storage media. Available media are CD, DVD, USB flash drive, USB hard disk, and network storage.
- **Media Capacity**: Select the media capacity. The system calculates the number of backup CDs that you need before performing the backup and informs you.

Image Archive Option

- **Backup period**: Specify the starting and ending date to back up patient data for a certain period.
- **Image Move after Backup**: Set to remove the backup image file after backup is completed.
- **Verification after CD burning**: Verify your patient data in a CD or DVD after burning the CD or DVD.
- **Finalization of CD/DVD**: Set to finalize a CD or DVD after backup is completed.
- **Skip the data that has already backed up**: Set to skip the data backup if the data has already been backed up.

NOTE

DICOMDIR is a DICOM file format which provides index and summary information for all the DICOM files on media. If you want to save studies to CD or DVD and view them on the PACS system, you should select this option.

To back up Image Archive,

1. Configure Media.
2. Configure Image Archive Option.
3. Prepare unformatted CD(s).
4. Click **Backup** to start backup Image archive.
   The media formatting starts and the instructional message appears.

You can view and import backup media via **E-View** menu.

To view the backup images,

1. Insert your media.
2. Go to **E-View**.
3. Change the source to your media from the local hard disk.
4. View the backup images of the study you want.

Full Backup

NOTE

The USB hard disk drive is only available for the full preset backup.

This full preset backup is for service purpose only. You can back up the system data such as user preset, image archive, and service configuration.

Advanced Cardiac

Protocol Editor

The **Protocol Editor** menu allows you to manage protocols to be used for Stress Echo. You can add, copy, and delete protocols, stages, and views.

Adding a new protocol

1. From the **Protocols** category, click **Add**.
2. Enter a new protocol name and select **OK**.
3. Select **Add** to add a new stage on the **Stages** category.
4. Enter a stage name and specify the stage options (Capture mode, Clips per view, Preview, Capture length, Capture Delay(ms), Timer Type).
5. Select **OK**.
6. Select **Add** to add a new view on the **Views** category.
7. Select a view name from the drop-down list and select **OK**.

Managing a protocol, stage, and view

To change the order of the stages or views,

– Select **Up** or **Down** to move a desired stage or view from the corresponding category.

To copy a protocol, stage, or view,

1. Select **Copy** to copy a desired protocol, stage, or view.
2. Enter a name for the selection and select **OK**.

To delete a protocol, stage, or view,

1. Select **Delete** to delete a desired protocol, stage, or view.
2. Select **Yes** to confirm the deletion.

Image Compress

The **Image Compress** menu allows you to set the compression strength of the stress echo images. Available options are High (30 %), Medium (50 %), Low (70 %), and Uncompress (100 %).

Cube Strain™

The **Cube Strain™** menu allows you to set the image capture time for the Cube strain™ function.

Image Preset

To enter the **Image Preset** menu, press the **[Image Preset]** key on the control panel.

To exit from the **Image Preset** menu, click **Save & Exit** or **Exit**. You can also press the **[Image Preset]**, **[Exit]**, or **[2D]** key on the control panel.

General workflow

To use Image preset function,

1. Press the **[Image Preset]** key on the control panel. The **General** menu appears.
2. Select the desired transducer from the transducer list.
3. Select the desired application from the application list.
4. To change a parameter, do one of the following:
   - Select the value from a list.
   - Select or clear a check box.
5. Click **Save & Exit** to save the changes and return to the scan mode.

New preset

You can create a new preset by pressing the **[F7]** key on the QWERTY keyboard. Once you have added a new preset, it appears in the application list of the transducer selection page, the ***Patient Registration*** screen, and the ***Image Preset*** screen. This function is useful when you want to use user-defined presets easily.

To create a new preset,

1. Adjust the image parameter settings as you want, and then press the **[F7]** key on the QWERTY keyboard.
2. Select the application that you want to add from the ***Application*** list.
3. Enter a preset name in the ***Preset Name*** field.
4. To show the automatic preset selection when you change the transducer, select the **Automatic Preset selection when changes the transducer** check box.
5. When you have finished, click **OK**.

To overwrite an existing preset,

1. Adjust the image parameter settings as you want, and then press the **[F7]** key on the QWERTY keyboard.
2. Select the application that you want from the ***Application*** list.
3. Select the preset that you want to overwrite from the ***Preset Name*** list.
4. To show the automatic preset selection when you change the transducer, select the **Automatic Preset selection when changes the transducer** check box.
5. When you have finished, click **OK**.
6. Click **Yes** to confirm.

To delete a preset,

1. Press the **[Image Preset]** key on the QWERTY keyboard.
2. Select the preset that you want to delete from the ***Preset Name*** list, and then press the **Delete Preset** soft key.
3. When the ***Delete*** dialog box appears, click **Yes** to confirm.

NOTE

The default presets cannot be deleted.

10

Care and Maintenance

This chapter describes care and mainteance of the system, transducers and biopsies.

System Care and Maintenance 10-2

Battery Care and Maintenance 10-6

Transducer Care and Maintenance 10-7

System Care and Maintenance

It is the responsibility of the user to verify that the ultrasound system is safe for diagnostic operation on a daily basis. Each day, prior to using the system, perform each of the steps in the daily checklist.

All exterior parts of the system, including the control panel, keyboard, and transducers, should be cleaned and/or disinfected as necessary or between uses. Clean each component to remove any surface particles. Disinfect components to kill vegetative organisms and viruses.

The air filter on the ultrasound system must be cleaned regularly to maintain proper system cooling. Remove and check the air filter weekly, and clean as needed.

CAUTION

- The system does not contain any operator serviceable internal components. Ensure that unauthorized personnel do not tamper with the unit.
- When defects or malfunctions occur, do not operate the system until the problems are resolved. Contact your local service representative.

Expected Service Life Description

The expected service life for the E-CUBE 8 system and transducers is identified in this table:

Equipment / Accessory	Expected Service Life
E-CUBE 8 system	The expected service life for the E-CUBE 8 system is at least seven (7) years from the manufacturing date under the provision of regular maintenance by authorized service personnel.
E-CUBE 8 transducers	The expected service life for the E-CUBE 8 transducers meets or exceeds five (5) years from the date the transducer is placed in service, under the provision that the customer follows the care instructions provided on the E-CUBE 8 User Manual.

Daily checklist

Perform the following each day before using the ultrasound system:

- Visually inspect all transducers. Do not use a transducer which has a cracked, punctured, or discolored casing or frayed cable.
- Visually inspect all power cords. Do not turn on the power if a cord is frayed or split, or shows signs of wear. If your system's power cord is frayed or split, or shows signs of wear, contact your ALPINION service representative for power cord replacement.
- Visually inspect that the trackball and other controls on the control panel to make sure that they are clean and free from gel or other contaminants.
- Visually inspect the ECG connector and cables. Do not use the ECG connector and cables if they are damaged.

WARNING

To avoid electrical shock, you must visually inspect the transducer prior to use. Do not use the transducer that has a cracked, punctured, or discolored casing or a frayed cable.

Monthly checklist

To inspect the system, examine the following on a monthly basis.

- Connectors on cables for any mechanical defects
- Entire length of electrical and power cables for cuts or abrasions
- Control panel and keyboard for defects
- Casters for proper locking operation

NOTE

To maintain the safety and functionality of the ultrasound system, maintenance must be performed every 12 months. Electrical safety tests must also be performed at regular intervals as specified by local safety regulations. Refer to the service manual for the electrical leakage test.

WARNING

When the LED lamp needs to be replaced, contact the ALPINION service representative.

CAUTION

To avoid electrical shock hazard, do not remove panels or covers from the console. This service must be performed by qualified service personnel. Failure to do so could cause a serious injury.

Weekly maintenance

The system requires weekly care and maintenance to function safely and properly. Clean the following:

- Monitor
- Control panel
- Footswitch

Failure to perform required maintenance may result in unnecessary service calls.

Cleaning the system

Prior to cleaning any part of the system:

– Turn off the system power. If possible, disconnect the power cord.

Cleaning the surface of the ultrasound system

CAUTION
Do not spray any liquid directly into the unit when cleaning the system.

1. Use a clean gauze pad or lint-free cloth, lightly moistened with a mild detergent, to wipe the surface of the ultrasound system. Take particular care to clean the areas near the trackball and the slide controls. Ensure these areas are free of gel and any other visible residue.
   Ensure that cleaning solution does not seep into the control panel, keyboard, or any other openings.
2. After cleaning, use a clean, lint-free cloth to dry the surface.
3. After cleaning, reconnect the power cord of the system into the power outlet.

Cleaning the liners of the transducer holders

1. Use the tab to remove the liner from the transducer holder.
2. Clean the liner under the running water, using a mild detergent and dry with a lint-free cloth.
3. Reinsert the liner into the transducer holder.

Cleaning the trackball

CAUTION
Do not drop or place foreign objects inside the trackball assembly. This may affect the trackball's operation and damage the system. Avoid other solvents that may damage the mechanical parts of the trackball assembly.

1. Remove the front panel bezel by rotating the bezel counter-clockwise.
2. Remove the trackball and the teflon ring.
3. Clean the trackball and the teflon ring with tissue and isopropyl alcohol.
4. Clean the inside of the trackball assembly with a cotton swab and isopropyl alcohol.
5. Allow the assembly parts to completely dry before the reassembly.
6. Replace the trackball and front panel bezel.

Cleaning the monitor face

Use a soft, folded cloth and a glass cleaner solution. Apply the glass cleaner to the cloth. Gently wipe the monitor face.

Do NOT use a glass cleaner that has a hydrocarbon base (such as Benzene, Methyl Alcohol or Methyl Ethyl Ketone) on monitors with the filter (anti-glare shield). Prolonged use of such cleaners will damage the filter (anti-glare shield). Hard rubbing will also damage the filter.

CAUTION

When cleaning the monitor, make sure not to scratch the monitor.

Removing and cleaning the air filter

The air filter on the ultrasound system must be cleaned regularly to maintain the proper system cooling. Remove and check the air filter weekly, and clean as needed.

CAUTION

Do not scrub, stretch, or bend the filter, or apply heat to the filter, as doing so could damage the filter.

1. Power off and unplug the power cord from the power outlet.
2. Grasp the air filter and pull it out of the system.
3. Rinse the air filter with running water and allow the filter to completely dry. To hasten drying, you may gently shake the filter, or blot the filter with a clean, lint-free cloth.
4. Reinsert the filter into the ultrasound system.
5. Plug the power cord into the power outlet.

Battery Care and Maintenance

The battery is a consumable item. The battery will gradually lose its capacity for charging after repeated use and after time has passed. Alpinion Medical Systems recommends that you replace the battery once in one year or after 500 recharging cycles, whichever comes first.

