SIEMENS Healthineers

ACUSON Origin
Diagnostic Ultrasound System
Instructions for Use

US

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Siemens Medical Solutions USA, Inc. 11668489-ABS-001-02-02

ACUSON Origin

Product Version 1.0

Software Version VB10

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Contents

Chapter 1 **Introduction**

Overview of the diagnostic ultrasound imaging system, intended use, and a detailed description of the touch screen and control panel.

Chapter 2 **Safety and Care**

Detailed information on the safety and care of the ultrasound system. Includes information on system maintenance.

Chapter 3 **Transducer Care and Accessories**

Detailed information on caring for transducers. Includes procedures for cleaning and disinfecting transducers. Also includes information on compatible transducer accessories.

Chapter 4 **System Setup**

Detailed descriptions for setting up and preparing the system for use. Includes information for transporting the system.

Chapter 5 **Beginning a Study**

Procedures for preventing unauthorized access to the ultrasound system; registering a patient; selecting a transducer, exam association, and operating mode; and capturing an image or clip.

Chapter 6 **Workflow Protocols**

Procedures for activating and editing a protocol to guide you through a predefined clinical workflow.

Chapter 7 **CINE**

Procedures for playing back data in the CINE memory buffer.

Chapter 8 **Image Optimization**

Procedures for optimizing parameters for each basic operating mode. Includes procedures for creating and editing user-defined image presets.

Chapter 9 **Annotations**

Procedures for annotating with text, directional arrows, and body markers.

Chapter 10 **Measurements and Calculations**

Description of the measurement function with procedures for using basic measurement tools for 2D-mode, Doppler, and M-mode.

Includes the following features or measurement and calculation packages:

- Obstetric

Chapter 11 **Cardiac Measurements and Calculations**

Description of the measurement function with procedures for using measurement tools specific to the cardiac imaging use cases.

Includes the following features or measurement and calculation packages:

- 3D Caliper
- AI Measure

Chapter 12 **Reports**

Procedures for saving, modifying, and transferring reports.

Chapter 13 **Printing and Recording**

Procedures for printing and recording images.

Appendix A **Technical Description**

Technical description of the ultrasound system. Includes the operating and storage temperatures for the system and transducers.

Appendix B **Icons and Indicators**

Description of system status indicators, special characters, and the imaging parameters and settings on the image screen.

Appendix C **Cybersecurity**

Information about ultrasound system security.

Appendix D **Acoustic Output Reference**

Acoustic output reporting tables.

Note: Not all features and options described in this publication are available to all users. Please check with your Siemens Healthineers representative to determine the current availability of features and options.

About the User and Reference Manuals

The user and reference manuals consist of the following publications.

Publication	Includes
Instructions for Use	▪ Conventions and typographical conventions used in the manuals ▪ Intended audience ▪ Introduction to the ultrasound system ▪ Safety and care information for the ultrasound system and compatible transducers ▪ Procedures for setting up and preparing the system for use ▪ Procedures for registering a patient and activating an operating mode ▪ Procedures for acquiring, optimizing, annotating, measuring, printing, and recording images ▪ Technical description of the ultrasound system ▪ Acoustic output data
Advanced Imaging Manual	This manual is a companion to the Instructions for Use publication and contains additional instructions for use for the safe and proper use of advanced imaging features on the ultrasound system. ▪ Description of the biopsy function ▪ Procedures for specialty imaging – Panoramic imaging – Contrast agent imaging – Comparing images from multiple modalities ▪ Procedures for reviewing images and clips ▪ Description of features for cardiology – Procedures for the physiologic function – Procedures for the stress echo function – Description of the transesophageal transducer, including cleaning and care of the transducer – Cardiac volume imaging – 2D Heart AI – 4D Heart AI
*System Reference**	▪ Description of customizable system settings ▪ Description of all measurement labels configurable for the ultrasound system ▪ Information about DICOM connectivity, network capabilities, and external devices ▪ Clinical references ▪ Information regarding the electromagnetic compatibility (EMC) testing of this ultrasound system

*Languages supported by the user interface include a translation of this publication.

Conventions

The user and reference manuals include the following conventions.

Convention	Description
Warnings and Cautions	⚠ **WARNING:** Warnings are intended to alert you to the importance of following the correct operating procedures where risk of injury to the patient or system user exists. ⚠ **Caution:** Cautions are intended to alert you to the importance of following the correct operating procedures to prevent the risk of damage to the ultrasound system.
Notes and Prerequisites	**Prerequisite:** Prerequisites contain tasks the user must complete or information the user needs prior to performing a procedure. **Note:** Notes contain information concerning the proper use of the ultrasound system or correct execution of a procedure.
Cross-references	Examples: **See also:** For information about cleaning and disinfecting a transducer, refer to Chapter 3 in this manual. **See also:** For information about customizing the measurement function, refer to Chapter 2 in the System Reference. **See also:** For additional information about the measurement function, refer to Chapter 10 in the Instructions for Use. **See also:** For information about exporting and importing images, refer to Chapter B2 in the Advanced Imaging Manual. **See also:** Alphanumeric Keyboard, page 1-26 **See also:** Chapter 2, Instructions for Use
Customizable Ultrasound System Settings	Settings for configuring and customizing the ultrasound system are described in the System Reference. When customization is available, the user manual provides a reference to the configuration settings. Example: Use the configuration settings to customize the measurement function.

Typographical Conventions

The following typographical conventions are in descriptions and procedures within your user and reference manuals. Use the conventions to identify the location of a control or selection on the ultrasound system.

Control or Selection	Description
Controls on the Control Panel	Controls located on the control panel are indicated by uppercase boldface type. Examples: ▪ Rotate **2D** to adjust the 2D gain. ▪ Press **ABC** to activate or exit the annotation function. ▪ Double-click **UPDATE** to display the 2D image.
Trackball and Trackball Keys	Right and left trackball keys are located on the control panel. The function assigned to the trackball and trackball keys is indicated by labels on the image screen. Examples: ▪ Adjust the size or position of the field of view and then press a trackball key. ▪ Position the measurement marker and then press a trackball key. ▪ Press the right trackball key.
Selections on the Image Screen	On-screen selections are indicated by boldface type. Roll the trackball to position the pointer on the control or object on the image screen and then press a trackball key. Examples: ▪ Click **Correct** on the patient registration form. ▪ Double-click a thumbnail. ▪ Select the check box for the required entries and then click **Delete**.
Controls on the Control Panel for the Touch Screen	Press and rotate controls on the control panel are labeled on the touch screen. The selection assigned to these controls is indicated by boldface type. Examples: ▪ Rotate **Tint**. ▪ Press **Steer**.
Selections on the Touch Screen	Touch screen selections are indicated by boldface type. Tap the touch screen to access a selection. Drag an object on the touch screen to reposition the object. Swipe the screen to display a separate page of selections. Examples: ▪ Tap **Workflow**. ▪ Drag the tail of the arrow on the touch screen to adjust the length.

1 Introduction

System Overview **3**

Intended Use **6**

Indications for Use Statement 6

Operating Modes 7

Patient Target Groups 7

Intended Use Environment 7

Intended Users 8

Contraindications 8

Transducers and Intended Applications 9

Principles of Operation **11**

Clinical Benefits **11**

Image Screen Overview **12**

Screen Saver 12

Touch Screen Overview **14**

Main Navigation Selections on the Touch Screen 16

Additional Selections and Symbols on the Touch Screen 16

Control Panel **18**

Annotation, Measurement, and Archive Controls 19

Trackball and Trackball Keys 20

Trackball Status Indicator 20

Operating Mode Controls 21

Image Format Controls 22

Footswitch **23**

Retractable Keyboard **23**

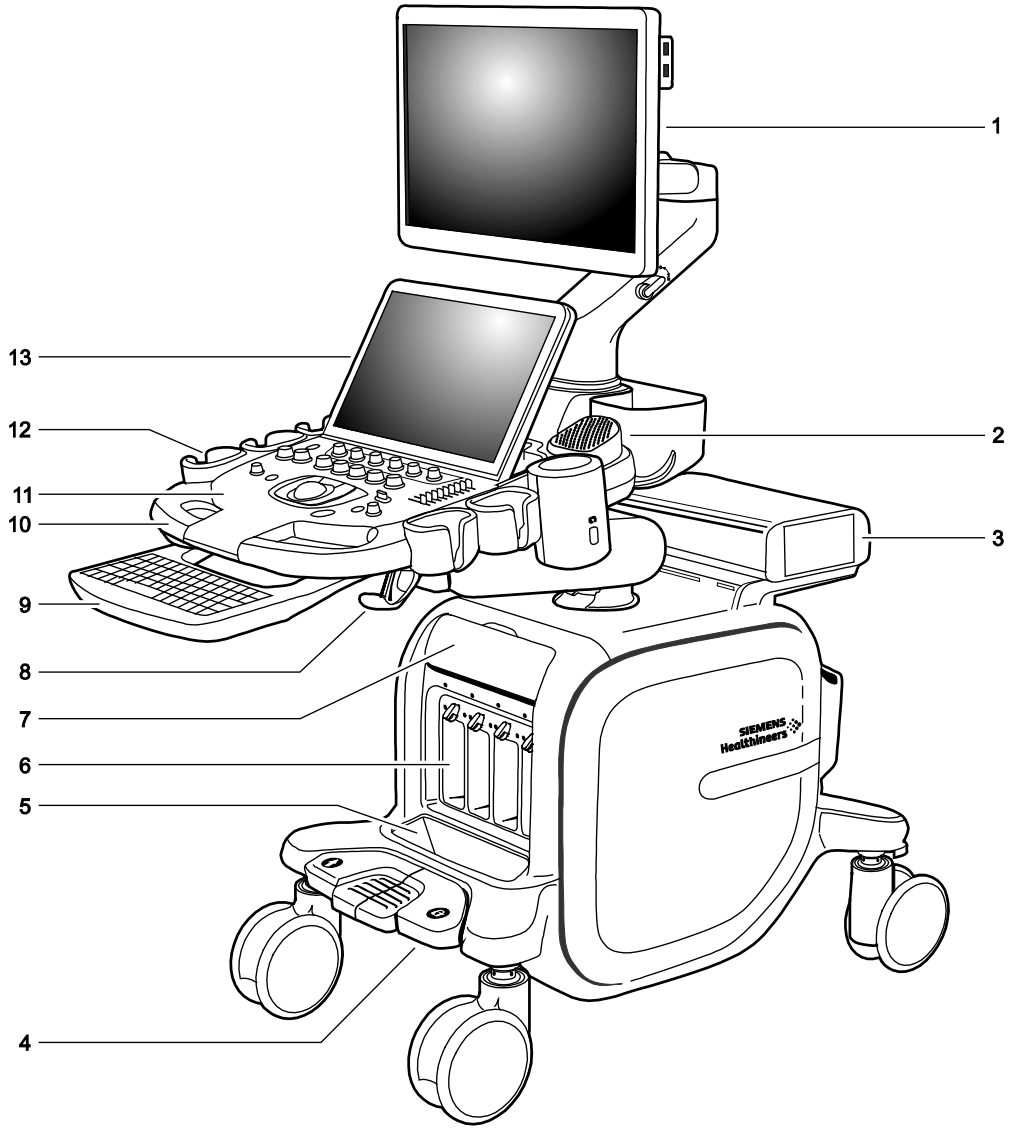
Special Keys on the Retractable Keyboard 23

Configuring the Ultrasound System **23**

System Overview

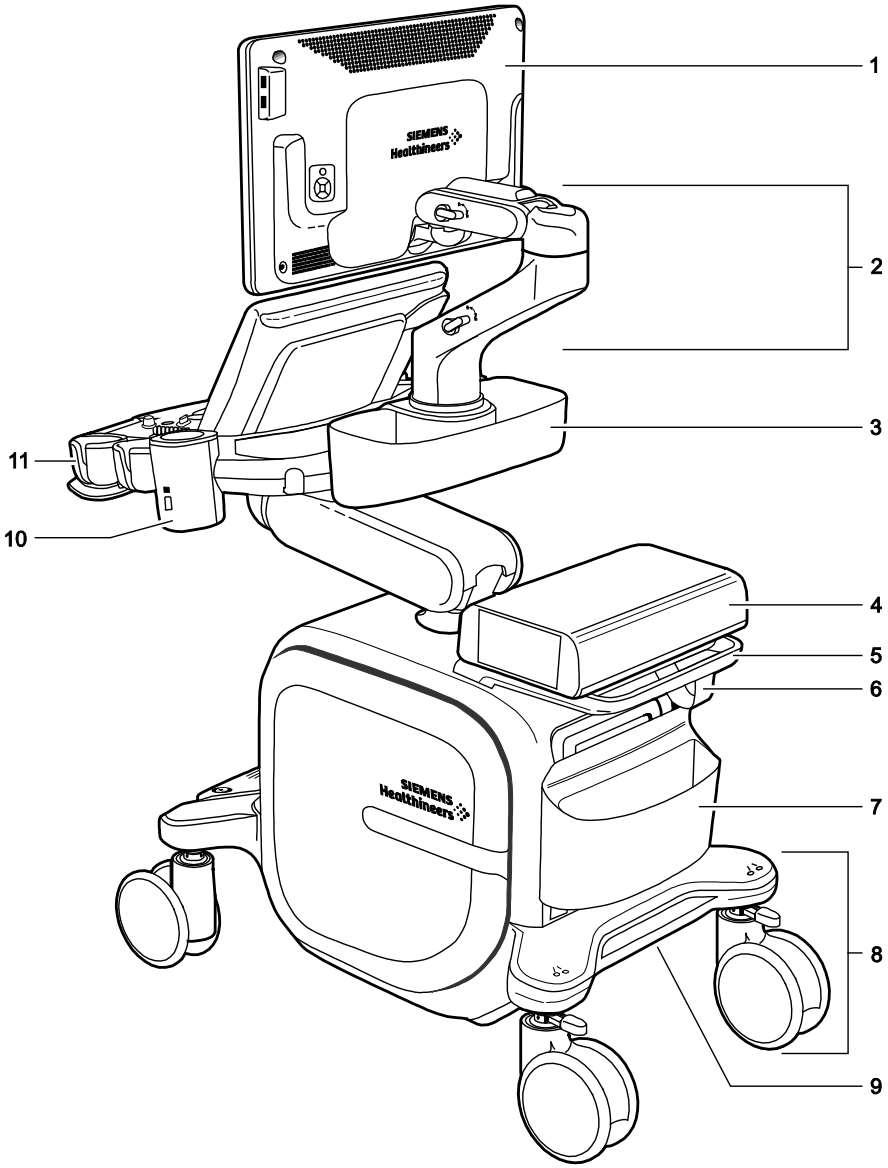
The ACUSON Origin ultrasound system is designed for diagnostic use in general, vascular, and cardiac imaging. The system streamlines clinical workflow from patient registration to study archival with software-based applications, transducers, and clinical communication tools.

See also: For a technical description of the ultrasound system, refer to Appendix A in this manual.



Example of the ultrasound system, front view.

1 Monitor
This example includes the monitor without a luminance sensor.
2 Speaker
3 Accessory shelf. This example includes the optional printer.
Accommodates an optional accessory, for example, a printer, recordable disc drive, or rear accessory tray
4 Lock and swivel lock for the front wheels
5 Storage bin for transducer connectors
6 Transducer ports for array transducers
7 Access door for ports
– Auxiliary continuous wave Doppler transducer port
– Auxiliary in/out port for the physiologic function
– ECG port
8 Transducer cable hook
9 Keyboard (optional)
10 Front handle
11 Backlit control panel
12 Transducer holder
13 Touch screen with USB ports



Example of the ultrasound system, back view.

1 Monitor
This example includes the monitor without a luminance sensor.
2 Adjustable arm for the monitor
3 Storage bin
4 Accessory shelf. This example includes the optional printer.
Accommodates an optional accessory, for example, a printer, recordable disc drive, or rear accessory tray
5 Rear handle for repositioning the ultrasound system
This handle is not intended for moving the system to another location.
6 Power cord hook
7 Storage bin and access door for connections and indicators
– Input/output panel
– Ethernet port
– Service indicator lights
8 Rear swivel wheel with locking lever
9 Power panel
10 Gel warmer
11 Transducer holder

Intended Use

⚠ **WARNING:** The analysis of results from an ultrasound examination requires that you are trained in the interpretation of diagnostic ultrasound studies and are qualified to make clinical diagnoses.

⚠ **WARNING:** To avoid the risk of human injury and permanent damage to the ultrasound system, do not use the ultrasound system, transducers, or ultrasound components and accessories during magnetic resonance imaging (MRI) or in an environment with magnetic resonance (MR) equipment.

⚠ **WARNING:** The ultrasound system is not intended for ophthalmic use.

⚠ **Caution:** In the United States of America, federal law restricts this device to sale or use by, or on the order of, a physician.

⚠ **Caution:** Ultrasound is used as an imaging aid, but may have further restrictions specific to in-vitro fertilization (IVF), chorionic villus sampling (CVS), and percutaneous umbilical cord blood sampling (PUBS) procedures. Observe local laws and regulations.

Indications for Use Statement

Product	Indications for Use Statement
ACUSON Origin Ultrasound System	The ACUSON Origin ultrasound imaging system is intended to provide images of, or signals from, inside the body by an appropriately trained healthcare professional in a clinical setting for the following applications: Abdominal, Pediatric, OB/GYN[1], Cardiac, Transesophageal, Intracardiac[2], Vascular, Adult Cephalic, and Peripheral Vascular. The system also provides the ability to measure anatomical structures for fetal, abdominal, pediatric, cardiac, peripheral vessel, and calculation packages that provide information to the clinician that may be used adjunctively with other medical data obtained by a physician for clinical diagnosis purposes.

1 Useful for visualization of ovaries, follicles, uterus, and other pelvic structures.

2 The catheter is intended for intracardiac and intra-luminal visualization of cardiac and great vessel anatomy and physiology as well as visualization of other devices in the heart of adult and pediatric patients. The catheter is intended for imaging guidance only, not treatment delivery, during cardiac interventional percutaneous procedures.

Operating Modes

- 2D-mode
  - 2D-mode
  - 2D-mode with Harmonics Imaging
  - 2D-mode with Harmonics Imaging for Contrast Agent Imaging
- Color flow Doppler
  - Color (velocity)
  - Power (energy)
- Doppler
  - Pulsed Wave Doppler
  - Pulsed Wave Doppler Tissue Imaging
  - High Pulsed Repetition Frequency Pulsed Wave Doppler
  - Steerable Continuous Wave Doppler for imaging transducers
  - Continuous Wave Doppler for non-imaging transducers
- M-mode
  - M-mode with Harmonics Imaging
  - Anatomical M-mode
- 3D/4D Volume Imaging

Combined Modes

- 2D-mode with color
- 2D-mode with Doppler
- 2D-mode with color and Doppler
- 2D-mode with M-mode
- 2D-mode with M-mode and color
- 4D Volume Imaging with color

Patient Target Groups

- Adult
- Pediatric
- Fetal

Intended Use Environment

The ultrasound system is a mobile device intended for use in clinical environments.

See also: For information about the environmental requirements, refer to Appendix A in this manual.

Intended Users

User	Interaction with Ultrasound Equipment	Expected Experience and Other Characteristics
Sonographer	▪ Acquires diagnostic views of anatomy, blood flow, and related pathology ▪ Performs measurements and analysis of the acquired images ▪ Prepares exam data for review and interpretation by a qualified physician	▪ Ranges from novices (for example, students) to advanced practitioners with certification in multiple subspecialties ▪ Educated in anatomy, physiology, patient care, and identification of pathology in ultrasound images ▪ Many sonographers have a Bachelor's degree; some have advanced degrees in related health care subjects
Physician	▪ Performs ultrasound exams ▪ Interprets exam data ▪ Writes and assembles exam findings in a report	▪ Medical doctor ▪ Trained in ultrasound imaging techniques ▪ Skilled in interpreting ultrasound exam data
Cardiologist	▪ Performs ultrasound exams ▪ Interprets exam data ▪ Writes and assembles exam findings in a report	▪ Medical doctor ▪ Expert in diagnostic imaging, including computer tomography, magnetic resonance imaging, X-ray, ultrasound, and nuclear medicine ▪ Advanced training in imaging physics with typically two to six years of post-doctoral training in the field of cardiology; some specialize in diagnostic ultrasound
System Administrator and Customer Service Engineer	▪ Configures the ultrasound system for use in a networked environment	▪ A system administrator is an individual within your organization who is designated to set up system parameters to connect the ultrasound system or workstation to a picture archiving and communication system (PACS). ▪ Customer service engineers are Siemens Healthineers representatives who configure the ultrasound system during initial installation, support troubleshooting activities, and repair the system.

Contraindications

There are no known contraindications for diagnostic ultrasound.

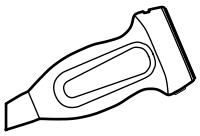
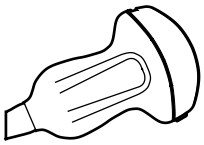
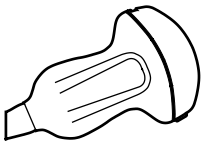
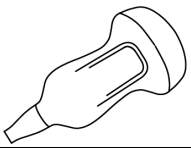
Transducers and Intended Applications

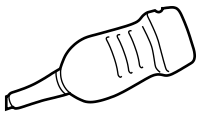
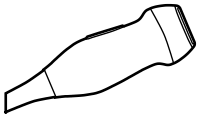
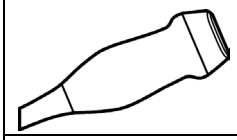
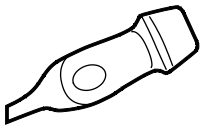
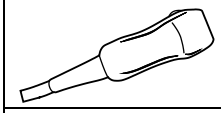
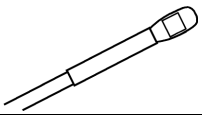
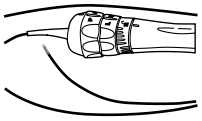
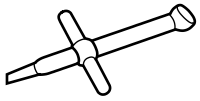
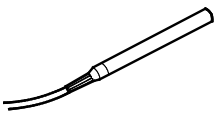
⚠ **WARNING:** The ultrasound system is not intended to be used with high-frequency surgical equipment. Use of transducers in conjunction with high-frequency surgical equipment may result in an increased risk of harm to the patient in the event of a defect in the high-frequency surgical neutral electrode connection.

Only the following transducers from Siemens Healthineers are compatible with your ultrasound system.

- The following transducers are available on the ACUSON Origin ultrasound system:

  7L2, 10L4, 14L5, DAX, 5C1, 9C2, 4V1, 5V1, 5Z1, 8V3, 10V4, Z6T, AcuNav Lumos 4D ICE, CW2, CW5

Transducer Name	Modes of Operation[1]	Intended Applications
Curved and Linear Array Transducers		
7L2 	2D, C, D, M	▪ Abdominal ▪ Peripheral Vessel ▪ Pediatric
10L4 	2D, C, D, M	▪ Abdominal ▪ Fetal ▪ Pediatric ▪ Peripheral Vessel
14L5 	2D, C, D, M	▪ Pediatric ▪ Peripheral Vessel
DAX 	2D, C, D, M	▪ Abdominal ▪ Fetal ▪ Pediatric
5C1 	2D, C, D, M	▪ Abdominal ▪ Fetal ▪ Pediatric
9C2 	2D, C, D, M	▪ Abdominal ▪ Fetal ▪ Pediatric

Transducer Name	Modes of Operation[1]	Intended Applications
Phased Array Transducers		
4V1 	2D, C, D, M	▪ Abdominal ▪ Fetal ▪ Pediatric
5V1 	2D, C, D, M, CW	▪ Cardiac ▪ Pediatric ▪ Adult Cephalic
5Z1 	2D, C, D, M, CW, Volume Imaging	▪ Cardiac
8V3 	2D, C, D, M, CW	▪ Cardiac ▪ Pediatric ▪ Abdominal
10V4 	2D, C, D, M, CW	▪ Cardiac ▪ Pediatric
Z6T 	2D, C, D, M, CW, Volume Imaging	▪ Cardiac ▪ Transesophageal
AcuNav Lumos 4D ICE 	2D, C, D, CW, Volume Imaging	▪ Cardiac ▪ Intra-Luminal ▪ Other (Intra-Cardiac) ▪ Pediatric
Continuous Wave Transducers		
CW2 	CW	▪ Cardiac ▪ Pediatric
CW5 	CW	▪ Peripheral Vessel

[1]Modes of Operation	Includes one or more of the following system operating modes:
2D (brightness mode)	2D-mode, 2D-mode with Harmonics imaging
C (color flow Doppler)	Color (velocity) or Power (energy)
D (Doppler)	Pulsed Wave Doppler, 2D/Doppler, 2D/Doppler with color, 2D/Doppler with power, 2D/Pulsed Wave Doppler Tissue Imaging
M (motion mode)	M-mode, M-mode with Harmonics imaging, 2D/M-mode, 2D/M-mode with color
CW (continuous wave Doppler)	Steerable Continuous Wave Doppler (for phased array transducers), Auxiliary Continuous Wave Doppler (for continuous wave [pencil] transducers)
Volume Imaging	3D volume imaging, 4D volume imaging

Principles of Operation

Diagnostic ultrasound uses high-frequency (above the audible range) sound waves to produce an image of anatomical structures within the body. Electrical pulses vibrate ceramics within a transducer to transmit the sound waves into the body. Sound waves travel through body tissue at approximately 1,540 meters per second and reflect back as echoes to the transducer at each point of change in tissue density, for example, at the border of two organs in the body. These return signals provide information about the acoustic properties of the tissue. The time to receive the echo in microseconds indicates a distance into the body. Structures furthest from the transducer surface require more time to return a signal than structures closer to the transducer surface. The strength and position of each signal indicates a point of varying intensity (brightness). The distances and intensities are processed and displayed on a screen to form a two-dimensional (2D) image.

Clinical Benefits

Ultrasound has a positive impact on the health of an individual as a non-ionizing diagnostic imaging tool. The device provides real-time anatomic and kinetic visualization of internal organs, tissue structures, blood flow, and Doppler-enabled hemodynamics. Ultrasound is the accepted imaging modality for the safe visualization of fetal anatomy and monitoring of fetal development.

The mobility and cost effectiveness of ultrasound increases access to patients in clinical environments. Patient benefits also include a safer examination compared to imaging modalities using ionizing radiation.

Real-time ultrasound imaging provides guidance during interventional procedures, for example, needle biopsies and fluid aspirations; in the absence of ultrasound, these procedures are conducted without visualization or with ionizing radiation.

Image Screen Overview

The image screen displays patient data, including images, imaging parameters and settings, measurements and reports, advanced imaging selections, and configuration settings.

Use the configuration settings to customize the image screen to accommodate your preferences and workflow, including the display of patient information on a saved or printed image or clip.

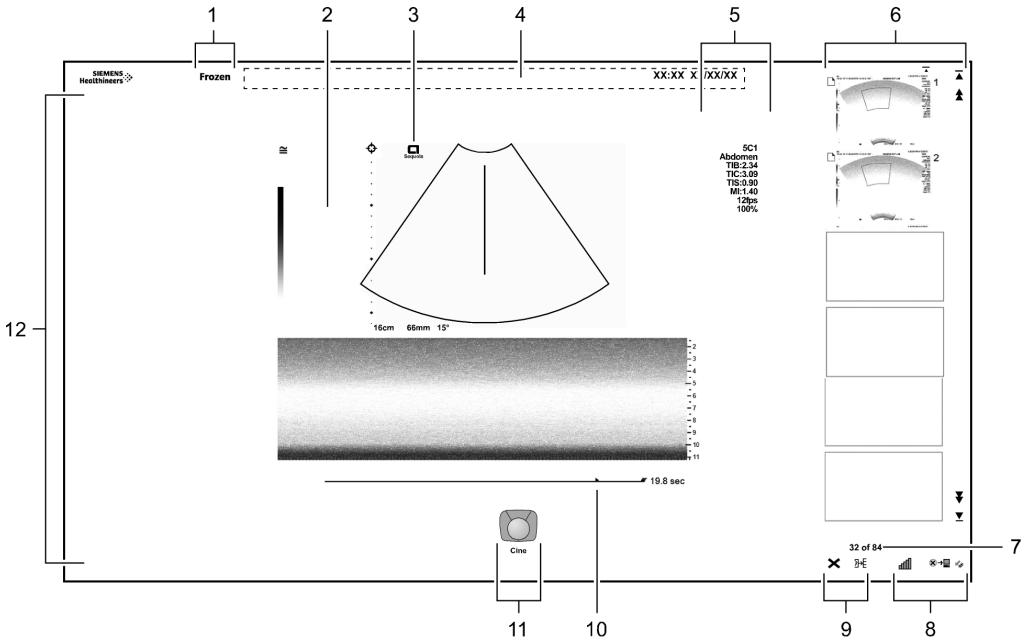
Note: The system reduces the font size of the imaging parameters to include patient information. For exams with extensive clinical data, for example, obstetric exams, the system includes the data and lists the active modes, but hides mode-specific imaging parameters and settings.

See also: For information about ultrasound system status indicators, refer to Appendix B in this manual.

Screen Saver

The screen saver feature freezes the ultrasound system and replaces the active display with a screen saver after the system has been inactive for a specified number of minutes. A user login is required to exit the screen saver and access the system.

Note: The screen saver feature is not available during the biopsy function.



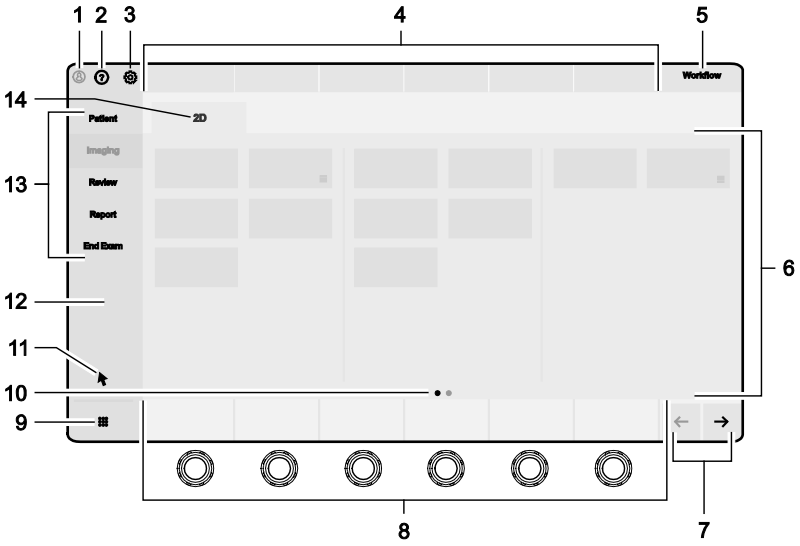
Example of a typical image screen.

1 Status of the image
   – **Live** indicates real-time acquisition
   – **Frozen** indicates a frozen image
   – **Review** indicates a previously saved image
2 Measured results
   Displays values for measurements and calculations
3 Transducer indicator
   Indicates the orientation of the scan
4 Patient banner
   Displays patient information, the ultrasound system date and time, and the institution name
5 Imaging parameters and settings
   Displays the active transducer, active image preset, and imaging parameters and settings for the active operating mode
   Displays patient information on a saved or printed image or clip
6 Thumbnail panel
   Displays reference images of previously saved images and clips
7 Current thumbnail and total number of thumbnails
8 Ultrasound system status
   Displays network information, for example, the strength of the wireless connection
9 Selections for deleting and printing thumbnails
10 CINE status indicator
11 Trackball status indicator
   Identifies the function assigned to the trackball keys
12 Displays selections available for the active function, for example, for the patient report or Fusion imaging

Touch Screen Overview

The touch screen has selections for use during an exam for each operating mode and during review.

- Orange indicates the selection is active.
- Dark orange indicates a tap on the selection.
- Gray indicates the selection is available.
- Dark gray indicates the selection is unavailable.



Example of the touch screen and image optimization controls during 2D imaging.

1 Options for logging in to the ultrasound system to restrict access to the ultrasound system
2 Information about how to use the ultrasound system
3 Selections for configuring the ultrasound system
4 Additional selections based on the workflow selection and operating mode
  – During patient registration, includes access to the patient registration form and other patient studies
  – During imaging, includes selections for activating a transducer and selecting image presets
  – During the annotation function, includes selections for body markers, text, and arrows
  – During measurements, includes access to measurement categories
  – During system configuration, includes selections to change the brightness of the control panel, touch screen, or keyboard
5 Additional options
  – During imaging, displays workflow selections
  – During measurements and annotations, displays a list of measurement packages for selecting additional measurements, calculations, and annotations
6 Selections for the operating mode, features, or functions
7 Additional pages of selections
8 Press and rotate controls on the control panel are labeled on the touch screen
9 Additional selections, for example, print
10 Number of pages of selections and the active page. The active page is indicated in white.
11 Pointer displays the cursor on the image screen during imaging
12 User-defined selections, as specified in the configuration settings
13 Main navigation selections
14 Operating mode
  During combined mode imaging, indicates the active operating mode

Main Navigation Selections on the Touch Screen

Selection	Description
Patient	Activates patient registration and displays selections for retrieving patient studies and registering a patient.
Imaging	Activates imaging.
Review	Activates review and displays workflow-specific selections.
Report	Activates the patient report and displays report navigation and selections.
End Exam	Displays selections for ending the current exam and patient study.

Additional Selections and Symbols on the Touch Screen

Icon	Description
	Indicates additional options available for the selection.
	A rectangular outline indicates the selection currently assigned to a dual-function control. The selections for the control are displayed on the inside of the rectangular outline. The settings are displayed outside of the rectangular outline.
	Indicates an available port for connecting an array transducer to the ultrasound system.
	Indicates an available port for connecting a continuous wave (pencil) transducer to the ultrasound system.
	Indicates a transducer enabled with gesture detection.
	A triangle indicates a folder of measurement labels during the measurement function.
	A category of measurements during the measurement function.
	A check mark indicates a measured or entered value is assigned to the measurement label. During protocols, indicates a protocol view is saved.
	Indicates guided measurements during the measurement function.

Icon	Description
	Accesses additional selections, for example, full-screen format. Use the configuration settings to add or remove selections from the touch screen.
	**Print** sends a screenshot of the image screen to the printer.
	**DVR Record/Pause** records and stores video clips to a digital video recorder.
	**DVR Record/Pause** temporarily stops recording to a digital video recorder.
	**Full Screen** activates full-screen display format on the image screen. Full-screen format increases the size of the image to hide the thumbnail panel and patient banner.
	**Hide Banner** temporarily hides the patient banner on the image screen. The system also hides any patient information in the imaging parameters.
	**Lock Screen** locks the touch screen and trackball. Pressing the freeze key unlocks the touch screen and trackball.
	**Service Image** saves a screenshot of the current image screen and touch screen to the service image folder on the ultrasound system. The system also hides any patient information in the imaging parameters.
	**Eject USB** disconnects all USB-compatible storage devices from the ultrasound system.
	Indicates the virtual keyboard.
---	**Reconnect Wi-Fi** reconnects the ultrasound system to the wireless network.
---	**Film Sheet** displays selections to copy images to the film sheet.
---	**Job Status** displays the job status dialog box.
---	**DVR Menu** displays selections for the digital video recording device.
---	**Send to Store Server** sends images and clips to all DICOM storage servers configured for transfer at the end of the exam.
---	**Panoramic** activates Panoramic imaging. Use the configuration settings to add or remove the selection from the touch screen.
---	**Unlock USB** accesses the security configuration settings for an encrypted USB storage device connected to the ultrasound system. You must enter the password for the encrypted USB storage device to grant the ultrasound system read-write access to the storage device, for example, to import or export data.
---	**Virtual Workstation** provides remote access to a configured archival and information system for confirming the status and transfer of patient data, images, and reports.

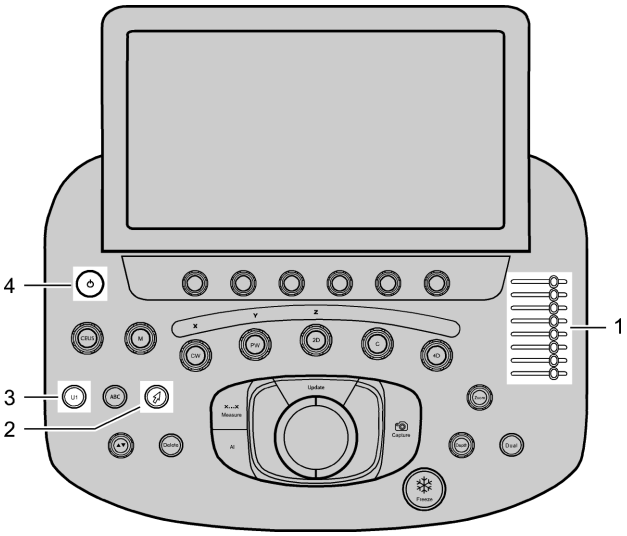
Control Panel

The control panel includes a touch screen, push controls, press controls, and press and rotate controls. The trackball and trackball keys provide access to objects on the image screen.

When the ultrasound system is in use, controls on the control panel are supported by backlighting. Orange lighting indicates the function assigned to the control is active. White lighting indicates the function assigned to the control is available, but not active. No lighting indicates the function assigned to the control is not available for use.

The press and rotate controls on the control panel located directly below the touch screen are always backlit when the ultrasound system is powered on.

See also: For information about configuring the user-defined control, refer to the System Reference.

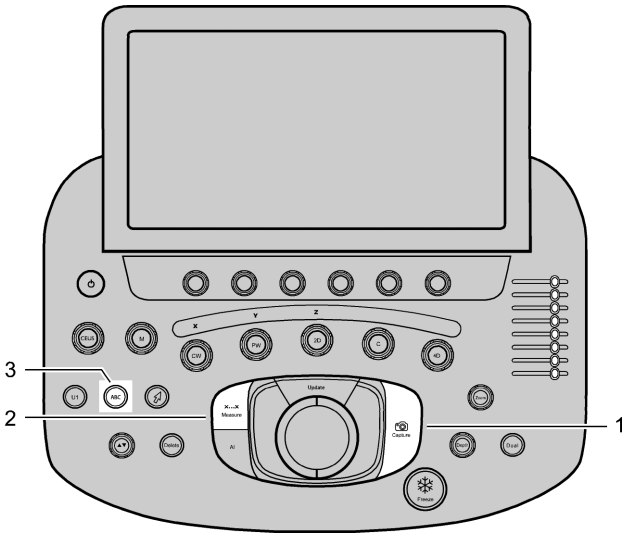


Example of the control panel and touch screen on the ultrasound system.

1 Controls for adjusting the depth gain compensation
2 Pointer
Displays the cursor on the image screen during imaging
3 **U1**
Activates the function assigned to the first user-defined control
Use the configuration settings to assign functionality to this control
4 Partial power on/off switch
Powers on or powers off the ultrasound system
Orange lighting indicates the ultrasound system is powered on
Flashing orange lighting indicates the ultrasound system is plugged in, but not powered on
No lighting indicates the ultrasound system is powered off and not plugged in

Annotation, Measurement, and Archive Controls

Use the configuration settings to assign the print and store functions to a control on the control panel.



Example of the annotation, measurement, and archive controls.

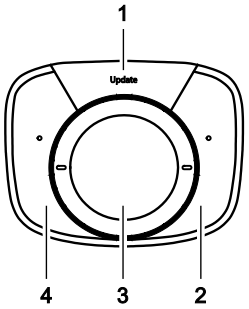
1 **CAPTURE**
- During live imaging, acquires and then saves a clip
- Ends clip capture while capturing a clip
- During system freeze, saves an image of the current CINE frame
- During CINE playback, saves a clip from the current CINE margins

2 **MEASURE**
Activates or exits the measurement function

3 **ABC**
Activates or exits the annotation function

Trackball and Trackball Keys

The trackball and trackball keys size and position an object on the image screen, for example, the region of interest, Doppler cursor, and measurement markers.

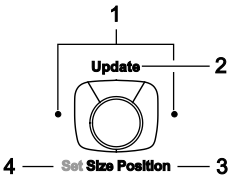


Example of the trackball and trackball keys.

1 **UPDATE**
   – Updates the Doppler spectrum and 2D image
   – Starts, pauses, or continues the acquisition process for the following features: Panoramic imaging
   – Displays a list of view labels during stress echo review
2 Right trackball key activates or confirms a selection depending on the active function
3 Trackball sizes and positions an object depending on the active function
4 Left trackball key activates or confirms a selection depending on the active function

Trackball Status Indicator

The trackball status indicator on the image screen displays the active functions and available functions for the trackball and trackball keys.

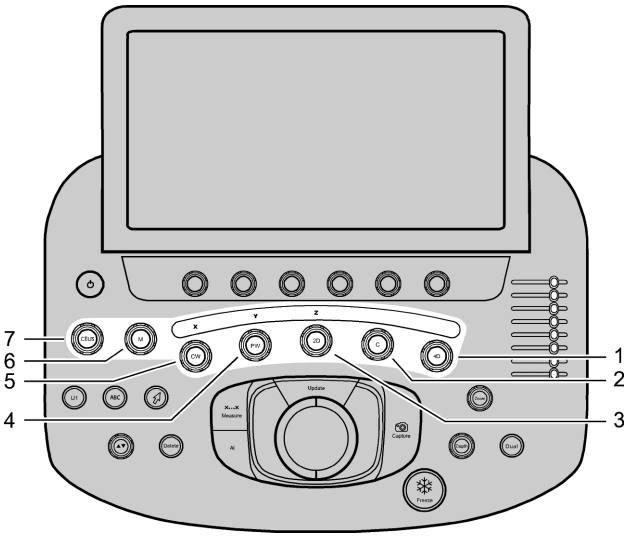


Example of the trackball status indicator on the image screen.

1 Dots indicate more than one function is available for the trackball
2 Task assigned to **UPDATE**
3 Available function for the trackball and trackball keys indicated in white, for example, **Size** or **Position**
4 Active function for the trackball indicated in orange, for example, **Set**

Operating Mode Controls

Operating mode controls activate the operating mode and adjust the gain. Press the operating mode control on the control panel to activate the operating mode. Rotate the operating mode control to adjust the gain for the operating mode.



Example of the operating mode controls.

1 **4D**
- Activates or exits cardiac volume imaging
- During cardiac volume imaging, rotate to adjust the gain

2 **C**
- Activates or exits color imaging
- Use the touch screen to activate additional Doppler options, for example, color or power

3 **2D**
- Reactivates 2D imaging
- During 2D imaging when an image is zoomed, exits zoom
- During dual imaging, exits dual
- During system freeze, reactivates image acquisition
- During contrast agent imaging, rotate to adjust the gain
- **Z** rotates a multiplanar reconstruction or volume along the z axis

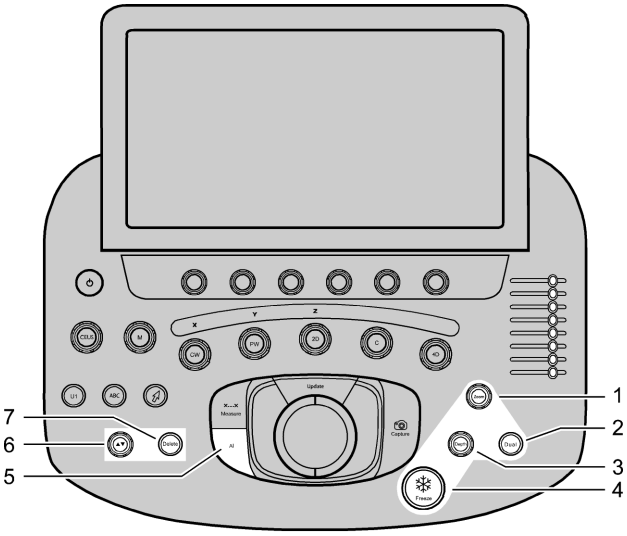
4 **PW**
- Activates or exits pulsed wave (PW) Doppler
- **Y** rotates a multiplanar reconstruction or volume along the y axis

5 **CW**
- Activates or exits continuous wave (CW) Doppler
- **X** rotates a multiplanar reconstruction or volume along the x axis

6 **M**
- Activates or exits M-mode imaging

7 **CEUS**
Activates or exits contrast agent imaging; also referred to as contrast-enhanced ultrasound (CEUS)

Image Format Controls



Example of the image format controls.

1 **ZOOM**
Zooms an image or magnifies a region of interest

2 **DUAL**
Activates dual imaging or selects the left or right side of the image screen

3 **DEPTH**
Adjusts the depth of the image

4 **FREEZE**
- Freezes or unfreezes the acquisition of an image, sweep, or spectrum
- Enables or disables CINE playback
- During clip capture, ends the capture
- During 3D imaging, stops the volume acquisition and displays a partial volume
- During 4D imaging, pauses the volume acquisition for reviewing and editing of volumes in CINE
- During dual or live dual imaging, simultaneously freezes both images

5 **AI**
- During system freeze in 2D-mode, Doppler mode, or M-mode, activates AI Measure
- During live imaging in Color mode or Doppler mode, activates AI Assist

6 **FORWARD/BACKWARD**
- When the control is rotated, navigates to the previous or next image or page of images on the image screen
- When the control is rotated during a protocol, navigates to the previous or next protocol view
- When the control is pressed during a protocol, pauses or resumes the protocol
- When the control is rotated during a stress echo protocol, navigates to the previous or next protocol stage or view
- When the control is pressed during a stress echo protocol, pauses or resumes the protocol view
- When the control is rotated in a report, navigates to the previous or next line

7 **DELETE**
- During the measurement function, deletes the measurement in progress in reverse sequence
- During the annotation function, deletes the annotation in progress in reverse chronological sequence
- Deletes the selected image in review

Footswitch

Use the footswitch as an alternative to using specific controls on the control panel.

Use the configuration settings to assign functionality to each pedal on the footswitch.

Retractable Keyboard

The retractable keyboard is an ultrasound system option, not a standard feature.

See also: For a description of special characters on the touch screen and retractable keyboards, refer to Appendix B in this manual.

Special Keys on the Retractable Keyboard

Key Name	Description
Blank	Accesses special characters located on the alphanumeric keyboard. This key displays the keyboard language and is blank on English keyboards.
Text Start (Space Bar)	Activates the annotation function. When the annotation function is active, inserts a blank space at the current position of the text cursor.
Alt	Provides access to special characters required for some languages when used in combination with the alphanumeric keys.
Alt Gr	(Available only on non-English keyboards) Accesses special characters located on the alphanumeric keyboard.

Configuring the Ultrasound System

You can customize the ultrasound system to accommodate your workflow and preferences.

See also: For detailed information about configuring the ultrasound system, refer to the System Reference.

2 Safety and Care

Operating Safety and Environment 3
Serious Incident Reporting 3
System Symbols 3
Labels 12
Biohazard Considerations 14
Note on Fetal Examinations 15
Acoustic Output 16
Transmit Power Control 17
Mechanical and Thermal Indices 18
Imaging Functions that Change Acoustic Output 19
Ultrasound Catheters and Transmit Power Reduction 19
Transducer Surface Temperature 20
Electrical Safety 21
Level of Protection against Electrical Shock for Transducers 23
Defibrillators 23
Defibrillator Use and Ultrasound Catheters 23
Implantable Devices 23
Possible Combinations with Other Equipment 24
Important Information for Maintaining Data Integrity 25
Data Compression 25

Caring for the Ultrasound System 26
Daily Checklist 26
Maintenance 27
Repair 27
Siemens Healthineers Authorized Care 27
Cleaning and Disinfecting the Ultrasound System 28
System Surfaces 29
Approved Disinfectant Wipes for the Ultrasound System Surfaces 31
Cleaning the Air Filter 34

Caring for Documentation and Storage Devices 36

Green Performance Management: Environmental Protection 36
Product Recycling and Disposal 36
Disposing of the Packaging Materials 36
Handling and Disposal of Components and Accessories 37
Energy Efficient Usage: Energy Conservation 37

Operating Safety and Environment

Do not operate the ultrasound imaging system until you fully understand the safety considerations and procedures presented in this manual.

Siemens Healthineers recommends the use of gloves during the operation, cleaning, and care of the ultrasound system.

See also: For biohazard considerations related to the use of latex products, refer to page 2-14.

Serious Incident Reporting

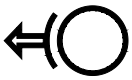
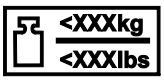
If you become aware of any (potential) malfunction of our device which has resulted or could result in serious health consequences for the user, patient or any other person please inform us immediately and if legally required, inform the Competent Authority of your country.

System Symbols

Refer to this table to identify important symbols located on the ultrasound imaging system and transducers.

Symbol	Explanation
V~	AC (alternating current) voltage source
	Caution: Risk of electric shock. (black and yellow illustration)
	Defibrillation-proof type CF applied part
	Defibrillation-proof type BF applied part
	Type BF applied part
	Consult Instructions for Use
	It is mandatory you refer to the manual. (blue illustration)
	Magnetic resonance (MR) unsafe. Prohibits the use or presence of the medical device in a magnetic resonance imaging (MRI) environment. (black and red illustration)

Symbol	Explanation
	Caution, consult accompanying documents (black illustration)
	General Warning (yellow and black illustration)
	Attention (black illustration)
	Partial power on/off control
	ON position of the mains switch (circuit breaker on the ultrasound system)
	OFF position of the mains switch (circuit breaker on the ultrasound system)
	Equipotential terminal
	Protective earth ground
	Signal input
	Signal output
	USB connection
	Direct current (DC) power input connection
	Indicator light
	Ethernet connection
	Auxiliary continuous wave Doppler transducer port
Aux 1	Auxiliary in/out port
ECG	Electrocardiogram (EKG)
	ECG port
	Electronic array transducer port

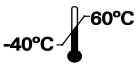
Symbol	Explanation
	Unlocked position
	Locked position
	Swivel
	Left-right rotation adjustment
	Height adjustment
	Swivel lock engaged
	Lock engaged
	Wheel lock engaged
	Wheel lock released
	Use only in dry conditions Do not install a wet air filter.
	Location of air filter
PUSH	Releases or engages the locking mechanism when pushed
IPX8	Protected against the effects of continuous immersion in water
Rx ONLY	Caution: In the United States of America, federal law restricts this device to sale or use by, or on the order of, a physician.
	Safe working load "XXX" represents the weight of the system unpacked and ready for operation with documentation devices installed. Additional objects or devices on the system cannot exceed the safe working load.

Symbol	Explanation
	The product must be properly disposed of in accordance with local, state, and regional laws and regulations. Products bearing this symbol are subject to the European Community Directive 2002/96/EC on waste electrical and electronic equipment (WEEE), amended by Directive 2012/19/EU. For collection and disposal of the product, its components, or its accessories, contact your local customer service representative.
	Environmentally friendly use period
	Do not exert excessive force when moving or positioning the ultrasound system. (black and red illustration)
	Do not lean. (black and red illustration)
	Shelf or compartment weight restriction "XX" represents the maximum weight restriction
	The viewing angle of the touch screen is adjustable.
	Pinch hazard
	Identifies the importer of the medical device
	Authorized representative in Switzerland
	European Conformity mark Indicates the manufacturer declares the product complies with the applicable requirements in Regulation (EU) 2017/745 and other applicable European Union harmonization legislation.
	Manufacturer's declaration of product compliance with applicable EEC directives
	UL symbol for listing as recognized components for Canada and United States of America

Symbol	Explanation
	Eurofins MET mark for Canada and United States of America Indicates the product complies with Underwriters Laboratories (UL) and Canadian Standards Association (CSA) safety standards. Includes the following certifications under the mark: Electrical Safety E115466
EC REP	Authorized representative in the European community
EAC	EAC (Eurasian Conformity mark) The Eurasian Conformity mark is a product marking to indicate that the product conforms to all Technical Regulations of the Customs Union assessment procedures.
Complies with IMDA Standards DAXXXXXX	Equipment complies with the standard and specifications published by IMDA (Info-communications Media Development Authority of Singapore) "XXXXXX" represents the dealer's license number
Segurança Compulsório INMETRO	TÜV SÜD INMETRO Certification Mark (Brazil)
UK CA	UK CA mark Product complies with applicable annexes and directives of the United Kingdom Conformity Assessment
	CCC mark Product complies with applicable regulations of the China Compulsory Certificate
	Product complies with applicable regulations of the Bureau of Indian Standards (BIS) Includes the registration number
ANATEL	Agência Nacional de Telecomunicações (ANATEL) certification label in Brazil Includes the certification number
	C-Tick Mark Product complies with applicable Australian or New Zealand standards for EMC and radio-communications
	National Communications Commission (NCC) certification of type approval label in Taiwan Includes the approval number
R	Technical Conformity Mark for specified radio equipment in Japan

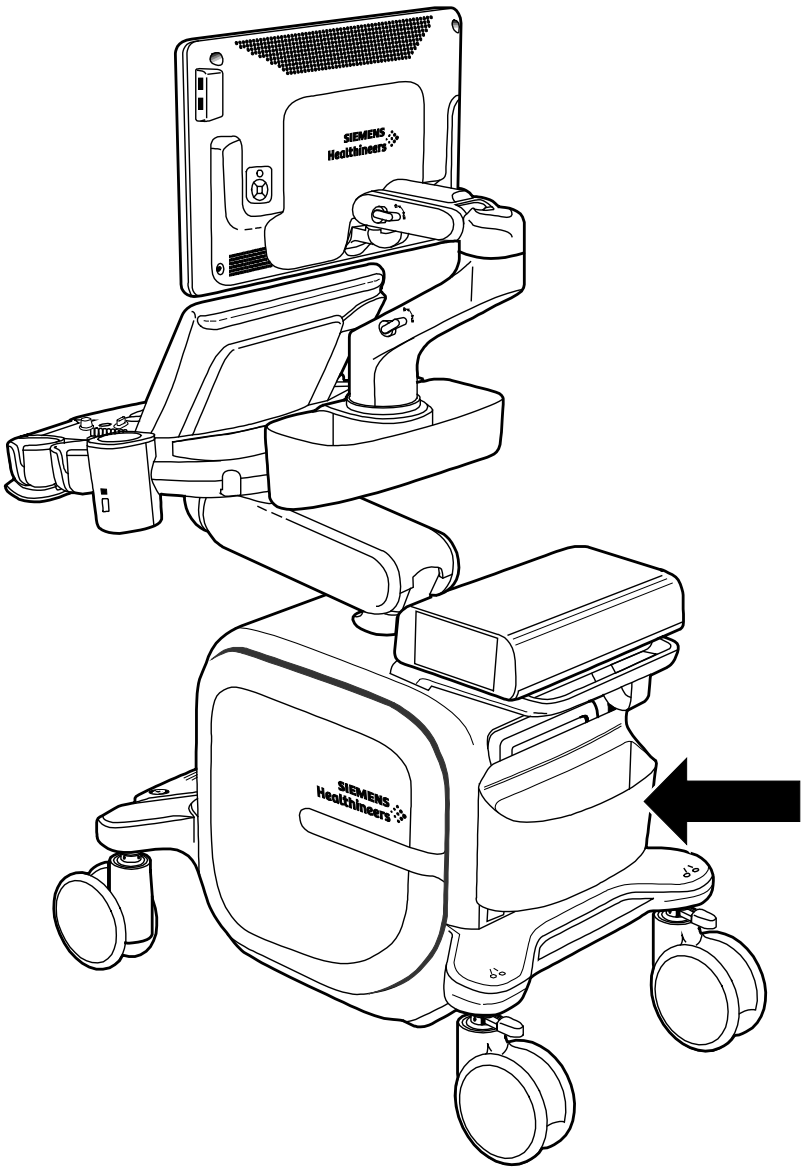
Symbol	Explanation
IC	ISED Canada (IC) Innovation, Science and Economic Development (ISED) certification of radio apparatus in Canada Includes the certification number
FCC ID	Federal Communications Commission (FCC) identifier for certification of radio frequency devices in the United States of America Includes the certification number
CMIIT ID	China Ministry of Industry and Information Technology (CMIIT) identifier for radio type certification in China Includes the certification number
IFETEL	Instituto Federal de Telecomunicaciones (IFT) certification in Mexico Includes the certification number
	National certification for Korea
	Ukrainian conformity mark
	The monitor is compliant with the limits for a Class B digital device, pursuant to Part 15 of the Federal Communications Commission (FCC) rules in the United States of America.
IVK	(Installierte Volumen Komponente) Identifier of selected system components or parts for product traceability
System IVK	(System Installierte Volumen Komponente) Identifies the system for product traceability
	Barcode with product identification information according to the following barcode specification: GS1 DataMatrix
	Manufacturer
	Date of manufacture Includes the year and month adjacent to the symbol

Symbol	Explanation
SN	Identifies the manufacturer's serial number of the medical device Includes the number adjacent to the symbol
REF	Identifies the manufacturer's catalog reference number of the medical device Includes the number adjacent to the symbol
CONFIG	Indicates the device consists of several components that can be assembled by the manufacturer in multiple configurations
COMBI	Indicates the system (a combination of products)
UDI	Indicates the unique device identifier (UDI)
MD	Indicates the equipment is a medical device
GTIN	Global Trade Item Number
Rev REV	Model revision
Serial SERIAL	Serial number
Count COUNT	Quantity of product
SW VERSION	Software version
Model MODEL	Product model number
REF	Device part number
YYYY-MM-DD	Date in YYYY-MM-DD (year-month-day) format
Origin US ORIGIN US	Manufacturer country of origin: United States of America
Origin KR ORIGIN KR	Manufacturer country of origin: Republic of Korea
Origin CN ORIGIN CN	Manufacturer country of origin: China
Origin JP ORIGIN JP	Manufacturer country of origin: Japan
Origin DO ORIGIN DO	Manufacturer country of origin: Dominican Republic
Origin FR ORIGIN FR	Manufacturer country of origin: France
Origin IT ORIGIN IT	Manufacturer country of origin: Italy
Origin Mx ORIGIN MX	Manufacturer country of origin: Mexico
Origin SK ORIGIN SK	Manufacturer country of origin: Slovakia

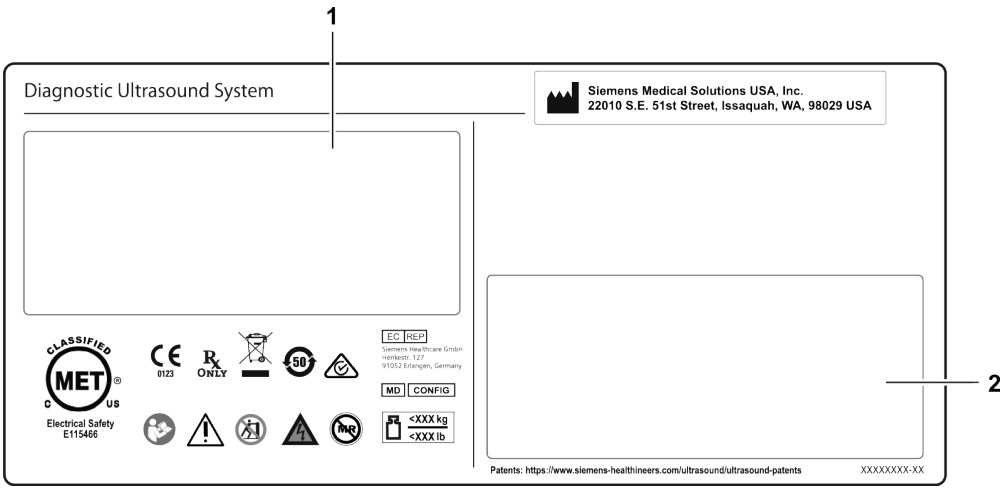
Symbol	Explanation
REVISION	Model revision
Model / Type	Product model number
Rating	Electricity rating
S/N	Serial number
P/N	Part number
	Barcode
	Do not re-use Indicates the medical device is for single use only and must not be used more than one time
	Electrostatic sensitive device
	Nonsterile
	Do not dispose of in trash receptacle. The product must be properly disposed of in accordance with local, state, and regional laws and regulations.
	Use by date Indicates the medical device should not be used after the accompanying date
	Storage temperature range (example)
	Weight and size "XXX" represents the weight of the system packaged for shipping "XX" represents the size of the box in inches
	Do not stack
	Stacking limitation "n" indicates the number of items that can be stacked
	Recycle
	The wood packaging material for shipping the ultrasound system complies with the International Standards for Phytosanitary Measures No. 15. (example)

Symbol	Explanation
	Do not expose to direct sunlight
	Storage atmospheric pressure range (example)
	Storage humidity range (example)
	Indicates this side up
	Do not allow to get wet
	Fragile. Handle with care.
	Refer to the operator's manual for information about compatible needle guides.
	Intentional transmitter of non-ionizing radiation

Labels

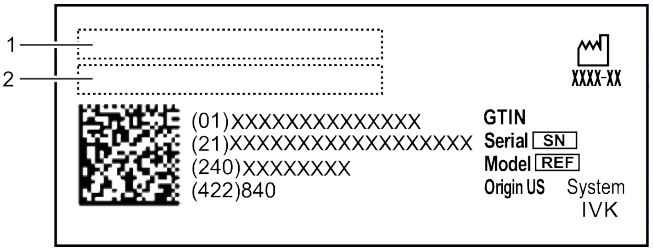


Example of the location of the system label.



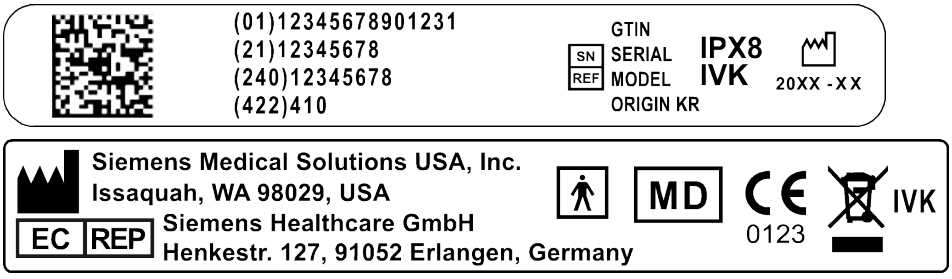
Example of ultrasound system label with certification labels.

1 Identification label
2 Country-specific labels



Example of identification label.

1 Product name
2 System input power requirement



Example of labels on a transducer.

Biohazard Considerations

⚠ **WARNING:** With the exception of systems licensed by Siemens Healthineers to use the ultrasound catheters, for example, the AcuNav ultrasound catheter, this equipment is not suitable for intracardiac use or direct cardiac contact.

⚠ **WARNING:** Siemens Healthineers makes every effort to manufacture safe and effective transducers. You must take all necessary precautions to eliminate the possibility of exposing patients, operators, or third parties to hazardous or infectious materials. These precautions should be considered in the use of any application that may indicate the need for such care, and during endocavity or intraoperative scanning; during biopsy or puncture procedures; or when scanning patients with open wounds.

⚠ **WARNING:** To eliminate the possibility of exposing patients, operators, or third parties to hazardous or infectious materials, always dispose of hazardous or infectious materials according to local, state, and regional laws and regulations.

⚠ **WARNING:** There have been reports of severe allergic reactions to medical devices containing latex (natural rubber). Health care professionals are advised to identify latex-sensitive patients and to be prepared to treat allergic reactions promptly. For additional information in the U.S.A., refer to FDA Medical Alert MDA91-1.

⚠ **WARNING:** Ultrasound energy is transmitted more effectively through water than through tissue. When using a standoff device of any kind, for example, a gel pad, the actual mechanical and thermal indices, MI and/or TI, may be higher than indicated in the output display on the system.

The assessment of the biological effects of diagnostic ultrasound on humans is a subject of ongoing scientific research. This system, and all diagnostic ultrasound procedures, should be used for valid reasons, for the shortest possible period of time, and at the lowest mechanical and thermal indices necessary to produce clinically acceptable images.

According to the ALARA (As Low As Reasonably Achievable) principles, acoustic output should be set to the ***lowest level required to satisfactorily perform the examination.***

The ultrasound imaging system complies with the standards of the American Institute of Ultrasound in Medicine (AIUM), the National Electrical Manufacturer's Association (NEMA), the guidelines of the United States Food and Drug Administration (FDA), and the guidelines of the International Electrotechnical Commission (IEC) in terms of safety and acoustic output levels. The ultrasound output levels are stated to permit the user to critically evaluate the system settings in the event of new research findings being announced.

Note on Fetal Examinations

The following recommendation is excerpted from the National Institute of Health in the United States of America. *Consensus Statement on the Use of Ultrasound Imaging During Pregnancy*, Volume 5, No. 1, based on the recommendation issued at the Health Consensus Development Conference, February, 1984:

> Ultrasound examination in pregnancy should be performed for a specific medical indication. The data on clinical efficacy and safety do not allow a recommendation for routine scanning at this time.
>
> Ultrasound examination performed solely to satisfy the family's desire to know the fetal sex, to view the fetus, or to obtain a picture of the fetus should be discouraged. In addition, visualization of the fetus solely for educational or commercial demonstrations without medical benefit should not be performed.

In August 1994, the Food and Drug Administration (FDA) notified the medical community and the ultrasound industry regarding its concerns about the misuse of diagnostic ultrasound equipment for non-medical purposes, and to discourage patients from having sonograms for non-medical reasons.

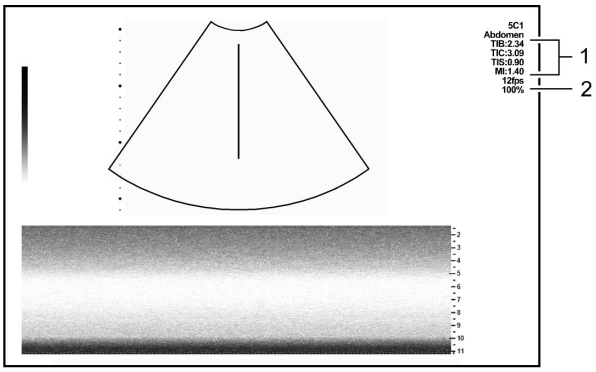
The American Institute of Ultrasound in Medicine (AIUM) has also advocated the responsible use of diagnostic ultrasound for all fetal imaging (August 2005).

Acoustic Output

⚠ **WARNING:** Ultrasound procedures should be used for valid reasons, for the shortest period of time, and at the lowest mechanical/thermal index setting necessary to produce clinically acceptable images.

Note: For systems distributed in the United States of America, refer to the *Medical Ultrasound Safety* ultrasound education program brochure produced by the AIUM that is shipped with the ultrasound system.

See also: For acoustic output information, refer to Appendix D in this manual.



Example of the mechanical and thermal indices and the transmit power display on the image screen.

1 Mechanical and thermal indices
2 Transmit power

Transmit Power Control

Adjust the transmit power and the corresponding acoustic pressure delivered through the transducer to the patient by using the designated control on the system. It is the main system function that determines the transmitted intensity of ultrasound for all transducers and imaging modes during real-time imaging, though it is not the only function that affects the mechanical and thermal indices. The range and especially the maximum level of the mechanical and thermal indices differ depending on the transducers. In addition, each image preset has a preset value for the transmit power control, which affects the default mechanical and thermal indices.

See also: Imaging Functions that Change Acoustic Output, page 2-19

Note: Maximum transmit acoustic intensity and the mechanical index for each image preset and transducer combination are limited in accordance with the United States Food and Drug Administration's (FDA) recommendations and guidelines. System default transmit intensity and mechanical index values are always below the FDA recommendations for each exam type. In addition to the transmit power control, there are other system controls or functions that could raise acoustic output levels.

To increase the transmit power:

1. Access the next page of touch screen selections, if necessary.
2. During real-time imaging, rotate **Transmit Power** clockwise to increase transmit power.

   The system briefly highlights the power value to indicate the change.

To decrease the transmit power:

1. Access the next page of touch screen selections, if necessary.
2. During real-time imaging, rotate **Transmit Power** counterclockwise to decrease transmit power.

   The system briefly highlights the power value to indicate the change.

Transmit Power Display

The transmit power range is from 0.2% to 100%. Selecting 100%, in combination with other system controls or functions, generates the maximum acoustic intensity and mechanical index for each transducer, where:

$I_{SPTA.3}$: ≤ 720 mW/cm² **and** MI ≤ 1.9

Mechanical and Thermal Indices

The ultrasound system incorporates an output display of mechanical and thermal indices to allow you to monitor, and to limit, the amount of ultrasound energy that is transferred to the patient.

The system displays the mechanical and thermal indices during real-time imaging, in all imaging modes.

Indices display in the abbreviated form shown below:

- **MI**: Mechanical Index
- **TIB**: Bone Thermal Index (fetal application)
- **TIS**: Soft Tissue Thermal Index
- **TIC**: Cranial Thermal Index

Imaging Functions that Change Acoustic Output

⚠ **WARNING:** Observe the real-time display of mechanical and thermal indices (MI/TI) at all times.

In addition to the adjustment of the transmit power, adjustment of the following imaging functions and/or controls may affect the acoustic output:

- Power on/off
- Automatic time-out
- Freeze
- Imaging mode
- Transducer and transducer frequency
- Transducer and image preset
- Image depth
- Field of view (scan angle); 2D steering angle for linear array transducers
- Frame rate
- Line density
- Focus
- Zoom
- M-mode cursor
- Doppler gate position and size; steering angle for linear array transducers
- Doppler pulsed repetition frequency (PRF)
- Simultaneous/update
- Color PRF
- Color and Power region of interest position and size; steering angle for linear array transducers
- Harmonics
- Compounding
- Gel pad use

Ultrasound Catheters and Transmit Power Reduction

The ultrasound system reduces the transmit power of a catheter prior to use in a patient and in the following conditions:

- The catheter is selected as the active transducer and the on-screen image is active, not frozen.
- The catheter is scanning air for a minimum of ten seconds, not immersed in saline during the catheter verification procedure or scanning tissue with echogenic properties.

To restore transmit power to the previous value, scan tissue with echogenic properties. Or, adjust an imaging parameter, for example, gain.

See also: For information on imaging with catheters, including the catheter verification procedure, refer to the instructions for use shipped with your catheter and with your SwiftLink connector.

Transducer Surface Temperature

The following table provides the maximum surface temperature of the transducers compatible with the ultrasound system.

The maximum surface temperature of the transducers is in accordance with IEC 60601-2-37.

	Maximum Temperature	
Transducer	**TMM**	**Still Air**
7L2	39.5°C	41.5°C
10L4	40.6°C	42.2°C
14L5	41.8°C	40.1°C
DAX	41.7°C	41.8°C
5C1	41.4°C	42.8°C
9C2	42.0°C	41.0°C
4V1	39.3°C	40.1°C
5V1	41.3°C	41.3°C
5Z1	40.2°C	36.1°C
8V3	40.8°C	40.3°C
10V4	40.9°C	40.0°C
Z6T	42.4°C	37.2°C
AcuNav Lumos 4D ICE	42.1°C	NA
CW2	35.9°C	31.5°C
CW5	34.9°C	40.9°C

TMM = Tissue Mimicking Material

NA = not applicable (not tested)

Electrical Safety

⚠ **WARNING:** To avoid electric shock, use a protective earth connection to connect the ultrasound system to the power supply (supply mains). The protective earth connection ensures additional grounding is provided to reduce the risk of electric shock.

⚠ **WARNING:** For systems used in the U.S.A.: To ensure grounding reliability, only connect the system to a hospital-grade power outlet (mains outlet).

⚠ **WARNING:** The power connector (mains plug) for the ultrasound system is a three-prong grounded plug in the U.S.A. and should never be adapted to any two-prong (non-grounded) outlet, either by modifying the plug or by using an adapter. In the U.S.A., proper grounding requires the power connector to be plugged into a hospital-grade power outlet (mains outlet).

⚠ **WARNING:** To avoid electrical shock, never modify the ultrasound system's power connector (mains plug), as doing so may overload your facility's power circuits. To ensure grounding reliability, connect the system only to an equivalent outlet.

⚠ **WARNING:** To avoid electrical shock, never use equipment or a mains power cord that shows signs of wear or tampering, or whose ground plug has been bypassed using an adapter.

⚠ **WARNING:** Equipment connected to the ultrasound system and in the patient zone must be powered from a medically-isolated power source or must be a medically-isolated device. Equipment powered from a non-isolated source can result in chassis leakage currents exceeding safe levels. Chassis leakage current created by an accessory or device connected to a non-isolated outlet may add to the chassis leakage current of the ultrasound system.

⚠ **WARNING:** Using an extension cord or multi-socket outlet setup to provide power to the ultrasound system or to the system's peripheral devices may compromise the system grounding and cause your system to exceed leakage current limits.

⚠ **WARNING:** To avoid electrical shock and damage to the ultrasound system, power off and unplug the equipment from the power supply (supply mains) before cleaning and disinfecting the system.

⚠ **WARNING:** Do not pour any fluid onto the ultrasound system surfaces, as fluid seepage into the electrical circuitry may cause excessive leakage current or system failure.

⚠ **WARNING:** To ensure proper grounding and leakage current levels, it is the policy of Siemens Healthineers to have an authorized Siemens Healthineers representative or Siemens Healthineers-approved third party perform all on-board connections of documentation and storage devices to the ultrasound system.

⚠ **WARNING:** To maintain the safety and functionality of the ultrasound system, electrical safety tests must be performed as specified by local safety regulations, or as needed.

⚠ **WARNING:** To prevent excessive leakage current from contacting the patient, do not touch a user-accessible connector on the system while touching or scanning the patient.
User-accessible connectors include the ECG connector, a transducer connector, a USB connector, and any other audio, video, or data transmission connectors.

⚠ **WARNING:** Connecting peripheral devices to accessory outlets on the ultrasound system effectively creates a medical electrical system, resulting in a reduced level of safety.

⚠ **WARNING:** Do not modify this equipment without authorization from Siemens Healthineers.

⚠ **Caution:** To avoid the possibility of static shock and damage to the system, avoid the use of aerosol spray cleaners on the monitor screens.

⚠ **Caution:** Do not use spray cleaners on the ultrasound system, as this may force cleaning fluid into the system and damage electronic components. It is also possible for the solvent fumes to build up and form flammable gases or damage internal components.

⚠ **Caution:** To maintain the safety and functionality of the ultrasound system, maintenance must be performed every 24 months. Electrical safety tests must also be performed at regular intervals as specified by local safety regulations, or as needed.

Level of Protection against Electrical Shock for Transducers

⚠ **WARNING:** Only use Type BF transducers with the ultrasound system to maintain a level of protection against electrical shock.

According to IEC 60601-1, the assemblies for the linear, curved, and phased array transducers provide a "Level of Protection Against Electrical Shock" of "Type BF."



Example of the Type BF icon located on the transducer label.

Defibrillators

⚠ **WARNING:** The ECG function is designed to withstand the effects of defibrillation. However, when possible, disconnect the ECG leads during defibrillation since a malfunction of the safety controls could otherwise result in electrical burns for the patient.

For patient safety, be sure to use defibrillators that do not have grounded patient circuits.



Example of the Type CF icon located on the transducer label.

Defibrillator Use and Ultrasound Catheters

⚠ **WARNING:** The catheter is designed to withstand the effects of defibrillation. However, when possible, disconnect the connector from the ultrasound system during defibrillation because a malfunction of the safety controls could otherwise result in electrical burns for the patient.

The catheter is designed to withstand the effects of defibrillation. There are no exposed conductive surfaces distal to the handle. Within the flexible shaft, a chassis ground shield covers all active circuits and conductors.

Recovery Time After Defibrillation during a Catheter Procedure

If you disconnect the SwiftLink catheter connector from the ultrasound system before defibrillation, the recovery time after defibrillation is equal to the time required to reconnect the connector to the ultrasound system.

The recovery time after defibrillation for the ultrasound system:

- Three (3) minutes if defibrillation is performed with the ultrasound system on.

Implantable Devices

⚠ **WARNING:** Ultrasound systems, like other medical equipment, use high-frequency electrical signals that can interfere with implantable devices such as pacemakers and implantable cardioverter-defibrillators (ICDs). If the patient has such an implantable device, you should be aware of any interference in its operation and immediately power off the ultrasound system.

Possible Combinations with Other Equipment

⚠ **WARNING:** Accessory equipment connected to the analog and digital interfaces must be certified according to the respective EN or IEC standards (for example, EN 60950 or IEC 60950 for data processing equipment and EN 60601-1 or IEC 60601-1 for medical equipment). Anyone who connects additional equipment to any of the signal input or signal output ports configures a medical system and is therefore responsible that the system complies with the requirements of the system standards EN 60601-1 or IEC 60601-1. Siemens Healthineers can only guarantee the performance and safety of the devices listed in the *Instructions for Use*. If in doubt, consult the Siemens Healthineers service department or your local Siemens Healthineers representative.

The ultrasound system can support two on-board documentation devices at one time.

On-board peripheral devices must be installed by an authorized Siemens Healthineers representative or by a Siemens Healthineers-approved third party. Devices installed by other people will be at the user's risk and may void the system warranty.

Important Information for Maintaining Data Integrity

⚠ **WARNING:** To prevent the loss of data that results from unplugging the system from the power supply (supply mains) before the system has completed its shutdown sequence, follow the system shutdown instructions in this manual.

⚠ **Caution:** To prevent corruption of data stored on inserted media, do not interrupt the exporting process. Do not delete exported patient data from the local database until the exporting process is complete and the inserted media is determined to be full (or no more exporting is planned for the inserted media).

To ensure data integrity:

- To prevent the loss of data that results from power failures and other system "down" occurrences, you must archive important data, such as patient records, onto external media.
- Loss of data is to be expected and its retrieval is not normally possible under the following conditions: loss of power to the ultrasound system, CPU failure, system lockup, and other similar causes.
- Should an abnormal system shutdown occur, retrieval of data not saved to the ultrasound system or not archived to external media is not normally possible.

  An abnormal system shutdown occurs if you do not power off the ultrasound system using the partial power on/off control located on the control panel. Other examples of abnormal system shutdown include: equipment malfunction, loss of power, or pressing and holding the partial power on/off control longer than four seconds.
- Should an abnormal system shutdown occur, the system may initially require additional time to reboot or to respond to user input. This is due to the operating system performing a background scan of the ultrasound system's data storage to detect and segregate any truncated or corrupted files.

Data Compression

⚠ **WARNING:** This product uses JPEG Lossy compression that is irreversible and can result in the loss of image quality. All compressed images contain information about the compression ratio and compression type. This product conforms to the DICOM standard. DICOM conformance statements for ultrasound products are available at www.siemens-healthineers.com/services/it-standards/dicom.

Caring for the Ultrasound System

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 ultrasound system, including the control panel, keyboard, transducers, and biopsy devices, should be cleaned and/or disinfected as necessary or between uses. Clean each component to remove any surface particles. Disinfect components to destroy pathogens and other microorganisms.

See also: Cleaning the Air Filter, page 2-34

Daily Checklist

⚠ **WARNING:** To minimize the risk of cross-contamination and infectious diseases, a sterile, non-pyrogenic transducer sheath must be in place during procedures requiring sterility.

⚠ **WARNING:** To avoid electrical shock, you must visually inspect a transducer prior to use. Do not use a transducer with cracked, punctured, or discolored casing or a frayed cable.

Discoloration Exception: The use of approved cleaners and disinfectants may cause discoloration of the transducer. You can continue to use a transducer discolored due to the use of approved cleaners and disinfectants only.

See also: For information about approved cleaners and disinfectants for a transducer, refer to Chapter 3 in this manual.

Perform the following each day before using the ultrasound system:

- Visually inspect all transducers. Do not use a transducer with a cracked, punctured, or discolored casing or a frayed cable. You can continue to use a transducer discolored due to the use of approved cleaners and disinfectants only.

  Verify the electrical component of the transducer connector is clean and free from gel or particles.
- 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 Siemens Healthineers service representative for power cord replacement.
- Visually inspect the ECG connector and the cable. Do not use the ECG function if the connector or cable is damaged or broken.
- Verify the trackball, DGC slide controls, and other controls on the control panel are clean and free from gel or other contaminants.

Once the system is powered on:

- Visually check the on-screen displays and lighting.
- Verify the screen displays the current date and time.
- Verify the transducer identification and indicated frequency are correct for the active transducer.

Maintenance

⚠ **Caution:** To maintain the safety and functionality of the ultrasound system electrical safety tests must be performed as specified by local safety regulations, or as needed.

Repair

⚠ **WARNING:** Do not modify this equipment without authorization from Siemens Healthineers.

For questions regarding repair or replacement of any equipment parts on your system, contact your Siemens Healthineers service representative.

Siemens Healthineers Authorized Care

Installers and operators must observe any statutory regulations that govern the installation, operation, inspection, and maintenance of this equipment.

To ensure the safety of patients, operators, and third parties, the equipment must be inspected every 24 months, and the replacement of parts is performed as necessary. This maintenance must be performed by a qualified Siemens Healthineers authorized representative. It is important to inspect the equipment more frequently if it is operated under extraordinary conditions.

Perform inspections and maintenance at the prescribed intervals to avoid worn and hazardous parts due to wear. Contact the Siemens Healthineers service department for the required maintenance.

As manufacturers and installers of ultrasound equipment, Siemens Healthineers cannot assume responsibility for the safety properties, reliability, and/or performance of the equipment, if:

- Installations, extensions, readjustments, modifications, additions, or repairs are carried out by persons not specifically authorized by Siemens Healthineers.
- Components that affect the safe operation of the system are replaced by parts not authorized by Siemens Healthineers.
- The electrical installation of the room where the equipment is located does not meet the power and environmental requirements stated in this manual.
- The equipment is not used in accordance with the operating instructions.
- The system is operated by personnel not adequately educated or trained.

Siemens Healthineers suggests that you request any person who performs maintenance, or repairs, to provide you with a certificate showing:

- The nature and extent of the work performed
- Changes in rated performance
- Changes in working ranges
- Date of service
- Name of person or firm performing the service
- Signature of person performing the service

Cleaning and Disinfecting the Ultrasound System

You must take all necessary precautions to eliminate the possibility of exposing patients, operators, or third parties to hazardous or infectious materials. Use universal precautions when cleaning and disinfecting. You should treat all portions of the imaging system that come in contact with human blood or other body fluids as if they were known to be infectious.

All exterior parts of the ultrasound system, including the control panel, keyboard, transducers, and biopsy devices, should be cleaned and/or disinfected as necessary or between uses. Clean each component to remove any surface particles. Disinfect the components to destroy pathogens and other microorganisms.

⚠ **WARNING:** To avoid electric shock and damage to the system, always power off and disconnect the equipment from the AC power source before cleaning and disinfecting.

⚠ **WARNING:** Disinfectants and cleaning methods listed are recommended by Siemens Healthineers for compatibility with product materials, not for biological effectiveness. Refer to disinfectant label instructions for guidance on disinfection efficacy and appropriate clinical uses.

⚠ **WARNING:** The use of any disinfectants other than those specified in the instructions for use may damage the ultrasound system and accessory surfaces and, as a result, may create electrical hazards for the patients and/or users.

⚠ **WARNING:** Contents of some disinfecting agents are known to be health hazards. Their concentration in the air must not exceed an applicable specified limit. Comply with the manufacturer's instructions when using these agents.

⚠ **Caution:** Do not clean or disinfect the system with chlorinated or aromatic solvents, acidic or basic solutions, isopropyl alcohol or strong cleaners such as ammoniated products, as these can damage the surface of the system. Use the recommended cleaning and disinfecting procedure. Only use approved cleaners and disinfectants on the ultrasound system.

⚠ **Caution:** Do not use spray cleaners on the ultrasound system as this may force cleaning fluid into the system and damage electronic components. It is also possible for the solvent fumes to build up and form flammable gases or damage internal components.

⚠ **Caution:** Do not pour any fluid onto the ultrasound system surfaces, including the control panel and touch screen, as fluid seepage into the electrical circuitry may cause excessive leakage current or system failure.

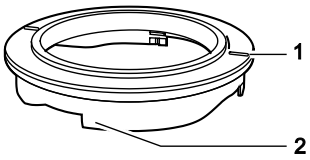
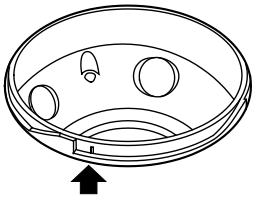
⚠ **Caution:** Prior to cleaning or disinfecting the system, you must disconnect and remove transducers from the ultrasound system. Unintended contact with disinfectants approved only for use with the system can result in damage to the transducers.

Note: Iodine and betadine may discolor the control panel. There is no associated degradation of imaging performance or control panel reliability due to discoloration by iodine or betadine.

System Surfaces

See also: For instructions on removing and attaching the transducers, transducer holders, and gel warmer, refer to Chapter 4 in this manual.

To	Do This
Clean and disinfect the surface of the ultrasound system	⚠ **Caution:** To avoid the possibility of static shock and damage to the ultrasound system, avoid the use of aerosol spray cleaners on the monitor screen and touch screen. 1. Power off the ultrasound system and then unplug the power cord from the power supply (supply mains). 2. Use a clean gauze pad or lint-free cloth, lightly moistened with a mild detergent, to wipe the surface of the ultrasound system. – Gently wipe the glass surfaces of the touch screen and monitor. – 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 fluids do not seep into any openings on the ultrasound system, such as the seams on the control panel. 3. After cleaning, use a clean, lint-free cloth to dry the surface. 4. Use an approved disinfectant wipe to disinfect the ultrasound system and accessories, except the transducer ports. 5. After cleaning and disinfecting, reconnect the ultrasound system power cord to the power supply (supply mains).
Clean the array transducer ports on the ultrasound system	⚠ **Caution:** To avoid damage to the transducer ports, never use gauze pads, lint-free cloths, or solutions to clean the transducer ports. 1. Disconnect transducers from the array transducer ports. 2. Use compressed air to remove particles from the ports. 3. Reconnect the transducer and then rotate the transducer locking lever from the unlocked position to the locked position approximately five times to dislodge any debris.
Clean and disinfect the holders for transducers and coupling gel	1. Remove the holder from the ultrasound system. 2. Clean the holder under running water, using a mild detergent and then dry with a clean, lint-free cloth. 3. As required, use an approved disinfectant wipe to disinfect the holder. 4. Reattach the holder to the ultrasound system.