NOTE

- For the replacement or disposal of the battery, contact an authorized agent or an ALPINION MEDICAL service engineer.
- The warranty period for the battery is six months.

Recharging the battery

Connecting AC power automatically begins charging the battery. To charge the battery faster, please power off the system.

CAUTION

Do not recharge the battery using a non-recommended method, as this may cause an explosion or a fire.

The battery that are not used for several weeks at a time should be recharged at regular intervals. Alpinion Medical Systems recommends that you recharge the battery every 1 or 2 months even without use.

The battery must be charged and discharged within the following temperature ranges:

	Temperature
Charge	0–45 °C
Discharge	-20–60 °C

Storing the battery

The battery must be stored within the following temperature ranges:

	Temperature
Less than 1 month	-20–60 °C
1 – 3 months	-20–45 °C
4 – 12 months	-20–20 °C

Transducer Care and Maintenance

It is the responsibility of the user to verify that the transducer is safe for diagnostic operation. After each use, inspect the transducer's lens, cable, and casing. Look for any damage that would allow liquid to enter the transducer. If any damage is found, do not use the transducer until it has been inspected and repaired/replaced by ALPINION Service Representative.

WARNING



- Always place a sterile, non-pyrogenic transducer sheath on a transducer used in procedures requiring sterility.
- There have been reports of severe allergic reactions to medical devices containing latex (natural robber). Health care professionals are advised to identify latex-sensitive patients and to be prepared to treat allergic reactions promptly.
- During neurosurgical procedures, if a transducer becomes contaminated with tissue or fluids of a patient known to have Creutzfeld-Jacob disease, the transducer should be destroyed, as it cannot be sterilized.
- When using an endocavity transducer with a CF type applied part, the patient leakage currents may be additive. Prior to each use, the leakage current test must be done.
- To avoid electrical shock and damage to the system, disconnect the transducer prior to cleaning or disinfecting.
- The list of disinfectants and cleaning methods are recommended by ALPINION for the compatibility with product materials, not for the biological effectiveness. Refer to disinfectant label instructions for the guidance on disinfection efficacy and appropriate clinical uses.

CAUTION



- Transducers are sensitive instruments – irreparable damage may occur if they are dropped, knocked against other objects, cut, or punctured. Do not attempt to repair to alter any part of a transducer.
- To avoid cable damage, do not roll the system over transducer cables.
- To avoid damage to the transducer, do not use transducer sheaths containing on oil-based coating or petroleum-or mineral oil-based ultrasound coupling agents. Use only a water-based ultrasound coupling agent.
- DO NOT place or store the transducer in the side pocket or the storage area on the system to prevent damaging it from accidently falling off.
- To avoid damage to the transducer, observe the immersion levels indicated for each transducer type. Do not immerse or allow the cable or connector of a transducer to become wet. See "Figure 10-1 Transducer immersion level" on page 10-11 for more detailed information.
- The transducer have been designed and tested to be able to withstand high-level disinfection as recommended by the manufacturer of the disinfectant product. Carefully follow the disinfectant manufacturer’s instructions. Do not immerse for more than one hour.

Transducer handling and infection control

This information is intended to increase user awareness of the risks of disease transmission associated with using this equipment and provide guidance in making decisions directly affecting the safety of the patient as well as the equipment user.

Diagnostic ultrasound systems utilize ultrasound energy that must be coupled to the patient by direct physical contact. Depending on the type of examination, this contact occurs with a variety of tissues ranging from intact skin in a routine exam to recirculating blood in a surgical procedure. The level of risk of infection varies greatly with the type of contact.

One of the most effective ways to prevent transmission between patients is with single use or disposable devices. However, ultrasound transducers are complex and expensive devices that must be reused between patients. It is very important, therefore, to minimize the risk of disease transmission by using barriers and through proper processing between patients.

Cleaning and disinfecting transducers

All transducers must be cleaned and disinfected after each use. Cleaning is an important procedure that must be carried out before disinfecting the transducer. For cleaning and disinfecting the transducer, carefully follow the proper disinfectant and disinfectant method recommended by ALPINION MEDICAL SYSTEMS. Using an inappropriate cleaning or disinfecting agent may damage the transducer.

WARNING

- To avoid electrical shock and damage to the system, disconnect the transducer before cleaning and disinfecting.
- Always use protective eyewear and gloves when cleaning and disinfecting transducers.
- Check the housing, strain relief, lens and seal for damage, and check for any functional problem after cleaning and disinfecting the transducer.

CAUTION

- Do not use a surgical brush when cleaning transducers.
- Do not use a cleaning brush when cleaning the transducer lens. Even the use of soft brushes can damage the transducer lens.
- Do not use paper products or products that are abrasive when cleaning the transducer. They damage the lens of the transducer.
- Be sure to use the proper concentration of enzymatic cleaner and rinse thoroughly.
- Before storing transducers, ensure that they are thoroughly dry.
- The use of 70% isopropyl alcohol (rubbing alcohol) and alcohol-based products on all transducers is restricted. On non-TEE transducers, the only parts that may be cleaned with isopropyl alcohol are the connector housing and the transducer housing and lens. Do not wipe any other part of a transducer with isopropyl alcohol (including cables or strain reliefs), as it can damage those parts of the transducer. This damage is not covered by the transducer warranty.

Cleaning the transducer

Cleaning is an important procedure that is carried out before disinfecting the transducer. The transducer must be cleaned after each use.

1. Disconnect the transducer from the system.
2. Moisten a clean gauze pad with purified water and wipe the transducer to remove any gel or particles remaining on the transducer. If purified water is not effective, then you can use an approved pre-cleaner or low-level disinfectant. Follow the solution manufacturer's instructions for the cleaning of transducers.
3. Carefully wipe the entire transducer, including the cable and connector.
   When cleaning the connector, do not allow any type of fluid to enter through the connector strain relief, electrical contacts or areas surrounding the locking-lever shaft and the strain relief.
4. To remove remaining particulate and cleaning residue, use cleaning wipes according to the manufacturers' instructions, or rinse thoroughly with water up to the immersion point.
   Do not immerse the connector, connector strain relief, or cable that is within 5 cm of the connector strain relief.

   NOTE

   If you place the transducer into the water or cleaning solution, make sure not to immerse the transducer into the liquid beyond the immersion level. See "Transducer Immersion Level" on page 10-11 for more information.
5. If remaining particulate and cleaning residue have dried onto the transducer surface, scrubbing with a soft bristle brush may be necessary.

   NOTE

   Do not use a cleaning brush when cleaning the transducer lens. Even the use of soft brushes can damage the transducer lens.
6. Dry the transducer using a sterile cloth or gauze after rinsing. Do not dry the transducer by heating it.

   NOTE

   To dry the lens, use a soft cloth and a blotting motion instead of a wiping motion.
7. Examine the housing, strain relief, lens and seal for damage, and check for any functional problem. If any damage is found, do not use a transducer and contact your ALPINION MEDICAL service engineer or an authorized agent.

Disinfecting the transducer

WARNING

- If a pre-mixed solution is used, be sure to observe the solution expiration date.
- The type of tissue it will contact during use dictates the level of disinfection required for a device. Ensure that the solution strength and duration of contact are appropriate for disinfection.

CAUTION

- Only wipe the cable, strain relief and parts of the transducer. Do not wipe the connector of the transducer.
- Do not immerse transducers in a solution for longer than one hour, unless under disinfectant manufacturer's instructions.
- Using a non-recommended disinfectant or not following the recommended disinfection method can damage and/or discolor the transducer and will void the transducer warranty.

To low-level disinfect a transducer,

1. Disconnect the transducer from the system.
2. Thoroughly clean, rinse, and dry the transducer.
3. After cleaning, choose a low-level disinfection solution compatible with your transducer.
4. Low-level disinfect the transducer by following the disinfection method recommended by the disinfection solution manufacturer.
5. After disinfecting, examine the housing, strain relief, lens and seal for damage, and check for any functional problem.
   If any damage is found, do not use a transducer and contact your ALPINION MEDICAL service engineer or an authorized agent.

To high-level disinfect a transducer,

1. Disconnect the transducer from the system.
2. Thoroughly clean, rinse, and dry the transducer.
3. After cleaning, choose a high-level disinfection solution compatible with your transducer.
   If a pre-mixed solution is used, be sure to observe the solution expiration date.
4. Disinfect or high-level disinfect the transducer by following the disinfection method recommended by the disinfection solution manufacturer. High-level disinfection is recommended for general transducers and is required for endocavity transducers.

   NOTE

   If you place the transducer into the water or disinfection solution, make sure not to immerse the transducer into the liquid beyond the immersion level. See "Transducer Immersion Level" on page 10-11 for more information.
5. Rinse the transducer with plenty of sterile water to remove all chemical residues on it. Or follow the rinsing method recommended by the disinfectant manufacturer to rinse the transducer.
6. Wipe off the water on the transducer with sterile cloth or gauze after rinsing it. Do not dry the transducer by heating.
7. Examine the housing, strain relief, lens and seal for damage, and check for any functional problem.
   If any damage is found, do not use a transducer and contact your ALPINION MEDICAL service engineer or an authorized agent.

Transducer Immersion Level

CAUTION

- Make sure not to immerse the transducer into any liquid beyond the immersion level specified for that transducer.
- Do not immerse the transducer connector and cable in liquid.

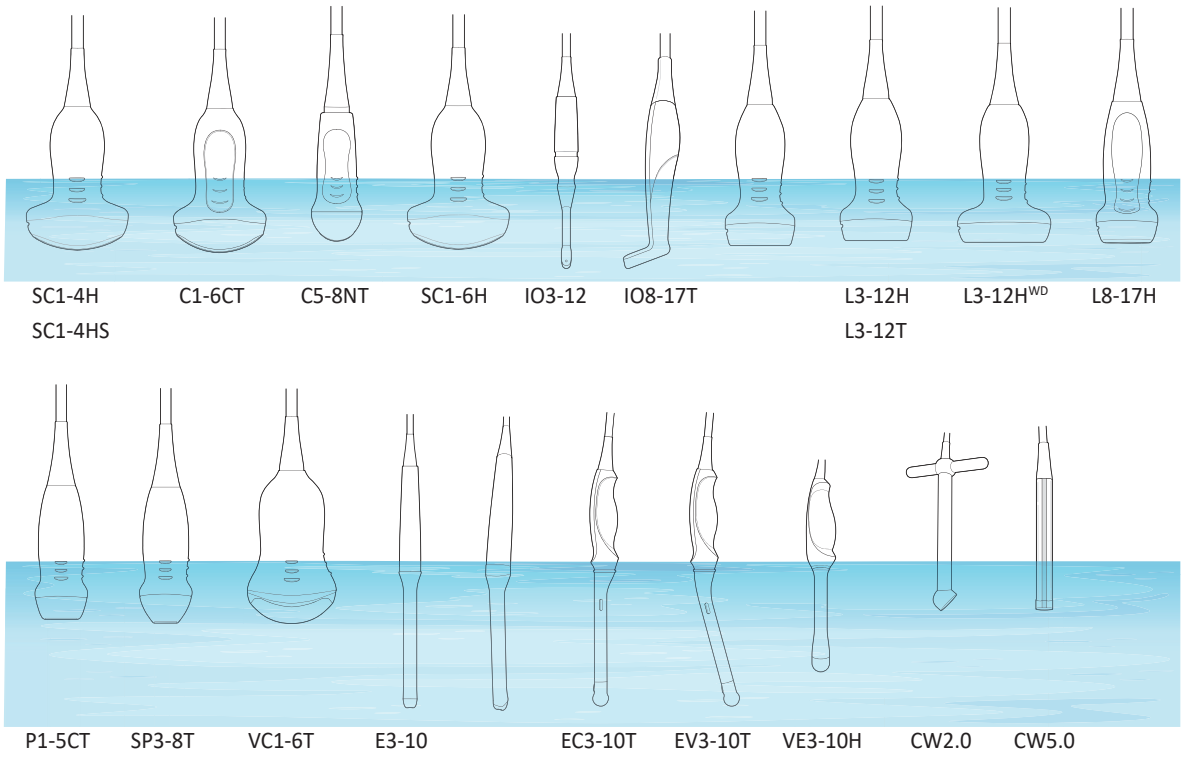


Figure 10-1 Transducer immersion level

List of Compatible Disinfectants and Cleaning Solutions

ALPINION MEDICAL SYSTEMS routinely reviews new cleaning and disinfection solutions for compatibility with the materials used in the transducer housing, cable and lens in order to provide users with options in choosing a cleaning or disinfection solution. Refer to Download Center on website (http://www.alpinion.com/web/support/download.asp) for the latest list of compatible cleaning solutions and disinfectants.

- HLD=High level disinfectant, ILD=Intermediate level disinfectant, LLD=Low level disinfectant
- Y=Yes, N=No
- S=Spray, W=Wipes, L=Liquid, P=Powder, G=Gel, D=Device
- O=Approved, X=Not approved (DO NOT USE), Δ=Untested (DO NOT USE)

Table 10-1 List of Compatible Disinfectants and Cleaning Solutions

	Disinfectant (1)													
	Cidex	Cidex OPA	Gigasept AF	Gigasept FF	Virkon	Cidex Plus	Wavicide-01	AIDAL PLUS	Cetylcide-G	Hibitane	Metricide 14	Sporicidin	Omnicide -FG2	Nuclean
Level	**HLD**	**HLD**	**-**	**HLD**	**HLD**	**HLD**	**HLD**	**HLD**		**-**	**HLD**	**HLD**	**-**	**-**
FDA Approval	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**N**	**Y**	**Y**	**Y**	**N**
TYPE	**L**	**L**	**L**	**L**	**P**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
C1-6CT	Δ	O	Δ	X	Δ	Δ	O	O	Δ	Δ	Δ	O	Δ	Δ
SC1-4HS	Δ	O	Δ	X	O	O	O	O	Δ	Δ	Δ	X	Δ	Δ
SC1-4H	Δ	O	Δ	X	O	O	O	O	Δ	Δ	Δ	X	Δ	Δ
SC1-6H	Δ	O	Δ	X	O	O	O	O	Δ	Δ	Δ	X	Δ	Δ
L3-12T	Δ	O	Δ	X	O	O	O	O	Δ	Δ	Δ	X	Δ	Δ
L3-12H	Δ	O	Δ	X	O	O	O	O	Δ	Δ	Δ	X	Δ	Δ
L3-12H^{WD}	Δ	O	Δ	X	O	O	O	O	Δ	Δ	Δ	X	Δ	Δ
L8-17H	Δ	O	Δ	X	O	O	O	O	Δ	Δ	Δ	X	Δ	Δ
P1-5CT	Δ	O	Δ	X	O	O	O	O	Δ	Δ	Δ	X	Δ	Δ
VC1-6T	Δ	O	Δ	O	O	O	Δ	O	Δ	Δ	Δ	Δ	Δ	Δ
E3-10	Δ	O	Δ	Δ	O	O	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
EV3-10T	Δ	O	Δ	X	O	O	O	O	Δ	Δ	Δ	X	Δ	Δ
EC3-10T	Δ	O	Δ	X	O	O	O	O	Δ	Δ	Δ	X	Δ	Δ
IO3-12	Δ	O	Δ	X	O	O	O	O	Δ	Δ	Δ	X	Δ	Δ
CW2.0	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
CW5.0	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
VE3-10H	Δ	O	Δ	O	O	O	Δ	O	Δ	Δ	Δ	Δ	Δ	Δ
C5-8NT	Δ	O	Δ	X	O	O	O	O	Δ	Δ	Δ	X	Δ	Δ
SP3-8T	Δ	O	Δ	O	O	O	O	Δ	Δ	Δ	Δ	Δ	Δ	Δ
IO8-17T	Δ	O	Δ	X	O	O	O	O	Δ	Δ	Δ	X	Δ	Δ

	Disinfectant (2)													
	Ster-Bac Blu	Sani-Cloth HB	PeraSafe	Super Sani-Cloth	Cleanisept wipes	CLEANISEPT® WIPES forte	Protex	Tristel Duo	SteriMax® Sporicide Wipes	SteriMax® Wipes	SteriMax Sporicide	UltraSan Broad Spectrum	CaviCide	CaviWipes
Level	-	LLD	HLD	-	LLD	LLD	LLD	HLD	-	-	-	-	-	L/ILD
FDA Approval	N	N	N	N	N	N	Y	Y	N	N	N	N	Y	Y
TYPE	L	W	L	W	W	W	S	S	W	W	S	S	S	W
C1-6CT	Δ	Δ	Δ	Δ	Δ	O	Δ	O	O	O	Δ	Δ	O	O
SC1-4HS	Δ	Δ	Δ	O	O	O	O	O	O	X	X	X	X	O
SC1-4H	Δ	Δ	Δ	O	O	O	O	O	O	X	X	X	X	O
SC1-6H	Δ	Δ	Δ	O	O	O	O	O	O	X	X	X	X	O
L3-12T	Δ	Δ	Δ	O	O	O	O	O	O	X	X	X	X	O
L3-12H	Δ	Δ	Δ	O	O	O	O	O	O	X	X	X	X	O
L3-12H^{WD}	Δ	Δ	Δ	O	O	O	O	O	O	X	X	X	X	O
L8-17H	Δ	Δ	Δ	O	O	O	O	O	O	X	X	X	X	O
P1-5CT	Δ	Δ	Δ	O	O	O	O	O	O	X	X	X	X	O
VC1-6T	Δ	Δ	Δ	O	O	O	Δ	O	Δ	Δ	Δ	Δ	Δ	Δ
E3-10	Δ	Δ	Δ	O	O	O	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
EV3-10T	Δ	Δ	Δ	O	O	O	O	O	O	X	X	X	X	O
EC3-10T	Δ	Δ	Δ	O	O	O	O	O	O	X	X	X	X	O
IO3-12	Δ	Δ	Δ	O	O	O	O	O	O	X	X	X	X	O
CW2.0	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
CW5.0	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
VE3-10H	Δ	Δ	Δ	O	O	O	Δ	O	Δ	Δ	Δ	Δ	Δ	Δ
C5-8NT	Δ	Δ	Δ	O	O	O	O	O	O	X	X	X	X	O
SP3-8T	Δ	O	Δ	O	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
IO8-17T	Δ	Δ	Δ	O	O	O	O	O	O	X	X	X	X	O

	Disinfectant (3)													
	Metricide OPA Plus	Metricide	Meliseptol Wipes sensitive	Meliseptol Wipes ultra	Revital-OX Resert	Meliseptol Foam pure	Sporox II	Protex wipes	Sani-cloth AF3	Acrylan	Descogen Liquid	Cutasept F	Cutasept G	Mikrobac Virucidal Tissues
Level	**HLD**	**HLD**	**-**	**-**	**HLD**	**-**	**HLD**	**-**	**L/ILD**	**-**	**-**	**-**	**-**	**-**
FDA Approval	**Y**	**Y**	**N**	**N**	**Y**	**N**	**Y**	**Y**	**Y**	**N**	**N**	**N**	**N**	**N**
TYPE	**L**	**L**	**W**	**W**	**L**	**L**	**L**	**W**	**W**	**L**	**L**	**L**	**L**	**W**
C1-6CT	Δ	Δ	Δ	Δ	O	O	X	Δ	Δ	Δ	Δ	X	X	O
SC1-4HS	O	O	X	O	O	O	O	O	O	X	O	X	X	O
SC1-4H	O	O	X	O	O	O	O	O	O	X	O	X	X	O
SC1-6H	O	O	X	O	O	O	O	O	O	X	O	X	X	O
L3-12T	O	O	X	O	O	O	O	O	O	X	O	X	X	O
L3-12H	O	O	X	O	O	O	O	O	O	X	O	X	X	O
L3-12H^{WD}	O	O	X	O	O	O	O	O	O	X	O	X	X	O
L8-17H	O	O	X	O	O	O	O	O	O	X	O	X	X	O
P1-5CT	O	O	X	O	O	O	O	O	O	X	O	X	X	O
VC1-6T	O	Δ	O	O	O	O	O	O	O	O	O	O	Δ	O
E3-10	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
EV3-10T	O	O	X	O	O	O	O	O	O	X	O	X	X	O
EC3-10T	O	O	X	O	O	O	O	O	O	X	O	X	X	O
IO3-12	O	O	X	O	O	O	O	O	O	X	O	X	X	O
CW2.0	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	O	Δ	Δ	Δ	Δ	Δ
CW5.0	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	O	Δ	Δ	Δ	Δ	Δ
VE3-10H	O	Δ	O	O	O	O	O	O	O	O	O	O	Δ	O
C5-8NT	O	O	X	O	O	O	O	O	O	X	O	X	X	O
SP3-8T	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
IO8-17T	O	O	X	O	O	O	O	O	O	X	O	X	X	O