To	Do This
Clean and disinfect the gel warmer	⚠ **Caution:** To avoid damage to the gel warmer, do not immerse the gel warmer in water or any solution. **Note:** To facilitate cleaning, remove the cap at the bottom of the gel warmer. Rotate the cap counterclockwise to remove the cap; rotate the cap clockwise to secure the cap. 1. Remove the gel warmer from the ultrasound system. 2. Unplug the power cable from the gel warmer. 3. Clean and disinfect the gel warmer using an approved disinfectant wipe. 4. Reattach the gel warmer to the ultrasound system.
Clean and disinfect the trackball	⚠ **Caution:** Do not drop or place foreign objects inside the trackball assembly because doing so may affect the trackball operation and damage the ultrasound system.  *Example of the trackball ring.* 1 Raised markings on either side of the ring 2 Tab for inserting into the trackball assembly  *Example of the point of attachment for the trackball ring on the trackball assembly.* 1. Rotate the ring around the trackball counterclockwise and then carefully lift up the ring to remove the ring and trackball. 2. Clean the ring and trackball with a cotton swab or lint-free pad moistened with mild detergent solution. 3. Clean the inside of the trackball assembly with a cotton swab or lint-free pad moistened with mild detergent solution. 4. As required, use an approved disinfectant wipe to disinfect the ring, trackball, and trackball assembly. 5. Allow the trackball components to completely dry before reassembly. 6. Reinstall the ring and trackball. a. Place the trackball inside the trackball assembly. b. Place the ring over the trackball, taking care to align the tab with the point of attachment on the trackball assembly. c. Rotate the ring clockwise until the ring snaps into place and the raised markings of the ring are in a horizontal position.

Approved Disinfectant Wipes for the Ultrasound System Surfaces

Use only approved disinfectant wipes on the surfaces of the ultrasound system and accessories, except the transducer ports.

Note: For spray disinfectants, you must apply the disinfectant to a clean, lint-free cloth before wiping the surfaces of the ultrasound system.

	Monitor screen	Touch screen	Trackball assembly	Gel warmer	Array transducer ports	All other ultrasound system surfaces*
Accel INTERVention Wipes	✓	✓	✓	✓	NA	✓
Acrylan	✓	✓	✓	✓	NA	✓
ANIOS OXIZYME	✓	✓	✓	✓	NA	✓
ANIOXY-TWIN	✓	✓	✓	✓	NA	✓
ANIOXYDE 1000	✓	✓	✓	✓	NA	✓
ANIOXYDE 1000 LD	✓	✓	✓	✓	NA	✓
antifect N liquid	✓	✓	✓	✓	NA	✓
AZO 70% IPA Wipes & Spray	✓	✓	✓	✓	NA	✓
AzoMax Wipes & Spray	✓	✓	✓	✓	NA	✓
Azo Universal Cleaning and Disinfectant Wipes	✓	✓	✓	✓	NA	✓
Bacillol 30 Tissues & Foam	✓	✓	✓	✓	NA	✓
Bacillol AF	✓	✓	✓	✓	NA	✓
Bacillol Tissues	✓	✓	✓	✓	NA	✓
Bacillol Wipes	✓	✓	✓	✓	NA	✓
CaviCide	✓	✓	✓	✓	NA	✓
CaviCide1	✓	✓	✓	✓	NA	✓
CaviWipes	✓	✓	✓	✓	NA	✓
CaviWipes 1	✓	✓	✓	✓	NA	✓
CaviWipes 2.0	✓	✓	✓	✓	NA	✓
CLEANISEPT WIPES	✓	✓	✓	✓	NA	✓
CLEANISEPT WIPES forte	✓	✓	✓	✓	NA	✓
Clinell Clorox Wipes	NA	✓	✓	✓	NA	✓
Clinell Universal Wipes & Spray	✓	✓	✓	✓	NA	✓
Clorox Healthcare Bleach Germicidal Wipes	NA	✓	✓	✓	NA	✓
Clorox Healthcare Fuzion Cleaner Disinfectant	NA	✓	✓	✓	NA	✓
Clorox Healthcare Bleach Germicidal Wipes	NA	✓	✓	✓	NA	✓
Clorox Healthcare Hydrogen Peroxide Cleaner Disinfectant	✓	✓	✓	✓	NA	✓
Clorox Healthcare VersaSure Cleaner Disinfectant Wipes	NA	✓	✓	✓	NA	✓

	Monitor screen	Touch screen	Trackball assembly	Gel warmer	Array transducer ports	All other ultrasound system surfaces*
Dispatch	NA	✓	✓	✓	NA	✓
Ecolab Quaternary Disinfectant Wipes	✓	✓	✓	✓	NA	✓
ESCULASE	✓	✓	✓	✓	NA	✓
gigasept PAA concentrate	✓	✓	✓	✓	NA	✓
gigasept pearls	✓	✓	✓	✓	NA	✓
HospiCare 3525s Disinfectant Wipes	✓	✓	✓	✓	NA	✓
HospiCare Multi-Surface Wipes 60R	NA	✓	✓	✓	NA	✓
Incidin OxyFoam S	✓	✓	✓	✓	NA	✓
Incidin OxyWipe S	✓	✓	✓	✓	NA	✓
Incidin OxyWipe	✓	✓	✓	✓	NA	✓
INTERCEPT Detergent	✓	✓	✓	✓	NA	✓
Meliseptol Wipes sensitive	✓	✓	✓	✓	NA	✓
Mikrobac Tissues	✓	✓	✓	✓	NA	✓
mikrozid AF wipes & liquid	✓	✓	✓	✓	NA	✓
mikrozid PAA wipes	✓	✓	✓	✓	NA	✓
mikrozid sensitive wipes & liquid	✓	✓	NA	NA	NA	NA
mikrozid universal wipes & liquid	✓	✓	✓	✓	NA	✓
Micro-Kill Bleach Germicidal Bleach Wipes	NA	✓	✓	✓	NA	✓
Oxivir Tb	✓	✓	✓	✓	NA	✓
PDI Easy Screen Cleaning Wipe	✓	✓	NA	NA	NA	NA
PHAGO'SPORE & PHAGO'WIPES SPORE	✓	✓	✓	✓	NA	✓
Protex Disinfectant Spray and Wipes	NA	✓	✓	✓	NA	✓
Protex ULTRA Disinfectant Wipes	NA	✓	✓	✓	NA	✓
RAPICIDE PA	✓	✓	✓	✓	NA	✓
Rely+On PeraSafe	✓	✓	✓	✓	NA	✓
Reynard IPA Surface Disinfection Wipes	✓	✓	✓	✓	NA	✓
Reynard Premier Detergent & Disinfectant Wipes	✓	✓	✓	✓	NA	✓
Sani-Cloth 70% Wipes	✓	✓	✓	✓	NA	✓
Sani-Cloth Active Wipes	✓	✓	✓	✓	NA	✓
Sani-Cloth AF Universal Wipes	✓	✓	✓	✓	NA	✓
Sani-Cloth AF3 Germicidal Wipes	✓	✓	✓	✓	NA	✓
Sani-Cloth Bleach Germicidal Disposable Wipes	NA	✓	✓	✓	NA	✓
Sani-Cloth Chlor Wipes	NA	✓	✓	✓	NA	✓
Sani-Cloth HB Germicidal Wipe	NA	✓	✓	✓	NA	✓
Sani-Cloth Plus Germicidal Disposable Cloth	✓	✓	✓	✓	NA	✓
Sani-Cloth Plus	✓	✓	✓	✓	NA	✓

	Monitor screen	Touch screen	Trackball assembly	Gel warmer	Array transducer ports	All other ultrasound system surfaces*
Septiwipes	✓	✓	✓	✓	NA	✓
SideKick Disinfecting Wipes	✓	✓	✓	✓	NA	✓
SONO Ultrasound Wipes	NA	✓	✓	✓	NA	✓
STERIMED 100	✓	✓	✓	✓	NA	✓
STERICID Wipes	✓	✓	✓	✓	NA	✓
Super Sani-Cloth Germicidal Disposable Wipe	✓	✓	✓	✓	NA	✓
SURFASAFE Premium	✓	✓	✓	✓	NA	✓
terralin PAA	✓	✓	✓	✓	NA	✓
Transeptic	✓	✓	✓	✓	NA	✓
Tristel Duo ULT	✓	✓	✓	✓	NA	✓
Tristel Solo for Ultrasound	✓	✓	✓	✓	NA	✓
trophon Companion Cleaning Wipes	NA	✓	✓	✓	NA	✓
Virex II 256	✓	✓	✓	✓	NA	✓
Virusolve+ Disinfectant Wipes	✓	✓	✓	✓	NA	✓
Wet Wipe Ethanol Disinfection with Detergent	✓	✓	✓	✓	NA	✓
WIP'ANIOS Excel	✓	✓	✓	✓	NA	✓
WipeClean Ethanol Disinfection 80%	✓	✓	✓	✓	NA	✓

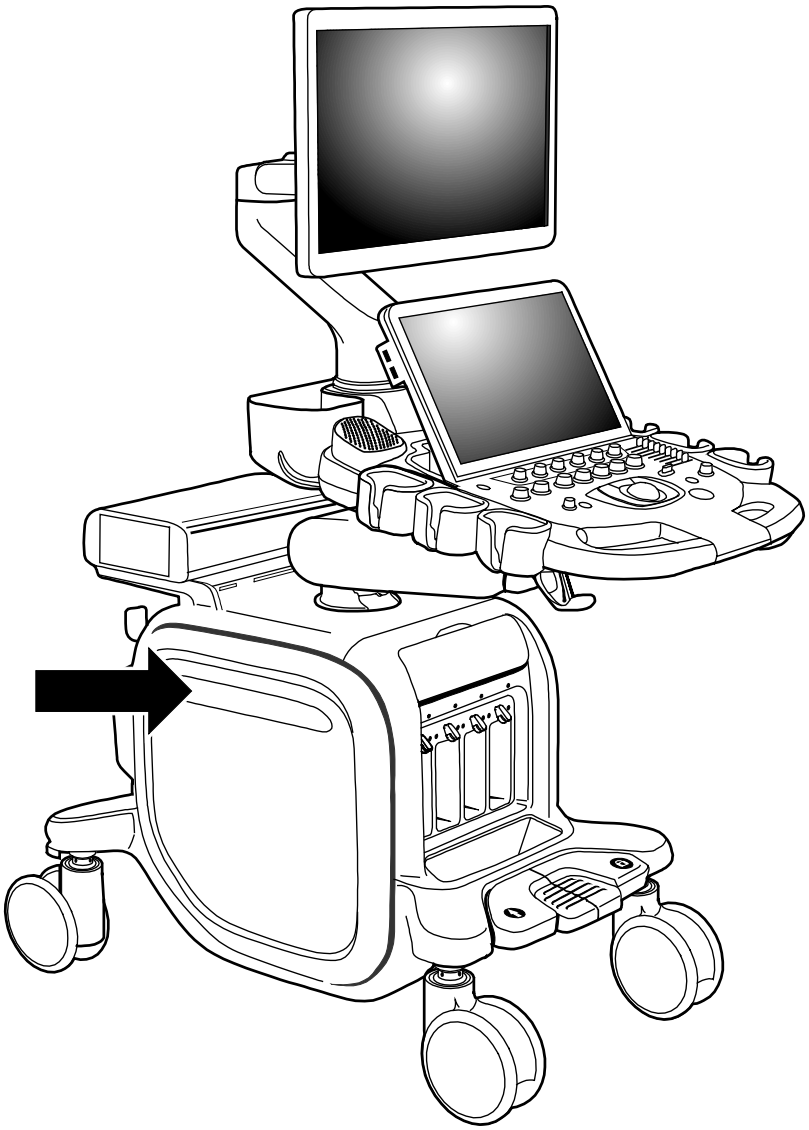
*All other system surfaces include the surfaces not listed in the above table, including the transducer holders and optional rear accessory tray.

✓ = approved

NA = not approved

Cleaning the Air Filter

The ultrasound system has a removable, washable air filter. Check and clean the air filter weekly, or as needed, to maintain proper system cooling.



Example of the location of the air filter.

To remove and clean the air filter:

⚠ **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 the ultrasound system and then unplug the power cord from the power supply (supply mains).
2. Push the air filter tray in to release the locking mechanism and then pull the tray from 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.

   ⚠ **Caution:** Do not insert the air filter tray into the ultrasound system with a wet filter as this can damage the ultrasound system.

4. Slide the dry air filter tray back into the ultrasound system.
5. Plug the power cord into the power supply (supply mains).

Caring for Documentation and Storage Devices

⚠ **Caution:** Computer viruses on a USB-compatible device can infect the ultrasound system. Check for viruses before connecting the device to the system.

Note: Study data stored directly to a USB device can be lost. Do not use a USB device for permanent data storage.

For information on the care of an optional documentation or storage device, refer to the manufacturer's operating instructions that accompanied the device.

Green Performance Management: Environmental Protection

Siemens Healthineers recognizes its responsibility to minimize the environmental impacts of services, operations, and products. For more information, contact your local Siemens Healthineers representative.

Product Recycling and Disposal

Dispose of this product according to local, state, and regional laws and regulations.

Batteries and electrical and electronic equipment can contain hazardous substances. If released, the hazardous substances can harm people and the environment.

Siemens Healthineers provides disassembly instructions to treatment facilities for the safe and proper removal and recycling of electrical and electronic components in this product. For more information, contact your local Siemens Healthineers representative.

To the extent required by local, state, and regional laws and regulations, Siemens Healthineers has programs for the return of used products. For more information, contact your local Siemens Healthineers representative.

Disposing of the Packaging Materials

Dispose of or recycle the packaging materials according to local, state, and regional laws and regulations.

To the extent required by local, state, and regional laws and regulations, Siemens Healthineers will collect and dispose of packaging materials for this product. For more information, contact your local Siemens Healthineers representative.

Handling and Disposal of Components and Accessories

⚠ **WARNING:** Observe local, state, and regional laws and regulations for the disposal of the ultrasound system components and accessories.

⚠ **WARNING:** Bodily fluids on used needles and needle guides can transmit infectious diseases. To eliminate the possibility of exposing patients, operators, or third parties to hazardous or infectious materials, always dispose of the needle and the needle guide according to local, state, and regional laws and regulations.

Component or Accessory	Handling Instructions
Air filter	**See also:** Cleaning the Air Filter, page 2-34 The air filter is reusable. Replace the air filter if the air filter is damaged in any way. For example, the air filter has a hole or the air filter tray will not fit in the air filter slot.
Bracket for needle guides	The bracket is reusable. Replace the bracket if the bracket is damaged in any way. Refer to the in-box instructions for disposal guidelines for the reusable bracket.
Needle guides	The sterile-packaged needle guide accessories are single-use items. Refer to the in-box instructions for disposal guidelines for the disposable needle guide accessories.
Protective overlay for the control panel	The protective overlay for the control panel is disposable. Replace the protective overlay if the overlay is damaged in any way. For example, if the protective overlay has a hole or does not fit on the control panel, replace the overlay.
Rear accessory tray	The rear accessory tray for the rear accessory shelf is disposable. Replace the rear accessory tray if the tray is damaged in any way.
Auxiliary cable	The auxiliary cable for the physio module is disposable. Replace the auxiliary cable if the cable is damaged in any way.

Energy Efficient Usage: Energy Conservation

See also: For information on supplying power to the system, refer to Chapter 4 in this manual.

To conserve energy, activate hibernate for the ultrasound system between uses.

When the ultrasound system is not in use, power off the system. Keep the system plugged into the power supply (supply mains). Ensure the circuit breaker (mains switch) on the ultrasound system is in the on position.

For maximum energy conservation when the system is in storage, power off and unplug the system from the power supply (supply mains).

3 Transducer Care and Accessories

Caring for Transducers 3
Methods for Cleaning and Disinfecting Transducers 5
Examples of Transducer Components 6
Immersion Levels 8
Cleaning and Disinfecting Transducers 9
Cleaning a Transducer at the Point of Use 10
Cleaning a Transducer 11
Disinfecting a Transducer 12
Disinfecting a Continuous Wave Transducer 13
List of Approved Cleaners 14
List of Approved Disinfectants 15

Transducer Accessories 16
Transducer Sheaths (Transducer Covers) 17
Brackets and Needle Guides 20

Caring for Transducers

See also: For information on cleaning and disinfecting transesophageal transducers, refer to Chapter C3 in the Advanced Imaging Manual.

⚠ **WARNING:** To minimize the risk of cross-contamination and infectious diseases, clean and high-level disinfect endocavity transducers after each use; clean and sterilize intraoperative transducers after each use.

⚠ **WARNING:** To avoid electrical shock, you must visually inspect a transducer prior to use. Do not use a transducer with cracked, punctured, or discolored casing or a frayed cable.

Discoloration Exception: The use of approved cleaners and disinfectants may cause discoloration of the transducer. You can continue to use a transducer discolored due to the use of approved cleaners and disinfectants only.

⚠ **WARNING:** Prior to each use, inspect the endocavity or intraoperative transducer for signs of mechanical damage such as cracks, cuts, tears, perforations, or protrusions. Do not use the transducer if the transducer appears damaged in any way. Any damage could cut the patient and compromise the electrical safety of the transducer, causing possible patient or user injury. Contact your local Siemens Healthineers representative.

⚠ **WARNING:** During neurosurgical procedures, if a transducer becomes contaminated with tissue or fluids of a patient known to have Creutzfeldt-Jakob disease, the transducer should be destroyed, as it cannot be sterilized.

⚠ **WARNING:** When using an endocavity or intraoperative transducer with a CF type applied part, the patient leakage currents may be additive.

⚠ **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 or alter any part of a transducer.

⚠ **Caution:** To avoid cable damage, do not roll the ultrasound system over transducer cables, and do not wrap the transducer cable around the transducer handle or the transducer connector.

⚠ **Caution:** To avoid damage to the transducer, do not use transducer sheaths containing an oil-based coating or petroleum- or mineral oil-based ultrasound coupling agents. Use only a water-based ultrasound coupling agent.

⚠ **Caution:** Follow all instructions provided by manufacturers of sterile goods (transducer sheaths) to ensure proper handling, storage, and cycling of all sterile goods.

⚠ **Caution:** To avoid damage caused by electrostatic discharge, do not touch the electrical component on the transducer connector.

Take extreme care when handling or storing transducers. They must not be dropped, jarred, or knocked against other objects. Do not allow transducers to come into contact with any sharp-edged or pointed object.

Protective Case

Due to the mechanical sensitivity of transducers, Siemens Healthineers recommends that you always use the transducer case when you ship a transducer or transport it from one place of examination to another. The case is specially designed to protect the sensitive parts of the transducer. Be sure that all parts of the transducer are properly placed inside the case before you close the lid.

Storage

Store transducers in a clean, dry, protected environment. Extreme temperatures or humidity may damage a transducer.

See also: For information on storage temperatures, refer to Appendix A in this manual.

Repair

Siemens Healthineers can only guarantee the safety and performance of transducers serviced by an authorized third-party. Contact your local Siemens Healthineers service representative when your transducer appears to be damaged or malfunctions in any way.

Methods for Cleaning and Disinfecting Transducers

You must observe the required methods for cleaning and disinfecting or cleaning and sterilization before the first use and after each use of a transducer.

Siemens Healthineers defines the methods for cleaning and disinfecting or cleaning and sterilization by classifying the use of the transducer according to the Spaulding Classification scheme observed by the United States Food and Drug Administration (FDA).

Example of Transducers	Use	Minimum Required Method	Classification
▪ Intraoperative ▪ Laparoscopic	Normally sterile tissue or body space	Cleaning and sterilization	Critical
▪ Endocavity ▪ Transesophageal	Intact mucous membranes	Cleaning and high-level disinfection	Semi-critical
▪ Non-invasive	Non-intact skin	Cleaning and high-level disinfection	Semi-critical
▪ Non-invasive	Intact skin	Cleaning and low-level disinfection	Non-critical

Important Information

The ultrasound system does not support transducers for the following uses:

- Laparoscopic

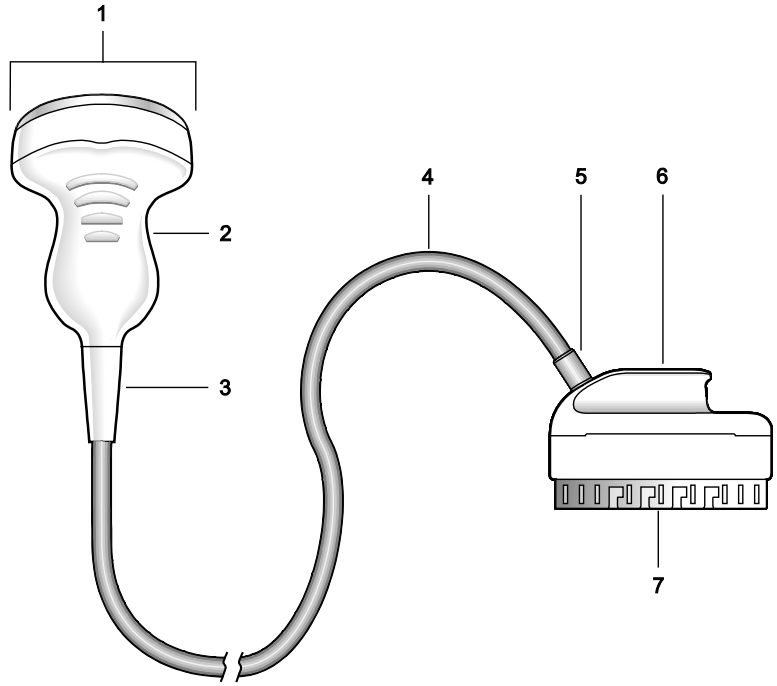
Reprocessing Methods

The transducer cleaning and disinfecting instructions in this chapter were validated for efficacy with the following reprocessing methods:

- Cleaning reprocessing methods:
  - Spraying or wiping a transducer
  - Immersing a transducer
- Disinfecting reprocessing methods:
  - Spraying or wiping a transducer
  - Immersing a transducer
  - Use of an automated reprocessing device
- Sterilization reprocessing methods:
  - Use of an automated sterilization system

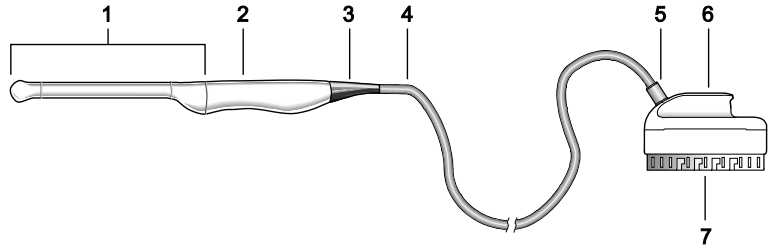
See also: Contact your customer service representative if you require additional information about reprocessing a transducer.

Examples of Transducer Components



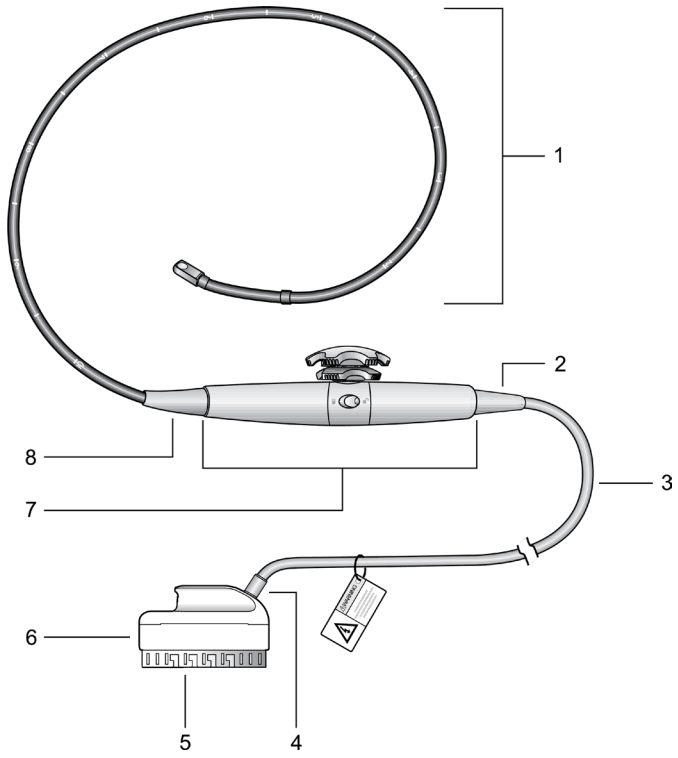
1 Transducer surface in contact with the patient
2 Handle
3 Strain relief for the transducer
4 Cable
5 Strain relief for the connector
6 Connector
7 Electrical component on the connector

Example of transducer components.



1 Transducer surface in contact with the patient
2 Handle
3 Strain relief for the transducer
4 Cable
5 Strain relief for the connector
6 Connector
7 Electrical component on the connector

Example of endocavity transducer components.



Example of transesophageal transducer components.

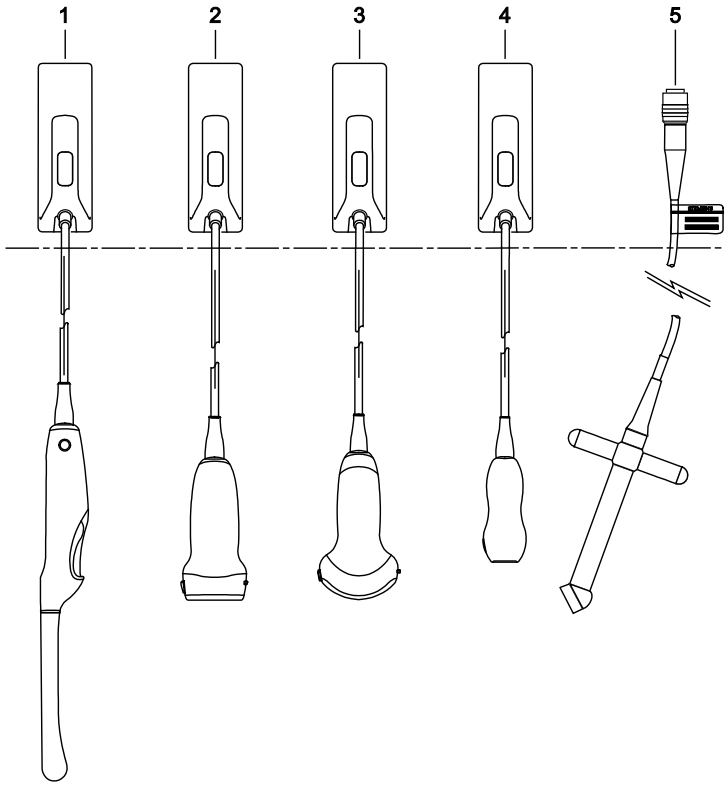
1 Transducer surface in contact with the patient (flexible shaft with depth markings, articulating section, and distal tip)
2 Strain relief for the handle
3 Cable
4 Strain relief for the connector
5 Electrical component on the connector
6 Connector
7 Handle with controls
8 Strain relief for the handle

Immersion Levels

⚠ **Caution:** To avoid damage to the transducer, observe the immersion levels indicated for each transducer type. Transducers with the protection level IPX8 are indicated by the presence of the "IPX8" symbol on the connector of the transducer.

⚠ **Caution:** Do not immerse the label located on the cable of the continuous wave transducer.

Note: Transducers meet Ingress Protection level IPX8 of EN 60529 and IEC 60529 to the depth of the immersion line shown in the illustration.



Example of immersion levels.

1 Endocavity
2 Linear
3 Curved
4 Phased
5 Continuous wave

See also: For information on cleaning and disinfecting transesophageal transducers, refer to Chapter C3 in the Advanced Imaging Manual.

Cleaning and Disinfecting Transducers

⚠ **WARNING:** To avoid electrical shock and damage to the system, disconnect the transducer prior to cleaning or disinfecting.

⚠ **WARNING:** Disinfectants and cleaning methods listed are recommended by Siemens Healthineers for compatibility with product materials, not for biological effectiveness. Refer to disinfectant label instructions for guidance on disinfection efficacy and appropriate clinical uses.

⚠ **Caution:** Do not sterilize transducers using hot steam, cold gas, or Ethylene Oxide (EO) methods. Before applying any other methods which might be recommended by manufacturers of sterilization equipment, please contact your Siemens Healthineers representative.

⚠ **Caution:** To avoid damage to the transducer, observe the immersion levels indicated for each transducer type. Do not immerse or allow the connector of a transducer or the strain relief on the connector to become wet.

⚠ **Caution:** The transducers have been designed and tested to be able to withstand disinfection as recommended by the manufacturer of the disinfectant product. Carefully follow the disinfectant manufacturer's instructions.

⚠ **Caution:** Do not use abrasive cleaners, organic solvents such as benzene, isopropyl alcohol, or phenol-based substances, cleaners, or disinfectants containing organic solvents to clean or disinfect transducers. These substances can damage the transducers.

Isopropyl Alcohol Exception: Immersing a transducer in isopropyl alcohol can damage the transducer. Only use approved cleaners and disinfectants on the transducer.

You can only use a clean, lint-free gauze pad moistened with isopropyl alcohol to clean the electrical component on the transducer connector.

⚠ **Caution:** Do not use an abrasive sponge or brush. These materials can damage the transducer.

⚠ **Caution:** The use of a spray cleaner or disinfectant may force fluid inside the transducer and the ultrasound system. To avoid damage, first remove the transducer from the system and then carefully spray the transducer. Never spray the transducer connector.

⚠ **Caution:** Prior to cleaning or disinfecting a transducer, you must disconnect and remove the transducer from the ultrasound system. Do not clean or disinfect the transducer on or near the ultrasound system. Unintended contact with approved transducer cleaners and disinfectants can result in severe damage to the ultrasound system components.

Required Task	Location in This Manual
Read and understand the biohazard considerations.	Chapter 2
Perform the steps in the daily checklist, including transducer inspection.	Chapter 2
Read and understand the cleaning and disinfecting information for the ultrasound system.	Chapter 2
Read and understand all transducer-specific warnings and cautions.	page 3-3
Disconnect the transducer.	Chapter 4
Observe the required method of cleaning and disinfecting for the transducer.	page 3-5
Wipe visible soil and contaminants from the transducer immediately after each use.*	page 3-10
Clean the transducer.*	page 3-11
Disinfect the transducer.*	page 3-12
Store the transducer.*	page 3-4

*For information about cleaning, disinfecting, and storing transesophageal transducers, refer to Chapter C3 in the Advanced Imaging Manual.

Cleaning a Transducer at the Point of Use

Cleaning a transducer immediately after each use prevents soil and contaminants from drying on the surface of the transducer and facilitates cleaning.

To immediately clean a transducer after each use:

1. Disconnect and remove the transducer from the ultrasound system.
2. Remove any transducer accessories from the transducer.
3. Immediately clean the transducer in close proximity to the point of use.
   a. Moisten a clean gauze pad or lint-free cloth with water or an approved cleaner. Or, use an approved cleaning wipe.

      See also: For a list of approved cleaners, refer to page 3-14.

   b. Carefully wipe the transducer surface intended for contact with the patient. Avoid touching the electrical components on the connector.
4. Perform subsequent cleaning of the transducer according to the next procedure.

Cleaning a Transducer

Cleaning a transducer removes soil and contaminants from the surface of the transducer and prepares the transducer for disinfection.

To clean a transducer:

Prerequisite: The transducer is disconnected and removed from the ultrasound system. Transducer accessories are removed from the transducer, including the transducer sheath.

1. Select an approved cleaner. Follow the cleaner manufacturer's instructions for concentration, temperature, and contact time when cleaning the surface of the transducer.

   See also: For a list of approved cleaners, refer to page 3-14.

2. Clean the transducer from the connector to the surface intended for contact with the patient using one of the following cleaning methods. Avoid touching the electrical components on the connector.
   - If immersion is required, keep the transducer connector and the connector strain relief dry while immersing the transducer in an approved cleaner to the level indicated on page 3-8.
   - If wiping is required, carefully wipe the transducer.
   - If spraying is required, do not spray the transducer near the ultrasound system. Never spray the transducer connector.
3. Rinse the transducer according to the cleaner manufacturer's instructions. Keep the electrical components on the connector dry.

   Note: If the cleaner manufacturer does not provide rinsing instructions, thoroughly rinse the transducer with deionized water at room temperature.
4. Disinfect the transducer or sterilize the transducer, as required.

To clean the electrical component on the transducer connector:

1. To remove any gel from the electrical component, carefully wipe the electrical component using a lint-free gauze pad moistened with water.
2. To remove any skin oils from the electrical component, carefully wipe the electrical component using a lint-free gauze pad moistened with isopropyl alcohol.
3. Use compressed air to remove particles from the electrical component.

Disinfecting a Transducer

Immediately after cleaning, disinfect a transducer to destroy pathogens and other microorganisms and to prepare the transducer for storage or the next clinical use.

To disinfect a transducer:

Prerequisite: Clean the transducer. Identify the required level of disinfection for the transducer.

1. Select an approved disinfectant for the required level of disinfection. Follow the disinfectant manufacturer's instructions for concentration, temperature, and contact time when disinfecting the surface of the transducer.

   See also: For a list of approved disinfectants, refer to page 3-15.

2. Disinfect the transducer from the connector to the surface intended for contact with the patient using one of the following disinfection methods. Avoid touching the electrical components on the connector.

   See also: For information about disinfecting a continuous wave (CW) transducer with a T-bar, refer to page 3-13.

   – If immersion is required, keep the transducer connector and connector strain relief dry while immersing the transducer in an approved disinfectant to the immersion level indicated on page 3-8.
   – If wiping is required, carefully wipe the transducer.
   – If spraying is required, carefully spray the transducer. Do not spray the transducer near the ultrasound system. Never spray the transducer connector.
   – If a reprocessing device is required, use a device compliant with ISO 15883 and follow the reprocessing device manufacturer's instructions.

3. Rinse the transducer according to the disinfectant manufacturer's instructions. Keep the electrical components on the connector dry.

   Note: If the disinfectant manufacturer does not provide rinsing instructions, thoroughly rinse the transducer with deionized water at room temperature.

4. Follow the disinfectant manufacturer's instructions for drying the transducer.

   Note: If the disinfectant manufacturer does not provide drying instructions, dry the transducer with a clean, lint-free, soft cloth.

5. Store the transducer in a clean, dry, protected environment.

Disinfecting a Continuous Wave Transducer

A continuous wave (CW) transducer with a T-bar requires additional tasks for disinfection.

To prepare a CW transducer for disinfection:

1. Rotate the screw on the side of the T-bar counterclockwise and then set the screw aside.
2. Loosen and then slide the T-bar onto the transducer cable.
3. Perform the additional tasks when following the disinfection instructions on page 3-12.
   - Carefully wipe the T-bar and screw using a disinfectant wipe.
     - Use a circular motion when wiping the T-bar and screw.
     - Slide the wipe partially through the hole on the T-bar and then rotate the T-bar to disinfect the interior of the hole.
     - Slide a portion of the wipe into the threaded screw hole on the T-bar and rotate the wipe to clean the interior of the hole.
   - Carefully wipe the transducer, including the cable, using a second disinfectant wipe.
   - Allow all surfaces to remain wet with disinfectant for a minimum of two minutes. Reapply the disinfectant to the transducer, T-bar, and screw, if necessary.

     Note: Follow the disinfectant manufacturer's instructions.
   - Rinse and then dry the transducer, T-bar, and screw.
4. Reassemble the transducer after all components are dry.
   a. Carefully slide the T-bar into place on the transducer.
   b. Rotate the screw clockwise into the T-bar to secure the T-bar to the transducer.

List of Approved Cleaners

See also: For an additional list of approved cleaners, refer to the Cleaners and Disinfectants Addendum.

Note: An approved cleaner may discolor the transducer. There is no associated degradation of imaging performance or transducer reliability.

	Clinell Universal Wipes & Spray	ENZOL	Prolystica 2X Concentrate Enzymatic Presoak and Cleaner	Protex ULTRA Disinfectant Wipes	Transeptic
7L2	✓	✓	✓	✓	✓
10L4	✓	✓	✓	✓	✓
14L5	✓	✓	✓	✓	✓
DAX	✓	✓	✓	✓	✓
5C1	✓	✓	✓	✓	✓
9C2	✓	✓	✓	✓	✓
4V1	✓	✓	✓	✓	✓
5V1	✓	✓	✓	✓	✓
5Z1	✓	✓	✓	✓	✓
8V3	✓	✓	✓	✓	✓
10V4	✓	✓	✓	✓	✓
CW2	✓	✓	✓	✓	✓
CW5	✓	✓	✓	✓	✓

✓ = approved

NA = not approved

List of Approved Disinfectants

The Federal Republic of Germany prohibits the use of wipes for disinfection of transesophageal transducers and any transducer used in a semi-critical procedure.

See also: For an additional list of approved disinfectants, refer to the Cleaners and Disinfectants Addendum.

Note: An approved disinfectant may discolor the transducer. There is no associated degradation of imaging performance or transducer reliability.

	CIDEX OPA	gigasept FF (new)	Revital-Ox RESERT HLD	Sani-Cloth AF3 Germicidal Disposable Wipes	Sani-Cloth HB Germicidal Disposable Wipe	Super Sani-Cloth Germicidal Disposable Wipe	trophon EPR, NanoNebulant[1]	trophon EPR, Sonex-HL[1]	trophon2, NanoNebulant[1]	trophon2, Sonex-HL[1]
7L2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
10L4	✓	NA	✓	✓	✓	✓	✓	✓	✓	✓
14L5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
DAX	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
5C1	✓	✓	✓	✓	✓	✓	✓[2]	✓[2]	✓[2]	✓[2]
9C2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
4V1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
5V1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
5Z1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
8V3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
10V4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CW2	✓	✓	✓	✓	✓	✓	NA	NA	✓	✓
CW5	✓	✓	✓	✓	✓	✓	NA	NA	✓	✓

✓ = approved

NA = not approved

[1]Indicates a reprocessing device with the approved disinfectant for use. For information about the reprocessing device, refer to the device manufacturer's instructions for use.

[2]For use only with the following serial numbers of 5C1 transducers: ≥2019XXXX.

Transducer Accessories

⚠ **WARNING:** Ensure the accessories for a transducer are properly cleaned, disinfected, or sterilized as appropriate before each use to avoid possible patient contamination.

Attachment procedures for the following accessories are presented in this chapter or shipped separately with the device.

Accessory	Curved Array	Linear Array	Phased Array
Disposable transducer sheaths	All	All	All
Reusable bracket and disposable needle guides	5C1 9C2	7L2 10L4 14L5	4V1 DAX

Transducer Sheaths (Transducer Covers)

⚠ **WARNING:** There have been reports of severe allergic reactions to medical devices containing latex (natural rubber). Health care professionals are advised to identify latex-sensitive patients and to be prepared to treat allergic reactions promptly. For additional information in the U.S.A., refer to FDA Medical Alert MDA91-1.

⚠ **WARNING:** To minimize the risk of cross-contamination and infectious diseases, a sterile, non-pyrogenic transducer sheath must be in place during procedures requiring sterility.

⚠ **WARNING:** Only a sterile transducer sheath provides the sterile barrier required for surgical or puncture procedures. To ensure sterility of a procedure, always place a sterile sheath on a transducer, as transducers cannot be sterilized using hot steam, cold gas, or Ethylene Oxide (EO) methods.

⚠ **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.

⚠ **Caution:** Siemens Healthineers recommends that you follow all instructions provided by manufacturers of sterile goods (transducer sheaths) to ensure proper handling, storage, and cycling of all sterile goods.

Transducer sheaths are single-use items used to ensure proper acoustic coupling and provide a prophylactic barrier for the intended ultrasound application. Sheaths are available for all transducers. Siemens Healthineers recommends the use of market-cleared transducer sheaths.

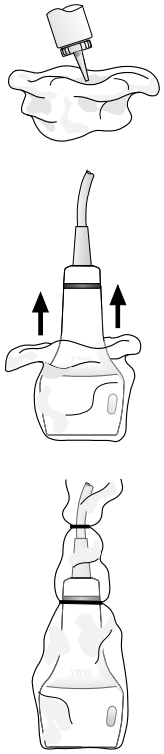
Using a disposable latex transducer sheath on a transducer reduces the possibility of cross-contamination. Always use a protective transducer sheath for endocavity exams, and when scanning an open wound or an area where the skin is not intact.

To place the transducer in a sheath:

Note: For sterile use, follow a sterile technique including use of sterile water and a sterile water-based coupling agent (gel), taking care not to contaminate the sheath.

Before applying any coupling agent (gel) to the sheath, remove any powder in the sheath by rinsing with water.

1. Remove the packaging and unfold the transducer sheath.
2. Apply a water-based coupling agent (gel) to the inside of the sheath and onto the face of the transducer.
3. Hold the transducer by the cable relief and unroll the sheath onto the transducer.
4. Pull the transducer sheath tightly over the face of the transducer to remove wrinkles.
5. Secure the sheath to the transducer housing or cable relief with the adhesive tapes or elastic bands.



Example of placing a sheath over a transducer.

Disposal

While wearing protective gloves, remove the transducer sheath from the transducer. Dispose of the transducer sheath according to local, state, and regional laws and regulations for waste.

Storage

⚠ **WARNING:** Before use, examine sterile goods, such as sheaths, for any material flaws. Some packaging may list an expiration date. Any product showing flaws, or whose expiration date has passed, should not be used.

⚠ **Caution:** Do not store transducer sheaths in direct sunlight, as ultraviolet damage can result.

Latex products have a limited shelf life, and should be stored in a cool, dry, dark place with an ambient temperature between -5°C and +40°C and up to 80% relative humidity at +40°C.

Brackets and Needle Guides

⚠ **WARNING:** Percutaneous procedures always involve heightened risk to the patient and to the operator handling biopsy needle guides. Clinicians using Siemens Healthineers recommended biopsy devices under ultrasound guidance should be trained and must observe proper needle insertion sequencing with the needle guide in order to avoid undue discomfort and unnecessary risk and injury to the patient.

⚠ **WARNING:** If a reusable bracket becomes contaminated with tissue or fluids of a patient known to have Creutzfeldt-Jakob disease, then the bracket should be destroyed. Sterilization is not effective against Creutzfeldt-Jakob contamination.

⚠ **WARNING:** Reusable brackets are packaged non-sterile. Sterilize or high-level disinfect brackets products prior to their first use and after each use.

⚠ **WARNING:** The disposable needle guides are packaged sterile and are single-use items. Do not use if the packaging indicates signs of tampering or if the expiration date has passed.

Use the reusable bracket to attach needle guides to the transducer.

Refer to the in-box instructions for attachment and care procedures for all needle guide accessories, including information on reprocessing the reusable bracket.

Storage

Always clean and sterilize or high-level disinfect the reusable bracket after each needle puncture or biopsy procedure, before storing the reusable bracket.