	Pre-Cleaner											
	T-spray	T-spray II	Enzol	Theracide Plus(S5N)	Transeptic	Metrizyme	Klenzyme	McKesson	Cidezyme	Endozyme	EmPower	Ultrasound probe cleaning wipes
Level	-	-	-	-	-	-	-	-	-	-	-	-
FDA Approval	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N
TYPE	S	S	L	L	L	L	L	L	L	L	L	W
C1-6CT	Δ	Δ	Δ	Δ	Δ	O	Δ	Δ	Δ	Δ	O	Δ
SC1-4HS	Δ	Δ	O	Δ	Δ	O	Δ	Δ	Δ	Δ	O	O
SC1-4H	Δ	Δ	O	Δ	Δ	O	Δ	Δ	Δ	Δ	O	O
SC1-6H	Δ	Δ	O	Δ	Δ	O	Δ	Δ	Δ	Δ	O	O
L3-12T	Δ	Δ	O	Δ	Δ	O	Δ	Δ	Δ	Δ	O	O
L3-12H	Δ	Δ	O	Δ	Δ	O	Δ	Δ	Δ	Δ	O	O
L3-12H^{WD}	Δ	Δ	O	Δ	Δ	O	Δ	Δ	Δ	Δ	O	O
L8-17H	Δ	Δ	O	Δ	Δ	O	Δ	Δ	Δ	Δ	O	O
P1-5CT	Δ	Δ	O	Δ	Δ	O	Δ	Δ	Δ	Δ	O	O
VC1-6T	Δ	O	O	O	O	O	Δ	Δ	Δ	O	O	O
E3-10	O	Δ	Δ	Δ	O	Δ	Δ	Δ	Δ	Δ	Δ	Δ
EV3-10T	Δ	Δ	O	Δ	Δ	O	Δ	Δ	Δ	Δ	O	O
EC3-10T	Δ	Δ	O	Δ	Δ	O	Δ	Δ	Δ	Δ	O	O
IO3-12	Δ	Δ	O	Δ	Δ	O	Δ	Δ	Δ	Δ	O	O
CW2.0	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
CW5.0	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
VE3-10H	Δ	O	O	O	O	O	Δ	Δ	Δ	O	O	O
C5-8NT	Δ	Δ	O	Δ	Δ	O	Δ	Δ	Δ	Δ	O	O
SP3-8T	Δ	Δ	O	Δ	Δ	O	O	Δ	Δ	Δ	Δ	Δ
IO8-17T	Δ	Δ	O	Δ	Δ	O	Δ	Δ	Δ	Δ	O	O

	Solution		
	Trophon® EPR	Antigermix	V-PRO
Level	-	-	-
FDA Approval	-	-	-
TYPE	**D**	**D**	**D**
C1-6CT	Δ	Δ	O
SC1-4HS	O	O	O
SC1-4H	O	O	O
SC1-6H	O	O	O
L3-12T	O	O	O
L3-12H	O	O	O
L3-12H^{WD}	O	O	O
L8-17H	O	O	O
P1-5CT	O	O	O
VC1-6T	O	X	Δ
E3-10	Δ	Δ	Δ
EV3-10T	X	O	O
EC3-10T	O	O	O
IO3-12	O	O	O
CW2.0	Δ	Δ	Δ
CW5.0	Δ	Δ	Δ
VE3-10H	O	X	Δ
C5-8NT	O	O	O
SP3-8T	Δ	Δ	Δ
IO8-17T	O	O	O

NOTE

Slight discoloration of parts of the transducer such as housing and cable can occur when disinfecting the transducer with Antigermix or V-PRO. This has no influence on the performance of the transducer.

Cable handling

Take the following precautions with transducer cables:

- Keep free from wheels
- Do not bend the cable acutely
- Avoid crossing cables between transducers

Planned maintenance

The following maintenance schedule is suggested for the transducer to ensure the optimum operation and safety.

- Daily: Inspect transducers
- After each use: Clean transducers
- After each use: Disinfect transducers

11

Safety and Regulatory Information

This chapter describes the safety and regulatory information relevant for operating this ultrasound system.

Safety Summary 11-2

Equipment Safety Information 11-3

Patient Safety Information 11-4

Anti-Virus Program 11-5

Electrical Safety Information 11-6

Transducer Safety Information 11-7

Biopsy Safety Information 11-9

System Symbols and Labels 11-10

Regulatory Information 11-14

Electromagnetic Compatibility (EMC) 11-17

Diagnostic Ultrasound Indications for Use Format 11-22

Acoustic Output 11-43

Safety Summary

You should make sure the following safety precautions during all phases of operation, service, and repair of the E-CUBE 8 ultrasound system. If you fail to comply with these safety precautions or specific warnings in this manual, you violate safety standards in terms of design, manufacture, and intended use of this system. ALPINION MEDICAL SYSTEMS Co., LTD. does not have liability for your failure to comply with these requirements.

Safety notice

WARNING



A WARNING notice indicates a hazard. You need to observe an operating procedure, practice, or conducts like that. If you do not correctly perform this notice, it could result in personal injury or death.

CAUTION



A CAUTION notice indicates a hazard. You need to observe an operating procedure, practice, or conducts like that. If you do not correctly perform this notice, it could result in damage to the system or loss of important data.

Service document

The service manual supplies block diagrams, lists of spare parts, descriptions, adjustment instructions or similar information to help adequately qualified technical personnel in repairing those parts defined as repairable by the manufacturer.

Equipment Safety Information

WARNING



- Installing the system yourself may cause damage to the system or electrical shock. To avoid damage to the system and avoid electrical shock, only qualified ALPINION service engineer must install the system.
- Do not remove the covers of a system yourself to avoid damage to the system and unexpected electrical shock. Only qualified ALPINION service engineer must repair or replace components.
- Do not modify this system such as system components, or software. When you modify the system, it may cause safety hazards. Only qualified ALPINION service engineer must modify the system.
- When you observe that the system causes any malfunction, you must stop operating the system and take proper action for patients. After that, contact ALPINION service engineer.
- The system voltage may cause serious injury or damage to the system.
- You must make sure grounded integrity of the power outlet and system regularly.
- To avoid risk of electric shock, you must connect the system to the supply mains with the protective earth.
- For patient safety, you must locate the system to easily unplug the power cord from the power outlet when a malfunction or an error occurs.
- Always make sure that you do not use the system in an explosive atmosphere.
- Before cleaning up and disinfecting the system, always make sure you turn off the system power and unplug the power cord from the power outlet.
- Do not allow water or liquids on or above the system. Dripping water or liquids into the system may cause electrical shock and damage to the system.
- You must follow safety precautions and avoid any situation that causes injury or damage.
- Always use the system properly to avoid serious injury. Before using the system, you must make sure the instructions and hazards involving ultrasound system. ALPINION provides training assistance, if needed.
- The use of the equipment outside the described conditions or intended use, and disregarding safety related information is considered abnormal use. The manufacturer is not liable for injury or damage caused by abnormal use. Any abnormal use will void the warranty of the equipment.
- Always use peripherals and accessories approved by ALPINION. You must securely connect peripherals and accessories to the system.
- Always use transducers approved or recommended by ALPINION.
- Always use approved ECG cables and recommended electrodes by ALPINION.
- Your ultrasound system is not intended for diagnosing and monitoring ECG. Do not use the system for cardiac operation.

Patient Safety Information

WARNING



- When you enter patient data, always make sure that you enter correct identification with the patient data.
- Do not use the system until you become familiar with the system operation.
- To avoid the transducer from overheating, you must freeze the system when imaging is not performed.

CAUTION



- Do not allow the system to transmit acoustic output when the transducer is not in use. Otherwise, it could result in overheating of the transducer.
- When not using the system, you should freeze the image or turn off the acoustic output.
- Do not use the system with defibrillator. The system does not include a defibrillation-proof applied part for ECG.
- Do not allow the germicide to contact your patient. Contact to the patient's skin or mucous membrane may cause an inflammation.

Anti-Virus Program

ALPINION MEDICAL SYSTEMS Co., LTD provides customers with the proactive measures to help secure the E-CUBE 8 ultraosund system. Below are some proactive measures that we have performed and implemented to help secure the product.

- Only the communication ports that are reqired for the E-CUBE 8 ultrasound system to operate are enabled. All other operating system communication ports are disabled. Typically, only one port is used for DICOM connectivity.
- To minimize the cause of security vulnerabilities, all operating system services that are not used by the system application software are disabled.
- The "auto run" feature is disabled on the system. For example, when a DVD or USB memory stick that contains a program that runs automatically is connected,the system will not open or run the program.

ALPINION MEDICAL SYSTEMS Co., LTD do not use Anti-Virus software for several reasons. The main reasons for not doing so:

- All virus scanners are constantly active in the background. Because of the software-intensive operating system of the ultrasound scanner, all computing resources are required for normal operation of this device. The activity of Anti-Virus software would degrade the system performance.
- The operating software of a medical ultrasound system belongs to an FDA-cleared medical device that requires a specific release process. Any update of the Anti-Virus software would mean a change of the system software. These changes require a comprehensive release and validation process to help ensure that the Anti-Virus update does not affect the system software performance and reliability.

For all the users, it is strongly recommended to follow several instructions to minimize the risk of virus and/or malware infections.

- Before using USB-connected devices or drives (USB HDD, USB flash drive, or Network storage), clean them first by executing a virus scan.
- It is recommended to block SMB ports (139.445) at Firewall level in order to prevent WannaCry ransomware attacks.

Electrical Safety Information

WARNING



- Do not clean or disinfect a system before turning off and unplug the system from the power outlet. Otherwise, it could result in electrical shock and damage to the system.
- Do not place water or liquids on the system. Dripping water or liquids into the system may cause electrical shock and damage to the system.
- Do not remove the panels or covers of a system to prevent system damage and electrical shock.
- Do not use extension cords, adaptors or converters, which are a three-prong to two-prong type, to connect with a power plug.
- The system voltage may cause serious injury or damage to the system. When you observe that the system causes any malfunction, you must stop operating the system and take proper action for patients. After that, contact ALPINION service engineer.
- Do not modify the AC power connector plug of the system to prevent electrical shock.
- You should use the ultrasound system after few hours when the system is in a humidity place.
- Do not connect, disconnect, or replace any part of the system during the scanning of a patient at the same time.
- Do not replace the fuse or power cord by yourself. An ALPINION MEDICAL service engineer or an authorized agent must perform the replacement. Replacing the fuse or power cord by yourself will avoid your warranty.
- Using spray cleaners on the system drips cleaning fluid into the system. It damages components in the system.
- Do not use aerosol spray cleaners on the monitor to prevent electrical shock and damage to the system.
- While using the ECG function, keep ECG cables or patients away from any other electrical conductor to prevent electrical shock.
- Different voltage power between your system and other devices may cause electrical shock. According to the IEC requirements (Refer to IEC 60601-1-1 and clause 16 of the 3 Ed. of IEC 60601-1, respectively), you must use the equipotential cable (equipotential bonding) to connect additional devices to your system. Contact your ALPINION MEDICAL service engineer.

Transducer Safety Information

Damaged transducers or improper use and manipulation of the transducer may result in injury or increase the risk of infection.

Never use excessive force when manipulating intracavity transducers. Become familiar with all instructions and precautions provided with the special purpose transducers.

The use of damaged transducers can result in injury or increase the risk of infection. Inspect transducer often for sharp, pointed, or rough surface damage that could cause injury or tear protective barriers.

WARNING



- Do not use damaged or defective transducer to prevent system damage and serious patient injury.
- Make sure you do not bend or pull the transducer cable to prevent the damage to the transducer.
- Use only approved coupling gels. Using unapproved gels may damage the transducer and void the warranty.
- To reduce the risk of leakage currents and electrosurgical interference, use only isolated output electrosurgical units with an endocavity transducer and disconnect the transducer when it is not in use.
- When an endocavity transducer causes malfunctions, contact ALPINION Service Representative to prevent any safety hazard from the transducer.

CAUTION



- Do not drop the transducer. Always keep the transducer secure when you do not use it.
- Using damaged or defective transducer causes unexpected electric shock. Make sure to use and take care of the transducer accordingly.
- Do not allow the system to transmit acoustic output when the transducer is not in use. Otherwise, it could result in overheating of the transducer.
- When not using the system, you should freeze the image or turn off acoustic output.
- To avoid serious patient injury, always inspect the transducer that you use has sharp edges and rough surfaces. Especially for an endocavity transducer, inspect it exhaustively prior to each use.
- Proper cleaning and disinfecting the transducer prevent disease transmission. You must follow infection control procedures.
- Always use sterile, legally marketed transducer sheaths for endocavity exams.
- Make sure that you do not use an expired transducer sheath.
- Using pre-lubricated condoms as a sheath might damage the transducer.
- Do not allow your eyes (or patient's eyes) to contact the coupling gel. If there is gel contact to the eyes, flush thoroughly with clean water.
- When the surface temperature of your endocavity transducer reaches a safe level 41 °C, manually freeze the system and stop imaging if the system does not respond automatically.

IPX8 immersion levels

CAUTION

To avoid damage to the transducer, observe the immersion levels indicated for each transducer type.

Transducers meet Ingress Protection IPX8 of EN 60529 and IEC 60529 to the depth of the immersion line shown in the illustration only for transducers with the “IPX8” symbol on the connector of the transducer.

NOTE

Test Standard of IPX8:
Immersion for 90 minutes at a depth of 1 meter.

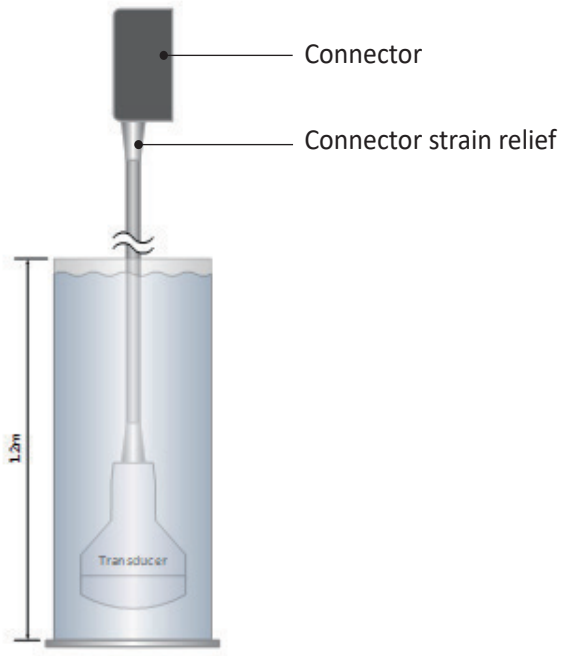


Figure 11-1 IPX8 immersion level

Biopsy Safety Information

Precautions concerning the use of biopsy procedure

WARNING



- Do not freeze the image during a biopsy procedure. The image must be live to avoid a positioning error. Biopsy guidezones are intended to assist the user in determining optimal transducer placement and approximate the needle path. However, actual needle movement is likely to deviate from the guideline. Always monitor the relative positions of the biopsy needle and the subject mass during the procedure.
- Biopsy procedures should not be used for In vitro fertilization (IVF), Chronic villus sampling (CVS), and Percutaneous umbilical blood sampling (PUBS).

CAUTION

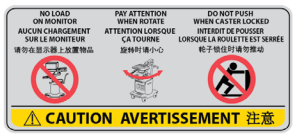


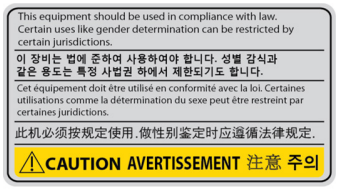
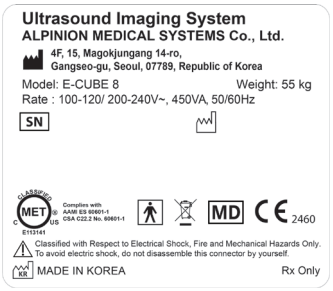
- The use of biopsy devices and accessories that have not been evaluated for use with this equipment may not be compatible and could result in injury.
- The invasive nature of biopsy procedures requires proper preparation and technique to control infection and disease transmission. Equipment must be cleaned as appropriate for the procedure prior to use.
  - Follow the transducer cleaning and disinfection procedures and precautions to properly prepare the transducer.
  - Follow the manufacturer's instructions for the cleaning of biopsy devices and accessories.
  - Use protective barriers such as gloves and transducer sheaths.
  - After use, follow proper procedures for decontamination, cleaning, and waste disposal.
- Improper cleaning methods and the use of certain cleaning and disinfecting agents may cause damage to the plastic components that will degrade imaging performance or increase the risk of electric shock. For details, see "Transducer Safety Information" on page 1-7.
- A biopsy must only be performed by physicians with adequate experiences under all circumstances the necessary safety precautions and sterility measures have to be respected.

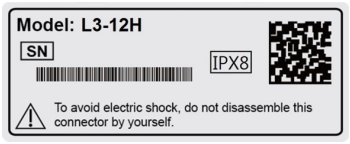
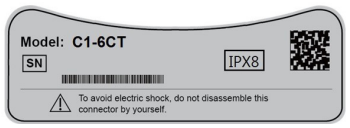
System Symbols and Labels

The following is a list of system symbols and labels for safety. They indicate that you must refer to the manual for specific information to avoid personal injury or damage to the product.

Safety symbols/ Labels	Location	Explanation
	On the power button of the control panel	System on/off/stand-by
	On the system rating label for overseas, transducer label, and ECG port	Patient applied part meets the isolation requirements for type BF equipment
	On the ECG port	ECG triggered display
	On the transducer label	This symbol indicates that the transducer meets immersion requirements. Depending on the transducer model, the immersion label may differ.
	On the multi-caution label, rating label for overseas, transducer label, and gel warmer label	This symbol indicates that when the end-user wishes to discard this product, it must be sent to separate collection facilities for recovery and recycling. By separating this product from other household-type waste, the volume of waste sent to incinerators or land-fills will be reduced and natural resources will thus be conserved. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of your equipment.
	On the multi-caution label, rating label for overseas, and system packing box	This system complies with regulatory requirements of Medical Device Regulation 2017/745 regarding medical device.
	On the multi-caution label, gel warmer label, and I/O panel	Consult instructions for use (or consult operating instructions)
	Various locations on labels	Attention (Caution) – consult accompanying documents if complete information cannot be provided on the label
	On the rating label for overseas: Adjacent to the AC power and the AC power outlet	Alternating current in accordance with IEC 60878-01-14
	Adjacent to the AC power outlet	Push-push button

Safety symbols/ Labels	Location	Explanation
	Adjacent to the AC power	Equipotentiality
	Adjacent to the DVD-RW	Universal Serial Bus
	On the system rating label for overseas and transducer label	Date of manufacture See ISO 8601 for date format
	On the system rating label for overseas and transducer label	Symbol for manufacturer This symbol shall be accompanied by the name and the address of the manufacturer.
	On the system rating label for overseas and transducer label	Serial Number
	On the multi-caution label	To ensure safety of user, moving and delivering system shall be performed by at least 2 persons.
	On the LCD caution label and multi-caution label	Do not forcibly push the monitor or the system when the casters are locked.
	On the LCD caution label	Do not press or place loads on the monitor when folded. Otherwise, monitor and (or) professional arm could be damaged.
	On the multi-caution label	Do not use mobile transmitter such as mobile phone, radio receiver, broadband power line, etc.
	On the LCD caution label	Be very careful not to injure yourself or damage the system when rotating the monitor arm.
	Rear of the LCD monitor	Caution label
	Top of the monitor arm	Care against pinch shall be taken. (In accordance with IEC 60878)

Safety symbols/ Labels	Location	Explanation
	Rear of the system body	Multi-caution label
	Right cover of the system body	No gender detection label
	Top (or side panel) of the system body	Safety working load label
	Bottom of the control panel	System rating label for overseas
- 제조업허가번호 : 제 3325 호 - 제조품목인증번호: 제인 17-4495 호 - 품목명 : 범용초음파영상진단장치 (A26380.01, 2등급) - 모델명 : E-CUBE 8 - 정 격 : 220V / 60Hz - 출 력 : 450 VA - 전기충격에 대한 보호의 형식 및 정도 : 1급기기, BF형기기 - 중 량 : 55 Kg - 제조번호 : - 제조일 : - 제조원 : 알피니언 메디칼 시스템(주) - 주 소 : 서울특별시 강서구 마곡중앙14로 15, 4층 - 사용목적 : 환자의 관심부위에 초음파 에너지를 전송하여 인체의 매질에서 반사되어 돌아오는 신호를 수신하여 영상으로 보여주는 기기. - 본 제품은 "의료기기" 임.	Bottom of the control panel	System rating label for domestics
	On the cable port of the gel warmer	Gel warmer voltage label
	Rear of the gel warmer	Gel warmer label
	Transducer	Name of transducer manufacturer, WEEE symbol, indicating separate collection, Certification mark

Safety symbols/ Labels	Location	Explanation
	Transducer	Transducer name, Serial, IPX Rating, Caution mark
	Transducer	Name of transducer manufacturer, WEEE symbol, indicating separate collection, Certification mark
	Transducer	Transducer name, Serial, IPX Rating, Caution mark