4 System Setup

Initial Setup **3**

System Ergonomics **3**
- Positioning the Control Panel 4
- Accessing the Retractable Keyboard 5
- Positioning the Touch Screen 5
- Positioning the Monitor 6

Moving the System **7**
- Securing the Wheels Locks 8
- Securing the Monitor 9
- Before the Move 10
- During the Move 11
- After the Move 11
- Shipping the Ultrasound System 12

System Startup **13**
- Accessing the Power Panel 13
- Plugging in the Ultrasound System 13
- Supplying Power to the Ultrasound System 14
  - Activating Hibernate 15
- Adjusting the Monitor Settings 16
  - Monitor with a Luminance Sensor 16
- Adjusting the Touch Screen and Control Panel Lighting 17
- Adjusting the Volume of the Audio 17
- Connecting and Disconnecting Transducers 18
  - Array Transducers 19
  - Continuous Wave Transducers 20
  - Protective Transducer Holders 21
  - Transducer Cable Management 21
- Connecting System Accessories 22
  - Connecting a Footswitch 22
  - Connecting a Smart Card Reader 22
  - Connecting Physio Cables 22
  - Connecting the Gel Warmer 23

Connecting the Ultrasound System to a Network **25**
- Wired Connection 25
- Wireless Network Connections 25

Input/Output Panel Connections **27**
- Connecting Peripheral Equipment 28
  - On-Board vs. Off-Board Documentation Devices 30
- Universal Video Converter 31

Connecting to Remote Services **32**

Installing Software Updates **33**

Initial Setup

⚠ **WARNING:** Do not tip the ultrasound system in any direction more than 5 degrees. This action can cause the system to tip over and create a risk for injury to the user or patient and damage to the system.

⚠ **WARNING:** Do not lean on or apply excessive force to the control panel or monitor. These actions can cause the ultrasound system to tip over and create a risk for injury to the user or patient and damage to the system.

The ultrasound system is initially unpacked and installed by a Siemens Healthineers representative who will verify the operation of the system. Any transducers, documentation and storage devices, accessories, and options delivered with your system are also connected and installed for you.

System Ergonomics

The relationship of repetitive ultrasound scanning with musculoskeletal disorders is indicated in literature for users conducting all types of ultrasound studies. Examples of musculoskeletal disorders include pain and injury to the neck, shoulder, back, wrist, hands, and fingers.

We recommend keeping informed about the trends in literature for continued education regarding scanning techniques, for example, handling a transducer to obtain a quality image and the proper posture to use while scanning a patient.

The ultrasound system provides features designed for your ergonomic considerations. You can adjust the height of the control panel to scan from a standing or sitting position and utilize the integrated footrest, adjust the viewing angle of the touch screen and monitor, and reposition the control panel to optimize your scanning environment. For direct access to your frequently-used functions, customize the touch screen buttons. Use the cable hangers to provide support for the transducer cables.

See also: For information about customizing the touch screen, refer to Chapter 1 and Chapter 2 in the System Reference.

See also: Transducer Cable Management, page 4-21

Positioning the Control Panel

⚠ **WARNING:** Carefully adjust the height of the control panel. A potential pinch point exists below the control panel and the base of the ultrasound system can create a risk for injury to the user.



Example of the adjustment controls for the control panel.

1 Rotate adjustment control
2 Height adjustment control

To rotate the position of the control panel:

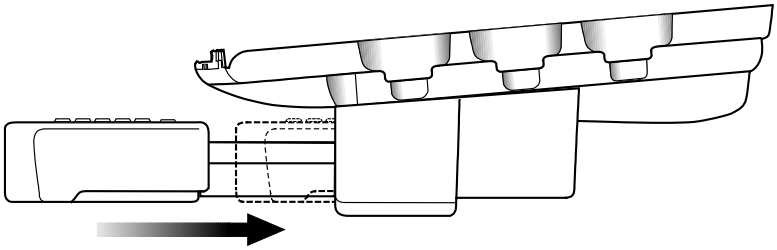
1. Press and hold the rotate adjustment control as you reposition the control panel to the right or to the left.
2. To lock the control panel in the required position, release the control.

To adjust the height of the control panel:

1. Press and hold the height adjustment control and place both hands on the handle to raise or lower the control panel.
2. To lock the control panel in the required position, release the control.

Accessing the Retractable Keyboard

The retractable keyboard is an ultrasound system option, not a standard feature.



Example of the retractable keyboard on the ultrasound system.

To access the keyboard:

- To extend the keyboard, gently pull the keyboard from the ultrasound system.
- To retract the keyboard, gently push the keyboard toward the ultrasound system.

Positioning the Touch Screen

⚠ **WARNING:** Carefully tilt the touch screen backward. A potential pinch point between the back of the touch screen and the speakers can create a risk for injury to the user.

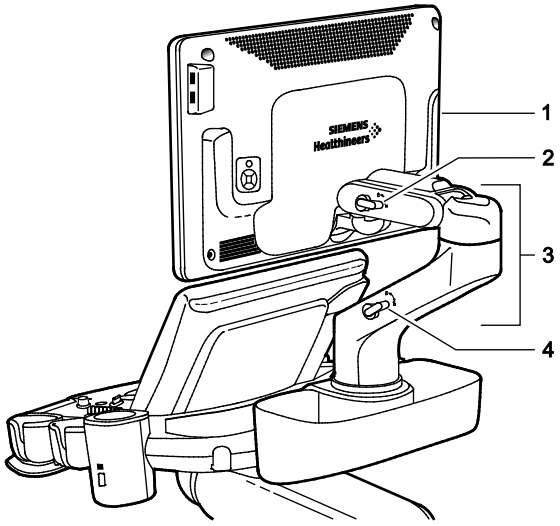
To adjust the viewing angle of the touch screen:

- Gently grasp the top center or the sides of the touch screen and then tilt the touch screen forward or backward.

  The touch screen retains the adjusted position.

Positioning the Monitor

⚠ **WARNING:** Carefully position the monitor to avoid risk for injury to the user. A potential pinch point between the adjustable arm and the touch screen exists when swiveling the adjustable arm to the 180° position. A potential pinch point also exists between the monitor and the adjustable arm when rotating the monitor.



Example of positioning the monitor.

1 Monitor handhold
2 Lock for securing the top of the adjustable arm in the center position
3 Adjustable arm
4 Lock for securing the bottom of the adjustable arm in the center position

To reposition the monitor:

1. Rotate the locks into the unlocked position.
2. To adjust the position of the monitor, gently grasp the adjustable arm as you swivel and extend the arm to the left or to the right.
3. To adjust the viewing angle of the monitor, gently grasp the monitor handholds as you tilt the monitor (screen) forward or backward.
4. To position the monitor for transport, rotate the top and bottom adjustable arms to the center position and then rotate the locks into the locked position.

Moving the System

⚠ **WARNING:** Preparations before moving the ultrasound system are required to minimize potential damage to sensitive components and to avoid safety hazards. Review the moving instructions before moving the system. Failure to transport or move the system properly could result in the system losing balance, creating a risk for human injury and equipment damage.

See also: For information on preparing the ultrasound system for the move, refer to page 4-10.

⚠ **WARNING:** Use caution when moving the ultrasound system. Exerting excessive force can cause the system to lose balance, creating a risk for human injury and damage to the system.

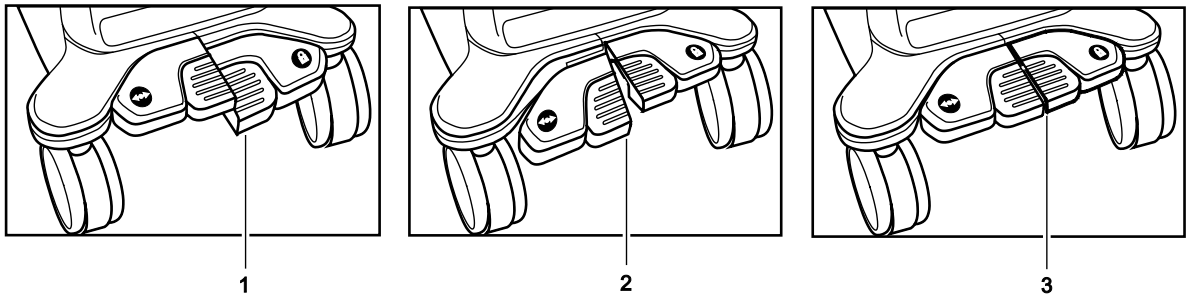
⚠ **WARNING:** Do not park the ultrasound system or leave the system unattended on a slope. Even when the rear wheels are locked, the system may slide down a ramp.

⚠ **Caution:** Do not lean on the monitor, touch screen, storage bin, or keyboard. Subjecting these components to heavy loads or excessive force can damage the ultrasound system.

The ultrasound system is a mobile unit. Before moving the system to another location, you must prepare for the move by powering off and securing the system.

Securing the Wheels Locks

The ultrasound system has four locking swivel wheels. The front wheels are simultaneously in a locked, locked swivel, or unlocked position. The rear wheels are individually locked or unlocked. Use your foot to unlock and lock the wheel locks on the system.

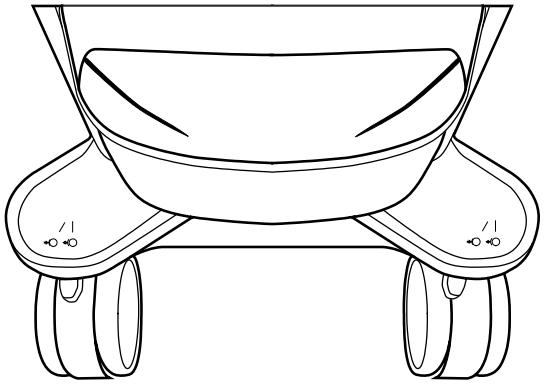


Example of the front wheel locks.

1 Locked
2 Swivel locked
3 Unlocked

To lock the front wheels:

- To prevent the front wheels from rolling, press the wheel lock into the locked position.
- To lock the directional swivel of the front wheels, press the wheel lock in the locked position.
- To roll the front wheels in any direction, raise the wheel lock to the unlocked position.



Example of the rear wheels individually in unlocked and locked positions.

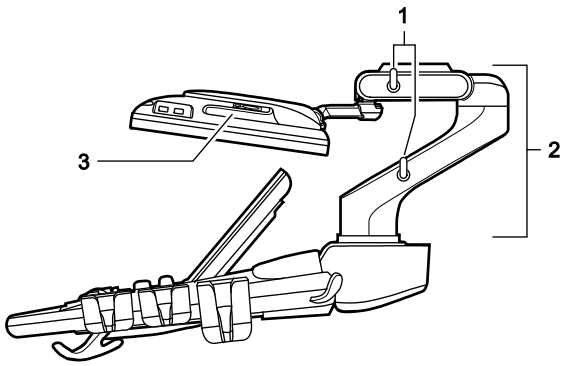
To lock the rear wheels:

- To lock a rear wheel, push the lever to the locked position.
- To unlock a rear wheel, push the lever to the unlocked position.

Securing the Monitor

⚠ **WARNING:** To avoid damage to the monitor and the potential for personal injury to the user, ensure the monitor does not swivel during transport. Lock the monitor in the transport position before moving the ultrasound system.

Position the monitor into the horizontal position to increase visibility when moving the ultrasound system.



Example of the monitor in locked position for moving the ultrasound system.

1 Locks in locked position
2 Adjustable arm
3 Monitor handhold

To lock the position of the monitor for transport:

1. Rotate the locks on the adjustable arm into the unlocked position.
2. Swivel the adjustable arm to align the monitor to the front, center of the ultrasound system.
3. Rotate the locks into the locked position.
4. Gently grasp the handholds on the monitor and tilt the monitor forward into the horizontal position.

Before the Move

⚠ **Caution:** To prevent damage to the ultrasound system during a move, retract or close any doors and trays on documentation devices or components on the ultrasound system. Ensure components do not protrude from the system.

Always pull on the plug when disconnecting the ultrasound system from the power supply (supply mains) and disconnecting devices from the system. Never pull on cords or cables.

To prepare the ultrasound system for the move:

1. Power off the ultrasound system.
2. Unplug the power cord from the power outlet (mains outlet).
3. Secure the power cord to avoid rolling the system wheels over the cord.
4. Disconnect all devices from the system, including the network cable, off-board peripheral devices, system accessories, and transducers.
5. Place each clean transducer in a protective carrying case for safe transport.

   See also: For information on cleaning and disinfecting transducers, refer to Chapter 3 in this manual.
6. Close any doors and trays on documentation devices or components on the ultrasound system and retract the keyboard, if necessary.
7. Ensure the control panel is in the center, locked position.
8. Transport gel and disk media separately.
9. Position and lock the monitor for transport.
10. Swivel lock or unlock the front wheels.
11. Unlock the rear wheels.

During the Move

⚠ **Caution:** When moving the ultrasound system, protect the system from environmental changes including moisture, winds, dirt and dust, and extreme heat or cold exposure.

⚠ **Caution:** Avoid moving the ultrasound system on outside surfaces with loose dirt, contaminates, or standing liquids.

⚠ **Caution:** Care should be taken to minimize shock and vibration of the ultrasound system. Avoid uneven surfaces that contain an abrupt height change or jarring surface irregularities.

⚠ **Caution:** Do not move the ultrasound system by pushing on the touch screen, monitor, storage bin, or cable hooks. Pushing on these components can cause loss of control and damage the ultrasound system. Use the front handle to move the system.

You can move the ultrasound system from room to room within a facility and reposition the system during an examination. Be careful on inclines and uneven surfaces. The ultrasound system can be moved across pavement and other hardened parking lot surfaces.

Note: You must lock the wheels of the ultrasound system when transporting the system by vehicle. The ultrasound system must be sufficiently anchored to the vehicle floor or walls to avoid shifting or moving during transport.

After the Move

⚠ **Caution:** Obstructed fans can cause potential ultrasound system overheating, system performance degradation, or failure. Do not allow fabric, such as linens or bedding, or surfaces to impede ventilation around the system. Ensure the system has proper ventilation during operation.

⚠ **Caution:** Wheel locks are most effective on a level surface. Never park the ultrasound system on an incline greater than five degrees.

To set up the ultrasound system after a move:

1. Position the ultrasound system.

   Note: Always position the ultrasound system away from structures, for example, a wall, to provide access to the power panel on the system.
2. Lock the front and rear wheels.
3. Plug the power cord into a hospital-grade or local equivalent power supply (mains outlet).

   See also: Plugging in the Ultrasound System, page 4-13
4. Reconnect devices to the system, including the network cable, off-board peripheral devices, system accessories, and transducers.
5. Unlock and position the monitor.
6. Power on the ultrasound system.

Shipping the Ultrasound System

You must prepare the ultrasound system to ship over long distances or transport the system over rough terrain.

To prepare the ultrasound system for shipment:

1. Repack the ultrasound system in the factory packaging and crate.
2. Load the system into a vehicle using a lift gate.
3. Secure the system with cargo straps to prevent lateral movement of the system during transport.
4. Provide shock cushions beneath the system to prevent sudden jarring of the system during transport.

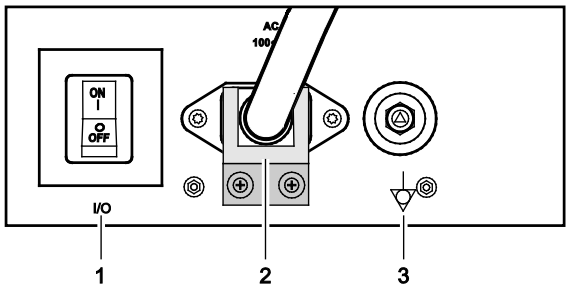
System Startup

⚠ **WARNING:** Operating the ultrasound system in close proximity to other equipment can cause reciprocal interference. You should observe and ensure normal operation of the ultrasound system and other equipment.

The first step to operating the ultrasound system is to connect the system to a power supply (supply mains).

Accessing the Power Panel

The power panel is located under the ultrasound system and is accessible from the back of the system.



Example of the power panel on the ultrasound system.

1 Circuit breaker (mains switch) of the ultrasound system
2 Power cord inlet with protective cover for the power cord
3 Equipotential terminal

Note: The power cord is attached to the ultrasound system and includes a protective cover for the power cord. If your power cord requires replacement, contact your Siemens Healthineers service representative.

Plugging in the Ultrasound System

⚠ **WARNING:** Before connecting the ultrasound system to a power supply (supply mains), you must read and understand the Electrical Safety section of Chapter 2 in this manual.

To plug in the ultrasound system:

- 100V~ to 240V~ systems used in the U.S.A.: plug the power cord into a hospital-grade power supply outlet (mains outlet).
- 100V~ to 240V~ systems outside the U.S.A.: plug the power cord into a standard power supply outlet (mains outlet). For example, a "Schuko" outlet (CEE 7/7 standard).

Supplying Power to the Ultrasound System

The ultrasound system is powered on and off using the partial power on/off control located on the control panel.

Illumination of the Control	System Status
Steady light	Powered on
Flashing light	Plugged into the power supply (supply mains) and the circuit breaker (mains switch) on the ultrasound system is in the ON position (|)
Off (not lit)	▪ Powered off ▪ Unplugged from a power supply (supply mains) ▪ Circuit breaker (mains switch) on the ultrasound system is in the OFF position (O)

For optimal system performance, power off the ultrasound system every 24 hours.

To power on the ultrasound system:

Prerequisite: Ensure the partial power on/off control is flashing.

1. Press the partial power on/off control.

   The ultrasound system performs self-diagnostic and calibration tests. The system is ready for use once the tests are successfully complete. If a problem occurs, an error code or message displays on the screen; note the problem and call your Siemens Healthineers service representative.

   See also: For information on logging in to the ultrasound system, refer to Chapter 5 in this manual.

2. Visually check the on-screen displays and lighting as indicated in the daily checklist before using the ultrasound system.

   See also: For the daily checklist, refer to Chapter 2 in this manual.

To power off the ultrasound system:

1. Press the partial power on/off control.
2. To finish the transfer of images before powering off, tap **Complete Data Transfer**.
3. To restart the system, tap **Restart**.
4. To power off the system, tap **Shut Down**.
5. To cancel the shutdown, tap **Cancel**.
6. To completely disconnect the ultrasound system from the power supply (supply mains), power off the system and then unplug the ultrasound system from the power supply.

Activating Hibernate

Hibernate decreases the time to power on and off the ultrasound system.

When hibernate is activated, the ultrasound system saves and ends the current exam. If transfer of images is in progress, you can choose to delay or continue the transfer before system hibernate. A delayed transfer resumes when the network connection is reestablished.

Note: You can activate hibernate up to 20 times in a 24-hour period.

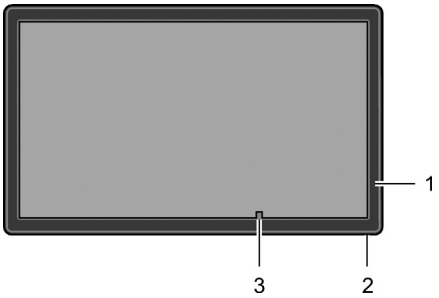
To activate hibernate:

1. Briefly press the partial power on/off control.
2. To finish the transfer of images before system hibernate, tap **Complete Data Transfer**.
3. Tap **Hibernate**.
   Note: Ensure the partial power on/off control is flashing.
4. Transport the ultrasound system to another location, if necessary.
   See also: Moving the System, page 4-7
5. To exit hibernate and power on the ultrasound system, press the partial power on/off control.

Adjusting the Monitor Settings

Adjust the brightness and contrast of images using the control panel and the configuration settings, not the monitor controls.

Monitor with a Luminance Sensor



Example of monitor with integrated luminance sensor.

1 Monitor frame
2 Menu control
3 Integrated luminance sensor for monitor calibration

Note: Access panels on the back of the monitor and the menu control are available only for your ultrasound customer service representative.

See also: For information about configuring the monitor for Grayscale Standard Display Function (GSDF) and ambient lighting, refer to Chapter 1 in the System Reference.

Adjusting the Touch Screen and Control Panel Lighting

You can adjust the brightness of the touch screen, backlighting of the controls on the control panel, and the backlighting of the keys on the retractable keyboard.

To adjust the brightness settings:

1. Tap the configuration button.

2. Tap **Control Panel Settings**.
3. To adjust the brightness of the control panel, rotate the required control.

Selection	Description
Touch Screen	Adjusts the brightness of the touch screen.
Light	Adjusts the brightness of the lighting of an active control.
White Light	Adjusts the brightness of the white lighting of an available control.
Keyboard	Adjusts the brightness of the backlighting of the retractable keyboard.

Adjusting the Volume of the Audio

The ultrasound system provides options for audible feedback during acquisition and when using the touch screen.

Use the configuration settings to enable the audible feedback and to adjust the volume of the audible tone.

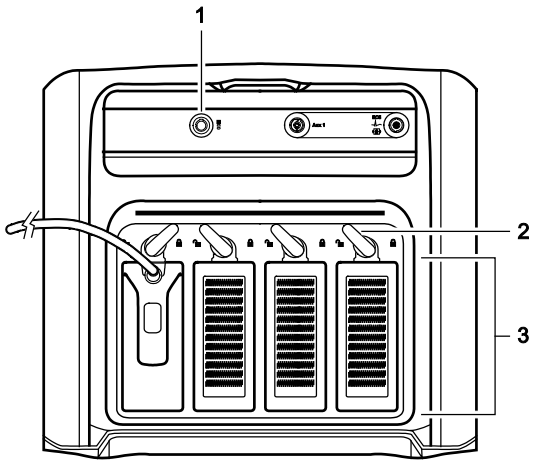
See also: For information on adjusting the Doppler volume, refer to Chapter 8 in this manual.

See also: For information on adjusting the volume during recording, refer to Chapter 13 in this manual.

Connecting and Disconnecting Transducers

⚠ **Caution:** To avoid damaging the transducer cable, do not pull on the cable to disconnect the transducer. Use the following instructions.

The touch screen displays the names of the transducers connected to the ultrasound system.



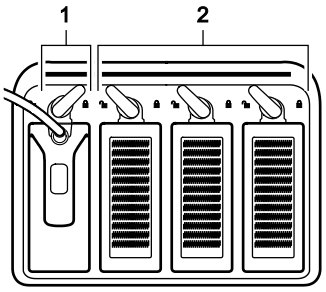
Example of transducer ports.

1 Transducer port for continuous wave (pencil) transducers
2 Transducer locking lever
3 Transducer ports for array transducers

Array Transducers

⚠ **Caution:** If you encounter resistance when rotating the lever to the locked position, do not force the lever. Carefully follow the instruction to reconnect the transducer to the ultrasound system.

When array transducers are connected or disconnected from the ultrasound system, there may be some resistance due to the shielding material inside the connectors. This is normal for these transducers.



Example of the locked and unlocked positions of the transducer locking lever.

1 Locking lever in locked position
2 Locking lever in unlocked position

To connect an array transducer:

1. Hold the transducer connector with the cable extending upward from the connector.
2. Insert the transducer connector into the port until you hear an audible click and then rotate the transducer locking lever to the locked position.

   Note: If the locking lever is not fully rotated to the locked position, the ultrasound system will not recognize the transducer. Ensure the lever is fully rotated to the locked position.
3. Place the transducer in the transducer holder.

To disconnect an array transducer:

1. Rotate the transducer locking lever to the unlocked position.
2. Firmly grasp the transducer connector and carefully pull the transducer from the transducer port.
3. To keep the transducer on the ultrasound system, place the transducer connector in the storage bin and ensure the transducer is in the transducer holder.

   See also: For information on cleaning, disinfecting, and storing transducers, refer to Chapter 3 in this manual.

Continuous Wave Transducers

Use the transducer port for continuous wave (pencil) transducers.

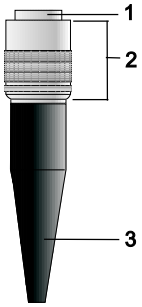
To connect a continuous wave transducer:

1. Align the connector key until the connector fits smoothly into the receptacle.
2. Insert the connector into the continuous wave transducer port until the connector locks in position.

To disconnect a continuous wave transducer:

- Pull on the connector housing ring to disengage the locking mechanism. Continue pulling on the ring to remove the connector from the transducer port.

  See also: For information on cleaning, disinfecting, and storing transducers, refer to Chapter 3 in this manual.



Example of a connector on a continuous wave transducer.

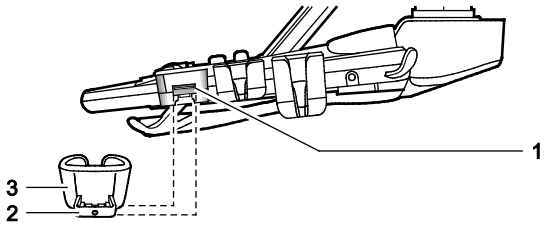
1 Connector
2 Retractable connector housing
3 Transducer cable

Protective Transducer Holders

⚠ **Caution:** Transducer holders have variable sizes both in depth and diameter. To avoid transducer damage, you must use the holder and insert provided for specialty transducers with small or large diameter handles.

After connecting a transducer to the ultrasound system, place the transducer in the protective holder attached to the control panel. Holders are also available for the coupling agent (gel).

The transducer holders are interchangeable and replaceable.



Example of transducer holders.

1 Point of attachment
2 Tab
3 Holder

To attach a transducer holder:

- Push the tab of the transducer holder into the point of attachment on the control panel until the holder snaps into place.

To remove a transducer holder:

1. Reach under the transducer holder to locate the tab on the holder. The tab extends below the point of attachment on the control panel.
2. Press the tab against the holder as you pull the holder away from the control panel.

Transducer Cable Management

⚠ **WARNING:** To avoid injury from tripping over a transducer cable, use the cable hangers on the ultrasound system to keep the transducer cable from contact with the floor.

Drape the transducer cable through the cable hangers on the ultrasound system. These hangers provide support for the transducer cables, keep cables off the floor, and help to prevent tangling of the cables when more than one transducer is connected to the system.

Connecting System Accessories

The ultrasound system has connections for system accessories.

Connecting a Footswitch

Attach the footswitch connector to a USB port on the input/output panel located on the back of the system.

Use the configuration settings to assign functions to the footswitch pedals.

Connecting a Smart Card Reader

A smart card reader restricts user access to the ultrasound system by requiring public key infrastructure (PKI) authentication.

Note: For information on the installation and operation of the smart card reader, refer to the manufacturer's operating instructions that accompanied the device.

To prepare the ultrasound system for a smart card reader:

1. Contact your Siemens Healthineers service representative to enable the public key infrastructure (PKI) authentication in the configuration settings of the ultrasound system.
2. Contact an ultrasound system administrator at your facility to connect the ultrasound system to an Active Directory domain controller.

   See also: For information on connecting the ultrasound system to a domain controller, refer to Chapter 7 in the System Reference.

To attach the smart card reader to the ultrasound system:

1. Place the smart card reader in an accessible location on the ultrasound system.
2. Connect the USB cable of the card reader to a USB port.

   Note: If the card reader is disconnected while the ultrasound system is in use, keep your smart card in the card reader, reconnect the USB cable, and then restart the ultrasound system.

Connecting Physio Cables

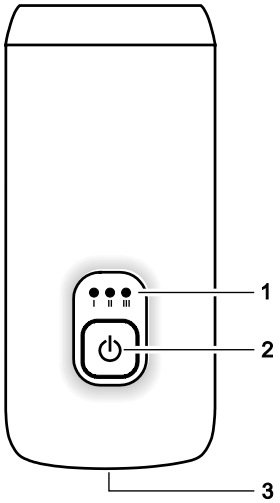
See also: For information on setting up the physiologic feature, refer to Chapter C1 in the Advanced Imaging Manual.

Connecting the Gel Warmer

⚠ **Caution:** Do not attempt to repair or alter the gel warmer. Contact your local Siemens Healthineers service representative immediately if your gel warmer appears to be damaged or malfunctions in any way.

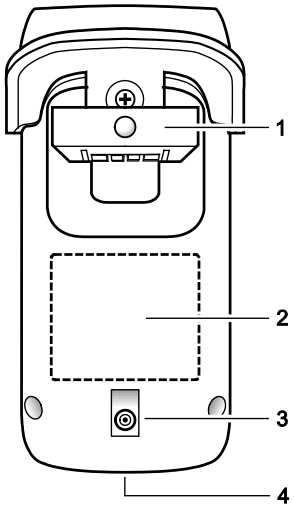
See also: For information on cleaning and disinfecting the gel warmer, refer to Chapter 2 in this manual.

When the ultrasound system and the gel warmer are powered on, the gel warmer continuously heats the bottle of gel inserted into the gel warmer.



Example of the gel warmer, front view.

1 Temperature indicator lights
2 Power on/off and temperature adjustment control
3 Cap for collecting gel spilled from the inverted gel bottle



Example of the gel warmer, back view.

1 Tab
2 Label
3 Power cable connector
4 Cap

To attach the gel warmer to the ultrasound system:

1. Remove the transducer holder on the side of the ultrasound system closest to the patient and farthest from the front of the system.

   See also: Protective Transducer Holders, page 4-21

2. Attach the gel warmer to the ultrasound system.
   a. Attach one end of the power cable accompanying the gel warmer to the connector on the back of the gel warmer and then attach the other end of the power cable to the connector on the control panel.
   b. Push the tab of the gel warmer into the point of attachment on the control panel until the warmer snaps into place.

To use the gel warmer:

1. Press and hold the power on/off control on the front of the gel warmer to power on the gel warmer.

   The gel warmer power control illuminates when the gel warmer is powered on.

   Note: A flashing light indicates there is a problem with the device. Check the cable connector on the gel warmer and on the ultrasound system. If you continue to experience a problem with the device, contact your Siemens Healthineers service representative.

2. Press the power on/off control to change the temperature setting of the gel warmer.

Selection	Setting	Temperature
I	Lowest	31°C
II	Medium	34°C
III	Highest	37°C

3. Invert the bottle of gel and then insert the bottle into the gel warmer.
4. To power off the gel warmer, press and hold the power on/off control.

Connecting the Ultrasound System to a Network

You can connect the ultrasound system to a local area network (LAN) through a wired or a wireless connection. When both wired and wireless connections are configured and available, the ultrasound system assigns priority to the wired connection.

If you are in the process of saving a study to a network location when you disconnect the system from a LAN or change the connection to a LAN, the ultrasound system pauses the process of saving the study and resumes saving the study when you reconnect the system to the LAN.

See also: For information on configuring a wireless network connection, refer to Chapter 5 in the System Reference.

Wired Connection

To connect the ultrasound system to a network through a wired connection:

Prerequisite: The required wired connection on the ultrasound system is configured by your network administrator.

1. Connect the network cable to the Ethernet port located on the back of the ultrasound system below the input/output panel door.
2. Connect the network cable to the hospital network port.

   The system disconnects from the wireless network, connects to the LAN through the wired connection, and displays an icon indicating a wired connection on the lower right of the image screen.

   Example of the icon indicating a wired connection.

Wireless Network Connections

⚠ **Caution:** Do not connect a wireless adapter or network card to any of the USB ports on the ultrasound system.

⚠ **Caution:** Use only the wireless configuration described in the System Reference for the ultrasound system.

⚠ **Caution:** Ultrasound systems operate in the range of radio frequencies (RF) and are susceptible to electromagnetic interference generated by other RF energy sources. To prevent this interference, increase the distance between the ultrasound system and the interfering RF energy source. Other medical devices and systems, including devices and systems in compliance with CISPR emission standards, may cause interference for the wireless connection.

The ultrasound system can send data, such as studies, measurement data, images, and clips, to a network location over a wireless network.

Note: Siemens Healthineers recommends connecting the ultrasound system to wireless networks that use the 5 GHz frequency bandwidth to reduce potential radio interference from devices using the 2.4-GHz frequency.

To connect the ultrasound system to a network through a wireless connection:

Prerequisite: Configure the wireless network connection.

1. Disconnect the network cable from the ultrasound system, if necessary.

   The ultrasound system connects to the most recently used wireless network, if the wireless network is secured and detected.

2. To reconnect the ultrasound system to the currently-selected wireless network:
   a. Tap the additional selections button.

   b. Tap **Reconnect Wi-Fi**.
3. To connect to another detected wireless network:
   a. Tap the configuration button.

   b. Click **Connectivity & Network**.
   c. Click **Wireless Network**.
   d. To enable connections to wireless networks, select the **Enable WiFi** check box, if necessary.
   e. Click the profile name of a wireless network.
   f. Click **Connect**.

   The ultrasound system connects to the wireless network. An icon indicates the strength of the wireless connection.

   Example of the icon indicating the signal strength of a wireless connection.

   Note: An "x" on the icon indicates the ultrasound system is not connected to a wireless network.

   g. To view the name of the network and network speed, position the pointer on the icon.

   The network speed is in megabits per second (Mbps).

Input/Output Panel Connections

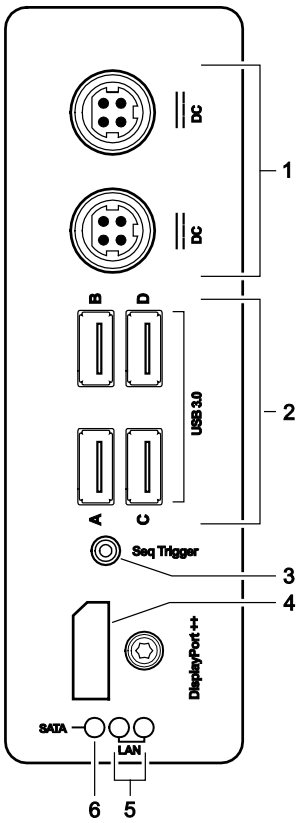
⚠ **WARNING:** Accessory equipment connected to the analog and digital interfaces must be certified according to the respective EN or IEC standards (for example, EN 60950 or IEC 60950 for data processing equipment and EN 60601-1 or IEC 60601-1 for medical equipment). Anyone who connects additional equipment to any of the signal input or signal output ports configures a medical system and is therefore responsible that the system complies with the requirements of the system standards EN 60601-1 or IEC 60601-1. Siemens Healthineers can only guarantee the performance and safety of the devices listed in the *Instructions for Use*. If in doubt, consult the Siemens Healthineers service department or your local Siemens Healthineers representative.

See also: For additional information on accessories and options, refer to Appendix A in this manual.

⚠ **WARNING:** To ensure proper grounding and leakage current levels, it is the policy of Siemens Healthineers to have an authorized Siemens Healthineers representative or approved third party perform all on-board connections of documentation and storage devices to the ultrasound system.

⚠ **Caution:** To prevent damage to the ultrasound system and peripheral devices, always power off the system before connecting or disconnecting peripheral devices.

The input/output (I/O) panel, an RJ-45 Ethernet (network) port, and lights for service diagnostics are located inside the I/O panel door on the back of the ultrasound system. You can route cables connected to the I/O panel and the Ethernet cable under the I/O panel door.



1 Power outlet for on-board peripheral devices
2 USB-A ports
3 Sequential trigger, an auxiliary trigger output for use in research and development environments
4 DisplayPort (video and audio)
5 Status indicator lights for local area network (LAN) connections
6 Status indicator light for an internal serial advanced technology attachment (SATA) drive

Example of connections on the input/output panel.

Connecting Peripheral Equipment

⚠ **WARNING:** Equipment connected to the ultrasound system and in the patient environment must be powered from a medically-isolated power supply (supply mains) or must be a medically-isolated device. Equipment powered from a non-isolated source can result in chassis leakage currents exceeding safe levels. Chassis leakage current created by an accessory or device connected to a non-isolated outlet may add to the chassis leakage current of the ultrasound system.

⚠ **WARNING:** Non-medical grade report printers cannot be used within a patient environment.

⚠ **WARNING:** During use of a non-medical grade report printer or when a non-medical grade report printer is connected to the ultrasound system, the ultrasound system cannot in any way be in contact with a patient.

Peripheral devices must be installed on the ultrasound system by an authorized Siemens Healthineers representative or by a Siemens Healthineers approved third party. Any use of other devices with the system will be at the user's risk and may void the system warranty.

To fulfill EN 60601-1 or IEC 60601-1 (Medical Electrical Equipment, Part 1: General Requirements for Basic Safety and Essential Performance) requirements, connection of peripheral equipment to your ultrasound system must adhere to one of the following conditions:

- The peripheral equipment itself is a medical device approved according to EN 60601-1 or IEC 60601-1; or
- Non-medical peripheral equipment approved according to any other EN or IEC standard (EN XXXXX or IEC XXXXX, for example, equipment complying with EN 60950 or IEC 60950) must use the following setup for connection:

  Equipotential terminal located on the power panel of the ultrasound system.

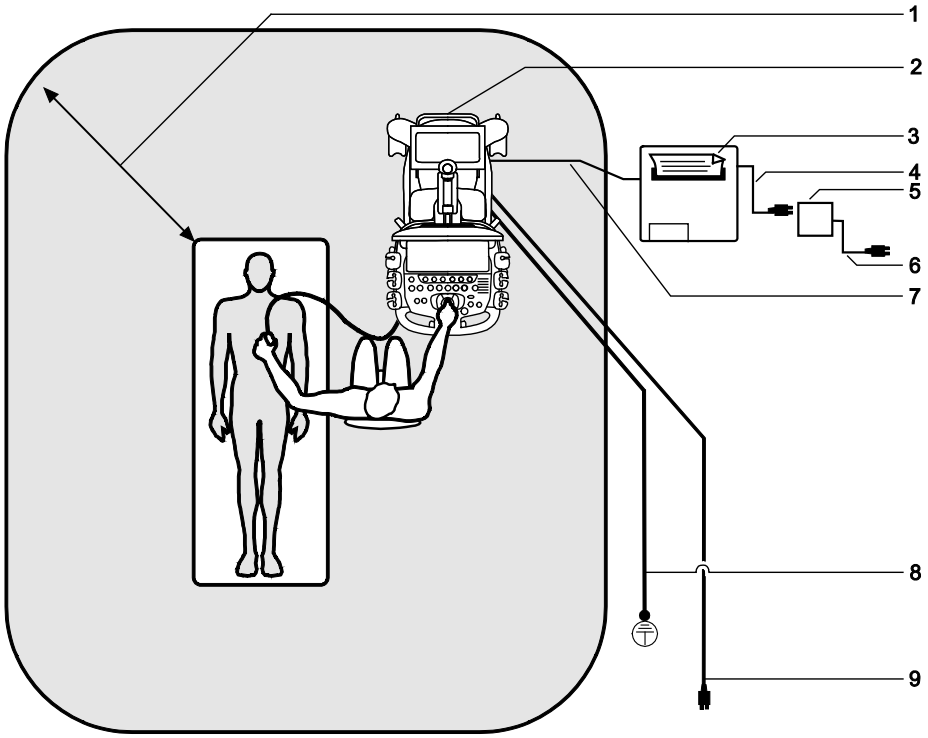
  – Connect the ultrasound system to an independent protective ground terminal, with a ground wire connection to the ultrasound system's equipotential terminal. Ensure that the protective ground wire is connected to a qualified protective ground connection independent of the existing system's ground connection (via the power cord).
  – The peripheral equipment is located at least 1.5 meters (1.8 meters [6 feet] in Canada and the U.S.A.) outside of the patient environment. A patient environment is defined as the area in which medical examination, monitoring, or treatment of the patient takes place.
  – The peripheral equipment is connected to a mains outlet (power outlet) outside the patient environment but still within the same room as the ultrasound system.

For additional information and other possible combinations, refer to the Medical Electrical Equipment Standard EN 60601-1 or IEC 60601-1, Annex I.

Note: The above information is based on current EN 60601-1 or IEC 60601-1 standards. If your country's regulatory standards for medical equipment do not correspond to EN 60601-1 or IEC 60601-1, your local requirements may be different.

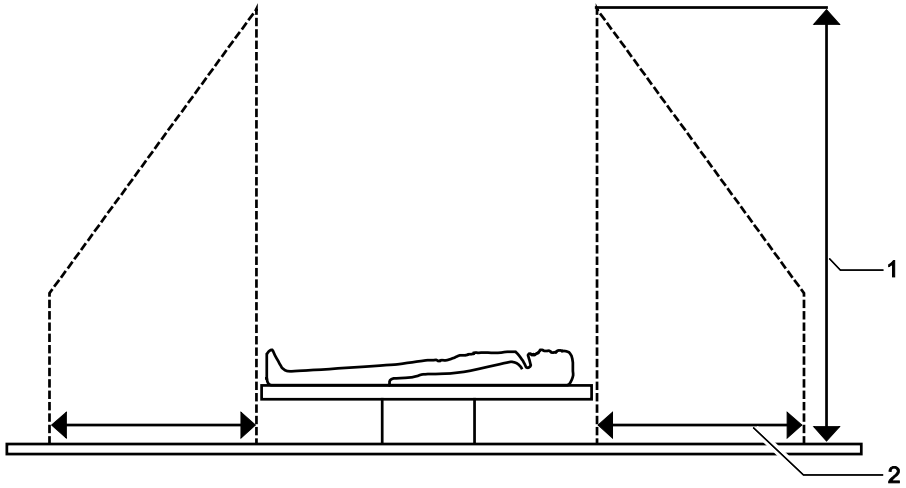
During normal operation, the ultrasound system is designed to display ultrasound images without noise, artifacts, or distortion that cannot be attributed to physiological effects.

Observe the peripheral equipment connections and patient environment shown in the following diagram to support the normal operation of the ultrasound system.



Example of a peripheral equipment connection and patient environment.

1 Patient environment represented by shading, extending exactly 1.5 meters (1.8 meters [6 feet] in Canada and in the U.S.A.) around patient and ultrasound system
2 Ultrasound system
3 Peripheral equipment (EN XXXXX or IEC XXXXX)
4 Peripheral equipment power cable
5 Medically-approved isolation transformer
6 Medically-approved isolation transformer power cable
7 Printer data cable
8 Additional protective ground
9 Ultrasound system power cord



Example of a peripheral equipment connection and patient environment.

1 2.5 meters (typical)
2 1.5 meters (1.8 meters [6 feet] in Canada and the U.S.A.)

On-Board vs. Off-Board Documentation Devices

On-board documentation devices must be installed by authorized Siemens Healthineers representatives.

Off-board documentation devices are user installable.

An off-board documentation device has a data cable connecting it to the ultrasound system but is connected to AC power separate from the ultrasound system. An off-board documentation device is located separately, for example, on a table next to the ultrasound system.

Up to four documentation devices in total may be connected to the ultrasound system. All installed documentation devices may be controlled from the ultrasound system.

The following configurations are supported:

On-board Documentation Devices	Off-board Documentation Devices
2	Up to 2
1	Up to 3
none	Up to 4

See also: For a list of supported on-board documentation devices, refer to Appendix A in this manual.

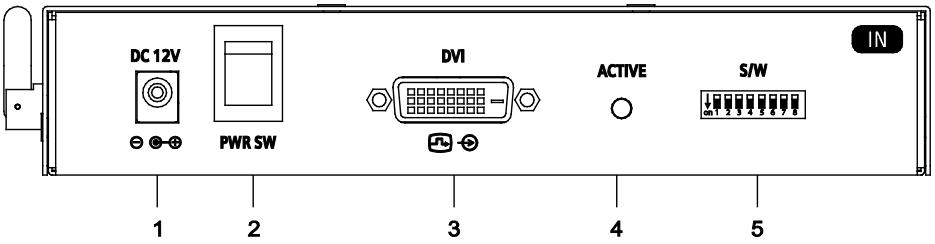
Universal Video Converter

The universal video converter receives digital video signals from the ultrasound system and then converts the digital signals to support secondary viewing devices, for example, an analog monitor or an analog video recording device.

Note: Secondary viewing devices connected to the ultrasound system using the universal video converter are intended for reference only and have not been validated for diagnostic use.