Regulatory Information

The E-CUBE 8 ultrasound system conforms to the following classifications, in accordance with the IEC/EN 60601-1:6.8.1:

Classifications:

- Type of protection against electrical shock: Class I
- Degree of protection against electrical shock (Patient connection): Type BF equipment
- Degree of protection against harmful ingress of water: Ordinary equipment and all of applied parts (IPX7, IPX8) except ECG meet ingress protection level according to IEC 60529.
- Degree of safety of application in the presence of a flammable anesthetic material 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.
- Mode of operation: Continuous operation

The E-CUBE 8 ultrasound system conforms to the following standards:

- MDR 2017/745
- EN ISO 10993-1:2009 (ISO 10993-1:2009)
- EN ISO 10993-10:2013 (ISO 10993-10:2010)
- EN ISO 10993-5:2009 (ISO 10993-5:2009)
- EN ISO 13485:2016 (ISO 13485:2016)
- EN ISO 14971:2019 (ISO 14971:2019)
- EN ISO 15223-1:2021 (ISO 15223-1:2021)
- EN 1041:2008+A1:2013
- EN 55011:2016+A1:2017 (CISPR 11:2015/AMD1:2016)
- EN 55032:2015 (CISPR 32:2015)
- EN 60601-1:2006+A2:2014 (IEC 60601-1:2005/AMD1:2012/COR1:2014)
- EN 60601-1-2:2015 (IEC 60601-1-2:2014)
- EN 60601-1-6:2010+A1:2015 (IEC 60601-1-6:2010/AMD1:2013)
- EN 60601-2-37:2008+A11:2011+A1:2015 (IEC 60601-2-37:2007/AMD1:2015)
- EN 61000-3-2:2014 (IEC 61000-3-2:2018)
- EN 61000-3-3:2013 (IEC 61000-3-3:2013)
- EN 61000-4-11:2004 (IEC 61000-4-11:2004)
- EN 61000-4-2:2009 (IEC 61000-4-2:2008)
- EN 61000-4-3:2006+A1:2008+A2:2010 (IEC 61000-4-3:2006/AMD2:2010)
- EN 61000-4-4:2012 (IEC 61000-4-4:2012)
- EN 61000-4-5:2014 (IEC 61000-4-5:2014)
- EN 61000-4-6:2014 (IEC 61000-4-6:2013)
- EN 61000-4-8:2010 (IEC 61000-4-8:2009)
- EN 62304:2006+A1:2015 (IEC 62304:2006/AMD1:2015)
- EN 62366-1:2015 (IEC 62366-1:2015)

- MEDDEV 2.12/2 Rev.2
- MEDDEV 2.7.1 Rev.4
- NEMA UD2:2004 (R2009)
- Medical Devices Regulations (SOR/98-282)
- 의료기기법, 의료기기법 시행령, 의료기기법 시행규칙

Manufacturer:



Name: Alpinion Medical Systems Co., LTD.
Address: 4F, 15, Magokjungang 14-ro,
Gangseo-gu, Seoul, 07789, Republic of Korea
+82 (2) 3777 8500

Authorized EU Representative:



Name: Alpinion Medical Deutschland GmbH
Address: Alpinion Medical Deutschland GmbH Lilienthalstrasse 17a
85399 Hallbergmoos Germany
Phone: +49 (0) 811 99 82 86 0

Authorized US Representative:

Name: Alpinion USA (Kevin Chun)
Address: 21222 30th Dr SE Ste C-122 Bothell, WA 98021, United States
Phone: +1 425 949 1059

Electromagnetic Compatibility (EMC)

This equipment generates, uses, and can radiate radio frequency energy. The equipment may cause radio frequency interference to other medical and non-medical devices and radio communications. To provide reasonable protection against such interference, this product complies with emissions limits for a Group 1, Class Medical Devices Regulation as stated in EN 60601-1-2.

Electrical medical equipment requires special precautions regarding EMC and must be installed and implemented according to the EMC information provided in the user manual.

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

Radiated or conducted electromagnetic signals can cause distortion, degradation, or artifacts in the ultrasound image which may impair the ultrasound unit's essential performance.

There is no guarantee that interference will not occur in a particular installation. If this equipment is found to cause interference (which may be determined by turning the equipment on and off), the user (or qualified service personnel) should attempt to correct the problem by one or more of the following measure(s):

- Reorient or relocate the affected device(s).
- Increase the separation between the equipment and the affected device.
- Power the equipment from a source different from that of the affected device.
- Consult the point of purchase or service representative for further suggestions.

Use of accessories, transducers and cables other than those specified may result in increased emission or decreased immunity of the equipment.

The manufacturer is not responsible for any interference caused by using other than recommended interconnect cables or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the users' authority to operate the equipment.

Devices which intrinsically transmit radio waves, such as cellular phones, radio transceivers, mobile radio transmitters, radio-controlled toys, etc., should preferably not be operated near the equipment. Keep the power to these type devices turned off when near the equipment.



NOTE

Use of devices that transmit radio waves near the equipment could cause it to malfunction. See "Minimum distances" on page 1-21 for information about the recommended minimum separation distances between portable and mobile RF communications equipment and the ultrasound unit.

The system or its components should not be used adjacent to or stacked with other equipment. If adjacent or stacked use is necessary, the system or its components should be observed to verify normal operation in the configuration in which it will be used.

The medical staff in charge of this equipment is required to instruct technicians, patients, and other people who maybe around this equipment to fully comply with the above requirement.

Electromagnetic emissions

This system is suitable for use in the following environment. The user must assure that it is used only in the electromagnetic environment as specified.

Guidance and manufacturer's declaration–electromagnetic emissions		
Emissions test	**Compliance**	**Electromagnetic environment - guidance**
RF emissions CISPR 11	Group 1	The E-CUBE 8 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 E-CUBE 8 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. WARNING: This system is intended for use by healthcare professionals only. This system may cause radio interference or may disrupt the operation of nearby equipment. It may be necessary to take mitigation measures, such as re-orienting or relocating the system or shielding the location.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations / flicker emissions IEC 61000-3-3	Complies	

Electromagnetic immunity

This system is suitable for use in the following environment. The user must assure that the system is used according to the specified guidance and only in the electromagnetic environment listed.

Guidance and manufacturer's declaration-electromagnetic immunity

Immunity test	IEC 60601 Test level	Compliance level	Electromagnetic environment -guidance
Electrostatic discharge (ESD) IEC 61000-4-2	±8 kV Contact ±2,4,8,15 kV air	±8 kV Contact ±2,4,8,15 kV 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	±0.5,1 kV line(s) to line(s) ±0.5,1,2 kV line(s) to earth	±0.5,1 kV line(s) to line(s) ±0.5,1,2 kV line(s) to earth	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	< 0 % U_T (> 95 % dip in U_T) for 0.5 cycle 0 % U_T (60 % dip in U_T) for 1 cycle 70 % U_T (30 % dip in U_T) for 25 cycle, 30 cycle <0 % U_T (> 95 % dip in U_T) for 250 cycle, 300 cycle	< 0 % U_T (> 95 % dip in U_T) for 0.5 cycle 0 % U_T (60 % dip in U_T) for 1 cycle 70 % U_T (30 % dip in U_T) for 25 cycle, 30 cycle <0 % U_T (> 95 % dip in U_T) for 250 cycle, 300 cycle	Mains power quality should be that of a typical commercial or hospital environment. If the user of the E-CUBE 8 image intensifier requires continued operation during power mains interruptions, it is recommended that the E-CUBE 8 image intensifier be powered from an uninterruptible power supply.
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.

Guidance and manufacturer's declaration-electromagnetic immunity			
Immunity test	**IEC 60601 test level**	**Compliance level**	**Electromagnetic environment -guidance [c]**
level	Electromagnetic environment - guidance	3 Vrms 3 V/m	Portable mobile RF communications equipment should be used no closer to any part of the E-CUBE 8, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. **Recommended separation distance** $d = 1{,}2\sqrt{P}$ $d = 1{,}2\sqrt{P}$ 80 MHz to 800 MHz $d = 2{,}3\sqrt{P}$ 800 MHz to 2.5 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, [a] should be less than the compliance level in each frequency range. [b] Interference may occur in the vicinity of equipment marked with the following symbol : 

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] 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 EUT is used exceeds the applicable RF compliance level above, the EUT should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the E-CUBE 8.

[b] Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.

[c] See examples of calculated separation distances in next table.

Minimum distances

The E-CUBE 8 is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the E-CUBE 8 can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the E-CUBE 8 as recommended below, according to the maximum output power of the communications equipment.

CAUTION

Portable and mobile RF communications equipment (e.g. peripherals such as antenna cables and external antennas, two-way radio, cellular phones, wireless computer networks) should be used no closer than 30 cm (12 inches) to any part of this system including cables provided by or designated by ALPINION MEDICAL SYSTEMS.

Recommended separation distances between portable and mobile RF communications equipment and the ultrasound unit

Rated maximum output power of transmitter [W]	Separation distance according to frequency of transmitter [m]		
	150 kHz to 80 MHz $d = 1{,}2\sqrt{P}$	80 MHz to 800 MHz $d = 1{,}2\sqrt{P}$	800 MHz to 2.5 GHz $d = 2{,}3\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in metres (m) can be estimated using the equation applicable to the frequency of the transmitter, where p is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.
NOTE 1) At 80 MHz and 800 MHz, the separation distance for 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.

Immunity and compliance level for system

Immunity test	Frequency of Interest [MHz]	Actual Immunity Level	Compliance Level
Conducted RF IEC 61000-4-6	0.15 MHz to 80 MHz	3 Vrms	0.3 Vrms
Radiated RF IEC 61000-4-3	80 MHz to 800 MHz	3 V/m	1 V/m
	800 MHz to 2.5 GHz	3 V/m	3 V/m

Diagnostic Ultrasound Indications for Use Format

E-CUBE 8 Ultrasound System

Indications for Use (Describe)

The device is intended for use by a qualified physician for the evaluation of soft tissue and blood flow in the clinical applications; Fetal, Abdominal (renal & GYN/pelvic), Pediatric, Small Organ (breast, testes, thyroid), Neonatal Cephalic, Adult Cephalic, Trans-rectal, Trans-vaginal, Musculo-skeletal (Conventional), Musculo-skeletal (Superficial), Cardiac (adult& pediatric), Peripheral Vascular (PV), and Urology (including prostate).