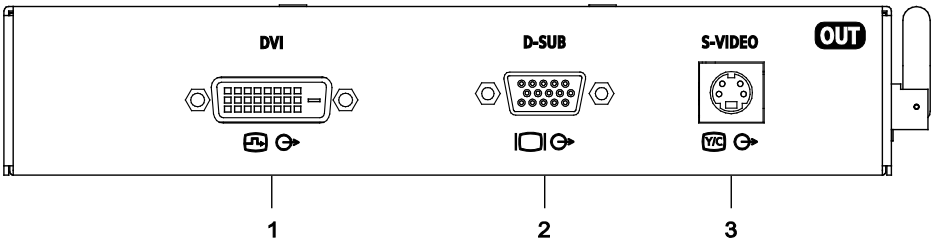
The display of the ultrasound image on the secondary viewing device is determined by the setting of the fifth switch on the universal video converter:

- The off position sends the 1920x1080 full image screen from the ultrasound system to the viewing device.
- The on position sends only an 1024x768 image from the ultrasound system. The image is scaled and cropped for the viewing device.



Example of the input ports and switches on the universal video converter.

1 Power cable input
2 Power switch
3 Digital video interface (DVI) input from the ultrasound system
4 Light indicating the universal video converter is active
5 Switches for video formats and display settings



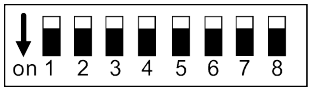
Example of the video output ports on the universal video converter.

1 Digital video interface (DVI) output
2 Video graphics array (S-VGA) output
3 S-video output
Requires selection of the first video format switch on the universal video converter: PAL or NTSC.

To set up the universal video converter:

1. Connect the DVI input cable from the ultrasound system to the universal video converter.
2. Connect the power cable to the power cable input on the universal video converter and then plug the AC/DC wall adapter to the power outlet.

   Note: Only use the AC/DC wall adapter provided with the universal video converter.
3. Connect the required video cable to a video output port on the universal video converter and then connect the video cable to the secondary viewing device.
4. Power on the ultrasound system, the universal video converter, and the secondary viewing device.
5. Push all switches on the universal video converter upward to the off position.



6. To display the scaled and cropped image on the secondary viewing device, push the fifth switch downward to the on position.



7. To select S-Video output from the universal video converter when a video cable is connected to the S-Video output:
   - For NTSC format, push the first switch upward to the off position.
   - For PAL format, push the first switch downward to the on position.

Connecting to Remote Services

(Available only when remote services is enabled on your ultrasound system)

You can connect to remote services through a wired or wireless network.

To begin the remote access session:

1. Use the phone number provided by your Siemens Healthineers representative.
2. Follow the instructions provided by your service representative, including how to disconnect from the remote service session.

   Note: If you do not disconnect from the session, the session will end after 30 minutes of inactivity.

Installing Software Updates

(Available only when remote customer services is enabled on your ultrasound system)

The remote update handling feature sends software updates to your ultrasound system over a secure network connection. You should install a software update within one week after the update is downloaded. However, you cannot postpone a mandatory security update.

Note: Installing a software update requires a permission level of administrator.

To install or defer software updates:

Prerequisite: Power on the ultrasound system and ensure the system is connected to a wired or wireless network.

1. Click the remote services icon on the lower right of the image screen.

   Note: A flashing "!" on the icon indicates the software update is mandatory for the ultrasound system. You cannot postpone a mandatory security update.
2. Click **Description** to view a description of the software update.
3. Select the checkbox to confirm you have read the description.
4. Click **Install**.

   The software update description provides the required installation time.

   If multiple software updates are ready for installation, the system installs the first update and then prompts you to continue installation of the next update.
5. Click **OK**.

   Note: Do not power off the ultrasound system while installation is in progress.

   The system may restart multiple times during installation. The system displays a message when installation is complete.
6. To postpone installation of the software update, click **Install Later**.
7. To postpone installation of all software updates, click **Install All Later**.

5 Beginning a Study

Preventing Unauthorized Access **3**
Logging In to the Ultrasound System 3

Registering a Patient **5**
Preregistering a Patient 5
Registering a New Patient and Beginning a Study 5
Selecting an Existing Patient and Beginning a New Study 6
Registering a Patient from the Worklist Server 7
Selecting a Patient from the Local Database 8
Patient Registration Form Selections 9
Patient History 11
Customizing the Patient Registration Form 12

Editing Patient Registration Information **13**

Beginning a Study without Registering the Patient **13**

Selecting a Different Image Preset and Transducer **14**

Restarting an Existing Study **15**

Resuming a Paused Study **15**

Selecting an Exam Association Package **16**

Activating an Operating Mode **17**
2D-mode Overview 19
Doppler Overview 19
M-mode Overview 19
Color Flow Overview 20
Acoustic Streaming with Cysts 20
Volume Imaging Overview 20

Capturing Images and Clips **21**

Pausing a Study **23**

Discontinuing a Study **23**

Completing a Patient Study **24**

Preventing Unauthorized Access

The security package on the ultrasound system protects patient information from unauthorized access by requiring a user login to access the ultrasound system. It is the responsibility of the ultrasound system administrator at your facility to observe local security policies and implement security settings and policies for the ultrasound system.

You can also restrict user access to the ultrasound system by requiring public key infrastructure (PKI) authentication with a smart card reader.

See also: For information about connecting a smart card reader to the ultrasound system, refer to Chapter 4 in this manual.

You can lock the screen to prevent unauthorized access to patient information. An active screen saver display also locks the screen. A locked screen requires a user login to access the system.

See also: For information about the screen saver, refer to Chapter 1 in this manual.

The ultrasound system administrator also assigns permissions for each user account. Permissions establish data access rights (either no access or full access) that determine whether a user can view studies stored on the system. To understand the permissions assigned to your user account, or if you do not have a user name and case-sensitive password, contact your ultrasound system administrator.

Use the configuration settings to review the permissions for the currently logged-in user account.

Logging In to the Ultrasound System

All users are required to log in to the ultrasound system prior to use.

To	Do This
Log in to the ultrasound system without a smart card	1. Click **DomainLogin**, if necessary. 2. Enter your user name and password. 3. Click **OK**.
Log in to the ultrasound system with a smart card	1. Insert your smart card into the smart card reader. 2. Click **PKILogin**. 3. Enter the personal identification number (PIN) for your smart card. 4. Click **OK**. 5. Keep your smart card in the card reader during use of the ultrasound system. **Note:** Removing your smart card from the reader locks the screen to prevent unauthorized access to patient data. To unlock the screen, re-insert your card and continue the exam.
Begin a study without a password	(Available only when enabled in the configuration settings) **Prerequisite:** Obtain the emergency access user name from your ultrasound system administrator. 1. Click **DomainLogin**, if required. 2. Enter the emergency access user name. 3. Click **OK**. The ultrasound system enables limited access to patient data.

To	Do This
Prevent unauthorized access to the ultrasound system	1. Click the login button.  2. Select **Lock System**.  The ultrasound system displays the login screen.
Change your password	(Available only when enabled for the currently logged-in user account in the configuration settings) **Note:** You cannot change the personal identification number (PIN) of your smart card on the ultrasound system. 1. Click the login button.  2. Select **Change Password**.  3. Enter the password information on the change password screen. 4. Click **OK**.
Log in as a different user	1. For systems with a smart card reader, insert your smart card into the card reader. 2. Click the login button.  3. Select **Log in Different User**.  4. Enter your user name and password. Or, enter the personal identification number (PIN) for your smart card. 5. Click **OK**.
Log off the ultrasound system	**Note:** You can log off the ultrasound system only after an exam is completed. 1. Click the login button.  2. Select **Log Off** <User Name> (where User Name is your assigned user name).  3. For systems with a smart card reader, remove your smart card.

Registering a Patient

Use the patient registration form to register a patient or edit information for a previously registered patient.

See also: For information about patient data access, refer to Appendix B in the System Reference.

Preregistering a Patient

The following information is required for pre-registration: patient's last name, identification number, and date of birth. The ultrasound system displays an asterisk (*) next to incomplete information in the patient registration form.

To preregister a patient:

Prerequisite: The ultrasound system is connected to a worklist server.

1. Tap **Patient**.
2. Tap **Patient Registration**, if necessary.
3. Enter the required patient registration information.
4. Tap **Preregister**.
   The patient study is added to the list of scheduled procedures on the worklist server.

Registering a New Patient and Beginning a Study

You can edit patient registration information at any time before ending the patient study.

To register a patient and begin a study:

1. Tap **Patient**.
2. Tap **Patient Registration**, if necessary.
3. Enter the required patient information.
4. To delete all patient information in the registration form, tap **Clear All**.
5. Tap **Start Study**.
   The ultrasound system exits patient registration and activates real-time imaging.
6. Tap the name of the transducer and then select an image preset from the exam list, if necessary.

Selecting an Existing Patient and Beginning a New Study

When you begin a new study for an existing patient, the system populates the patient registration form with the preexisting patient data.

Note: Study-specific information is not copied to the registration form.

To select an existing patient and begin a new study:

Prerequisite: Access patient registration or the patient browser.

1. Select the required patient study.
2. Tap **New Study**.
3. Enter the study-specific information and update the patient information, if necessary.
4. Tap **Start Study**.

Registering a Patient from the Worklist Server

When you select a patient from the worklist server, you can edit the patient registration information and begin the patient study.

Use the configuration settings to assign a default exam, transducer, and exam package to a worklist procedure description.

To register a patient from a worklist server:

Prerequisite: Connect the ultrasound system to a Hospital Information System/Radiology Information System (HIS/RIS) server configured for Modality Performed Procedure Step (MPPS).

1. Tap **Patient**.
2. Tap **Patient Registration**, if necessary.
3. Click **Worklist**.

   The ultrasound system displays a list of patient studies saved to the worklist server.
4. To select a different worklist server connected to the ultrasound system, select the server name.
5. To refresh the list of patients, click **Refresh**.
6. To clear the worklist, click **Clear Worklist**.
7. To search for a patient, click the server search icon and then search for a patient.

   The system displays the files matching your search criteria.

   See also: For information about searching for a patient study or creating a query, refer to Appendix B in the System Reference.
8. Select the required patient study.
9. Edit the study information, for example, the name of the exam, if necessary.
10. Tap **Start Study**.
11. To exit without beginning the patient study and search for a different scheduled procedure, tap **Cancel**.

Selecting a Patient from the Local Database

When you select a patient from the local database on the ultrasound system, you can begin a new study for the patient or review or insert images and clips for a stored patient study.

To select a patient from the local database:

Prerequisite: Import the patient study stored on an external storage device to the local database on the ultrasound system.

1. Tap **Patient**.
2. Tap **Patient Registration**, if necessary.
3. Click **Local Database**.

   The system displays a list of patients saved to the local database on the ultrasound system.
4. To search for a patient, enter the search criteria for the patient name, identification number, or accession number.

   The system filters the list of patients as you enter the search criteria. The search is not case-sensitive.

   See also: For information about searching for a patient study or creating a query, refer to Appendix B in the System Reference.
5. Select the required patient study.
6. To begin a new patient study, tap **New Study**.
   a. Edit the study information, if necessary.
   b. Tap **Start Study**.
7. To review a patient study, tap **Load to Review**.

   See also: For information about reviewing a patient study, refer to Chapter B1 in the Advanced Imaging Manual.
8. To exit without selecting the patient study and search for a different patient, tap **Cancel**.

Patient Registration Form Selections

The patient registration form contains general and use-specific information. The use-specific information entered in the patient registration form is not copied to a new study for the patient.

Selection	Description
Patient	---
Last Name	Patient's last name. If a last name is not entered, the ultrasound system generates the name **Unknown**. The patient name (first, middle, and last names combined) is limited to 64 characters.
First Name	Patient's first name.
Middle Name	Patient's middle name.
Patient ID	Identification number for the patient. If an identification number is not entered, the system generates a unique identifier starting with the system date and time. The identification number is limited to 64 characters. If there is not enough space for the entire number to display on the image screen, the number is appended with three dots (…).
Date of Birth	Patient's date of birth. Enter the month, day, and year in the format specified in the configuration settings. If a date of birth is not entered before the end of the study, the ultrasound system generates the date of birth **11/18/1858**, but does not display this date on the form.
Age	The system calculates and displays the patient's age based on the patient's date of birth.
Gender	Patient's gender. If no gender is selected, the ultrasound system assigns gender based on the exam: ▪ **Female** for the obstetric, early obstetric, and gynecological exams ▪ **Male** is not assigned for any exams ▪ **Other** for all exams other than obstetric, early obstetric, and gynecological exams

Selection	Description	
Height	Patient's height.	
Weight	Patient's weight.	
BP	Patient's blood pressure, in mmHg.	
BSA	(Available only for cardiac image presets) The ultrasound system calculates the patient's body surface area (BSA) in m² based on height and weight entries.	
Institution	---	
Institution Name	Name of the institution.	
Performing Physician	Physician's name.	
Referring Physician	Referring physician's name.	
Operator	Your initials or other identifying information.	
Exam	List of system and user-defined image presets for an associated exam.	
	Abd-Difficult	Abdomen, difficult
	Abdomen	Abdomen
	Arterial	Arterial
	Cardiac	Cardiac
	Carotid	Cerebrovascular
	Fetal Echo	Fetal echo
	Intracardiac	Intracardiac
	OB	Obstetric
	TCI	Transcranial imaging
	Vascular Access	Vascular access
	Venous	Venous
Requested Procedure	List of Modality Performed Procedure Step from a Hospital Information System/Radiology Information System server.	
Request ID	Identification code for the procedure in the imaging service request. An imaging service request identifies attributes that are common among the requested procedures. Typically generated by a Hospital Information System/Radiology Information System server. The identification number is limited to 16 characters.	
Accession No	Identification number indicating the sequence of the current study as related to other studies for this patient. Used for billing purposes. Typically generated by a Hospital Information System/Radiology Information System server. The identification number is limited to 16 characters. An accession number is required for sending data to a Nuance report template.	
Comments	Information describing the symptom or particular circumstance that indicates the advisability or necessity of a specific medical procedure.	

Patient History

(Available for the following exam associations: Obstetric, Early OB, Fetal Echo)

- Modifying the date of the last menstrual period or the date of conception updates the estimated date of delivery and clinical age.
- Modifying the estimated date of delivery updates the clinical age.
- Modifying the clinical age updates the estimated date of delivery.

Selection	Description
History	---
LMP	Date of last menstrual period
DOC	Date of conception
EDD	Estimated date of delivery Calculation of the date is based on entries for last menstrual period or date of conception and/or estimated fetal age.
Clinical Age	Calculation of the estimated fetal age in weeks and days is based on entries for last menstrual period, date of conception, or estimated date of delivery.
No. Fetuses	For multiple fetuses, select the number of fetuses to enable the multiple gestation analysis capability.
Gravida **Para** **Aborta** **Ectopics**	Patient's history of pregnancies. Enter the number for each selection. The entries in these fields are transferred to the patient report, but do not display on the image screen.
OB History	Enter growth data for use in the growth analysis graph (growth curves) on the obstetric report. Includes previous obstetric measurements. **See also:** For information about entering growth data for obstetric use, refer to Chapter 10 in this manual.
Interval Growth	Calculation of the growth rate is based on values entered in the obstetric history.

Customizing the Patient Registration Form

You can customize the display of patient information on the patient registration form.

To customize the patient registration form:

1. Tap **Patient**.
2. Tap **Patient Registration**, if necessary.
3. To show or hide the list of patient studies, click the show hide button.

   Note: The ultrasound system hides the list of patient studies during an exam.
4. To sort patient data, click the title of the column in the list of patient studies.
5. To show or hide information in the patient registration form, click a selection:
   - **Long Form** displays all information.
   - **Short Form** displays the following patient information: last name, identification number, date of birth, gender, age, and exam.

Editing Patient Registration Information

During a patient study, you can display the patient registration form to edit patient registration information or select a different exam or protocol. You can also select a different transducer and exam at any time.

Use the configuration settings to restrict editing for the following information: patient's last name, identification number, and date of birth.

To edit registration information during an exam:

1. Tap **Patient**.
2. Click **Correct**.
3. Edit the information in the patient registration form.
4. To confirm the edits and continue imaging, tap **OK**.
5. To continue imaging without saving the edits, tap **Cancel**.

Beginning a Study without Registering the Patient

You can begin a study without registering the patient.

To begin a study without registering the patient:

1. Tap **Start Study**.

   The ultrasound system saves the study with a temporary identification and the last name of **Unknown** and then activates real time imaging.

   See also: For information about editing patient information during a study, refer to page 5-13.

2. Tap the name of the transducer and then select an image preset, if necessary.

Selecting a Different Image Preset and Transducer

An image preset consists of a set of optimized image parameters and settings for a compatible transducer. You can use gesture detection to select a different image preset and transducer during a study.

Gesture detection is available for the following transducers:

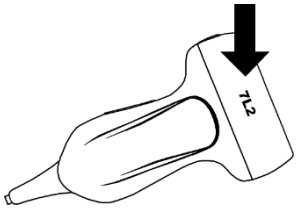
- 7L2, 10L4, 14L5, DAX, 5C1, 9C2, 5V1, 5Z1

Use the configuration settings to enable the gesture detection option.

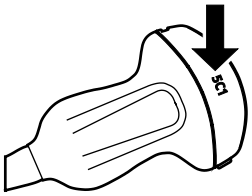
To select a different image preset and transducer during a study:

Prerequisite: The transducer is connected to the ultrasound system.

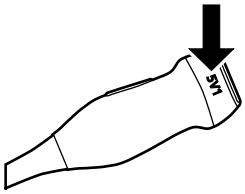
- Tap the name of the transducer on the touch screen and then select an image preset.
- For transducers with gesture detection enabled:
  a. Tap the transducer name on the transducer. Or, double-tap the handle of the transducer.
     Note: Avoid tapping the surface of the transducer intended for contact with the patient.
  b. Select an image preset, if necessary.



Example of the tap location on a linear array transducer.



Example of the tap location on a curved array transducer.



Example of the tap location on a phased array transducer.

To edit an image preset:

1. Tap the name of the transducer on the touch screen, if necessary.
2. Adjust an imaging parameter, for example, **Frequency**.
3. Tap the name of the transducer again and then tap **Edit**.
   A message indicates the image preset will be updated.
4. To update the image preset, tap **Save**.
5. To exit without updating the preset, tap **Cancel**.

Restarting an Existing Study

You can continue imaging a patient, acquire images and clips, perform measurements and update calculated results, add annotations, and edit the patient registration information by appending to an existing study.

You can append to a study stored in the local database within 24 hours of starting the study.

To restart an existing study:

Prerequisite: The patient study is stored on the local database on the ultrasound system.

1. Tap **Patient**.
2. Tap **Patient Registration**, if necessary.
3. Click **Local Database**.
4. Select the required patient study.
5. Tap **Append Study**.
   The system displays the patient registration form with all fields dimmed.
6. Tap **Start Study**.

Resuming a Paused Study

You can resume a paused study at any time.

A yellow icon identifies a paused study in the list of patient studies on the patient registration and patient browser screens.



To resume a paused study:

1. Tap **Patient**.
2. Tap **Patient Registration**.
3. Click **Paused Studies**, if necessary.
4. Select the required paused study.
5. Tap **Resume Study**.
   The ultrasound system activates imaging.

Selecting an Exam Association Package

An exam association package includes an image preset, a measurement and report calculation package, annotation body markers, annotation text package, and protocol. You can select measurement labels, text annotations, body markers, or protocols without changing the image preset or exam association package.

To select an exam association package:

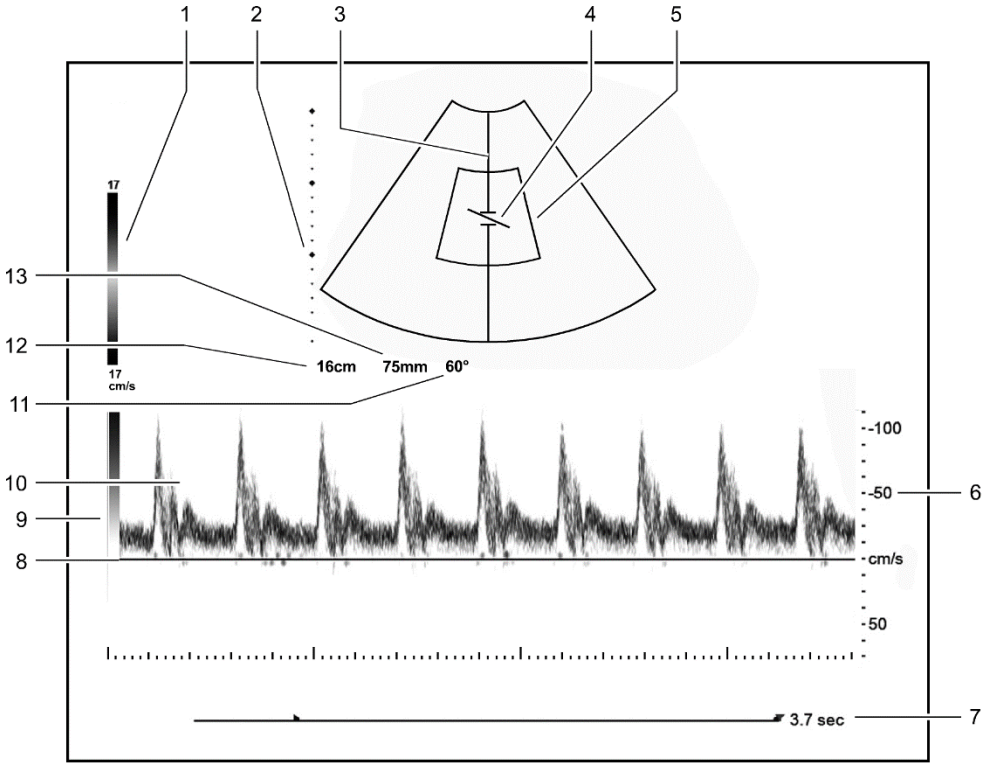
Prerequisite: Activate the measurement function or the annotation function.

1. Tap **Exam Package**.
2. Tap the required selection:

Selection	Description
Abdomen	Abdomen
Breast	Breast
Cardiac	Cardiac
Carotid	Cerebrovascular
Early OB	Early obstetric
Fetal Echo	Fetal echo
GYN	Gynecological
LEA	Peripheral vascular arterial, lower extremity
LEV	Peripheral vascular venous, lower extremity
MSK	Musculoskeletal
Neo Head	Neonatal head
Neonatal Head	Neonatal head
OB	Obstetric
Ped Hip	Pediatric hip
Pediatric Abdomen	Pediatric abdomen
Pelvis	Pelvis
Penile	Penile
Prostate	Prostate
Renal	Renal
TCI	Transcranial imaging
Testis	Testis
Thyroid	Thyroid
UEA	Peripheral vascular arterial, upper extremity
UEV	Peripheral vascular venous, upper extremity

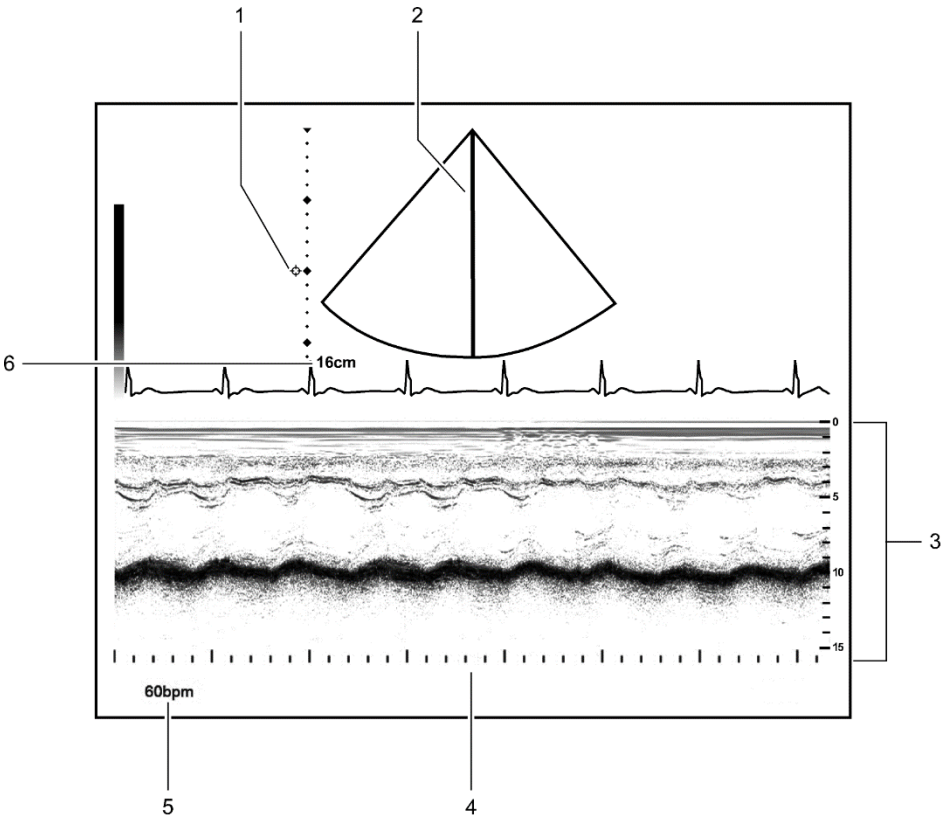
Activating an Operating Mode

You can activate combined mode imaging. To assign priority to an operating mode during combined mode imaging, tap the mode on the touch screen.



Example of 2D-mode with Doppler and color imaging.

1 Color bar
2 Depth scale
3 Doppler cursor
4 Doppler gate and Doppler angle indicator
5 Color region of interest
6 Doppler scale
7 CINE bar and current frame indicator
8 Doppler baseline
9 Gray bar
10 Doppler spectrum
11 Doppler angle
12 2D depth
13 Pulsed wave Doppler gate depth



Example of 2D-mode with M-mode imaging.

1 Focal zone markers
2 M-mode cursor
3 M-mode sweep with depth scale
4 Time scale
5 Heart rate
6 2D depth

To activate an operating mode:

1. Press the control on the control panel. For example, press **C** to activate color imaging.

   Note: If the system is configured to display the Doppler or M-mode cursor before activating the Doppler spectrum or M-mode sweep, adjust the position of the cursor and then press the required control again.

2. To deactivate all operating modes except 2D-mode, press **2D**.
3. To assign priority to an operating mode during combined mode imaging, tap the mode on the touch screen. For example, tap the **Color** tab to assign priority to color imaging during 2D imaging with color.

2D-mode Overview

2D-mode indicates brightness or two-dimensional gray scale imaging. You can display dual 2D-mode images, select transducer-dependent image formats, and adjust imaging parameters and settings for the active image.

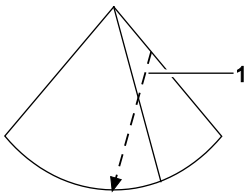
Doppler Overview

Doppler displays a 2D image and a Doppler spectrum. The cursor represents the acoustic line along which the sample volume or the Doppler gate is placed for gathering Doppler information. The system supports both pulsed wave and continuous wave Doppler.

M-mode Overview

M-mode displays a 2D image and an M-mode sweep. The cursor represents the acoustic line along which the M-mode information is gathered.

During cardiac use, use Anatomical M-mode to view an M-mode sweep based on the patient's anatomy and independent of transducer orientation. You can rotate and reposition the anatomic M-mode cursor to align with the patient's anatomy.



1 Example of the anatomic M-mode cursor.

Color Flow Overview

During Color imaging, the system applies color to indicate velocities of blood flow in a defined region of interest (ROI) within a 2D image.

- Color mode applies color to the velocities and directions of blood flow within the ROI.
- Power mode applies color to the energy measurement generated by the blood flow within the ROI.

Acoustic Streaming with Cysts

⚠ **WARNING:** Acoustic streaming may occur in fluid filled cysts under certain conditions, for example, when it is necessary to repetitively image a fluid filled cyst with long ultrasound pulses. To verify that flow inside of a cyst is actually acoustic streaming, use spectral Doppler with a large gate and low scale and filter settings and move the sample volume around the inside of the cyst.

Acoustic streaming is a well-known physical phenomenon that can occur while imaging fluid filled cysts. Under typical imaging conditions, the color flow and Doppler scale and filter settings are set too high to see the low velocity acoustic streaming, however, physical artifacts may be generated under the following conditions:

- Long ultrasound pulses are repetitively used to image a fluid filled cyst about one centimeter or larger.
- The fluid in the cyst has low viscosity.
- The center of the cyst is located near the elevation focus of the transducer.
- The pulsed repetition frequency (PRF) setting is low. (Acoustic streaming flow is typically visible between one and two centimeters per second.)
- The wall filter setting is low. (Acoustic streaming velocities are usually set by filters.)

You can confirm the flow inside of a cyst is acoustic streaming by using a large gate and low scale and filter settings and then moving the sample volume inside the cyst.

Note: Flow away from the transducer is visible at multiple locations throughout the center of the cyst if it is acoustic streaming. It is more difficult to generate acoustic streaming near the edge of the cyst.

Volume Imaging Overview

See also: For information on cardiac volume imaging, refer to Chapter D2 in the Advanced Imaging Manual.

Capturing Images and Clips

When you capture an image or clip, the system saves the data to the ultrasound system and displays a thumbnail of the image or clip in the thumbnail panel. The thumbnail includes an assigned number.

Use the configuration settings to enable the display of patient information on a saved or printed image or clip.

When you select a thumbnail during imaging and review, the system outlines the active image and thumbnail.

See also: For information about capturing images and clips during a stress echo protocol, refer to Chapter C2 in the Advanced Imaging Manual.

To	Do This
Capture an image	▪ Press **FREEZE** and then press **CAPTURE**. The system displays an icon on the image. 
Capture a clip	▪ Press **CAPTURE**. The system displays an icon on the image.  Use the configuration settings to specify the duration for recording a clip. ▪ To end the clip capture, press **CAPTURE** again. Or, press **FREEZE**.
Display the image in full-screen format	1. Tap the additional selections button, if necessary.  2. Tap **Full Screen**.  The full-screen format increases the size of the image to hide the thumbnail panel and patient banner.
View additional thumbnails	▪ Click the page up button to view thumbnails not currently visible on the screen.  ▪ Click the page down button to view thumbnails not currently visible on the screen. 

To	Do This
View the first or last thumbnail	▪ Click the top of the list button to view the first thumbnail.  ▪ Click the bottom of list button to view the last thumbnail. 
Delete an image	1. Select a thumbnail. 2. Click **Delete**.  The system displays a red icon on the thumbnail of the image. The thumbnail remains in the thumbnail panel until the images are deleted from the ultrasound system. The ultrasound system deletes the images marked for deletion at the end of the exam.
Show or hide the patient banner	1. Tap the additional selections button.  2. Tap **Hide Banner**. The system also hides any patient information in the imaging parameters.
Lock the touch screen and trackball	1. Tap the additional selections button.  2. Tap **Lock Screen**. 3. To unlock the screen, press **FREEZE**.
Adjust the settings for clip capture	**See also:** For information about adjusting the clip capture settings, refer to Chapter 7 in the Instructions for Use.

Pausing a Study

Pausing an active study saves measurement data and images in the local database on the ultrasound system. A study remains paused until you resume or discontinue the study.

You can resume a paused study at any time.

A yellow icon identifies a paused study in the list of patient studies on the patient registration and patient browser screens.



Note: You cannot transfer, export, print, or delete a paused study.

To pause a patient study:

1. Tap **Patient**.
2. Tap **Pause Study**.

Discontinuing a Study

You can discontinue an active study or a paused study. When a study is discontinued, the ultrasound system notifies the connected DICOM server of the abandoned study.

When a study is discontinued, all images and clips marked for deletion are deleted from the ultrasound system.

You can review, print, export, send, or delete a discontinued study. You cannot resume or append a discontinued study.

A gray icon identifies a discontinued study in the list of patient studies on the patient registration and patient browser screens.



See also: For information about patient browser icons, refer to Appendix B in the System Reference.

To discontinue a study:

1. Select the study to discontinue.
   - Select a paused study from the patient browser or patient registration.
   - Tap **Patient** to select the active study.
2. Tap **Discontinue Study**.
3. Enter a reason, if necessary, and then click **OK**.

   Note: If available, the reason for discontinuing the study is sent to a connected Hospital Information System/Radiology Information System (HIS/RIS) server configured for Modality Performed Procedure Step (MPPS).
4. To retain the study, click **Cancel**.

Completing a Patient Study

You can end an exam at any time.

Note: Disable the biopsy function prior to ending the exam.

To end the current patient examination:

1. Tap **End Exam**.

   The system displays a message indicating ending the exam will delete all images marked for deletion and requests confirmation to end the exam.

2. To end the exam, tap **OK**.

   The system deletes all images marked for deletion. If a protocol is in progress when you end the exam and you have not archived the protocol, all skipped views in the protocol and all images marked for deletion are also deleted.

3. To continue the exam, tap **Cancel**.

6 Workflow Protocols

Overview **3**
Activating Protocols 3

Editing Protocol Views **4**

Overview

A workflow protocol is a pre-defined checklist that guides you through a clinical workflow. The protocol consists of one or more protocol views. For example, a protocol view is an image or clip and can include measurements and annotations. When you activate a protocol, the protocol views display in the thumbnail panel.

Use the configuration settings to configure protocols or create a user-defined protocol.

Activating Protocols

You can activate a protocol during imaging.

To activate a protocol:

1. Tap **Workflow**.
2. Tap **Protocols** and then tap the required protocol.

To complete a protocol view:

- To complete a view with manual progression, tap the protocol view and then press **CAPTURE**.
- To complete a view with automatic progression, press **CAPTURE**.

  The system displays a check mark on the protocol view on the touch screen.
- To complete a view with a measurement:

  a. Press **MEASURE**.

  The system displays the first measurement marker on the image screen.

  b. Complete the measurement and then press **CAPTURE**.
- To exit the protocol, tap **Exit**.

  If there are incomplete protocol views, the system displays a message to complete or skip the views.

Editing Protocol Views

Changes to the protocol view affect only the active protocol.

The name of the protocol view displays on the touch screen and in the thumbnail panel.

To edit a protocol:

1. Activate a protocol.
2. To view additional pages of protocol views, tap the arrows.

To	Do This
Change the progression for the views	▪ Tap **Progression**. – **Automatic** activates the next view in the protocol when the current view is complete. – **Manual** waits for you to select the next view in the protocol. You can capture multiple images for a single view. The ultrasound system inserts additional views after the active view.
Add a view	1. Tap **Add View**. 2. Enter a name for the view. 3. Tap **Save**. 4. To exit without saving the new view, tap **Cancel**.
Delete a completed view	1. Tap the name of the completed view. 2. Tap **Delete**. The system removes the view with the image and any measurements from the thumbnail panel. The system displays the image during review with a red X. The measurements are not deleted from the report.
Rename a view	1. Tap the name of the view. 2. Tap **Rename View**. 3. Enter a view name and then tap **Save**. 4. To exit without renaming the view, tap **Cancel**.
Change the view sequence	1. Tap **Reorder**. The system displays a thick border around each view. 2. Click the required view. 3. Click the thick border at the required location. 4. Click **Close**.
Pause a protocol	1. Tap **Pause Protocol**. 2. To select a different protocol, tap the name of the protocol. 3. To save an image outside of the protocol, press **CAPTURE** during a paused protocol.
Resume a protocol	▪ Tap the **Protocols** tab and then tap the name of the protocol.
Assign a protocol view name to the frozen image	1. Freeze the image. 2. Tap **Remain Frozen**. 3. Tap the name of the required protocol view.

7 CINE

Overview **3**
CINE Playback Selections 3
Reviewing and Adjusting CINE Playback **4**

Overview

CINE continuously stores in a temporary memory buffer recently acquired data in all operating modes.

During CINE playback, the ultrasound system displays a CINE bar below the image, representing the status of the CINE memory. In dual display format, the system displays a CINE bar below each image.

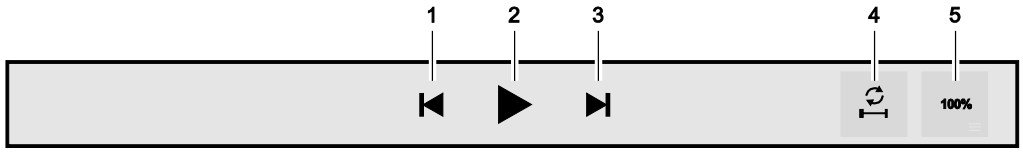


Example of the CINE bar on the image screen.

1 Beginning position of the CINE data
Reposition this marker to edit the length of the CINE data.
2 Location of the currently displayed CINE data
3 Ending position of the CINE data
Reposition this marker to edit the length of the CINE data.
4 Frame number of the current frame, in frames or seconds.

CINE Playback Selections

The ultrasound system displays CINE selections on the touch screen.



Example of the CINE selections.

1 Repositions the beginning position to the first frame
2 Starts or pauses playback
3 Repositions the ending position to the last frame
4 Aligns playback of multiple images or clips
The selection lists the current setting.
5 Adjusts the rate of playback
The selection lists the current setting.

Reviewing and Adjusting CINE Playback

You can view data stored in the CINE memory in continuous playback or frame-by-frame review.

To play back CINE data:

- Freeze the image, if necessary.

To	Do This
Reset the CINE memory	▪ Unfreeze the image.
Start continuous playback	▪ Tap the play button. 
Stop continuous playback	▪ Tap the pause button. 
Adjust the rate of CINE playback	▪ Tap the playback rate button and then select a setting. The system displays the playback rate as a percentage.
Reposition the beginning and ending position of playback	▪ To reposition the beginning marker, rotate **Left Margin**. ▪ To assign the beginning marker to the current frame, press **Left Margin**. ▪ To reposition the ending marker, rotate **Right Margin**. ▪ To assign the ending marker to the current frame, press **Right Margin**.
View a clip during review	**Note:** You cannot edit the length of the CINE data for a clip in review. 1. Double-click a thumbnail containing a clip.  *Example of an icon identifying a clip.* 2. Press **UPDATE**, if necessary. – **Cine** indicates the trackball is assigned to viewing a clip frame-by-frame. – **Pointer** indicates the trackball is assigned to the pointer for selecting on-screen objects, including the marker indicating the current position of CINE data.
Display the first frame	▪ Tap the first frame button. 
Display the last frame	▪ Tap the last frame button. 
View the CINE data frame-by-frame	▪ Rotate **Cine**. Or, roll the trackball.

To	Do This
Align playback of clips in a multiple view layout	▪ Tap a synchronize button: – **None** cancels playback alignment.  – **Loop Aligned** begins and ends simultaneous playback of CINE data.  – **Same Start** begins simultaneous playback of CINE data. 
Store the current frame of CINE during an active study	(Available only in full-screen format during playback) ▪ Press the control assigned to the store function.
Store the current frame of CINE during review	(Available only in full-screen format during playback) ▪ Press the control assigned to the store function.
Align playback of cardiac clips in a multiple view layout	▪ Rotate **Sync Mode** to select a setting. – **None** cancels playback alignment. – **Same Start** begins simultaneous playback of CINE data. – **Loop Aligned** begins and ends simultaneous playback of CINE data.
Display the first frame of a cardiac clip	▪ Rotate **Playback** counterclockwise.
Display the last frame of a cardiac clip	▪ Rotate **Playback** clockwise.
Select a section of a cardiac clip for playback	(Available only when a physio signal is present) ▪ Rotate **Cropping Mode** to select a setting. – **ED Only** displays only the end diastolic portion of the heart cycle. – **ES Only** displays only the end systolic portion of the heart cycle. – **R-R** displays the full heart rate cycle of systolic and diastolic portions. – **Extended R-R** displays the full heart rate cycle of systolic and diastolic portions with an outward extension of right and left margins of 200 milliseconds (ms).
Adjust the rate of CINE playback for a cardiac clip	▪ Rotate **Playback speed**. The system displays the playback rate as a percentage.

To	Do This
Specify the duration for recording a cardiac clip	(Available only when a physio signal is present) 1. Press **Clip Capture** to select a setting. – **Seconds** indicates the duration of the clip, in seconds. – **Beats** indicates the duration of the clip, in heart beats. 2. Rotate **Clip Capture** to select a duration.
Specify a method for capturing cardiac clip data	(Available only when a physio signal is present) ▪ Tap **Capture Type** and then select a setting. – **Prospective** acquires a continuous clip of the newly acquired images. – **Retrospective** acquires a clip of the previously acquired images. – (Available only during stress echo) **Continuous** acquires a clip of continuously acquired images.
Display the end diastole or select another frame as end diastole	(Available only with the 2D Heart AI and 4D Heart AI features) 1. Rotate **ED**, if necessary. – **Move Set** repositions and sets the end diastolic marker. – **Go To** displays the frame assigned to the end diastolic marker. 2. Rotate **ED** to move or go to the marker. 3. To set the current frame as end diastole, press **ED**.
Display the end systole or select another frame as end systole	(Available only with the 2D Heart AI and 4D Heart AI features) 1. Rotate **ES**, if necessary. – **Move Set** repositions and sets the end systolic marker. – **Go To** displays the frame assigned to the end systolic marker. 2. Rotate **ES** to move or go to the marker. 3. To set the current frame as end systole, press **ES**.
Adjust the length of a cardiac clip	(Available only with the 2D Heart AI and 4D Heart AI features) 1. Press **Cine**, if necessary. – **Beats** adjusts the playback length in heartbeats. Available when an ECG is present. – **Frs** adjusts the playback length in frames. 2. Rotate **Cine** to select the duration.
Display the end diastolic and end systolic frames in a side-by-side format	(Available only when a physio signal is present) ▪ Tap **ED-ES Split**. The ultrasound system displays the end diastolic frame on the left image and the end systolic frame on the right image. ▪ To alternate the active image, press **UPDATE**.

8 Image Optimization

Overview **3**
Adjusting the Settings for Imaging Parameters 3
Optimizing 2D Images **6**
Optimizing Color Images **9**
Optimizing the Doppler Spectrum **11**
Optimizing M-mode Sweeps **15**
Editing User-Defined Image Presets **16**
Imaging with AI Assist **17**
Using AI Assist during a Transthoracic Echocardiogram 17

Overview

You can optimize an image using the selections on the control panel and the touch screen. Active imaging parameters and settings are indicated in white on the image screen, and any adjustments to the settings are indicated in green.

See also: For additional information on identifying active imaging parameters and settings or the assignment of the trackball on the image screen, or a description of the control panel, including the touch screen, refer to Chapter 1 in this manual.

The imaging parameters and settings available for optimization depend on the image preset, transducer, and imaging mode. During combined mode imaging, adjustments to the imaging parameters and settings are applied only to the active priority mode.

Use the configuration settings to display or hide imaging parameters and settings on the image screen.

Adjusting the Settings for Imaging Parameters

The following imaging parameters and settings are available for all operating modes. Any exceptions are noted.