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal	P	P	P		P	P	P	P	P
Abdominal	P	P	P		P	P	P	P	P
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric	P	P	P		P	P	P	P	P
Small Organ (breast, testes, thyroid)	P	P	P		P	P	P	P	
Neonatal Cephalic	P	P	P		P	P	P	P	
Adult Cephalic	P	P	P		P	P	P	P	
Trans-rectal	P	P	P		P	P	P	P	N
Trans-vaginal	P	P	P		P	P	P	P	N
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)	P	P	P		P	P	P	P	
Musculo-skeletal (Superficial)	P	P	P		P	P	P	P	
Intravascular									
Cardiac Adult	P	P	P	P	P	P	P	P	
Cardiac Pediatric	P	P	P	P	P	P	P	P	
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel	P	P	P	P	P	P	P	P	N
Urology (including prostate)	P	P	P		P	P	P	P	P

N = new indication; P = previously cleared by FDA K172732; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

E-CUBE 8 with C1-6CT Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal	P	P	P		P	P	P	P	
Abdominal	P	P	P		P	P	P	P	
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric	P	P	P		P	P	P	P	
Small Organ (breast, testes, thyroid)									
Neonatal Cephalic									
Adult Cephalic									
Trans-rectal									
Trans-vaginal									
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)	P	P	P		P	P	P	P	
Musculo-skeletal (Superficial)	P	P	P		P	P	P	P	
Intravascular									
Cardiac Adult									
Cardiac Pediatric									
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel	P	P	P		P	P	P	P	
Urology (including prostate)	P	P	P		P	P	P	P	

N = new indication; P = previously cleared FDA K172732; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

E-CUBE 8 with C5-8NT Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal									
Abdominal	P	P	P		P	P	P	P	
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric	P	P	P		P	P	P	P	
Small Organ (breast, testes, thyroid)									
Neonatal Cephalic	P	P	P		P	P	P	P	
Adult Cephalic									
Trans-rectal									
Trans-vaginal									
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)									
Musculo-skeletal (Superficial)									
Intravascular									
Cardiac Adult	P	P	P		P	P	P	P	
Cardiac Pediatric	P	P	P		P	P	P	P	
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel	P	P	P		P	P	P	P	
Urology (including prostate)									

N = new indication; P = previously cleared by FDA K172732; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

E-CUBE 8 with SC1-4H Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal	P	P	P		P	P	P	P	
Abdominal	P	P	P		P	P	P	P	
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric	P	P	P		P	P	P	P	
Small Organ (breast, testes, thyroid)									
Neonatal Cephalic									
Adult Cephalic									
Trans-rectal									
Trans-vaginal									
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)	N	N	N		N	N	N	N	
Musculo-skeletal (Superficial)	N	N	N		N	N	N	N	
Intravascular									
Cardiac Adult									
Cardiac Pediatric									
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel	N	N	N		N	N	N	N	
Urology (including prostate)	P	P	P		P	P	P	P	

N = new indication; P = previously cleared by FDA K161439; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

E-CUBE 8 with SC1-4HS Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal	P	P	P		P	P	P	P	
Abdominal	P	P	P		P	P	P	P	
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric	P	P	P		P	P	P	P	
Small Organ (breast, testes, thyroid)									
Neonatal Cephalic									
Adult Cephalic									
Trans-rectal									
Trans-vaginal									
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)	N	N	N		N	N	N	N	
Musculo-skeletal (Superficial)	N	N	N		N	N	N	N	
Intravascular									
Cardiac Adult									
Cardiac Pediatric									
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel	N	N	N		N	N	N	N	
Urology (including prostate)	P	P	P		P	P	P	P	

N = new indication; P = previously cleared by FDA K161439; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

E-CUBE 8 with SC1-6H Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal	P	P	P		P	P	P	P	
Abdominal	P	P	P		P	P	P	P	
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric	P	P	P		P	P	P	P	
Small Organ (breast, testes, thyroid)									
Neonatal Cephalic									
Adult Cephalic									
Trans-rectal									
Trans-vaginal									
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)	P	P	P		P	P	P	P	
Musculo-skeletal (Superficial)	P	P	P		P	P	P	P	
Intravascular									
Cardiac Adult									
Cardiac Pediatric									
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel	N	N	N		N	N	N	N	
Urology (including prostate)	P	P	P		P	P	P	P	

N = new indication; P = previously cleared by FDA K161439; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

E-CUBE 8 with L3-12T Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal									
Abdominal	P	P	P		P	P	P	P	
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric	P	P	P		P	P	P	P	
Small Organ (breast, testes, thyroid)	P	P	P		P	P	P	P	
Neonatal Cephalic	P	P	P		P	P	P	P	
Adult Cephalic									
Trans-rectal									
Trans-vaginal									
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)	P	P	P		P	P	P	P	
Musculo-skeletal (Superficial)	P	P	P		P	P	P	P	
Intravascular									
Cardiac Adult									
Cardiac Pediatric									
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel	P	P	P		P	P	P	P	
Urology (including prostate)									

N = new indication; P = previously cleared by FDA K172732; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

E-CUBE 8 with L3-12H Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal									
Abdominal	P	P	P		P	P	P	P	
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric	P	P	P		P	P	P	P	
Small Organ (breast, testes, thyroid)	P	P	P		P	P	P	P	
Neonatal Cephalic	P	P	P		P	P	P	P	
Adult Cephalic									
Trans-rectal									
Trans-vaginal									
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)	P	P	P		P	P	P	P	
Musculo-skeletal (Superficial)	P	P	P		P	P	P	P	
Intravascular									
Cardiac Adult									
Cardiac Pediatric									
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel	P	P	P		P	P	P	P	
Urology (including prostate)									

N = new indication; P = previously cleared by FDA K172732; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

E-CUBE 8 with L3-12H^{WD} Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal	P	P	P		P	P	P	P	
Abdominal	P	P	P		P	P	P	P	
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric	P	P	P		P	P	P	P	
Small Organ (breast, testes, thyroid)	P	P	P		P	P	P	P	
Neonatal Cephalic									
Adult Cephalic									
Trans-rectal									
Trans-vaginal									
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)	P	P	P		P	P	P	P	
Musculo-skeletal (Superficial)	P	P	P		P	P	P	P	
Intravascular									
Cardiac Adult									
Cardiac Pediatric									
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel	P	P	P		P	P	P	P	
Urology (including prostate)									

N = new indication; P = previously cleared by FDA K172732; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

E-CUBE 8 with L8-17H Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal	N	N	N		N	N	N	N	
Abdominal	N	N	N		N	N	N	N	
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric	N	N	N		N	N	N	N	
Small Organ (breast, testes, thyroid)	N	N	N		N	N	N	N	
Neonatal Cephalic	N	N	N		N	N	N	N	
Adult Cephalic									
Trans-rectal									
Trans-vaginal									
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)	N	N	N		N	N	N	N	
Musculo-skeletal (Superficial)	N	N	N		N	N	N	N	
Intravascular									
Cardiac Adult									
Cardiac Pediatric									
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel	N	N	N		N	N	N	N	
Urology (including prostate)									

N = new indication; P = previously cleared by FDA; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

E-CUBE 8 with IO3-12 Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal									
Abdominal									
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric									
Small Organ (breast, testes, thyroid)	P	P	P		P	P	P	P	
Neonatal Cephalic									
Adult Cephalic									
Trans-rectal									
Trans-vaginal									
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)	N	N	N		N	N	N	N	
Musculo-skeletal (Superficial)	N	N	N		N	N	N	N	
Intravascular									
Cardiac Adult									
Cardiac Pediatric									
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel	N	N	N		N	N	N	N	
Urology (including prostate)									

N = new indication; P = previously cleared by FDA K150773; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

E-CUBE 8 with IO8-17T Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal									
Abdominal									
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric									
Small Organ (breast, testes, thyroid)	P	P	P		P	P	P	P	
Neonatal Cephalic									
Adult Cephalic									
Trans-rectal									
Trans-vaginal									
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)	P	P	P		P	P	P	P	
Musculo-skeletal (Superficial)	P	P	P		P	P	P	P	
Intravascular									
Cardiac Adult									
Cardiac Pediatric									
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel	N	N	N		N	N	N	N	
Urology (including prostate)									

N = new indication; P = previously cleared by FDA K153424; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

E-CUBE 8 with SP3-8T Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal	P	P	P		P	P	P	P	
Abdominal	P	P	P		P	P	P	P	
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric	P	P	P		P	P	P	P	
Small Organ (breast, testes, thyroid)									
Neonatal Cephalic	P	P	P		P	P	P	P	
Adult Cephalic	P	P	P		P	P	P	P	
Trans-rectal									
Trans-vaginal									
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)									
Musculo-skeletal (Superficial)									
Intravascular									
Cardiac Adult	P	P	P		P	P	P	P	
Cardiac Pediatric	P	P	P		P	P	P	P	
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel									
Urology (including prostate)									

N = new indication; P = previously cleared by FDA K172732; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

E-CUBE 8 with P1-5CT Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal	P	P	P		P	P	P	P	
Abdominal	P	P	P		P	P	P	P	
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric	P	P	P		P	P	P	P	
Small Organ (breast, testes, thyroid)									
Neonatal Cephalic									
Adult Cephalic	P	P	P		P	P	P	P	
Trans-rectal									
Trans-vaginal									
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)									
Musculo-skeletal (Superficial)									
Intravascular									
Cardiac Adult	P	P	P		P	P	P	P	
Cardiac Pediatric	P	P	P		P	P	P	P	
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel	P	P	P		P	P	P	P	
Urology (including prostate)									

N = new indication; P = previously cleared by FDA K172732; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

E-CUBE 8 with VC1-6T Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal	P	P	P		P	P	P	P	P
Abdominal	P	P	P		P	P	P	P	P
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric	P	P	P		P	P	P	P	P
Small Organ (breast, testes, thyroid)									
Neonatal Cephalic									
Adult Cephalic									
Trans-rectal									
Trans-vaginal									
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)									
Musculo-skeletal (Superficial)									
Intravascular									
Cardiac Adult									
Cardiac Pediatric									
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel									
Urology (including prostate)	P	P	P		P	P	P	P	P

N = new indication; P = previously cleared by FDA K172732; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

E-CUBE 8 with VE3-10H Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal	P	P	P		P	P	P	P	P
Abdominal									
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric									
Small Organ (breast, testes, thyroid)									
Neonatal Cephalic									
Adult Cephalic									
Trans-rectal	P	P	P		P	P	P	P	P
Trans-vaginal	P	P	P		P	P	P	P	P
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)									
Musculo-skeletal (Superficial)									
Intravascular									
Cardiac Adult									
Cardiac Pediatric									
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel	N	N	N		N	N	N	N	N
Urology (including prostate)	P	P	P		P	P	P	P	P