To	Do This
Adjust the imaging parameters and settings for another operating mode during combined mode imaging	▪ Tap the tab for the required mode and then adjust the settings for the imaging parameter. – **Color** assigns priority to color imaging – **2D** assigns priority to 2D-mode imaging – **PW** assigns priority to pulsed wave Doppler – **CW** assigns priority to continuous wave Doppler – **M Mode** assigns priority to M-mode
Adjust the gain (increase or decrease brightness of the displayed image)	▪ Rotate the required mode control on the control panel. For example, to adjust color gain, rotate **C**. The ultrasound system retains changes to the gain settings when you freeze or unfreeze the image.
Adjust the transmit frequency	(Available settings are transducer, mode, and feature dependent) ▪ Rotate **Frequency**. – **High** indicates a high frequency – **Mid** indicates a mid-level frequency – **Low** indicates a low frequency – **Pen** improves penetration – **Res** improves resolution An **H** displays before the transmit frequency setting when Harmonic imaging is active.
Adjust the transmit power	▪ Rotate **Transmit Power**.

To	Do This
Adjust the imaging depth	▪ Rotate **DEPTH**. The system displays the depth value on the image screen below the image.
Optimize the uniformity of image brightness in the field of view	1. Tap **Auto TEQ**. The system displays an icon on the image screen.  2. To exit the feature, tap **Auto TEQ** again.
Adjust the depth gain compensation	▪ Slide the depth gain compensation controls on the control panel. The ultrasound system retains changes to the settings when you freeze and unfreeze the image.
Distinguish the contours of a structure using the UltraArt universal image processing feature	**Prerequisite:** Activate 2D imaging. During combined mode imaging, tap the **2D** tab to access the optimization settings. 1. Tap the UltraArt button.  The system displays images with different settings on the touch screen and outlines the active setting. 2. Tap an image to apply the settings. The system closes the display of images after a specified period of time. 3. To exit, tap the UltraArt button again.
Adjust the overall contrast resolution (dynamic range)	▪ Rotate **DR**.
Adjust the balance of the line density and the frame rate	(Available only during real-time imaging with Clarify disabled) ▪ Rotate **Line Density**. An increase in the line density enhances the resolution and decreases the frame rate.
Select a processing curve or assign color to velocity or energy information	▪ Rotate **Maps**. The system assigns echo amplitudes to gray levels in the image and updates the gray bar. During color imaging, selects a processing curve that assigns the velocity range to a range of colors. Darker hues indicate lower velocities. Shades of green indicate variation in the flow. During power imaging, selects a processing curve that assigns flow amplitudes to color levels. A color bar represents signal strength. Brighter colors on the color bar indicate stronger signals.
Change the color tint	▪ Rotate **Tint**. The system adds color to the gray map and updates the gray bar.

To	Do This
Zoom an image	(Not available during Anatomic M-mode) 1. Rotate **ZOOM** to adjust the magnification level. The system displays a **Z** on the image screen below the image. 2. To pan the magnified image: a. Roll the trackball. b. Press a trackball key. 3. To cancel magnification, press **ZOOM**.
Magnify a high-definition (HD) region of interest	(Not available during Doppler, M-mode, and Anatomic M-mode) **Prerequisite:** The image depth is greater than two centimeters. 1. Press **ZOOM**. The system displays a zoom box (region of interest) on the image and **HD Z** below the image. 2. Adjust the size or position of the zoom box. a. Press a trackball key, if necessary. ▪ **Position** indicates the trackball is assigned to repositioning the zoom box. A solid line outlines the zoom box. ▪ **Size** indicates the trackball is assigned to resizing the FOV. A dotted line outlines the zoom box. b. Roll the trackball to adjust the size or position. 3. Press **ZOOM**. The system acquires a high-definition image indicated within the zoom box at a higher frame rate and updates the depth value on the image screen to indicate the distance from the skin line to the top of the zoom box. 4. To cancel magnification, press **ZOOM**.
Reverse the horizontal orientation of the image (right-to-left or left-to-right)	▪ Tap **L/R Flip**. The system reverses the orientation of the image and the transducer orientation indicator.
Reverse the vertical orientation of the image (top-to-bottom or bottom-to-top)	▪ Tap **U/D Flip**. The system reverses the orientation of the image and the transducer orientation indicator.

Optimizing 2D Images

Prerequisite: Activate 2D imaging. During combined mode imaging, tap the **2D** tab to access the optimization settings.

To	Do This
Resize or reposition of the field of view (FOV)	(Available only for phased and curved array transducers with curved and vector formats) 1. Press a trackball key, if necessary. – **Position** indicates the trackball is assigned to repositioning the FOV. A dashed line outlines the FOV. – **Size** indicates the trackball is assigned to adjusting the width of the FOV. A dotted line outlines the FOV. – **Set** indicates the trackball is no longer assigned to adjusting the FOV. The system removes the outline from the FOV. 2. Roll the trackball to adjust the size or position and then press a trackball key.
Expand the width of the acquisition field of view (FOV) from 70° to 100°	(Available only for the 5C1 transducer) (Not available during Zoom or HD Zoom) ▪ Tap **Wide FOV**. ▪ To exit, tap **Wide FOV** again.
Reduce or enlarge the size of the 2D image	▪ Tap **Image Size** and then select a size setting.
Rotate an image	(Available only for linear array transducers) (Not available during seamless dual imaging) ▪ To rotate the image 90 degrees in a clockwise direction, tap **90°**. ▪ To rotate the image 90 degrees in a counterclockwise direction, tap **270°**. ▪ To reset to the starting position, tap **0°**. **Note:** Only the active image rotates during dual imaging. Both images rotate during live dual imaging.
Activate a linear or trapezoid image format	(Available only for linear array transducers) ▪ Tap **Trapezoid**.
Adjust the angle of the field of view	(Available only for linear array transducers in a linear format) ▪ To incrementally adjust the angle, rotate **Steer**. ▪ To adjust the angle left, straight, and right, press **Steer**. The geometry of the transducer determines the angle of the field of view.
Create a visible smoothing effect	▪ Rotate **Persist**. A higher setting includes more lines of image data for each image frame.

To	Do This
Enhance contrast resolution with the Harmonics feature	**Note:** Use harmonic imaging to enhance visualization, improve image contrast and spatial resolution, or to reduce noise. ▪ Tap **Harmonics**. An **H** displays before the transmit frequency setting when Harmonic imaging is active.
Activate spatial compounding	**Note:** Use spatial compounding to reduce speckle and enhance tissue differentiation in 2D images. ▪ Tap **Compounding**.
Activate the InFocus feature to continuously adjust the transmit focal zones	1. Tap **InFocus**. 2. Tap the InFocus button.  The system displays an icon on the image screen.
Adjust the number, position, and spacing of the transmit focal zones	**Note:** During live dual imaging, changes to focal zones in one image affects the other image the next time the image is activated. 1. Press **InFocus**. 2. Tap the InFocus edit button.  The system displays an icon on the depth scale to indicate the location of the focal zone.  3. Rotate **InFocus** to position the focal zone at or below the area of interest.
Adjust the speed of sound	(Available speed of sound values are dependent on the current transducer and image preset) 1. Tap **Speed of Sound**. 2. Select a setting. A lower setting is for fatty tissue and a higher setting is for less fatty or soft tissue.

To	Do This
Activate Clarify	**Note:** Use Clarify to decrease image artifacts. 1. Tap **Clarify**. The system displays a region of interest (ROI) on the image. 2. Adjust the size or position of the ROI in linear format. a. Press a trackball key, if necessary. ▪ **Position** indicates the trackball is assigned to repositioning the ROI. A solid line outlines the ROI. ▪ **Size** indicates the trackball is assigned to resizing the ROI. A dotted line outlines the ROI. b. Roll the trackball to adjust the size or position and then press a trackball key. 3. Rotate **Clarify** to select a setting. Higher settings increase the visualization of micro-vasculature in the image.
Activate dual format	1. Press **DUAL**. The system displays the real-time image on the left and no image on the right. 2. Press **UPDATE**. The system freezes the image on the left and displays a real-time image on the right. 3. To alternate the active image, press **UPDATE** 4. To exit, press **DUAL**.
Activate live dual display	1. Tap **Live Dual**. The system displays two real-time images in a side-by-side format. 2. To exit, tap **Live Dual**. Or, press **2D**.
Magnify images during live dual display	1. Press **ZOOM**. The system displays the region of interest (ROI) on the right image. 2. To magnify the left image, press **UPDATE**. 3. To magnify both images, double-click **UPDATE**. 4. To cancel magnification, press **ZOOM**.

Optimizing Color Images

Prerequisite: Activate color. During combined mode imaging, tap the **Color** tab to access the optimization settings.

To	Do This
Select color imaging or power imaging	▪ To select power imaging, tap **Power**. The system applies color to the energy measurement generated by the blood flow within the region of interest and displays the color bar on the image screen. ▪ To select color imaging, tap **Color**. The system applies color to the velocities and directions of blood flow within the region of interest and displays the color bar on the image screen.
Resize or reposition the color region of interest (ROI)	1. Press a trackball key, if necessary. – **Position** indicates the trackball is assigned to repositioning the color ROI. A solid line outlines the color ROI. – **Size** indicates the trackball is assigned to resizing the color ROI. A dotted line outlines the color ROI. 2. Roll the trackball to adjust the size or position and then press a trackball key.
Adjust the angle of the color region of interest	(Available only for linear array transducers in a linear format) ▪ To incrementally adjust the angle, rotate **Steer**. ▪ To adjust the angle left, straight, and right, press **Steer**.
Emphasize the blood flow, the tissue, or both	▪ Tap the required setting. – **2D Only** emphasizes the tissue. – **Color Only** emphasizes the blood flow. – **2D + Color** combines the tissue and blood flow.
Optimize hemodynamic flow conditions	▪ Tap a setting. – **Low** provides maximum sensitivity to low velocity flows by incorporating the lowest possible filter settings and lower pulse repetition frequency. You may experience increased flash (motion artifacts). – **General** produces an optimal balance between flash suppression and maximum sensitivity by using an adaptive wall filter. – **High** optimizes the system for the high arterial flow common to pulsatile vessels and stenotic conditions. – (Available only during power imaging) **Slow** optimizes the visualization of slow blood flow in microvascular structures within the region of interest. – Additional settings are available based on anatomy, for example, kidney or aorta.

To	Do This
Optimize visualization of color frequency for the region of interest	(Available only during color imaging or power imaging) ▪ To enable the feature, press **Frequency** and then tap **Auto**. The system adjusts the color frequency for the region of interest, and the imaging parameters and touch screen indicate the feature is on. **Note:** When you reposition the region of interest, the system changes the color frequency. ▪ To exit, press **Frequency** and then tap **Manual**.
Visualize the direction of blood flow within the region of interest	(Available only during power imaging) ▪ Tap **Dir Power**. The system displays colors depicting the direction of flow in the region of interest and the color bar. ▪ To exit, tap **Dir Power** again.
Invert the color scale	▪ Tap **Invert**. The system reverses the colors depicting forward and reverse flow in the region of interest and the color bar.
Adjust the range of displayed color velocities	▪ Rotate **Scale**. The system adjusts the scale factor of the pulse repetition frequency.
Extend the range of displayed color velocities in one direction	▪ Rotate **Baseline**. The system repositions the color baseline and updates the color bar.
Adjust the level of motion or low flow sensitivity	▪ Rotate **Filter**. A higher wall filter reduces the level of sensitivity.
Adjust the color persistence	▪ Rotate **Persist**. During color imaging, adjusts the time that the colors corresponding to blood flow velocity remain in the region of interest before decaying or being replaced by another color. During power imaging, adjusts the time that power data is processed in calculating the power amplitude display.
Adjust the color priority level	▪ Rotate **Priority**. During color imaging, adjusts the amount of color pixel information overlaying the 2D image. During power imaging, adjusts the display of the amount of power information.
Smooth the flow pattern	▪ Rotate **Smooth**. As the spatial averaging (smoothing) increases, the flow sensitivity increases and spatial resolution decreases.
Activate Auto Doppler during color imaging	**See also:** For information about activating Auto Doppler during color imaging, refer to page 8-14.
Activate live dual display during color imaging	1. Press **DUAL**. The ROI displays on the real-time image on the right. 2. Tap **Color**. 3. Adjust the color images, if necessary. 4. To exit the feature, press **DUAL**.

Optimizing the Doppler Spectrum

Prerequisite: Activate Doppler. During combined mode imaging, tap the **PW** or **CW** tab to access the optimization settings.

Use the configuration settings to select a default layout for the 2D image and Doppler spectrum.

To	Do This
Reposition the Doppler cursor and gate on the 2D image	▪ Roll the trackball to adjust the position of the Doppler cursor and gate.
Resize the Doppler gate on the 2D image	▪ Rotate **Gate Size**.
Correct the flow angle	(Not available for cardiac image presets) **Note:** The flow angle indicator displays on the Doppler gate. ▪ To incrementally adjust the angle, rotate **Angle Correct**. ▪ To adjust the angle left, straight, and right, rotate **Angle Correct**. The system displays the position of the Doppler gate below the image. The system also displays the flow angle below the image.
Adjust the angle of the Doppler cursor	▪ To incrementally adjust the angle, rotate **Steer**. ▪ To adjust the angle left, straight, and right, press **Steer**.
Adjust the Doppler audio volume	(Available only on a frozen image) **Note:** The touch screen displays a number to indicate the level of the volume. ▪ To increase the volume, tap the plus button.  ▪ To decrease the volume, tap the minus button.  ▪ To mute the volume, tap the volume button.  ▪ To unmute the volume, tap the mute button. 

To	Do This
Adjust the scrolling speed of the Doppler spectrum	▪ Rotate **Sweep Speed**. The system displays time markers on the touch screen.
Pause the Doppler spectrum and refresh the 2D image	1. Press **UPDATE**. 2. To pause the 2D image and acquire the spectrum, press **UPDATE** again.
Change the format of the 2D image and Doppler spectrum	▪ To display the Doppler spectrum and hide the 2D image, tap the trace button.  ▪ To display the 2D image and hide the Doppler spectrum, tap the 2D button.  ▪ To display both the 2D image and the Doppler spectrum a. Tap the split screen button.  b. Tap the button for the required format.  ▪ To simultaneous acquire both the 2D image and the Doppler spectrum, tap **Live/Live**.
Invert the Doppler spectrum and left/right speaker output	▪ Tap **Invert**. The system reverses the vertical orientation of the Doppler spectrum and the Doppler audio on the baseline. Negative values display above the baseline. The system displays the term **inverted** below the baseline.
Distinguish the contours of a structure using edge enhancement	▪ Tap **Edge** and then select a setting.
Reject low frequency settings	**Note:** This selection can reject signals generally caused by tissue clutter. ▪ Rotate **Filter**.
Adjust the display of blood flow velocity	▪ Rotate **Baseline**.

To	Do This
Adjust the scale factor of pulse repetition frequency (PRF)	**Note:** Adjusting the PRF may improve velocity range sensitivity or control aliasing. ▪ Rotate **Scale**.
Activate high pulse repetition frequency	▪ Tap **HPRF**.
Apply colors to the Doppler shift information of moving tissue with the region of interest	(Available only for the cardiac and fetal echo image presets) ▪ Tap **DTI** and then select a setting.
Activate the auto statistics feature to trace the maximum velocity on a Doppler spectrum	(Compatible only with pulsatile flow) **Note:** During live imaging, the system uses three consecutive heart beats. On a frozen image, the system uses the last measured heart beat. 1. Tap **Auto Trace** and then tap the method for analyzing the Doppler spectrum. – **Above Baseline** determines statistics for Doppler data above the baseline. – **Below Baseline** determines statistics for Doppler data below the baseline. – **Above and Below** determines statistics for Doppler data above and below the baseline. The system positions the peak systole at the maximum velocity of the Doppler spectrum and the end diastole at the end of the heart cycle. 2. Position and anchor the ending measurement marker. 3. To remove the statistics from the screen, tap **Auto Trace** again. Use the configuration settings to show or hide the values in the measured results. 4. To assign a measurement label, press **MEASURE** and then select a label.

To	Do This
Activate Auto Doppler during color imaging	(Not available during power imaging) 1. Tap **Auto Doppler**, if necessary. An icon displays on the image screen when the feature is active.  An icon with color highlighting indicates the feature is active. A white icon indicates the feature is suspended during user adjustments to the ROI or Doppler steering angle. 2. Confirm placement of the color region of interest (ROI), Doppler gate, color flow angle, and steering angle of the Doppler cursor as you scan. 3. Manually reposition the color region of interest, Doppler gate, and Doppler steering angle, if necessary. The system suspends the feature during manual adjustment. 4. To reactivate the feature, press **FREEZE** to reactivate imaging. Or, press **Auto Doppler**. 5. To exit the feature, tap **Auto Doppler**. The system removes the icon from the image screen.

Optimizing M-mode Sweeps

Prerequisite: Activate M-mode. During combined mode imaging, tap the **M mode** tab to access the optimization settings.

The system gathers M-mode information from the acoustic line represented by the position of the M-mode cursor.

Use the configuration settings to select a default layout for the 2D image and M-mode sweep.

To	Do This
Resize or reposition of the M-mode cursor	1. Press a trackball key, if necessary. – **Position** indicates the trackball is assigned to repositioning the cursor. The cursor is a solid line. – **Size** indicates the trackball is assigned to resizing the cursor. The cursor is a dotted line. 2. Roll the trackball to adjust the size or position and then press a trackball key.
Change the format of the 2D image and M-mode sweep	▪ To display the M-mode sweep and hide the 2D image, tap the trace button.  ▪ To display the 2D image and hide the M-mode sweep, tap the 2D button.  ▪ To display both the 2D image and the M-mode sweep. a. Tap the split screen button.  b. Tap the button for the required format. 
Pause the M-mode sweep and refresh the 2D image	1. Press **UPDATE**. 2. To pause the 2D image and acquire the sweep, press **UPDATE** again.
Adjust the angle of the M-mode cursor	(Available only for linear array transducers) ▪ Rotate **Steer**.
Adjust the scrolling speed of the M-mode sweep	▪ Rotate **Sweep Speed**. Time markers do not scroll with the M-mode sweep.

To	Do This
Distinguish the contours of a structure using edge enhancement	▪ Tap **Edge** and then select a setting.
View the M-mode sweep based on patient anatomy and independent of the transducer orientation	(Available only for cardiac image presets) 1. Rotate **Angle**. The system activates anatomical M-mode. The anatomical M-mode cursor displays as a dashed line with an arrow pointing in the direction of the deeper part of the image. 2. To reposition the anatomical M-mode cursor along with the M-mode cursor, roll the trackball. 3. To exit anatomical M-mode, tap **Reset**. 4. To exit anatomical M-mode, press **2D**.

Editing User-Defined Image Presets

You can edit existing image presets to capture the optimized configuration of imaging parameters and settings for the active transducer.

See also: For information on creating an image preset, refer to Chapter 2 in the System Reference.

To edit an existing image preset:

1. During imaging, adjust the imaging parameters and settings required for the image preset.
2. Tap the name of the transducer.
3. Tap **Edit**.
   The ultrasound system displays a notification indicating all imaging parameters will be updated for the image preset.
4. Tap **Save**.
   The ultrasound system adds an asterisk (*) to the existing preset and saves the imaging parameters and settings for the active transducer.
5. To exit without saving the changes to the image preset, tap **Cancel**.

Imaging with AI Assist

The following AI features are available for the ultrasound system:

- AI Assist for a transthoracic echocardiogram (TTE)

Using AI Assist during a Transthoracic Echocardiogram

AI Assist for a transthoracic echocardiogram (TTE) recognizes anatomy for transthoracic views of the heart, for example, the mitral valve (MV) in a view of the parasternal short axis (PSAX).

The feature performs the following functions:

- During color imaging, positions and sizes the color region of interest (ROI) over the cardiac anatomy on the image, for example, the mitral and aortic valves.
- During Doppler imaging, positions the Doppler gate on the image.
- Displays the name of the cardiac view and the selections for anatomy area, for example, apical three chamber (A3C).
- Progresses through a predefined sequence of anatomy areas.

Use the configuration settings to select the default activation for the feature and to define the anatomy and sequence for each cardiac view.

See also: For a list of supported cardiac views and anatomy areas, refer to Appendix D in the System Reference.

You can activate AI Assist for TTE only with compatible transducers and image presets.

See also: For a list of compatible transducers and image presets, refer to Appendix A in the Instructions for Use.

To activate AI Assist during a TTE study:

Prerequisite: Select a compatible transducer. Select the Cardiac imaging preset.

- Activate the required imaging modes (color, pulsed wave (PW) Doppler, continuous wave (CW) Doppler) and then tap **AI Assist**, if necessary.

  The system displays a color ROI or a Doppler gate on the image for the first predefined cardiac view and anatomy area.

  Note: If the system displays the color ROI or Doppler gate in the center of the image and displays **AI Assist None** on the touch screen, reposition the transducer, adjust the imaging depth, or reduce noise artifacts.

To	Do This
Select an anatomy area in the cardiac view	▪ Tap an anatomy selection on the touch screen. ▪ Press **AI** to progress through the sequence of predefined anatomy areas.
Adjust the image settings, if necessary	**Note:** Manual adjustments suspend the AI Assist feature and deselect all anatomical selections on the touch screen. ▪ Adjust the imaging depth. ▪ Reposition and resize the color ROI.
Optimize the Doppler spectrum	**Note:** Manual adjustments suspend the AI Assist feature and deselect all anatomical selections on the touch screen. 1. Press **PW** or **CW** to activate the Doppler spectrum. The system dims the selections for cardiac view and anatomy areas while the Doppler spectrum is active. Dimmed selections are unavailable. 2. Adjust the settings in fine increments as necessary. **See also:** For information about optimizing the Doppler spectrum, refer to page 8-11.
Reposition the Doppler gate when the Doppler spectrum is active	**Note:** Manual adjustments suspend the AI Assist feature and deselect all anatomical selections on the touch screen. 1. Press **UPDATE**. The system reactivates 2D imaging and the anatomy selections for the cardiac view. 2. Tap an anatomy selection on the touch screen, if necessary. 3. To reactivate the Doppler spectrum, press **UPDATE** again.
Reactivate AI Assist	▪ Tap **AI Assist**. ▪ Press **AI**. ▪ Tap an anatomy selection on the touch screen. The system displays a color ROI and/or a Doppler gate on the image for the selected cardiac view and anatomy area.
Activate or deactivate an imaging mode	▪ Press **C**. ▪ Press **PW**. ▪ Press **CW**.
Suspend or pause AI Assist	▪ Tap **AI Assist**.
Exit AI Assist	▪ Press **2D**.

9 Annotations

Annotating with Text **3**

Annotating with Directional Arrows **5**

Annotating with Body Markers **6**

Annotating with Text

During imaging or review, you can annotate an image by using the keyboard to enter text or by selecting predefined text. Each annotation text package includes predefined text for anatomical structures, imaging views, and body positions.

Use the configuration settings to customize text.

Note: To position the text at a location other than the default location, use the directional arrow keys on the keyboard to position the cursor and then use the keyboard to enter the text.

To activate the text function:

1. Press **ABC**.
2. Tap the **Text** tab, if necessary.

To	Do This
Define the default position for text on the image screen	1. Position the cursor on the image screen. 2. Tap **Set Home**.
Position the cursor at the default position	▪ Tap **Home**.
Insert predefined anatomical text or modifier text on an image	1. Position the cursor on the image screen. 2. Tap the predefined text.
Insert custom text on an image	1. Position the cursor on the image screen. 2. Tap the keyboard icon. 3. Tap **Text** for regular text. Or, tap **Title** for bold text. 4. Enter the text. The system displays a predefined label matching the first characters you enter, if specified in the configuration settings. 5. To accept the suggested text, tap **Tab** or press a trackball key. 6. To continue entering text instead of accepting the suggested text, enter the required characters.
Insert or remove characters in text	1. Position the cursor between the characters. 2. Use the keyboard to insert or delete characters.

To	Do This
Reposition text on an image	1. Position the cursor on the text and then press a trackball key. 2. Roll the trackball to the new location and then press a trackball key to confirm the position.
Delete one word of text on an image	1. Position the cursor on the text and then press a trackball key. 2. Press **DELETE**.
Delete a line of text on an image	1. Position the cursor on the line and then press a trackball key. 2. Tap **DELETE** repeatedly.
Temporarily hide annotations	▪ Tap the show hide button.  **Note:** An icon with color highlighting indicates the text is hidden. ▪ To redisplay hidden text, tap the show hide button again.
Remove all text, arrows, and body markers from an image	▪ Tap **Clear Screen**.
Select the next custom text annotation	▪ Tap **Select Line**.
Overwrite existing annotations with a temporary label	(Available only during review) 1. Position the cursor before the first character of the first word to overwrite. 2. Tap the overwrite button.  3. Use the keyboard to insert or delete characters. **Note:** To fully overwrite existing text, the temporary label must be the same length or longer than the original text. 4. Press a trackball key to confirm the text.
Exit the annotation function	▪ Press **ABC**.

Annotating with Directional Arrows

You can annotate an image with arrows during imaging or review.

To activate the arrow function:

1. Press **ABC**.
2. Tap the **Arrow** tab.

To	Do This
Insert and position a new arrow on an image	1. Roll the trackball to position the arrow and then press a trackball key. 2. To adjust the length of the arrow, drag the tail of the arrow on the touch screen. 3. To change the direction indicated by the arrow tip, drag the tail in the required direction on the touch screen. 4. Press **ABC** to confirm the size, position, and direction of the arrow.
Insert an additional arrow	▪ Press **UPDATE**.
Select the last arrow	▪ Tap **Previous Arrow**.
Cycle through the arrows	▪ Tap **Previous Arrow** repeatedly.
Delete an arrow	1. Tap **Previous Arrow** to select the required arrow. 2. Press **DELETE**.
Remove all text, arrows, and body markers from the image	▪ Tap **Clear Screen**.
Exit the arrow annotation function	▪ Press **ABC**.

Annotating with Body Markers

Body markers are on-screen anatomical graphics that indicate the anatomy under evaluation and the orientation of the transducer. You can annotate an image with a body marker during imaging or review.

Use the configuration settings to customize body markers for each body marker package.

To activate the body marker function:

1. Press **ABC**.
2. Tap the **Body Marker** tab.

To	Do This
Select a body marker	▪ Tap the required body marker. The system places the body marker on the image with the transducer marker selected for repositioning.
Reposition a body marker	1. Tap **Trackball** to select **Body Marker**. 2. Roll the trackball to reposition the body marker. 3. To confirm the position, tap **Trackball** again.
Display the transducer marker	▪ Tap **Transducer Marker**. – **On** inserts a transducer marker. – **Off** removes the transducer marker.
Reposition a transducer marker	▪ Tap the required transducer marker on the touch screen and then slide your finger to the new location. The system updates the location of the transducer marker on the image screen.
Change the orientation of a transducer marker	▪ Tap the dot on the touch screen and then slide your finger around the circle to the required location. The system updates the orientation of the transducer marker on the image screen.
Delete the body marker	1. Select the required body marker. 2. Press **DELETE**.
Remove all text, arrows, and body markers from the image screen	▪ Tap **Clear Screen**.
Exit the body marker function	▪ Press **ABC**.

10 Measurements and Calculations

Overview **3**
Activating the Measurement Function 4
Positioning and Anchoring Measurement Markers 5
Positioning and Anchoring Markers in Dual Format 5

Performing a Measurement **6**
Labeling Measurements 6
Editing or Deleting a Measurement 7
Viewing Measured Results 8
Measured Result Units 8

Measuring with 2D-mode Basic Measurement Tools **9**
Measured Results of 2D-mode Basic Measurement Tools 10

Measuring with Doppler Basic Measurement Tools **11**
Measured Results of Doppler Measurement Tools 12

Measuring with M-mode Basic Measurement Tools **13**
Measured Results of M-mode Measurement Tools 13

Measuring with Compound Measurement Tools **14**
Measured Results of Compound Tools 15

Calculations **16**
Calculating Ratios 16
Measured Results of Calculations and Ratios 16

Measuring with Use-specific Tools **17**
Performing Obstetric Measurements 17
Calculated Results of Obstetric Tools 18
Measured Result Units 18
Measuring Fetal Structures with the Auto OB Feature 19
Performing Pediatric Hip Measurements 20
Calculated Results of Pediatric Hip Tools 21
Measuring Carotid Intima-Media Thickness with the Auto IMT Feature 22
Calculated Results of Auto IMT Tools 22

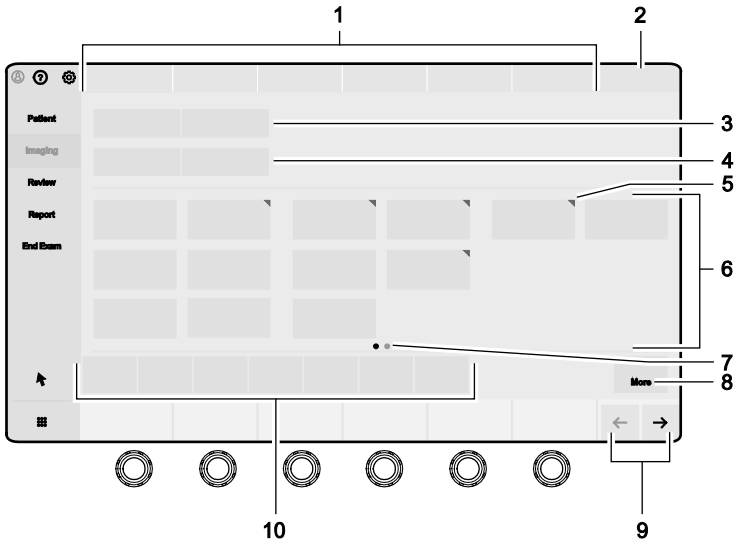
Overview

The measurement function provides measurement tools, measurement labels, and calculations based on the active operating mode. You can use labels from any measurement package during the measurement function without changing the image preset. The ultrasound system displays the measured value in the measured results.

A folder of measurement labels includes system-defined sequences of individual measurements. The system advances to the next measurement label after you complete a measurement, or you can manually select a label in any sequence.

When you change the calibration of an image, for example the image depth, the ultrasound system removes the measurement markers and measured results from the image screen.

Use the configuration settings to customize the measurement function.



Example of the touch screen during the measurement function.

1 Categories of measurement labels based on the measurement package
Custom indicates user-defined measurement labels.
2 Measurement package, for example, abdomen
3 Measurement label modifiers, for example, left or right
4 Sub-categories of measurement labels, for example, liver transplant
5 A triangle indicates a folder of measurement labels
A check mark indicates a measured value is assigned to the label.
6 Measurement labels for the selected measurement package
A check mark indicates a measured value is assigned to the label.
7 Indicator for each page of measurement labels
– A white dot indicates the active page.
– A gray dot indicates additional pages of measurement labels.
8 **More** indicates additional measurement tools are available
9 Accesses additional pages of measurement labels
10 Measurement tools
– A color indicates the active measurement tool.
– White indicates the available measurement tools.

Activating the Measurement Function

The measurement function is available during a patient exam or with saved images. The ultrasound system stops CINE playback when you activate the measurement function.

Use the configuration settings to configure the ultrasound system to activate the measurement function when you freeze the image.

To activate the measurement function during a patient exam:

Prerequisite: During Doppler or M-mode, freeze the image.

1. Press **MEASURE**, if necessary.
2. To exit the measurement function, press **MEASURE**.

To activate the measurement function with saved images:

Prerequisite: Save the images in an ultrasound format, not screen capture format.

1. Tap **Review**.
2. Select the image in the thumbnail panel.
3. Press **MEASURE**.
4. To exit the measurement function, press **MEASURE**.

Positioning and Anchoring Measurement Markers

A measurement marker and a unique identifying number indicate the beginning and ending points of a measurement.

The ultrasound system removes measurement markers and measured results when you enter any of the following functions: patient browser, patient registration, system configuration, review, patient report, and help. To prevent the loss of a measurement in progress, ensure all measurement markers are anchored and the measurement is labeled before accessing another screen.



Example of a measurement marker.

To position and anchor a measurement marker:

1. Activate the measurement function.
2. To position a measurement marker, roll the trackball.

   The system displays the markers available for positioning and the corresponding measured result in blue on the image screen. The system changes the size of the markers according to the distance between the pair of markers.
3. To anchor a marker, press a trackball key.

   The system displays a measured value in the measured results and activates the next marker.
4. To complete a measurement, position the last marker and then press a trackball key. Or, position the last marker and then press **ABC** to access the annotations feature.

   The system displays the completed markers and the corresponding measured result in yellow on the image screen.

   Note: For all measurement packages except for the cardiac image presets, you can also complete a measurement by pressing the control assigned to the following functions: print, image store, clip store.

Positioning and Anchoring Markers in Dual Format

You can perform a measurement across the boundaries of dual or seamless dual images even if there is a gap between the images, but not if one of the images is zoomed. The measured values are estimates.

Performing a Measurement

You must assign a label to the measured value to include the value in a patient report.

Labeling Measurements

You can assign a measurement label to a measurement after completing the measurement. You can also assign a measurement label to the most recent unlabeled, completed measurement.

Modifier labels are available where appropriate to indicate the view of the anatomy, for example, right or left.

To measure then label:

Prerequisite: A measurement label has not been selected.

1. Activate the measurement function.
2. Tap the required measurement tool.
3. Position and anchor the beginning and ending measurement markers.
4. Tap a modifier for the measurement label, if necessary.
5. Tap the required measurement label.

   The ultrasound system activates the measurement tool for the selected label if the label does not support the active tool.
6. To select a measurement label from a different exam association package:
   a. Tap **Exam Package** and then tap the required package.
   b. Tap the required measurement label.

To label then measure:

1. Activate the measurement function.
2. Tap the required measurement label.

   The system activates the measurement tool for the selected measurement label.
3. Tap a modifier for the measurement label, if necessary.
4. To select a measurement label from a different exam association package:
   a. Tap **Exam Package** and then tap the required package.
   b. Tap the required measurement label.
5. To activate a different measurement tool, tap the required measurement tool.
6. Position and anchor the beginning and ending measurement markers.

Editing or Deleting a Measurement

Note: You cannot edit measured results acquired with the following tools: Doppler heart cycle tool or Doppler trace tool.

To	Do This
Edit the active measurement	1. Press **UPDATE** to cycle through the markers. 2. Reposition and then anchor the marker.
Delete a segment of a traced circumference	1. Rotate **Undo** counterclockwise to remove a segment of the trace. 2. To restore the deleted segment, rotate **Undo** clockwise. 3. Roll the trackball to continue tracing the circumference and then anchor the marker.
Edit a segment of a traced circumference	1. Roll the trackball to position the arrow on the image. The system highlights a segment. – For smaller adjustments, position the arrow on or near the segment and then press a trackball key. – For larger adjustments, position the arrow away from the segment and then press a trackball key. 2. To continue to adjust the selected segment, roll the trackball. 3. To adjust another segment, press a trackball key. 4. Press **UPDATE** to complete the edit.
Edit a completed measurement	1. Tap **Last Caliper** to cycle through the completed measurements. 2. Reposition and then anchor the measurement marker. The system updates the measured value in the measured results and in the report.
Delete a completed measurement	1. Tap **Last Caliper** to cycle through the completed measurements. 2. Press **DELETE**. The measurement is removed from the image screen, but remains in the patient report.
Remove all measurements from the image screen	▪ Tap **Clear Screen**. The system also removes annotations from the image screen.

Viewing Measured Results

The ultrasound system displays measured and calculated values in the measured results on the image screen. The ultrasound system also displays an indicator when the length of the displayed value exceeds the field size for the precision specified in the configuration settings. The full value is used in a calculation.

When the denominator is zero in a ratio, the ultrasound system displays a blank value for the calculation and does not copy the value to the report.

During obstetric use, the ultrasound system also displays measured and calculated values on the touch screen.

Use the configuration settings to configure the display of fetal data in the measured results.

To change the location of measured results:

1. Position the cursor on the measured results.
   The system displays the measured results with a green border.
2. Roll the trackball to reposition the measured results and then press a trackball key.

Measured Result Units

Units	Description
cm	centimeters
cm²	centimeters squared
cm³	centimeters cubed
cm/s	centimeters per second
kPa	kilopascal
mm	millimeters
mm/s	millimeters per second
°	degrees
m/s	meters per second
kHz	kilohertz
bpm	beats per minute
sec	second
s	second
l/min	liters per minute
%	percentage

Measuring with 2D-mode Basic Measurement Tools

See also: To edit a measurement, including a segment of a traced circumference, refer to page 10-7.

To	Do This
Measure a distance	1. Tap **Distance**.  2. Position and then anchor the beginning and ending markers.
Measure a depth	(Available only for non-Cardiac exams) **Note:** You cannot assign a label to a measured result for depth. 1. Tap **Depth**.  2. Position and then anchor a marker. The system indicates the distance from the skin line.
Measure the circumference and area of a structure using an ellipse	1. Tap **Ellipse**.  2. Position and then anchor the first marker. The system displays an ellipse. 3. Position and then anchor the major axis. 4. Position and then anchor the other axis.
Measure the circumference and area of a manually traced structure	**Note:** Tolerances of circumference measurements cannot be guaranteed when using the manual tool because the accuracy of tracing a circumference is largely dependent on the user's incremental movements using the trackball. 1. Tap **2D Trace**.  2. Position and then anchor the first marker. 3. Roll the trackball to trace the structure and then anchor the next marker. The ultrasound system closes the trace between the two endpoints and indicates the major and minor axis.
Measure the diameter of a manually traced structure	1. Tap **Open Trace**.  2. Position and then anchor the first marker. 3. Roll the trackball to trace the structure and then anchor the marker.

To	Do This
Measure an acute angle	1. Tap **More**, if necessary. 2. Tap **Angle**.  3. Position and then anchor the end point of the first independent line. 4. Roll the trackball to extend the length of the line and then anchor the line. 5. Position and then anchor the end point of the second independent line. A dashed line indicates the measured angle. 6. Roll the trackball to extend the length of the line and then anchor the line.
Measure the circumference and area of a system-traced structure	(Available only for non-cardiac exams) 1. Tap **More**, if necessary. 2. Tap **Auto Calcs**.  3. Position and then anchor the first marker. 4. Roll the trackball to encompass the structure of interest within the rectangle and then press **SELECT**. The system traces the structure. 5. To confirm the traced circumference, press **SELECT**.

Measured Results of 2D-mode Basic Measurement Tools

Measured Results	Abbreviation
Distance, major diameter	**D**
Depth	**Depth**
Circumference	**C**
Area	**A**
Axis length	**D1**, **D2**
Angle	**Angle**

Measuring with Doppler Basic Measurement Tools

Changes to the Doppler gate and the transmit frequency update the labeled measurements and the corresponding calculations displayed in the measured results.

See also: To edit a measurement, including a segment of a traced circumference, refer to page 10-7.

To	Do This
Measure a velocity	1. Tap **Velocity**.  2. Position and then anchor the marker on the Doppler waveform.
Measure a heart rate	1. Tap **More**, if necessary. 2. Tap **Heart Rate**.  3. Position and then anchor the first marker at the beginning of the cardiac cycle. 4. Position and then anchor the next marker at the end of the required number of cardiac cycles. **Note:** You can manually enter a heart rate value in the patient report.
Manually trace the heart cycle	1. Tap **D-Trace**.  2. Position and then anchor the first marker both horizontally and vertically. 3. Position and then anchor the next marker to manually draw a trace of the waveform. The system displays markers on the traced waveform to indicate peak systole and end diastole. 4. Position and then anchor the marker to indicate peak systole and end diastole.
Measure the resistive index	1. Tap **RI-S/D**.  2. Position and then anchor the first marker to indicate peak systole. 3. Position and then anchor the next marker to indicate end diastole.
Measure the change in distance over time	1. Tap **Acceleration**.  2. Position and then anchor the beginning and ending markers. A dotted line indicates the slope.

To	Do This
Measure time	1. Tap **Time**.  2. Position and then anchor the beginning and ending markers. The blue mark on each marker is a guide for positioning the marker on the waveform.
Measure the heart cycle	1. Tap **Heart Cycle**.  2. Position and then anchor the first marker (delimiter). 3. Position the second marker to the right of the first marker. The system draws the maximum trace between the delimiters and places markers on peak systole. 4. Anchor the second marker. 5. Position and then anchor the marker to indicate end diastole.

Measured Results of Doppler Measurement Tools

Measured Results	Abbreviation
Velocity	**Vel**
Velocity input values	**V1**, **V2**
Peak pressure gradient	**Peak Grad**
Mean pressure gradient	**Mean Grad**
Heart rate	**HR**
Time or acceleration time	**Time**
Peak systolic velocity	**PS**
End diastolic velocity	**ED**
Velocity time integral	**VTI**
Maximum velocity	**Vmax**
Mean velocity	**Vmean**
Time averaged mean velocity	**TAMn**
Time averaged maximum velocity	**TAMx**
Pulsatility index calculation	**PI**
Minimum diastole	**MD**
Resistive index calculation	**RI**
Peak systolic velocity to end systolic velocity calculation	**S/D**
Positive slope value	**Acceleration**
(Available only for Transcranial Imaging (TCI) measurement labels) Mean Flow Velocity: (Peak Systolic Velocity + (End Diastolic Velocity x 2))/3	**Mean TCD**

Measuring with M-mode Basic Measurement Tools

To	Do This
Measure a distance	1. Tap **M-Distance**.  2. Position and then anchor the beginning and ending markers.
Measure a change in distance over time	1. Tap **M-Slope**.  2. Position and then anchor the beginning and ending markers. Asterisks in the measured results indicate a slope value greater than 999 millimeters.
Measure a heart rate	1. Tap **M-Heart Rate**.  2. Position and then anchor the first marker at the beginning of the cardiac cycle. 3. Position and then anchor the next marker at the end of the required number of cardiac cycles. **Note:** You can manually enter a heart rate value in the patient report.
Measure a time interval	1. Tap **Time**.  2. Position and then anchor the beginning and ending markers.

Measured Results of M-mode Measurement Tools

Measured Results	Abbreviation
Distance	**D**
Heart rate	**HR**
Time	**Time**
Slope	**Slope**

Measuring with Compound Measurement Tools

Use the compound measurement tools when the measurement sequence requires more than one imaging mode or tool. Compound measurements require multiple measurements on one image or involve measurements on multiple images.

Compound measurements can be done in any sequence. You can also temporarily stop compound measurements and perform measurements unrelated to the compound measurement.

You must complete the compound measurement before selecting another compound measurement tool.

See also: To edit a measurement, including a segment of a traced circumference, refer to page 10-7.

To	Do This
Measure area stenosis	1. Tap **%Stenosis-A**.  2. Position and then anchor the beginning and ending markers. 3. To complete the measurement, position and then anchor the second set of measurement markers.
Measure distance stenosis	1. Tap **%Stenosis-D**.  2. Position and then anchor the beginning and ending markers. 3. To complete the measurement, position and then anchor the second set of measurement markers.
Measure a volume	1. Tap **More**, if necessary. 2. Tap **Volume**.  3. Measure the volume using the measurements specified in the configuration settings, for example, three distance measurements. 4. To complete the measurement, anchor the last marker.

To	Do This
Measure volume flow	(Not available during review) 1. Tap a measurement label. 2. Tap **More**, if necessary. 3. Tap **Vol Flow**.  4. Position and then anchor the beginning and ending markers on the 2D image. 5. Position and then anchor a marker on the waveform. 6. Position the second marker to the right of the first marker. The system traces the waveform between the two markers. 7. Anchor the marker.

Measured Results of Compound Tools

Measured Results	Abbreviation
%Stenosis	**%Stenosis**
Input distance values	**D**, **D1**, **D2**, **D3**
Input ellipse axis values	**D1**, **D2**
Input area values	**A1**, **A2**
Volume	**Vol**
Volume flow	**Vol Flow**
Cross-sectional area	**A**
Time Averaged Mean Velocity	**TAMn**

Calculations

Calculations use formulas requiring specific measurements. The ultrasound system performs a calculation after you complete the required measurements.

See also: For information on calculation formulas, refer to Appendix C in the System Reference.

Calculating Ratios

The ultrasound system displays the calculation with the first measurement listed first and the second measurement listed second. For example, the system displays the distance ratio as D1/D2.

To determine a ratio:

1. Tap **More**, if necessary.
2. Tap the required measurement tool.
   - **Area Ratio** calculates the ratio of two area measurements

   - **Distance Ratio** calculates the ratio of two distance measurements

   - **Velocity Ratio** calculates the ratio of two velocities on a Doppler waveform

3. Position and then anchor the beginning and ending markers.

Measured Results of Calculations and Ratios

Measured Results	Abbreviation
Distance input values	**D1**, **D2**
Distance ratio calculation	**Distance Ratio**
Area input values	**A1**, **A2**
Area ratio calculation	**Area Ratio**
Velocity input values	**V1**, **V2**
Velocity ratio calculation	**Velocity Ratio**

Measuring with Use-specific Tools

The measurement function includes exam-specific measurement tools, for example, during the obstetric exam.

Performing Obstetric Measurements

The obstetric and early obstetric exams include measurement labels and calculation labels for 2D-mode, M-mode, and Doppler.

Calculation labels are not included on the touch screen. The ultrasound system performs the calculations when you make the required measurements. Calculation results are included on the image screen and in the patient report.

See also: For a list of measurement and calculation labels, refer to Chapter 3 in the System Reference.

Prerequisite: Select an obstetric exam or an obstetric exam package and then activate the measurement function.

To	Do This
Determine an amniotic fluid index (AFI)	(Available only for a 2D-mode image) 1. Tap **AFI**. The ultrasound system activates the measurement label for the first quadrant: **AFI - Q1**. 2. Position and anchor the beginning and ending measurement markers for each quadrant. The system activates the next quadrant and displays the distance for each measured quadrant. When the four measurements are complete, the system calculates the AFI.
Measure the fetal heart rate	(Available only for an M-mode sweep or Doppler waveform) 1. Tap **Fetal HR**. 2. Position and anchor the first marker at the beginning of the cardiac cycle. 3. Position and anchor the second marker at the ending of the second cardiac cycle.
Obtain measurements for the obstetric ratios	▪ Measure the fetal structures required for the ratio. Use the configuration settings to customize the display of obstetric ratios in the report.
Add a fetus	1. Tap **Add Fetus**. 2. Select the number of fetuses and then click **OK**.
Measure multiple fetuses	**Prerequisite:** Enter the number of fetuses on the patient registration form. ▪ Tap the required fetus identifier, for example, **Fetus B**, and then perform the measurement.

Calculated Results of Obstetric Tools

Results	Abbreviation
Last menstrual period	**LMP**
Date of conception	**DOC**
Estimated date of delivery	**EDD**
Estimated fetal weight	**EFW**
Standard deviation	**SD**

Measured Result Units

Units	Description
w, **d**	Weeks, days
g	Grams
lb, **oz**	Pounds, ounces
%	Growth percentile

Measuring Fetal Structures with the Auto OB Feature

The Auto OB measurement feature detects and measures the following fetal structures:

- Biparietal Diameter
- Head Circumference
- Abdominal Circumference
  - Anterior Posterior Abdominal Diameter
  - Transabdominal Diameter
- Femur Length
- Crown Rump Length
- Humerus Length
- Occipital Frontal Diameter

Use the configuration settings to select the outer-to-outer measurement method for biparietal diameter or to create user-defined fetal measurement labels.

To measure fetal structures:

Prerequisite: During an obstetric exam, acquire and then freeze a 2D image.

1. Activate the measurement function.
2. Tap **Auto OB**, if necessary.
3. Tap the required measurement label.
   The system places the measurement markers on the image.
4. Reposition the beginning and ending measurement markers, if necessary.
   The system displays the values in measured results.
5. To manually perform a measurement:
   a. Tap **Auto OB** to exit the feature.
   b. Perform the measurement.

Performing Pediatric Hip Measurements

(Available only for a 2D-mode image)

Prerequisite: Knowledge of the Graf technique for evaluation of the pediatric hip, including the classification zones for the hip from dislocated to normal.

The measurement function provides a tool to measure the angles of the left and right pediatric hip and tools to determine the stressed and flexed percentages of femoral head coverage.

Use the configuration settings to select the default angles for measurement.

- An alpha angle only requires a reference line and one intersecting line.
- Alpha and beta angles require a reference line and two intersecting lines.

You can view the Graf Sonometer, a graph of the measured angles, in the patient report. The system provides a Sonometer for alpha only angles and for alpha and beta angles.

See also: For a list of measurement labels, refer to Appendix C in the System Reference.

To determine a hip angle:

Prerequisite: Activate the measurement function and then select the **Ped Hip** exam package.

1. Tap **Left** for the left hip or **Right** for the right hip.
2. Tap **Hip Angle**.

   A baseline for use as a reference line displays on the image screen. The mark on the baseline indicates the pivot point.
3. Position the baseline.
   a. Position the baseline along the straight section of the ilium with the arrow pointing toward the femoral head.
   b. To adjust the angle of the baseline in fine increments, rotate **Rotate**.
   c. To rotate the baseline in 90° increments, press **Rotate**.
   d. Anchor the line.
4. Position the intersecting line to measure the alpha angle.
   a. Position the alpha line at the bony rim of the acetabulum.
   b. Position the alpha line along the lower limb of the ilium and intersect the baseline.
   c. To adjust the alpha line in fine increments, rotate **Rotate**.
   d. Anchor the line.
5. Position the intersecting line to measure the beta angle.

   Note: The intersecting line to measure the beta angle is available only when you have enabled alpha and beta angle measurements in your configuration settings.
   a. Position the beta line at the bony rim of the acetabulum.
   b. Position the beta line along the labrum and intersect the baseline.
   c. To adjust the beta line in fine increments, rotate **Rotate**.
   d. Anchor the line.

To determine a stressed or flexed percentage of femoral head coverage:

Prerequisite: Activate the measurement function and then select the **Ped Hip** exam package.

1. Tap **Left** for the left hip or **Right** for the right hip.
2. Tap **Stressed %FHC** or **Flexed %FHC**.

   A baseline for use as a reference line displays on the image screen. The mark on the line indicates the pivot point.
3. Position the baseline.
   a. Position the baseline along the straight section of the ilium with the arrow pointing toward the femoral head.
   b. To adjust the angle of the baseline in fine increments, rotate **Rotate**.
   c. To rotate the baseline in 90° increments, press **Rotate**.
   d. Anchor the line.
4. Roll the trackball to position the circle for determining the femoral head diameter.
5. Rotate **Size** to adjust the size of the circle and then anchor the circle.

Calculated Results of Pediatric Hip Tools

Results	Abbreviation
Alpha angle	**α**
Beta angle	**β**
Hip	**Hip**
Left	**Lt**
Right	**Rt**
Percentage of femoral head coverage	**%FHC**
Stressed	**Stressed**
Flexed	**Flexed**

Measuring Carotid Intima-Media Thickness with the Auto IMT Feature

(Not available during real-time imaging)

Auto IMT detects and measures the carotid intima-media thickness on a user-defined region of interest.

Use the configuration settings to show or hide the values in the measured results.

See also: For a list of measurement and calculation labels, refer to Appendix C in the System Reference.

To determine a carotid intima-media thickness:

Prerequisite: Activate the measurement function and then select the **Carotid** exam package.

1. Tap **Right** for the right vessel or **Left** for the left vessel.
2. Tap an IMT label, for example, **Prox CCA IMT**.

   The region of interest (ROI) displays on the 2D image. The dashed reference line is 1 cm from the ROI.
3. To preview temporary values for different locations of the vessel:
   a. Position the ROI over the posterior wall of the common carotid artery and then press **UPDATE**.

      The system traces the vessel and displays measured values for the selected region of interest.

   b. To exit the preview, roll the trackball.
4. Define the region of interest.
   a. Position the ROI over the posterior wall of the common carotid artery and then press a trackball key.

      The system traces the vessel and displays two lines for measuring thickness of the vessel with the active line in blue.

   b. To edit the lines for measuring thickness of the vessel:
      i. Roll the trackball to position the cursor near the active line in blue.
      ii. Press a trackball key to adjust the contour of the line.
      iii. Continue editing the line, as necessary.
5. To complete the measurement, press **UPDATE**.

Calculated Results of Auto IMT Tools

Results	Abbreviation
Mean intima-media thickness	**Mean**
Maximum intima-media thickness	**Max**
Minimum intima-media thickness	**Min**
Intima-media thickness of the distal wall 10 mm proximal to the common carotid artery-carotid sinus junction The value is derived from the position of the region of interest as recommended by the Japanese Society of Ultrasound Medicine.	**C10**

11 Cardiac Measurements and Calculations

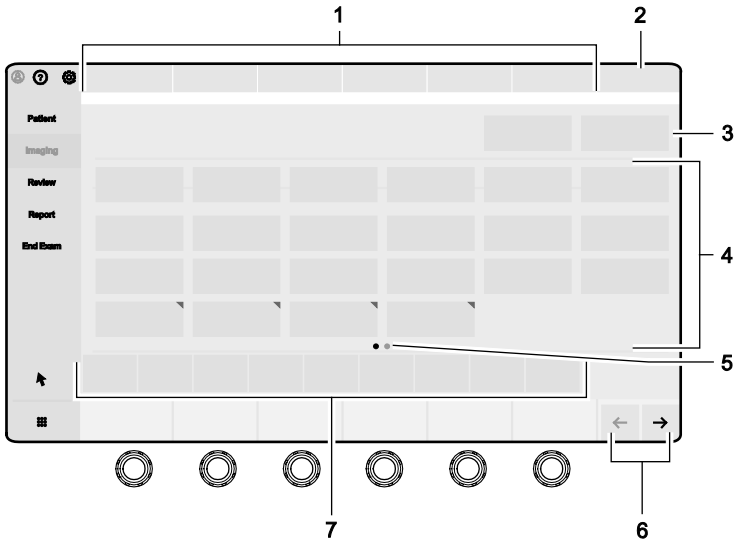
Overview **3**
Measured Results 5
Measured Result Units 5
Selecting Cardiac Measurement Labels **6**
Measuring with 2D-mode Measurement Tools **8**
Measured Results of 2D-mode Measurement Tools 11
Measuring with Doppler Measurement Tools **12**
Measured Results of Doppler Measurement Tools 15
Measuring with M-mode Measurement Tools **16**
Measured Results of M-mode Measurement Tools 18
Measuring with 3D Caliper **19**
Measuring with AI Measure **20**
Performing a Measurement with AI Measure 21
Editing or Deleting a Measurement Obtained with AI Measure 22
Troubleshooting On-screen Messages during AI Measure 22

Overview

The measurement function provides measurement tools, measurement labels, guided measurements, and calculations specific to the cardiac exam. You can perform cardiac measurements by selecting the cardiac study during patient registration or an exam, or by selecting the cardiac exam package during the measurement function.

Guided measurements are system-defined sequences of individual measurements. The system advances to the next measurement label after you complete a measurement, or you can manually select a label in any sequence.

See also: For additional information about the measurement function, refer to Chapter 10 in this manual.



Example of the touch screen during the measurement function.

1 Operating mode and category of measurement based on anatomy and physiology, for example, left ventricular diastology
2 Exam package, for example, cardiac
3 Measurement labels, for example, heart rate
4 Categories of measurements based on view of the anatomy, for example, apical or subcostal view.
   – A triangle indicates a folder of measurement labels, for example, left ventricular diastolic series.
   – An arrow displayed with a folder of measurement labels indicates guided measurements.
   – Measurement labels, for example, left ventricular outflow tract diameter, systole
   – A check mark indicates a measured value is assigned to the label.
5 Indicator for each page of measurement labels
   – A white dot indicates the active page.
   – A gray dot indicates additional pages of measurement labels.
6 Accesses additional pages of measurement labels
7 Measurement tools
   – A color indicates the active measurement tool.
   – White indicates the available measurement tools.

Measured Results

The ultrasound system displays measured and calculated values in the measured results on the image screen. You cannot reposition measured results during a cardiac study.

Measured Result Units

Units	Description
cm	centimeters
cm²	centimeters squared
cm³	centimeters cubed
cm/s	centimeters per second
cm/m²	centimeters per meters squared
kPa	kilopascal
mm	millimeters
mm/s	millimeters per second
α, **β**	Alpha, Beta
°	degrees
ml	milliliters
ml/m²	milliliters per meters squared
m/s	meters per second
m/s²	meters per second squared
ms	milliseconds
kHz	kilohertz
bpm	beats per minute
sec	second
s	second
l/min	liters per minute
l/min/m²	liters per minute per meters squared
l/m²	liters per meters squared
%	percentage
mmHg	millimeters of mercury

Selecting Cardiac Measurement Labels

The system activates a measurement tool and displays the first measurement marker when you select a measurement label.

To select a cardiac measurement label:

Prerequisite: Select the cardiac study or the cardiac exam package.

1. Activate the measurement function.
   The ultrasound system activates a measurement tool for the active operating mode.
2. Select the required measurement category:

Selection	Description
RV	Right ventricle
AoV	Aortic valve
MV	Mitral valve
TV	Tricuspid valve
PV	Pulmonary valve
LV	Left ventricle
RV Diastology	(Available only during Doppler) Right ventricle diastology
LV Diastology	(Available only during Doppler) Left ventricle diastology
Pericardial Effusion	Pericardial effusion
LA	(Available only during 2D-mode) Left atrium
RA	(Available only during 2D-mode) Right atrium
Veins	Veins

Selection	Description
Ao/LA	(Available only during M-mode) Aorta/left atrium
LV/RV	(Available only during M-mode) Left ventricle/right ventricle
IVC	Inferior vena cava
Arteries	Arteries
Shunts	Shunts

3. Select the view of the anatomy, if necessary, and then select the measurement label.

   Measurement labels from any exam package are available if you select the measurement label before completing the measurement.

4. To hide the calculation values in the measured results, tap **Hide Results**.
5. To show the calculation values in the measured results, tap **Show Results**.

Measuring with 2D-mode Measurement Tools

See also: For information about how to edit a measurement, including a segment of a traced circumference, refer to Chapter 10 in this manual.

To	Do This
Enter a heart rate value	(Available only for the following measurements as default: **AoV**, **MV**, **PV**, **TV**, **LV**, and **RV**) 1. Tap a folder for a measurement label. 2. Tap **HR Edit**. 3. Enter a value and then tap **Save**. 4. To exit without saving a value, tap **Cancel**.
Enter an aliasing velocity value	(Available only for the following measurements: **AoV**, **MV**, **PV**, and **TV**) 1. Tap a folder for a measurement label. 2. Tap the label, for example, **AR Aliasing Velocity**. 3. Enter a value and then tap **Save**. 4. To exit without saving a value, tap **Cancel**.
Enter a right atrial pressure value	(Available only for the following measurements: **TV**) 1. Tap a folder for a measurement label. 2. Tap **RA Pressure**. 3. Enter a value and then tap **Save**. 4. To exit without saving a value, tap **Cancel**.
Measure a distance	1. Tap **Distance**.  2. Position and then anchor the beginning and ending markers.

To	Do This
Measure the circumference and area of a structure using an ellipse	1. Tap **Ellipse**.  2. Position and then anchor the first marker. The system displays an ellipse. 3. Position and then anchor the major axis. 4. Position and then anchor the other axis. 5. Adjust the position of the ellipse, if necessary, and then anchor the ellipse.
Measure the circumference and area of a manually traced structure	1. Tap **2D Trace**.  2. Position and then anchor the first marker. 3. Roll the trackball to trace the structure and then anchor the next marker. **Note:** Tolerances of circumference measurements cannot be guaranteed when using the manual tool because the accuracy of tracing a circumference is largely dependent on the user's incremental movements using the trackball.
Measure an acute angle	1. Tap **Angle**.  2. Position and then anchor the beginning and ending markers for the reference line. 3. Position and then anchor the beginning and ending markers for the intersecting line to create an angle.
Measure the circumference and area of a structure with three or more points indicated by markers	1. Tap **Spline**.  2. Position and then anchor three or more points on the traced structure. 3. Press **UPDATE** and then press a trackball key to complete the measurement. The system also indicates the major and minor axis.

To	Do This
Make a left ventricular function assessment	**Note:** This series measurement does not separately measure diastole and systole. Use measurement labels to specify diastole and systole measurements. 1. Activate the measurement function. 2. Tap **LV Series**.  3. Position and then anchor the first marker on the anterior interventricular septum. 4. Position and then anchor the next marker on the posterior interventricular septum. 5. Position and then anchor the next marker on the endocardium of the left ventricular free wall. 6. Position and then anchor the next marker on the posterior left ventricular free wall.
Determine an end diastolic volume or end systolic volume using Simpson's method of disks	1. Activate the measurement function. 2. Tap **Vol MOD Spline**.  3. Position and then anchor the first marker in the basal septal segment. 4. Position and then anchor the last marker in the basal lateral segment. The system indicates the long axis and disks of the traced contour and highlights a segment. 5. Position and then anchor the additional markers following the contours of the endocardium. 6. To edit the contour: a. Roll the trackball to select the segment or long axis and then press a trackball key. ▪ For smaller adjustments, position the arrow on or near the highlighted segment and then press a trackball key. ▪ For larger adjustments, position the arrow away from the highlighted segment and then press a trackball key. ▪ To rotate the long axis, position the arrow within the contour and then press a trackball key. b. To continue to adjust the selected segment, roll the trackball. 7. Press **UPDATE** to complete the measurement.

Measured Results of 2D-mode Measurement Tools

Measured Results	Abbreviation
Distance	**D**
Axis length	**D1**, **D2**
Circumference	**C**
Area	**A**
Interventricular septum	**IVS**
Left ventricle internal dimension	**LVID**
Left ventricle posterior wall thickness	**LVPW**
Alpha angle	**α**
Beta angle	**β**
Volume	**Vol**

Measuring with Doppler Measurement Tools

Changes to the Doppler gate and the transmit frequency update the labeled measurements and the corresponding calculations displayed in the measured results.

To	Do This
Enter a heart rate value	(Available only for the following measurements as default: **AoV**, **MV**, **PV**, **TV**, **LV**, and **RV**) 1. Tap a folder for a measurement label. 2. Tap **HR Edit**. 3. Enter a value and then tap **Save**. 4. To exit without saving a value, tap **Cancel**.
Enter an aliasing velocity value	(Available only for the following measurements: **AoV**, **MV**, **PV**, and **TV**) 1. Tap a folder for a measurement label. 2. Tap the label, for example, **AR Aliasing Velocity**. 3. Enter a value and then tap **Save**. 4. To exit without saving a value, tap **Cancel**.
Enter a right atrial pressure value	(Available only for the following measurements: **TV**) 1. Tap a folder for a measurement label. 2. Tap **RA Pressure**. 3. Enter a value and then tap **Save**. 4. To exit without saving a value, tap **Cancel**.
Measure a velocity	1. Tap **Velocity**.  2. Position and then anchor the marker on the Doppler waveform.
Measure a heart rate	1. Tap **Heart Rate**.  2. Position and then anchor the first marker at the beginning of the cardiac cycle. 3. Position and then anchor the next marker at the end of the required number of cardiac cycles. **Note:** You can manually enter a heart rate value in the patient report.

To	Do This
Measure the peak systole, end diastole, and resistive index	1. Tap **D-Trace**.  2. Position and then anchor the first marker both horizontally and vertically. 3. Roll the trackball to manually draw a trace of the waveform. A marker displays on the traced waveform to indicate peak systole. 4. Anchor the marker. 5. Anchor the marker for end diastole.
Measure the change in velocity over time	1. Tap **Acceleration**.  2. Position and then anchor the beginning and ending markers. A dotted line indicates the slope.
Measure a time interval	1. Tap **Time**.  2. Position and then anchor the beginning and ending markers.
Measure the velocity below a trace of the waveform	1. Tap **VTI**.  2. Position and then anchor the first marker both horizontally and vertically. 3. Roll the trackball to manually draw a trace of the waveform. A marker displays on the traced waveform to indicate maximum velocity. 4. Anchor the marker.

To	Do This
Measure the velocity below a trace of the waveform	(Not available during review) 1. Tap **Auto VTI**.  2. Position and then anchor the first marker. 3. Position the second marker to the right of the first marker. The system traces the waveform between the two markers and indicates maximum velocity. 4. Anchor the marker.
Determine a valve area by defining the time needed for the peak transvalvular gradient to fall to its half value	1. Tap **PHT**.  2. Position and then anchor the first marker on the waveform at peak velocity. 3. Position and then anchor the next marker on the deceleration of the mitral valve. The position of the marker on the line indicates the location of the measurement.

Measured Results of Doppler Measurement Tools

Measured Results	Abbreviation
Velocity	**Vel**
Minimum velocity	**Vmin**
Maximum velocity	**Vmax**
Peak gradient	**Peak Grad**
Mean gradient	**Mean Grad**
Heart rate	**HR**
Time	**Time**
Acceleration rate	**Acceleration**
Acceleration time	**AT**
Pressure half time	**PHT**
Slope	**Slope**
Velocity time integral	**VTI**
Deceleration time	**DT**

Measuring with M-mode Measurement Tools

To	Do This
Enter a heart rate value	1. Tap a folder for a measurement label. 2. Tap **HR Edit**. 3. Enter a value and then tap **Save**. 4. To exit without saving a value, tap **Cancel**.
Measure a vertical distance	1. Tap **M-Distance**.  2. Position and then anchor the beginning and ending markers.
Measure a change in distance over time	1. Tap **M-Slope**.  2. Position and then anchor the beginning and ending markers.
Measure a heart rate	1. Tap **M-Heart Rate**.  2. Position and then anchor the first marker at the beginning of the cardiac cycle. 3. Position and then anchor the next marker at the end of the required number of cardiac cycles. **Note:** You can manually enter a heart rate value in the patient report.

To	Do This
Measure a time interval	1. Tap **Time**.  2. Position and then anchor the beginning and ending markers.
Make a left ventricular function assessment	**Note:** This series measurement does not separately measure diastole and systole. Use measurement labels to specify diastole and systole measurements. 1. Freeze the waveform. 2. Activate the measurement function. 3. Tap **LV Series**.  4. Position and then anchor the first marker on the anterior interventricular septum. 5. Position and then anchor the next marker on the posterior interventricular septum. 6. Position and then anchor the next marker on the endocardium of the left ventricular posterior wall. 7. Position and then anchor the next marker on the posterior left ventricular posterior wall.

Measured Results of M-mode Measurement Tools

Measured Results	Abbreviation
Distance	**D**
Heart rate	**HR**
Slope	**Slope**
Time	**Time**
Interventricular septum	**IVS**
Left ventricle internal dimension	**LVID**
Left ventricle posterior wall thickness	**LVPW**

Measuring with 3D Caliper

Use the 3D caliper tool to perform measurements on a multiplanar reconstruction (MPR) during image acquisition, on a frozen image, or in review.

To perform a 3D caliper measurement:

Prerequisite: Acquire cardiac volume images.

See also: For information about acquiring cardiac volume images, refer to Chapter D2 in the Advanced Imaging Manual.

1. Tap **3D Caliper**.
   The system displays a caliper in the center of the MPR.
2. Roll the trackball to position the caliper and then press a trackball key.

To	Do This
Perform a measurement	▪ Enable the check box on the touch screen for two previously placed calipers and then tap the link icon. **Note**: The system only displays the link and unlink icons when two calipers are selected. 
Remove a measurement	▪ Enable the check box on the touch screen for two previously linked calipers and then tap the unlink icon. 
Remove a caliper	▪ Select a caliper and then tap the delete icon. 
Change the label on a caliper	1. Select a caliper. 2. To change the label to a predefined label, tap the required label. 3. To customize the label, tap the keyboard icon and then enter a unique label. 
Hide measurement results	▪ Tap **Hide Results**.
Delete all calipers and results	▪ Tap **Clear Screen**.
Save the measurement	▪ Press the control assigned to the capture function.

Measuring with AI Measure

(Available only when a physio signal is present)

AI Measure accelerates the workflow for performing cardiac measurements by reducing the number of keystrokes. The feature activates the calipers and performs the required measurements for the selected measurement group or series. For example, when measuring the parasternal long axis view for the left ventricle, diastole, the system places the calipers and performs each required measurement. When you confirm the measured results, the system saves the results to the patient report.

The system identifies measurement labels available during AI Measure with **AI** in orange superscript text.

See also: For information about measurement labels available during AI Measure, refer to Appendix D in the System Reference.

During M-mode and Doppler imaging, the system measures results for up to three completed heart cycles, as configured for the AI Measure feature.

Use the configuration settings to configure exam-specific measurement settings for AI Measure or to add measurements and series to user-defined workflow protocols.

Performing a Measurement with AI Measure

After you confirm measurements performed with AI Measure, the system displays the most recent measurement for each label in the measured results and the five most recent results display in the patient report. The patient report also displays the average value of all measurements for each label.

Note: The configuration of measurement labels does not affect the display of measured results.

During review of an M-mode or Doppler image, position the pointer over the area of interest before activating the AI Measure feature. For example, reposition the pointer from the Doppler spectrum to the 2D mode image.

To activate the AI Measure function:

Prerequisite: During a cardiac study with a compatible transducer, freeze an image or pause CINE playback with an ECG trace or activate measurements. During review, select an image or clip with a minimum of one heart beat and an ECG trace.

- Press **AI**.

To	Do This
Perform a measurement	1. Select the required measurement category or series, for example, **LV d AI**. The system traces the image the first measurement in the category or series, displays the measurement results, and activates the last caliper for the measurement. **Note:** If the system is unable to trace the image, the system displays a single caliper on the image and an on-screen message. Choose an alternate method to obtain a measured result. 2. Confirm the caliper position to accept and save the measurement result.
Confirm the caliper position to accept and save the measurement result	▪ Perform one of the following options to complete a measurement: – Press the control assigned to the capture function. – Press **UPDATE** to select **Accept All**. – Enter an annotation. **See also:** For information about entering annotations, refer to Chapter 9 in this manual. A check mark displays next to the completed measurement and the measurement is saved to the patient report.
Change the number of heart cycles included in the measurement	(Available during M-mode or Doppler imaging) ▪ Rotate **Cycles**.

Editing or Deleting a Measurement Obtained with AI Measure

Note: The system deletes all unconfirmed measurements. Deleted measurements are not saved to the patient report.

To	Do This
Select a caliper in Doppler	▪ Press and then rotate **Edit Caliper** to select the required caliper. – Rotate the control clockwise to select the next caliper. – Rotate the control counterclockwise to select the previous caliper. ▪ Roll the trackball to the required measurement and then press a trackball key. Green text identifies the selected caliper.
Select a caliper in 2D	▪ Press **Edit Caliper**. ▪ To cycle through the available calipers, press **UPDATE** to select **Toggle Caliper**.
Edit a caliper	1. Select a caliper. 2. Reposition and anchor the selected caliper. 3. Confirm the caliper position to accept and save the updated measurement result.
Delete a completed measurement	▪ Select the required completed measurement and then press **Delete**.
Delete or terminate an incomplete measurement	▪ Press **Delete**.
Delete all measurements, including measurements obtained prior to activating AI Measure	▪ Tap **Clear Screen**.

Troubleshooting On-screen Messages during AI Measure

Message	Displays When	Recommended Action
Measurement Unsuccessful **Unable to perform selected measurement**	The system is unable to trace the image.	▪ Click **OK** and then choose one of the following methods: – Select another measurement label during AI Measure. – Select another image during AI Measure. – Manually reposition and anchor the calipers. – Select another measurement tool.

12 Reports

Overview **3**

Modifying the Report **4**

Obstetrical Report **6**

Modifying the Obstetrical Report 6

Fetal Growth Charts 8

Entering Growth Data 9

Pediatric Hip Report **10**

Saving Report Data **11**

Transferring Report Data 11

Nuance Data Transfers 12

Overview

A patient report includes patient information and organizes measurements, calculations, images, and comments into sections by exam.

The ultrasound system copies the most recent information from patient registration to the patient report, including the patient history for each patient study. The patient banner displays patient information on each page of the patient report.

Measured results are added to a section of the report when the first labeled measurement is completed.

Use the configuration settings to configure the patient report.

See also: For information about printing a report, refer to Chapter 13 in this manual.

Modifying the Report

Editable values are displayed in a text box in the patient report. You cannot edit a calculation value.

Images marked for deletion during imaging or review are not removed from the patient report.

To modify the patient report:

- Tap **Report** and click the name of the required section of the report, if necessary.

To	Do This
Edit a measured value	1. Tap **Edit Report**. 2. To change a measured value, enter the numerical value in the text box. The system places an asterisk next to the edited value and updates calculated values based on the measurement value. 3. To delete a measured value, delete the numerical value in the text box.
Enter an assessment	(Available for the following exams: abdomen, carotid, obstetric, early obstetric, fetal echo, gynecology, pediatric hip) 1. Select an option from the drop-down list. 2. Enter comments.
Edit a ratio	▪ Select a different value for calculating the ratio from the drop-down list.
Insert comments	1. Click **Summary Comments**. 2. Position the cursor in the text box and enter the information. 3. To insert predefined text, click **Load Comments**. a. To insert comments defined for the current exam, click the comment. b. To insert comments defined for a different exam, select the exam from the drop-down list and then click the comment. 4. Click **OK**.
Show or hide a section of the report	1. To view a section of the report, click the section name on the left side of the image screen. 2. To expand a section of the report, click the plus button next to the name of the section.  3. To hide a section of the report, click the minus button next to the name of the section.  The printed report does not include hidden sections of the report. 4. To view all sections of the report, click **Expand All**. 5. To hide all sections of the report, click **Collapse All**. 6. To view the next or previous line of the report, rotate **FORWARD/BACKWARD**.

To	Do This
Reorganize the measured results displayed in the report	1. Click a measured result heading from the drop-down list to view the available options. 2. To hide a column of measured results, click the blank selection in the drop-down list. 3. To show different measured results in the selected column, click another option from the drop-down list.
Copy images, protocol views, and clips to the patient report	1. Click **Images**. 2. Click the image on the thumbnail panel. The protocol view name displays in the image section of the report, but not in the printed report. 3. To change the display format of the images, click the required format from the drop-down list, for example, 2x2. 4. To rearrange an image in the report, click the image and then click the new location. 5. To delete an image from the report, click the image and then click **Delete**.  Images deleted from the report are not deleted from the exam.
Select the method for displaying a measurement value	1. Click **Edit Report**. 2. Select the type of measured value to include as the value for the measurement label. – **Last** uses the most recent measurement value. – **Avg** uses the average of all measurement values. – **Min** uses the minimum value. – **Max** uses the maximum value. Depending on the number of measurements completed for the label, you can select the first through the fifth measurement to include as the value for the measurement label. The system updates the measurement values and corresponding calculations in the report.
Create a single report for multiple exams	▪ Complete all exams and then tap **End Exam**.
Create a separate report for each exam	▪ Tap **End Exam** after each exam.

Obstetrical Report

The obstetrical report includes selections for maternal and fetal assessments, fetal growth charts (growth curves), images, and comments. When multiple fetuses are present, completed measurements, images, and assessments are available for each fetus.

To include the standard deviation of each measurement, the clinical age, last menstrual period, date of conception, or estimated date of delivery must be entered in the patient registration form. If this information is absent, the system displays only the gestational age.

Use the configuration settings to customize the display of obstetric ratios, standard deviations, and gestational age on the report.

Modifying the Obstetrical Report

- Modifying the date of the last menstrual period or the date of conception updates the estimated date of delivery and clinical age.
- Modifying the estimated date of delivery updates the clinical age.
- Modifying the clinical age updates the estimated date of delivery.

The system displays the following indicators for out-of-range values in the patient report:

- **OOR** indicates the values are outside the valid range.
- OB ratios:
  - ******* indicates the clinical age is outside the valid range for the OB ratio. The asterisks display on the low and high values of the range.
  - An OB ratio value within brackets (**< >**) indicates the clinical age is in the valid range, but the OB ratio value is outside the normal range.

To modify the report:

1. Tap **Report**.
2. Click **Edit Report**.

To	Do This
Select another reference for a measurement label	1. Click **Fetal Biometry**. 2. Select another author from the drop-down list. **Note:** When multiple fetuses are present, the author applies to all fetuses.
Modify the estimated date of delivery or last menstrual period	▪ Click **Patient History** and then enter a new date.
Select a different reference for calculating gestational age	1. Click **Collapse All**. 2. Click **Fetus Information**. 3. Select another author from the drop-down list. **Note:** When multiple fetuses are present, the author applies to all fetuses.
Assess fetal structures	1. Click **Fetal Assessment**. 2. Select a description from a drop-down list or enter text to describe structural observations.
Assess maternal structures	1. Click **Maternal Assessment**. 2. Select a description from a drop-down list or enter text to describe structural observations.

To	Do This
Enter a biophysical profile for a fetus	(Not available for the early obstetric exam) 1. Click **Biophysical Profile**. 2. Enter a value for each selection. The ultrasound system totals the values to calculate a score for the biophysical profile.
Review fetal growth curves	1. Click **Fetal Growth Charts**. 2. To edit the reference author, select an author from the drop-down list. 3. To select another fetal measurement label, select the label from the drop-down list. 4. To change the display layout, select the layout from the drop-down list, for example, 1x1.
Copy fetal images and clips to the patient report	1. Click **Fetus**, if necessary. 2. To specify a specific fetus, click the corresponding identifier, for example, **Fetus B**. 3. Click **Fetus Images**. 4. Click the image on the thumbnail panel.
Compare measured values for multiple fetuses	▪ Click **Fetus Side-by-Side**.

Fetal Growth Charts

You can view fetal growth charts (growth analysis graphs) to evaluate predicted fetal growth patterns for a measurement, ratio, or calculation.

A fetal growth chart includes measured or calculated values within the limits for the selected author. Each growth chart includes the following information:

- Measured results on the vertical axis
- Clinical age on the horizontal axis
- Author of the predicted fetal growth pattern with color indicators:
  - Red indicates the upper limit
  - Green indicates the mean
  - Blue indicates the lower limit
- Icons of different shapes and colors represent multiple fetuses on a fetal growth chart. A legend indicates the icon associated with each fetus.
- Growth data from prior exams, if entered as growth data, for the following parameters: BPD, AC, FL, HC, HL

Note: The references for growth curves typically use 5 or 10 percent for the lower limit and 90 or 95 percent for the upper limit.

The publication for growth curves by Chitty uses both two and three standard deviations for the graphical representation of data. These standard deviations correspond to the 3rd and 97th percentiles and the 10th and 90th percentiles.

The ultrasound system generates the growth curves using the published standard deviations. Measurement values depicted in the growth curve are mathematically correct, but do not directly map to the clinical publication. For consistency with other fetal biometric calculations, the system plots fetal growth and calculates a growth percentile using the 5th and 95th percentiles with a +/- 1.5 standard deviation. The 3rd and 97th percentiles are included in the author's publication.

See also: Publications are listed in Appendix F of the System Reference.

The JSUM reference uses 5 percent and 95 percent for the lower and upper limits, respectively, for the middle cerebral artery and umbilical artery growth curves. The JSUM, Tokyo, and Osaka references use a standard deviation of 1.5 from the mean for the lower and upper limits for all other growth curves.

Note: The ultrasound system plots fetal growth and calculates a growth percentile for a measured or calculated value only when the values are within the growth curve limits and the gestational age is within the range of the selected author.

Use the configuration settings to create user-defined growth curves.

To view a fetal growth chart:

1. Tap **Report**.
2. Click **Fetal Growth Charts**.
3. To view a growth chart for another measurement, ratio, or calculation, select an option from the measurement list.
4. To select a growth chart for another reference author, select an option from the author list.
5. To change the layout for the fetal growth charts:
   - Select **1x1** to display a single graph in the report.
   - Select **2x2** to display four graphs in the report.

Entering Growth Data

You can enter growth data and estimated fetal weight parameters. The ultrasound system incorporates growth data into the fetal growth chart on the obstetrical report.

You can also select interval growth to include growth percentiles for the following parameters in the obstetrical report: BPD, AC, and FL. The ultrasound system uses growth data from the current exam and the selected prior exam to calculate the interval growth rate for the selected author. When a prior exam is not selected in obstetric history, the system uses the most recent exam.

Use the patient browser to import measured results from prior exams.

The system retains growth data entered in the patient history until the end of the exam.

To enter growth data:

Note: The system does not check growth data entered in the patient history for accuracy or internal consistency.

1. To enter data for a new patient, register the patient and select an obstetric study.
2. To enter data for a registered patient, tap **Report**.
3. Click **OB History**.
4. Enter the required information.

   The ultrasound system copies the exam date to the obstetric history for each fetus.
5. To include the data in obstetric trending, select **Trend**.
6. To select a previous exam for calculating interval growth rate percentages, select **Interval Growth**.
7. Click **OK**.
8. To exit without saving the changes, click **Cancel**.

Pediatric Hip Report

Prerequisite: Knowledge of the Graf technique for evaluation of the pediatric hip, including the classification zones for the hip from dislocated to normal.

The pediatric hip report includes an assessment for the left and right hips and the Graf Sonometer. The Sonometer is a depiction of the measured angle or angles in a graph.

Use the configuration settings to customize the display of information to include in the report.

To assess the left or right hip:

1. Tap **Report**.
2. Click **Ped Hip**.
3. Click **Right Hip Description** or **Left Hip Description**.
4. Select an assessment from each drop-down list, for example, you can select a descriptive option for the osseous profile, osseous acetabulum, cartilaginous acetabulum, or anatomical classification (type).

To view the measured angle in a graph:

1. Tap **Report**.
2. Click **Ped Hip**.
3. Click **Right Hip Sonometer** or **Left Hip Sonometer**.

   The system displays a Sonometer according to your configuration settings for alpha only angles or for beta and alpha angles.

Saving Report Data

You can save report data as an image or transfer report data from the ultrasound system.

To save the patient report:

1. Tap **Report**.
2. To save the patient report, click **Store Report**.
   You can continue the patient exam while the ultrasound system saves the report.
3. To save only the displayed section of the patient report, press **IMAGE**.

Transferring Report Data

You can transfer report data to an external location during an exam or at the end of an exam, as specified in the configuration settings. The images, growth charts, and obstetrical growth history are not included in the exported patient report.

Report data includes the following file formats:

- .xml
- DICOM Structured Report
- Nuance PowerScribe 360
- .pdf

To transfer data to a connected USB device:

1. Connect a USB-compatible storage device to the ultrasound system.
2. Tap **Report**.
3. Tap **Export to PDF**.
4. Enter a filename and then click **OK**.
5. Tap the additional selections button.

6. Tap **Eject USB** and remove the USB-compatible storage device.

To transfer data during an exam:

(Not available for the cardiac exam)

1. Tap **Report**.
2. Click **Transfer Report**.

Nuance Data Transfers

⚠ **WARNING:** If the Nuance data transfer feature is enabled, the ultrasound system transfers measured results from the patient report to the configured destination device when you end an exam. If measured results are deleted from the patient report on the ultrasound system after the measurements are successfully transferred, the measurements are not deleted on the destination device.

If the transfer fails (for example, the ultrasound system is not connected to the network), the system resends the data until the transfer is successful or you delete the transfer from the status queue.

To view the status of Nuance data transfers:

Prerequisite: Enter an accession number for the patient study in the patient registration form.

1. Tap **Patient**.
2. Tap **Patient Browser**.
3. Tap **Job Status**. Or, click **Job Status**.
4. To cancel a data transfer, select the data transfer and then click **Delete**.
5. Click **Close**.

To troubleshoot the Nuance data transfers:

1. Tap **Patient**.
2. Tap **Patient Browser**.
3. Tap **Job Status**. Or, click **Job Status**.
4. To troubleshoot a data transfer listed in the status:
   a. Review the cause for the data transfer failure listed in the **Description** column.

Cause	Recommended Action
The Nuance server did not recognize the site, user, name, or password entered in the configuration settings.	Verify the configuration settings are correct and update the information, if necessary.
The ultrasound system could not connect to the Nuance server.	Ensure the ultrasound system is connected to the network.
The Nuance server did not recognize the accession number.	▪ Verify the accession number on the ultrasound system matches the accession number on the report template. ▪ Refresh the worklist server to ensure the most recent information was transferred to the ultrasound system and to the computer where the Nuance software is installed.

   b. Select the data transfer and then click **Retry**.
5. To troubleshoot a data transfer not listed in the status, verify the Nuance server accepted the transferred data.
   a. The following log file lists the measured results not transferred because corresponding custom fields are not configured on the Nuance server:
   c:\syngo\log\NuanceExportMissingCustomFields.txt

   Contact your service representative for the ultrasound system for assistance accessing the log file. Contact the administrator responsible for the Nuance software for assistance configuring custom fields.

   Note: The log file is overwritten after each data transfer.

   b. If the data was accepted by the Nuance server, compare the measured results sent by the ultrasound system to the measurements displayed in the template. The template may use different labels than the ultrasound system patient report.

13 Printing and Recording

Printing Images 3

Printing the Report 4

Customizing Print Settings 5

Previewing a Print Job 7

Recording a Patient Study 8

Printing Images

You can print an image during an active study or during review of an active exam or previous exam.

Use the configuration settings to reassign controls on the control panel to the print function and configure the print destination.

To	Do This
Print an image during an active study	▪ Press the control assigned to the print function. The system sends a request to the printer and saves the image to the local database.
Print an image from a clip	1. Rotate **Cine** to display the required frame in the clip. 2. Press the control assigned to the print function.
Print an image during review	▪ Press the control assigned to the print function. The system sends a request to the printer and saves the image to the local database.
Copy images to the film sheet during review	1. Select the required images. 2. Tap **Copy to Film**.  3. Select a printer and then click **Continue**, if necessary. During review of an active study, the system prints the image at the end of the exam. During review of a stored study, the system prints the image when you exit review.
Print an image from a study stored on the local database	1. Tap **Patient**. 2. Tap **Patient Browser**. 3. Select an image from the local database. 4. Click **Patient** and then click **Copy to Film**.  5. Select a printer and then click **Continue**, if necessary. 6. Click **Patient** and then click **Expose Film Task**.  **Note:** You can verify the film task status in print preview.

To	Do This
View the status of a print job	1. Tap the additional selections button.  2. Tap **Film Sheet**. 3. Click **Film Task Status** and then select the required printer.  4. Tap **Exit**. **Note:** You can verify the film task status in print preview.

Printing the Report

You can print the entire contents of the patient report or print a screenshot of a section of the report.

To print the patient report:

Prerequisite: The ultrasound system is connected to a supported printer.

1. Tap **Report**.
   The system displays the preview of the report, including patient registration information.
2. To print the entire report, click **Print Report**.
3. To print a screenshot of the report, select the required section and then press the control assigned to the print function.
4. To exit the preview of the report, click **Report**.

Customizing Print Settings

Use the film sheet to save images for subsequent printing.