N = new indication; P = previously cleared by FDA K161439; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

E-CUBE 8 with EV3-10T Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal	P	P	P		P	P	P	P	
Abdominal									
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric									
Small Organ (breast, testes, thyroid)									
Neonatal Cephalic									
Adult Cephalic									
Trans-rectal	P	P	P		P	P	P	P	
Trans-vaginal	P	P	P		P	P	P	P	
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)									
Musculo-skeletal (Superficial)									
Intravascular									
Cardiac Adult									
Cardiac Pediatric									
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel	P	P	P		P	P	P	P	
Urology (including prostate)	P	P	P		P	P	P	P	

N = new indication; P = previously cleared by FDA K172732; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

E-CUBE 8 with EC3-10T Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal	P	P	P		P	P	P	P	
Abdominal									
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric									
Small Organ (breast, testes, thyroid)									
Neonatal Cephalic									
Adult Cephalic									
Trans-rectal	P	P	P		P	P	P	P	
Trans-vaginal	P	P	P		P	P	P	P	
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)									
Musculo-skeletal (Superficial)									
Intravascular									
Cardiac Adult									
Cardiac Pediatric									
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel	P	P	P		P	P	P	P	
Urology (including prostate)	P	P	P		P	P	P	P	

N = new indication; P = previously cleared by FDA K172732; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

E-CUBE 8 with E3-10 Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal	P	P	P		P	P	P	P	
Abdominal									
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric									
Small Organ (breast, testes, thyroid)									
Neonatal Cephalic									
Adult Cephalic									
Trans-rectal	P	P	P		P	P	P	P	
Trans-vaginal	P	P	P		P	P	P	P	
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)									
Musculo-skeletal (Superficial)									
Intravascular									
Cardiac Adult									
Cardiac Pediatric									
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel	P	P	P		P	P	P	P	
Urology (including prostate)	P	P	P		P	P	P	P	

N = new indication; P = previously cleared by FDA K172732; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

E-CUBE 8 with CW2.0 Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal									
Abdominal									
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric									
Small Organ (breast, testes, thyroid)									
Neonatal Cephalic									
Adult Cephalic									
Trans-rectal									
Trans-vaginal									
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)									
Musculo-skeletal (Superficial)									
Intravascular									
Cardiac Adult				P					
Cardiac Pediatric				P					
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel									
Urology (including prostate)									

N = new indication; P = previously cleared by FDA K172732; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

E-CUBE 8 with CW5.0 Transducer

Intended Use: Diagnostic ultrasound imaging or fluid flow analysis of the human body as follows:

Clinical Application	Mode of Operation								
	B	M	PWD	CWD	Color Doppler	Power Doppler	Tissue Harmonic Imaging	Combined* (Specify)	Other** (Specify)
Ophthalmic									
Fetal									
Abdominal									
Intra-operative (Specify)									
Intra-operative (Neuro)									
Laparoscopic									
Pediatric									
Small Organ (breast, testes, thyroid)									
Neonatal Cephalic									
Adult Cephalic									
Trans-rectal									
Trans-vaginal									
Trans-urethral									
Trans-esoph. (non-Card.)									
Musculo-skeletal (Conventional)									
Musculo-skeletal (Superficial)									
Intravascular									
Cardiac Adult				P					
Cardiac Pediatric				P					
Intravascular (Cardiac)									
Trans-esoph. (Cardiac)									
Intra-cardiac									
Peripheral vessel				P					
Urology (including prostate)									

N = new indication; P = previously cleared by FDA K172732; E = added under appendix
* Combined: B/Color Doppler, B/PWD, B/Color Doppler/PWD; **Other: 3D, 4D

Acoustic Output

The E-CUBE 8 ultrasound system shows the acoustic output display (e.g. Mechanical Index (MI), Thermal Index (TI)) on the upper right side of the screen. This acoustic output display allows you to monitor the acoustic levels generated by the system.

Two standards for the acoustic output display are as follows:

AIUM/NEMA UD3 Standards for Real-time Display of Thermal and Mechanical Acoustic Output Indices on Diagnostic Ultrasound equipment.

IEC 60601-2-37, Mechanical Electrical Equipment – Part2-37: Particular Requirements for the Safety of Ultrasound Medical Diagnostic and Monitoring Equipment.

WARNING

You should use the E-CUBE 8 ultrasound system at the lowest mechanical/thermal index setting necessary to generate clinically acceptable images.



Acoustic output display (Mechanical/Thermal indices)

The E-CUBE 8 ultrasound system displays Mechanical index (MI) and Thermal index (TI) on the upper right side of the screen as shown below.

The acoustic output display has three values as follows:

- Mechanical Index (MI)
- Thermal Index (TI)
- Power value

MI is used as an indicator of the mechanical bio-effect such as cavitation in the tissue. TI represents the ratio of total power to the power required to raise tissue by 1°C. The power value informs you of where the system is operating within the range of available output power.

One of the following TI values display on the screen based on the application and type of tissue.

- Soft Tissue Thermal Index (TIS)
- Bone Thermal Index (TIB)
- Cranial Bone Thermal Index (TIC)

The TI and MI are displayed all the times. The MI and TI display start at a value of 0.4 and increments in steps of 0.1 (values less than 0.4 are displayed as < 0.4).

WARNING

Be sure to have read and understood control explanations for each mode used before attempting to adjust the power control or any control that can affect Acoustic Output.

Controls affecting acoustic output

The potential for producing mechanical bioeffects (MI) or thermal bioeffects (TI) can be influenced by certain controls. The power control has the most significant effect on Acoustic Output. Indirect effects may occur when adjusting controls.

Controls that can influence MI and TI are detailed under the bioeffects portion of each control in the Image chapter. Always observe the acoustic output display for possible effects.

To minimize exposure time and keep ultrasound levels low, operate your system by using the ALARA (As Low As Reasonably Achievable) principle, increasing output only when you needed to obtain diagnostic image quality. It is recommended that all users receive ALARA training program. The ALARA training program by ALPINION application specialists provides you with basic ultrasound principles, possible biological effects, the derivation and meaning of the indices, ALARA principles, and examples of specific applications of the ALARA principle.

Principle of ALARA

The principle of ALARA, which stands for As Low As Reasonably Achievable, is to keep the radiation exposure at the minimum level necessary to obtain the diagnostic information. This principle is widely practiced in medical x-ray protection where exposure at any level is potentially harmful. Historically, ALARA was initiated as a cautious approach for dealing with uncertain hazards but has since become the principle method for reducing the risk of injury from hazards that do not have safe minimum threshold.

While no minimum thresholds for harmful bioeffects have been established with the use of diagnostic ultrasound, the principle of ALARA can be readily implemented on equipment incorporating an output display. As the operator adjusts the equipment to optimize the image quality, the display interactively updates to indicate the effect on output.

Controls that have no noticeable impact on image quality should be set to minimize the output while controls that improve the image quality and also increase acoustic output should be set no higher than needed to achieve a diagnostic quality image.

12

Appendix

This chapter describes:

Appendix A. Biopsy Guide 12-2

Appendix A. Biopsy Guide

The system supports biopsy capability for the transducers listed in the table below.

Biopsy Guide	Transducer	Type	Dimension	Manufacturer
L3-12 Biopsy	L3-12T, L3-12H	Multi-angle	90.5(W)×48.3(D)×22.9(H) mm	CIVCO Medical Solutions
SC1-4HS Biopsy	SC1-4HS	Multi-angle	101.6(W)x56.6(D)x30.5(H) mm	Aspen Surgical Products, Inc.
SC1-6 Biopsy	C1-6CT, SC1-4H, SC1-6H	Multi-angle	106.7(W)×55.8(D)×27.9(H) mm	CIVCO Medical Solutions
E3-10 Biopsy (Disposable)	E3-10	Single-angle	167.6(W)x17.8(D) mm	CIVCO Medical Solutions
E3-10 Biopsy (Reusable)	E3-10	Single-angle	157.8(W)x25.4(D) mm	CIVCO Medical Solutions
EN3-10 Biopsy (Disposable)	EV3-10T, EC3-10T	Single-angle	147.8(W)×20.7(D) mm	Aspen Surgical Products, Inc.
EN3-10 Biopsy (Reusable)	EV3-10T, EC3-10T	Single-angle	138.8(W)×28.0(D) mm	Aspen Surgical Products, Inc.
VE3-10H Biopsy (Disposable)	VE3-10H	Single-angle	148.3(W)x35.5(D) mm	Aspen Surgical Products, Inc.
VE3-10H Biopsy (Reusable)	VE3-10H	Single-angle	142.4(W)x40.9(D) mm	Aspen Surgical Products, Inc.

WARNING

The biopsy option is intended for use by a duly licensed physician who has received the appropriate training in biopsy techniques as dictated by current relevant practices, as well as in proper operation of the ultrasound unit.

Biopsy Starter Kit for Linear and Convex Transducers

Convex and Linear transducers have an optional biopsy kit specific for each transducer. The biopsy kit consists of:

- A reusable non-sterile bracket
- Disposable sterile Ultra-Pro II™ Needle guide kits (CIVCO Medical Solutions) consisting of:
  - Sets with needle inserts covering gauge size 14 through 23 (2.1 mm to 0.6 mm)
  - Sterile sheath
  - Rubber bands
  - Gel
- Instructions

In addition sterile Ultra-Pro II™ Needle guide kits can be ordered as replacement kit.

WARNING
Read the instructions and the user's guide for the Ultra-Pro II™ Needle guide kits before using the biopsy equipment.

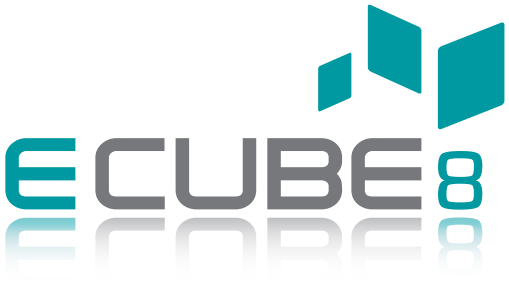
Biopsy Starter Kit for Endocavity Transducers

The endocavity transducer has an optional specific biopsy kit. The biopsy kit consists of:

- Disposable sterile needle guide/ Reusable non-sterile needle guide
- Sterile sheath
- Rubber bands
- Gel
- Use Instructions for Disposable Endocavity Needle Guide/ Use Instructions for Reusable Endocavity Needle Guide

In addition disposable sterile endocavity needle guide can be ordered as replacement kit.

WARNING
Read the instructions for the Disposable/Reusable Endocavity Needle Guide from Aspen Surgical Products, Inc. before using the biopsy equipment.



USER MANUAL

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