To customize print settings:

1. Tap the additional selections button.



2. Tap **Film Sheet**.
3. Select the required saved image or print job and then select an option.

To	Do This
View the next or previous page of images within the selected print job folder	▪ To access the next page, click the upper right of the icon; to access the previous page, click the lower right of the icon. 
Change the layout of the film sheet	▪ Click **Layout** and then select an option. The size of an image decreases when additional images are included on the page. **Note:** If you apply a layout to part of a print job folder, the system places the reformatted images on the last film sheet at the end of the print job, resulting in a new sequence of images.
Remove images from the print queue on the film sheet	▪ Click **Delete**.
Change the printer destination	1. Click **Camera**. 2. Select the required printer from the drop-down list. 3. Select a film size from the drop-down list.
Hide or show the overlays	**Prerequisite:** Images are stored as ultrasound images with overlays. Examples of overlays include date, patient name, and transmit frequency. 1. Click **Images**. 2. Select **Customized Text**.  3. To hide text, select **No Text**.  4. To show hidden text, select **All Text**. 

To	Do This
Hide or show graphics	**Prerequisite:** Images are stored as ultrasound images with overlays. Examples of graphics include annotations, measurement markers, the region of interest, and the color bar velocity. 1. Click **Images**. 2. To hide graphics, select **Hide Graphics**.  3. To show graphics, select **Show Graphics**. 
Select the display format of the image	▪ Click **Images**. – **Fit to Segment** displays the image as large as possible without clipping the image.  – **Original Image** displays an image in the original aspect ratio.  **Note:** This format may cause errors during printing. – **Clip Document** displays a rectangular image.  **Note:** This format may cause errors during printing.

Previewing a Print Job

Prerequisite: Connect a DICOM printer server to the ultrasound system.

1. Tap **Review**.
2. Tap **Patient Browser**.
3. Tap **Print Preview**.
   The system displays the following printer options:

Selection	Description
Copies	Indicates the number of copies to print.
Layout	Identifies the selected page layout.
Images	Provides options for adjusting images.
Camera	Provides options for selecting a printer.
Film Size	Indicates the size of the print output.
Layouts	Provides page layout options for the selected printer.

4. To remove an image outline from the layout page, select the image and then click **Delete**.
5. To reposition an image, drag the image to a new position.
6. To exit print preview, tap **Exit**.

Recording a Patient Study

You can record a patient study for later playback. When you start and then stop recording, the ultrasound system saves a title on the recording media. Each time you pause and then resume recording during a session, the ultrasound system saves a chapter on the recording media. A title can consist of multiple chapters. The ultrasound system assigns a title using the patient's last name and the exam type.

The ultrasound system displays the following information on the touch screen.

- **Video Destination** displays the location for recording the patient study.
- **Available Space** indicates a status of the space available on the recording media.
- **Video Timer** indicates the time elapsed since the start of the recording.

To record a patient study:

Prerequisite: Connect and power on the recording device before powering on the ultrasound system and insert formatted media into the recording device. Refer to the manufacturer's instructions for information about formatting new media.

1. Tap the additional selections button.

2. Tap **DVR Menu**.

To	Do This
Begin recording a patient study	▪ Tap **Start**.
Temporarily stop recording	▪ Tap **Pause**.
Continue recording after pausing	▪ Tap **Resume**.
End recording	▪ Tap **Stop**.
Select the destination for recording the patient study	1. Tap **Change Destination**. The ultrasound system activates the configuration settings. 2. Select the destination from the list. – **Network File Share** sends the recording to a network location from the drop-down list. – **USB Storage** sends the recording to a location from an external storage device. 3. To exit the configuration settings and record the study, tap **Imaging** and then tap **Start**.
Remove the recording selections from the touch screen	▪ Tap **Exit**.

Appendix A Technical Description

Standard Features **3**
Cybersecurity 3
Data Storage Encryption 3
System Operating Software 3
Operating Modes 4
Imaging Features 9
Measurements, Calculations, and Reports 12
Wireless Data Transfer 14
Storage and Archiving 14
Mobility 14
Maximum Physical Dimensions 15
User-Accessible Connections 15
Operator Control Panel 15
Monitor 16
Transducer Technology and Design Attributes 17

Accessories and Options **19**
Language-Specific Operating System 19
List of Available Options 20
Stress Echo Option 21
3D Measurements Option 21
AI Measure Option 21
ICE (Intracardiac Echo) Imaging Option 22
SwiftLink Lumos Catheter Connector Option 22
2D Heart AI Options 23
4D Heart AI Option 24
Contrast Agent Imaging Option 24
Auto OB Measurements Option 25
Auto Doppler Option 25
AI Assist Option 25
Panoramic Imaging Option 26
Wide FOV Option 26
Retractable Keyboard Option 26
Footswitch Option 26
Smart Card Reader Option 26

Printer Option 27
DVD/CD Optical Drive Option 27
Protective Overlay Option 27
Rear Accessory Tray Option 27
Gel Warmer Option 27
Large Gel Holder Option 27
Leakage Current Tester Option 28
Universal Video Converter Option 28
Physio Module Option 28
Remote Services Option 28
Transducer Options 29
Disposables and Consumables 30
User-Accessible Cables 31

Measurement Range and Accuracy 32
Clinical Measurements: Range and Accuracy 32
AI Measure Measurements 36
2D Heart AI Measurements 39
4D Heart AI Measurements 41
AI Assist 42

System Requirements 43
Power Supply Requirements 43
Possible Combinations with Other Equipment 43
Environmental Requirements 45

System Classifications 46

Standards Compliance 47
Quality Standards 47
Design Standards 47
Acoustic Output Standards 47
Radio and Telecommunications Standards 47

Standard Features

The ultrasound system includes the language-specific user interface and power cord required for your region.

Cybersecurity

- Your ultrasound system includes a security package to protect patient confidentiality and system security.

  See also: For information about cybersecurity, refer to Appendix C in this manual.

Data Storage Encryption

⚠ **Caution:** Data storage encryption on your ultrasound system requires a USB storage device with the recovery key for recovering encrypted data in the event of a system failure. The ultrasound system administrator must keep the recovery key in a secure location.

- Patient data encryption software protects patient health information and system settings stored on the ultrasound system by preventing unauthorized access
- Includes a USB storage device with the recovery key for recovering encrypted data

System Operating Software

- Windows-based operating software
- Multi-language capability
- User-modifiable configuration settings, including libraries of annotations and body markers
- User-defined image presets, transducer, and image parameter settings
- Supports DICOM file format
- Supports PC file format
- Compatible with remote update handling for remote application support and remote troubleshooting
- Supports self-installable software updates from an online portal

Operating Modes

- 2D-mode
  - 2D-mode
  - 2D-mode with Harmonics Imaging
  - 2D-mode with Harmonics Imaging for Contrast Agent Imaging
- Color flow Doppler
  - Color (velocity)
  - Power (energy)
- Doppler
  - Pulsed Wave Doppler
  - Pulsed Wave Doppler Tissue Imaging
  - High Pulsed Repetition Frequency Pulsed Wave Doppler
  - Steerable Continuous Wave Doppler for imaging transducers
  - Continuous Wave Doppler for non-imaging transducers
- M-mode
  - M-mode with Harmonics Imaging
  - Anatomical M-mode
- 3D/4D Volume Imaging

  See also: For information about cardiac volume imaging, refer to page A-9 in this chapter.

Combined Modes

- 2D-mode with color
- 2D-mode with Doppler
- 2D-mode with color and Doppler
- 2D-mode with M-mode
- 2D-mode with M-mode and color
- 4D Volume Imaging with color

Formats

- Single, dual, live dual, and seamless dual image display format
- Display formats for M-mode and Doppler
  - Full screen
  - Side by side
  - 1/2 2D with 1/2 trace
  - 1/3 2D with 2/3 trace
  - 2/3 2D with 1/3 trace
- Virtual format imaging: linear, steered, or trapezoidal format
- Curved-sector, linear, and phased-sector data acquisition and display formats
- Image display formats during review: 1x1, 2x1, 2x2, 3x2, 3x3, and 4x4

2D-mode Features

- Adjustable size and position of field of view
- Magnification in frozen, CINE, or real-time imaging
- CINE capture: up to 300 seconds
- Acquired 2D-mode frame rates, depending on the transducer and imaging depth: up to 250 fps (frames per second)
- Fundamental and harmonic transmit frequencies, transducer dependent
- User-selectable transmit frequencies: up to 14.0 MHz
- Multi-line signal parallel processing
- Linear array transducer beam steering
- 2D/Doppler refresh, update, and triplex functions
- Gain in one decibel increments: -20 dB to 20 dB
- Dynamic range in one decibel increments: 10 dB to 80 dB
- 2D-mode with Harmonics imaging
- InFocus dynamic transmit focusing
- Grayscale and colorization (tint) maps
- Persistence levels: up to 4
- Speed of sound, image preset-dependent: up to 4
- Line density: up to 3
- UltraArt universal image processing: Off, 1 to 3
- Clarify: up to 5
- Maps: up to 7
- Tints: up to 10

Color Features

- Gain in 0.5 decibel increments: -20 dB to 20 dB
- User-adjustable color region of interest (ROI), size, and position
- Independent controls for color gain, pulse repetition frequencies, invert, baseline, line density, persistence, priority, filter, and smoothing
- User-selectable transmit frequencies: up to 5
- Color On/Off, invert, and baseline shift functions
- User-selectable color flow states: low, general, high, and anatomy specific, for example, kidney or aorta
- Color-adaptive wall filter
- Pulse repetition frequency range: 200 Hz to 10,000 Hz
- Color velocity maps, image preset-dependent: up to 10
  - Includes a velocity variance map
- Color AutoHz imaging
  - Compatible transducers: 5C1

    Supported image presets: Abdomen, Abdomen-Difficult
  - Compatible transducers: 10L4

    Supported image presets: Arterial, Venous

Power Features

- Power gain in 0.5 decibel increments: -20 dB to 20 dB
- Independent controls for power gain, pulse repetition frequencies, invert, baseline, line density, persistence, priority, filter, and smoothing
- User-selectable transmit frequencies: up to 5
- User-selectable power flow states: low, general, high, slow, and anatomy specific, for example, kidney or aorta
  - Slow setting:
    - Compatible transducers: 5C1

      Supported image presets: Abdomen, Abdomen-Difficult
    - Compatible transducers: 9C2

      Supported image presets: Abdomen
- User-selectable Power map selections: up to 5
- Persistence levels: up to 4
- Power smoothing levels: up to 4
- Pulse repetition frequency range: 200 Hz to 10,000 Hz
- Adaptive wall filter

Pulsed Wave Doppler Features

- Fast Fourier Transformation (FFT) processing: up to 256 points
- FFT speed: up to 2,880 FFTs per second
- User-selectable transmit frequencies per transducer: up to 3
- Simultaneous 2D-mode and Doppler display and 2D/Doppler with color (Triplex)
- User-selectable 2D/Doppler refresh
- User-adjustable Doppler scale and baseline position controls
- User-adjustable Doppler UltraArt universal image processing and edge controls
- Angle correction in one-degree increments: 0° to 89°
- Transmit frequencies: 1.25 MHz to 10 MHz
- Pulse repetition frequencies (PRF) and high-pulse repetition frequency (HPRF) Doppler: 500 Hz to 35,714 Hz
- Wall filter selections: 10 Hz to 500 Hz
- Adjustable Doppler gate size: 0.5 mm to 30 mm
- Doppler signal processing enables calculation of waveform statistics during real-time imaging
- Derived waveform Doppler trace function analyzes real-time or frozen Doppler spectrum for maximum velocity information. Waveform may be set to trace above baseline, below baseline, or both.
- Doppler CINE control feature: stores up to 30 seconds of Doppler data
- Sweep speed selections: up to 12
- Gain in one decibel increments: -30 dB to 30 dB
- Dynamic range in five decibel increments: 10 dB to 80 dB
- Doppler gain, scale, baseline, spectral invert, sweep speed, wall filter, edge, UltraArt universal image processing, grayscale map, colorization (tint) map, flow angle correction, and dynamic range adjustment on real-time or frozen images
- Adjustable audio volume with different levels and a mute control: up to 21 levels
- Optimization of scale, baseline, gain and/or dynamic range selected manually or upon entering freeze
- Pulsed wave Doppler tissue imaging available for all cardiac and fetal echo image presets on vector and curved array transducers

Continuous Wave Doppler Features

- Fast Fourier Transformation (FFT) processing: up to 256 points
- FFT speed: up to 2,880 FFTs per second
- User-selectable transmit frequencies per transducer: up to 2
- Simultaneous 2D-mode and Doppler display
- User-selectable Doppler update mode
- User-adjustable Doppler scale and baseline position controls
- User-adjustable Doppler UltraArt universal image processing and edge controls
- Angle correction in one-degree increments: 0° to 89°
- Flow angle correction on real time or frozen images, with velocity readout update
- Transmit frequencies: 1.8 MHz to 5.0 MHz
- Pulse repetition frequencies (PRF): 2,000 Hz to 50,000 Hz
- Wall filter selections: 40 Hz to 1,000 Hz
- Doppler CINE control feature: up to 30 seconds of Doppler data can be stored
- Sweep speed selections: up to 12
- Gain in one decibel increments: -30 dB to 30 dB
- Dynamic range in five decibel increments: 10 dB to 80 dB
- Doppler gain, scale, baseline, spectral invert, sweep speed, wall filter, edge, UltraArt universal image processing, grayscale map, colorization (tint) map, flow angle correction, and dynamic range adjustment on real time or frozen images
- Adjustable audio volume with different levels and a mute control: up to 21 levels
- Automatic optimization of scale, baseline, gain and/or dynamic range selected manually or upon entering freeze

M-Mode Features

- Independent controls for M-mode gain and sweep speed
- Dynamic range display in one decibel increments: 10 dB to 80 dB
- Gain in one decibel increments: -20 dB to 20 dB
- Sweep speed selections: 8 mm/s to 200 mm/s
- User-selectable transmit frequencies: up to 14.0 MHz
- User-selectable edge enhancement selections: up to 5
- Maps: up to 7
- Tints: up to 10
- Anatomical M-mode for the cardiac image preset supports visualization of an M-mode sweep by rotating the M-mode cursor off axis

Imaging Features

Cardiac Imaging

- Includes the physio module
- Enables cardiac imaging functions

Cardiac Volume Imaging

- Acquires and enables simultaneous viewing of three-dimensional images in real-time for assessing motion
- Enables the cardiac volume imaging function from the control panel
- Supports 2D and color in combination with 4D imaging
- Rendering methods: surface
- Requires the compatible transducers: 5Z1, Z6T

  Supported image presets: Cardiac
- Requires the compatible transducers: AcuNav Lumos 4D ICE

  Supported image presets: Intracardiac

Harmonics

- Available for all imaging transducers
- Harmonic transmit frequencies per transducer: up to 4

Compounding

- 2D image optimization technique for enhanced viewing of tissue differences by detection of subtle lesions and enhanced tissue differentiation

Biopsy

- Available for transducers compatible with needle guide attachments

See also: For information on transducer accessories, refer to Chapter 3 in this manual.

Tissue Equalization (TEQ) Technology

- Optimizes the overall field of view (FOV) image brightness uniformity by changing the depth gain compensation and overall gain
- Supports 2D-mode, 4D cardiac volume, and spectral Doppler imaging
- Auto Tissue Equalization Optimization continuously applies the TEQ technology to a 2D-mode image

UltraArt Universal Image Processing

- Reduces speckle and enhances contrast to provide a realistic tissue presentation and patient-specific processing that adapts to differences in tissue

Clarify Technology

- Available in combination with 2D-mode, the 2D-mode image in Doppler, compounding, and harmonics
- Clarify can decrease artifacts in the 2D-mode image, resulting in an improved view of anatomical structures. Decreased artifacts can enhance definition of both tissue and vessel walls by increasing contrast resolution and improving boundary detection. Clarify uses flow information to eliminate noise and reverberation from vessels.

Speed of Sound

- Optimizes the 2D image by adjusting the speed of sound
- Available speed of sound values are dependent on the active image preset

Auto IMT

- Detects and measures the posterior carotid intima-media thickness on a user-positioned region of interest
- Measures the maximum intima-media thickness and average intima-media thickness of the carotid artery

Modality Compare

- Displays images from a previous exam side-by-side with images from the current exam
- Supported modalities for previous exams
  - Mammography
  - Computed tomography
  - Magnetic resonance imaging
  - Ultrasound

Clips

- Prospective capture of motion image data
- Retrospective capture of motion image data
- (Available only during Stress Echo) Continuous capture of motion image data
- Acoustic Rate Capture
- Variable clip length (1 to 300 seconds)
- Clip formats
  - Compressed JPEG Lossy
  - Uncompressed Clips
  - AVI and JPEG
  - DICOM
- Supports storing of individual images within clips

Protocols

A protocol is a predefined checklist that guides you through a clinical workflow.

- Define protocol views that include an image or clip with measurements and annotations
- Change the sequence of views during a protocol
- Pause and resume a protocol
- Activate a clinical application program during a protocol
- Create new protocols or modify existing protocols
- Import or export protocols using a USB storage device

DICOM

- DICOM 3.0 standard

Virtual Workstation

- Provides remote access to your facility's archival and information system using a virtual workstation on the ultrasound system
- Includes connection options for a web browser connection or a remote desktop session

Measurements, Calculations, and Reports

The measurement function is available during a patient exam or with stored images. Each measurement label supports up to 25 measurements. The ultrasound system copies only the five most recently labeled measurements to the report.

General Functions

- 2D-mode and M-mode have unlimited sets of measurement markers per image for distance measurements
- Doppler has unlimited sets of measurement markers per image for velocity measurements
- Label then measure or measure then label workflow for individual labels
- Customizable measurement packages: up to 30
- Customizable reports

See also: For additional information about general measurements and calculations, refer to the measurement chapters in this manual.

General 2D-mode Measurements and Calculations

- Distance
- Depth
- Angle
- Circumference
- Area
- Volume
- Stenosis
- Volume flow
- Ratio calculations

General M-mode Measurements and Calculations

- Distance
- Depth
- Heart rate
- Slope
- Time

General Doppler Measurements and Calculations

- Measurements on a frozen or CINE image including velocity
- Heart rate
- Heart cycle
- Systolic/diastolic ratio
- Resistive index
- Pulsatility index
- Time averaged velocity
  - Time averaged mean velocity
  - Time averaged maximum velocity
- Acceleration
- Time
- Doppler statistics (system-generated waveform trace) for real-time and CINE display of Doppler spectral measurements and calculations, including PS, ED, S/D, PI, RI, TAMx, TAMn
- Ratio calculations (two velocity measurements)

Exam-specific Measurements and Calculations

The measurement function is arranged by exam package and is available for use with all exam packages. All exam packages support the following measurement and report features.

- All general measurements and calculations
- Exam-specific patient report (editable)

See also: For information about exam-specific measurements and calculations, refer to the measurement chapters in this manual.

Auto Calcs Software

- Provides area, volume, and maximum diameter measurements using a border detection algorithm on a user-defined region of interest
- Can be used wherever manual trace is available

Wireless Data Transfer

- Enable wireless capabilities on the ultrasound system

Storage and Archiving

The ultrasound system supports data storage and review of completed ultrasound studies, including static images, dynamic clips, measurements, calculations, and reports.

Mobility

- Hibernate decreases the time to power on and off the ultrasound system. The system is ready for use in approximately 40 seconds.
- Compact and lightweight industrial design
- Steering handle for portability and maneuvering
- Rear handle for repositioning the ultrasound system
- Four locking swivel wheels
- Transducer holders and cable management
- Tilt-down monitor
- Locking arm for monitor
- Locking control panel

Maximum Physical Dimensions

Width:	60 cm
Height:	120 cm to 175 cm
Depth:	94 cm to 108 cm Minimum depth for storage: 108 cm
Weight:	125 kg (276 lb.) Not to exceed 155 kg (341 lb.) The weight of the system is based on the system unpacked and ready for connecting transducers and using in a patient examination. The weight includes documentation devices, such as printers, installed on the system.

User-Accessible Connections

- USB ports on the left side of touch screen for importing and exporting protocols and exams, archiving, and serviceability (quantity 2)
- USB ports on the input/output panel for peripheral devices (quantity 4)
- DC power sockets on the input/output panel for on-board peripherals (quantity 2)
- DC power sockets on each side the control panel for the gel warmer (quantity 2)

See also: Input and Output Signals for Audio, Video, and Data Transmission Connections, page A-44

Operator Control Panel

- Backlit controls and keys
- Control panel adjustment for standing and sitting positions
  - Left/right swivel: ±90°
  - Range of height: 76 cm to 99 cm
- Control panel text available in: English, German, French, Spanish, Italian
- Control panel layout supports ambidextrous operation
- Touch screen
  - Control panel with orange backlighting
    - 33.782 cm (13.3 inch) diagonal widescreen
    - Variable tilt angle: 30° to 60°
  - Full high-definition video
  - Touch screen for use with gloved hands

Monitor

- Monitor with a luminance sensor
  - 23.8-inch diagonal
  - Dual-layer display technology
  - Wide color gamut with White Light Emitting Diode (WLED) technology
  - Built-in Grayscale Standard Display Function (GSDF) capability
  - Integrated luminance sensor for monitor calibration
  - Supports QAWeb for providing quality assurance, DICOM calibration, asset management, and reports
- Full high-definition video display
  - 16:9 widescreen format
  - 1920×1080 resolution
  - 1024×768 image screen capture for images and reports
  - High contrast ratio
  - Uniformity across a range of environmental lighting and viewing angles
  - Reduced glare in all working environments
- Adjustable position
  - Height: 139 cm to 173 cm
  - Tilt: +90° forward and -15° backward
  - Swivel: ±45° left and right
  - Lateral adjustment using the adjustable arms: ±360° around the system
- Transport position
  - Monitor folded down
  - Locks secure the top and bottom adjustable arms in the center position

Transducer Technology and Design Attributes

- Multi-D array transducer technology
- Lightweight, ergonomic transducer design
- Touch screen and gesture transducer selection
- Four array transducer ports
- One auxiliary continuous wave transducer port
- Compact-pinless connectors
- Storage bin for transducer connectors
- Transducer holders for all transducer designs and gel bottle storage
- Gel warmer
- Virtual format imaging
- User-adjustable display depth: transducer dependent (0.5 cm to 55 cm)

Transducer	Maximum Display Depth (cm)
7L2	20
10L4	14
14L5	8
DAX	55
5C1	40
9C2	30
4V1	30
5V1	30
5Z1	30
8V3	24
10V4	14
Z6T	26
AcuNav Lumos 4D ICE	16
CW2	N/A
CW5	N/A

N/A = not applicable

- Range of operating frequencies

Transducer	2D-mode	Doppler
7L2	2.2 MHz - 7.5 MHz	2.65 MHz - 5.0 MHz
10L4	3.5 MHz - 8.5 MHz	4.0 MHz - 7.3 MHz
14L5	5.5 MHz - 11.5 MHz	5.3 MHz - 7.3 MHz
DAX	1.1 MHz - 3.0 MHz	1.25 MHz - 2.2 MHz
5C1	1.4 MHz - 4.5 MHz	1.4 MHz - 4.0 MHz
9C2	2.0 MHz - 7.0 MHz	2.5 MHz - 4.5 MHz
4V1	1.5 MHz - 4.3 MHz	1.8 MHz - 3.3 MHz
5V1	1.33 MHz - 3.7 MHz	1.5 MHz - 3.5 MHz
5Z1	1.29 MHz - 2.5 MHz	2.0 MHz – 3.1 MHz
8V3	2.3 MHz - 8.0 MHz	2.5 MHz - 6.5 MHz
10V4	4.0 MHz - 8.7 MHz	4.0 MHz - 7.3 MHz
Z6T	2.6 MHz - 5.8 MHz	3.33 MHz - 5.0 MHz
AcuNav Lumos 4D ICE	4.0 MHz - 8.3 MHz	4.0 MHz - 6.0 MHz
CW2	---	2.0 MHz
CW5	---	5.0 MHz

  – 2D-mode includes fundamental and harmonic imaging, without contrast
  – Doppler includes pulsed wave, pulsed wave Doppler tissue imaging, continuous wave, and color imaging

Accessories and Options

⚠ **WARNING:** Accessory equipment connected to the analog and digital interfaces must be certified according to the respective EN or IEC standards (for example, EN 60950 or IEC 60950 for data processing equipment and EN 60601-1 or IEC 60601-1 for medical equipment). Anyone who connects additional equipment to any of the signal input or signal output ports configures a medical system and is therefore responsible that the system complies with the requirements of the system standards EN 60601-1 or IEC 60601-1. Siemens Healthineers can only guarantee the performance and safety of the devices listed in the *Instructions for Use*. If in doubt, consult the Siemens Healthineers service department or your local Siemens Healthineers representative.

⚠ **WARNING:** You must only use the transducers, accessories, cables, and replacement parts for internal components specified by Siemens Healthineers to reduce the risk of increased RF (radio frequency) emissions or decreased immunity of the ultrasound system.

The Siemens Healthineers-authorized accessories and options for your ultrasound system are listed in this chapter. The available options depend on the licenses purchased for your ultrasound system.

For information about the combinations of options available for purchase, contact your Siemens Healthineers representative.

Note: To ensure compliance with the Medical Device Regulations, use only the devices listed in this chapter with your ultrasound system.

Language-Specific Operating System

Includes the operating and general imaging system software and system user and reference manuals.

- English Language Operating System
- International English Language Operating System
- German Language Operating System
- French Language Operating System
- Spanish Language Operating System
- Italian Language Operating System

List of Available Options

Optional features are available as upgrades for your ultrasound system.

Optional Features

	Ultrasound System
Feature	**ACUSON Origin**
2D Heart AI	○
2D Heart+ AI	✓
4D Heart AI	✓
Advanced Power	✓
Advanced Rendering	NA
AI Assist	✓
AI Measure	✓
Auto OB Measurements	✓
Auto Doppler	✓
Cardiac Imaging	●
Cardiac Volume Imaging	●
Cardiac Workflow	✓
Contrast Agent Imaging	✓
Directional Power	○
Dynamic MultiHertz (AutoHz Color)	○
Gesture Detection for Transducers	○
Panoramic Imaging	○
Protocol Workflow	○
Stress Echo	✓
Virtual Workstation	✓
Wide FOV	○

● = included at purchase

○ = included at purchase in the United States of America, available as an option at purchase or upgrade in other regions

✓ = available as an option at purchase or upgrade

NA = not available as an upgrade

Stress Echo Option

- Requires the cardiac imaging option
- Acquires cardiac clips for multiple-stage 2D stress echo protocols and review
- Supports acquisition of any stage or view in any sequence during a protocol
- Supports adding stages and views during a stress echo study
- Captures all imaging modes and contrast enhanced ultrasound imaging
- Compatible transducers: 5V1, 8V3, 10V4, 5Z1, CW2

  Supported image presets: Cardiac

3D Measurements Option

- Supports tools for projecting measurements on 3D volumes
- Compatible transducers: 5Z1, Z6T

  Supported image presets: Cardiac

AI Measure Option

- Accelerates the workflow for performing cardiac measurements by reducing keystrokes for supported measurement labels
- Available during 2D-mode, M-mode, continuous wave (CW) Doppler, pulsed wave (PW) Doppler, or PW Doppler Tissue Imaging (DTI)
- Compatible transducers: 5V1, 8V3, 10V4, 5Z1, Z6T

  Supported image presets: Cardiac

ICE (Intracardiac Echo) Imaging Option

- Refines the volume imaging workflow for intracardiac echo
- Requires the following accessories:
  - SwiftLink Lumos catheter connector (with instructions for use)
  - Sterile covers for the catheter connector
- Compatible transducers: AcuNav Lumos 4D ICE

  Supported image presets: Intracardiac

SwiftLink Lumos Catheter Connector Option

- Reusable connector
- Connects the ultrasound catheter to the ultrasound system
- Compatible transducers: AcuNav Lumos 4D ICE

2D Heart AI Options

⚠ **WARNING:** This feature uses ultrasound data collected prior to analysis. The quality of the data collected and used as input could have an effect on the output of this feature. Variability in ultrasound system performance, operator technique, patient characteristics, and other factors may affect the output. At all times, the clinician is advised to carefully review the output and confirm the information presented with clinical judgment and any other relevant sources of data.

- Requires the cardiac imaging option
- Detects, traces, and analyzes endocardial contours (borders) on 2D clips of the heart chambers for assessing myocardial motion and mechanics
- Compatible with contrast agent imaging for left ventricle opacification (LVO)
- Compatible transducers: 5V1, 8V3, 10V4, 5Z1

  Supported image presets: Cardiac

2D Heart AI

- Performs heart volume measurements using 2D-mode data from two-image frames
- Detects, contours, and analyzes the left ventricle (LV), right ventricle (RV), left atrium (LA), and right atrium (RA)
- Detects and analyzes end diastole (ED) and end systole (ES) and display ED-ES images in a side-by-side format
- Includes methods for manually tracing the contours of the heart chambers
- Provides a results summary

2D Heart+ AI

- Includes 2D Heart AI
- Detects the apical four, two, and three chamber views (A4C, A2C, A3C)
- Detects, contours, and analyzes the left ventricle (LV), right ventricle (RV), left atrium (LA), and right atrium (RA)
- Tracks the contours the left ventricle (LV) and left atrium (LA) throughout the cardiac cycle
- Analyzes and compares up to three clips
- Provides a tracking results summary, curve graph, and bullseye plot based on every frame in the cardiac cycle

4D Heart AI Option

⚠ **WARNING:** This feature uses ultrasound data collected prior to analysis. The quality of the data collected and used as input could have an effect on the output of this feature. Variability in ultrasound system performance, operator technique, patient characteristics, and other factors may affect the output. At all times, the clinician is advised to carefully review the output and confirm the information presented with clinical judgment and any other relevant sources of data.

- Requires the cardiac imaging option
- Supports multiple heart cycles or single beat
- Supports the visualization of the left ventricle and left atrium and quantitative analysis of ejection fraction, volumes, and mechanical dyssynchrony
  - Traces the endocardial surface from the entire volume and displays the contours on multiple reference planes for calculating volume measurements, such as ejection fraction, end-diastole, and end-systole
- Supports visualization of the right ventricle and right atrium for evaluation and quantification of size and function
  - Includes ejection fraction, end diastolic, and end diastolic volume calculations
  - Measurement results are available as a graph for measurements over time, a bullseye plot with graphical representation of the heart, or in a tracking results summary
  - Available for transthoracic (TTE) volumes and transesophageal echocardiography (TEE) volumes in 2D-mode or in 2D-mode and color
  - Supported in apical and short axis views, tracking in review, and physio
- Compatible transducers: 5Z1, Z6T

  Supported image presets: Cardiac

Contrast Agent Imaging Option

Note: At the time of publication, the United States Food and Drug Administration has cleared ultrasound contrast agents only for use in left ventricular opacification to improve the delineation of the left ventricular endocardial border, liver for lesion characterization in adult and pediatric patients, and vesicoureteral reflux (VUR) in pediatric patients. Check the current regulation for the country where you are using this ultrasound system for contrast agent clearance.

- Supports the following contrast agent destruction techniques:
  - Burst or Flash
  - Flash Sequencing
- Real time, low Mechanical Index technique for contrast agent imaging
- Compatible transducers: 7L2, 10L4, 14L5*, DAX, 5C1, 9C2, 4V1, 5V1, 5Z1, 8V3, 10V4

  Note: Transducers indicated with an asterisk (*) are not compatible with contrast agent imaging in the United States of America.

Auto OB Measurements Option

- Provides system-generated measurements of crown rump length, biparietal diameter, head circumference, abdominal circumference, femur length, humerus length, and occipital frontal diameter
- Supports biparietal diameter outer-to-outer or outer-to-inner measurements

Auto Doppler Option

- Uses Doppler signals detected from within the color region of interest (ROI) to identify the vessel with the most prominent flow and provide system-generated Doppler steering and angle corrections.
- During 2D-mode with color, the system repositions and steers the color region of interest (ROI) in the center of the detected vessel.
- During 2D-mode with color and pulsed wave Doppler, the system repositions and steers the color region of interest (ROI) and repositions and adjusts the angle of the Doppler gate in the center of the detected vessel and performs angle correction for the flow in that vessel.
- Available during color Doppler, pulsed wave Doppler, and color Doppler in combination with pulsed wave Doppler
- Compatible transducers: 10L4

  Supported image presets: Arterial, Carotid

AI Assist Option

- Positions and sizes a color region of interest (ROI) and/or Doppler gate and Doppler cursor for a selected cardiac view and anatomy area during a transthoracic echocardiogram (TTE)
- Available during 2D-mode with color, pulsed wave (PW) Doppler, continuous wave (CW) Doppler, or color Doppler in combination with PW Doppler or CW Doppler
- Supported cardiac views: PLAX, PLAX-RVIT, PLAX-RVOT, A2C, A3C, A4C, A5C, PSAX, PSAX-AV, Suprasternal, Subcostal-4C, Subcostal-IVC
- Supported anatomy areas (restricted by cardiac view): MV, TV, AV/LVOT, PV/RVOT, MV+AV, PulmV, IVC, IVS, IAS, LV, Desc Ao
- Compatible transducers: 5V1, 5Z1, 8V3

  Supported image presets: Cardiac

Panoramic Imaging Option

- Panoramic images may be created up to 60 cm in length and up to 360° when the depth is less than the radius of the target area being scanned
- CINE display of frame-by-frame review of individual data frames within the panoramic image
- On-screen reference and speed indicators enhance imaging technique
- Reverse during acquisition
- Zoom and pan capabilities
- Compatible with UltraArt universal image processing
- Color Panoramic imaging is a combination of real-time panorama imaging and real-time power mode acquisition. All power information is preserved during image acquisition, and the peak of the signal is saved for the color panoramic image.

Wide FOV Option

- Expands the width of the acquisition field of view (FOV) from 70° to 100°
- Supports 2D-mode
- Compatible transducers: 5C1

Retractable Keyboard Option

- Language-specific alphanumeric keyboard available in: English, German, French, Spanish, Italian, Danish, Finnish and Swedish, Norwegian

Footswitch Option

- Configurable three-pedal footswitch
- Attaches to a USB port on the ultrasound system

Smart Card Reader Option

- Attaches to a USB port on the ultrasound system
- Requires connecting the ultrasound system to a Microsoft Active Directory domain controller
- The ultrasound system supports the following smart card readers:
  - HID OMNIKEY 3021 USB Reader*
  - HID OMNIKEY 3121 USB Desktop Reader*
  - Identiv SCR3310v2.0 USB Smart Card Reader*
  - Gemalto IDBridge CT30 Smart Card Reader*

*Not available from Siemens Healthineers.

Printer Option

- Black and white printer assembly, UP-D898DC, Sony
- Print media, UP-D898DC thermal printer paper

Off-board Documentation Devices

- Black and white printer, UP-X898MD, Sony
- Color printer, UP-D25MD, Sony

DVD/CD Optical Drive Option

⚠ **Caution:** Use only disc media brands qualified by Siemens Healthineers. You may have problems storing data to or retrieving data from disc media not qualified by Siemens Healthineers.

- Recordable disc drive for storage, review, and archival of patient and image data
- Compatible with medical-grade digital video disc (DVD) media
- Disc media
  - The combination drive supports the following media: DVD-R, DVD-RW
  - The following media brands are recommended for use with the combination drive: Panasonic, TDK, Maxell, Verbatim M Disc

Protective Overlay Option

- Protective overlay for avoiding possible contamination
- Includes protective overlays for the control panel, the rotary controls, and the touch screen

Rear Accessory Tray Option

- Provides additional on-board storage
- Attaches to the accessory shelf

Gel Warmer Option

- Continuously warms a bottle of gel when the ultrasound system and gel warmer are powered on
- Connects to the ultrasound system in place of a transducer holder and with a power cable

Large Gel Holder Option

- Stores large bottles of gel in place of a transducer holder

Leakage Current Tester Option

- Required for testing a transesophageal transducer prior to each use
- Measures the leakage current of a transesophageal transducer independent of an ultrasound system
- Includes an ultrasound transducer adapter
- Requires an ultrasound transducer electrical leakage tester, a test basin, a conductivity probe, and leakage tester manufacturer's instructions for use

Universal Video Converter Option

Converts digital video signals from the ultrasound system to analog video signals to support an external display device. Includes the following cables:

- Universal AC/DC power adapter and cable
- DisplayPort-to-DVI video cable

Physio Module Option

- Includes the ECG function, which contains the ECG cable and leads
  - Auxiliary cable for the physio module
  - ECG leads, standard U.S.A.
  - ECG leads, standard European

Remote Services Option

- Enables a Siemens Healthineers representative to remotely view and control your system
- Requires using the phone number provided by your Siemens Healthineers representative to initiate remote assistance. The representative guides you through the communication session.

Transducer Options

Refer to the following table to identify transducers compatible with your ultrasound system.

Options	Description
Transducers, Curved Array	▪ 5C1 ▪ DAX ▪ 9C2
Transducers, Linear Array	▪ 7L2 ▪ 10L4 ▪ 14L5
Transducers, Phased Array	▪ 4V1 ▪ 5V1 ▪ 5Z1 ▪ 8V3 ▪ 10V4 ▪ Z6T ▪ AcuNav Lumos 4D ICE
Transducers, Continuous Wave (CW)	▪ CW2 ▪ CW5
Transducer Accessories (Reusable bracket and disposable needle guides)	▪ Verza Guidance System – Biopsy and Fusion needle guide set, 7L2 – Biopsy and Fusion needle guide set, 10L4 – Biopsy and Fusion needle guide set, 5C1 – Biopsy and Fusion needle guide set, 9C2 – Biopsy and Fusion needle guide set, DAX – Biopsy needle guide set, 14L5

Disposables and Consumables

- Needle guides
- ECG electrode patches
- Auxiliary cable for the physio module
- Ultrasound coupling agent (gel)
- Transducer sheaths (transducer covers)
- Single-use sterile ultrasound catheters
- Sterile catheter connector covers
- Distal tip protector for transesophageal transducers
- Bite guards
- Cleaning and disinfecting products, including solutions, wipes, and gauze pads
- Removable media, for example, disc media and USB storage devices
- Printer paper
- Shipping containers
- Packing materials
- Protective overlay for the control panel
- Rear accessory tray

User-Accessible Cables

Cable Type	Shielded	Length (m)	Ferrite
AC mains input (system power)	No	≤ 4.5 m	No
USB (8 each)	Yes	2.0 m	No
DisplayPort	Yes	1.0 m	Yes
Footswitch, Kinesis	Yes	2.8 m	No
Footswitch, Whanam FSU3000S	Yes	≤ 3.0 m	No
Gel warmer	No	≤ 0.3 m	No
Black and white printer (DC type)			
Power cable (DC input)	Yes	≤ 0.7 m	No
USB cable	Yes	≤ 0.6 m	No
Black and white printer (AC type)			
Power cable (AC input)	No	≤ 2.75 m	No
USB cable	Yes	≤ 2.0 m	No
Color printer (AC type)			
Power cable (AC input)	No	≤ 2.75 m	No
USB cable	Yes	≤ 2.0 m	No
DVD/CD optical drive			
Power cable (DC input)	No	≤ 0.7 m	No
USB 3.0 cable	Yes	≤ 1.1 m	No
ECG cable	Yes	≤ 4.15 m	No
Transducer cables			
7L2	Yes	≤ 2.2 m	Yes
10L4	Yes	≤ 2.3 m	Yes
14L5	Yes	≤ 2.3 m	Yes
DAX	Yes	≤ 2.9 m	Yes
5C1	Yes	≤ 2.3 m	Yes
9C2	Yes	≤ 2.2 m	Yes
4V1	Yes	≤ 2.3 m	Yes
5V1	Yes	≤ 2.2 m	Yes
5Z1	Yes	≤ 2.2 m	Yes
8V3	Yes	≤ 2.3 m	Yes
10V4	Yes	≤ 2.0 m	No
Z6T	Yes	≤ 1.9 m	Yes
AcuNav Lumos 4D ICE	Yes	≤ 2.78 m	Yes
CW2	Yes	≤ 2.3 m	Yes
CW5	Yes	≤ 2.2 m	Yes
Transducer components			
SwiftLink Lumos Catheter Connector, micro-pinless	Yes	≤ 2.5 m	Yes
Universal video converter			
Universal AC/DC power adapter and cable	No	≤ 1.75 m	No
DisplayPort-to-DVI video cable	Yes	≤ 1.0 m	Yes

Measurement Range and Accuracy

The following tables describe the variability in accuracy for clinical measurements.

Clinical Measurements: Range and Accuracy

The ultrasound system utilizes the selected speed of sound for all measurements. When the speed of sound is adjusted or an image preset is used with a different speed of sound, the anatomy measured at a different speed of sound produces different measured results. However, the following ranges and accuracy apply to all speeds of sound.

Direct Measurement	Range	Accuracy
Distance (all transducers except the AcuNav Lumos 4D ICE catheter)	0 cm – 40 cm	3% of the distance or 1.5 mm; whichever is greater assuming 1,540 m/sec speed of sound. Does not apply to trace tool.
Distance (AcuNav Lumos 4D ICE catheter)	0 cm – 22 cm	5% of the distance or 4 mm; whichever is greater assuming 1,540 m/sec speed of sound. Does not apply to trace tool.
Distance using extended field of view	0 cm – 27.5 cm	Linear transducer: 5% of the distance or 2.5 mm; whichever is greater assuming 1,540 m/sec speed of sound. Curved transducer: 8% of the distance or 2.5 mm; whichever is greater assuming 1,540 m/sec speed of sound.
Angle	0° – 180°	±2° assuming the intersecting line is a minimum of 1 cm.
M-mode Distance	0 cm – 40 cm	3% of the distance or 1.5 mm; whichever is greater assuming 1,540 m/sec speed of sound.
Trace Distance	0 cm – 139 cm	5% of the distance or 6 mm; whichever is greater, assuming minimal operator error in tracing the desired object and assuming 1,540 m/sec speed of sound.
Trace Circumference	0 cm – 139 cm	5% of the circumference or 6 mm; whichever is greater, assuming minimal operator error in tracing the desired object and assuming 1,540 m/sec speed of sound.
Trace Area (all transducers except the AcuNav Lumos 4D ICE catheter)	0 cm^2 – 1170 cm^2	6% of the area or 1.5 cm^2; whichever is greater, assuming minimal operator error in tracing the desired object and assuming 1,540 m/sec speed of sound.
Trace Area (AcuNav Lumos 4D ICE catheter)	0 cm^2 – 200 cm^2	10% of the area or 6.4 cm^2; whichever is greater, assuming minimal operator error in tracing the desired object and assuming 1,540 m/sec speed of sound.
Time	0 sec – 9.0 sec	Less than ±1% of the sweep speed or ±10 msec, whichever is greater.
Velocity	1 cm/sec – 2000 cm/sec	10% of the velocity or 5 cm/s; whichever is greater using a calibrated flow phantom.

2D-Mode Measurements

2D-mode Measurements	Range or Formula	Minimum Value	Maximum Value
Distance	0 cm – 40 cm	D-Tol(D)	D + Tol(D)
Distance Ratio	D1/D2	(D1-Tol(D1))/(D2+Tol(D2))	(D1+Tol(D1))/(D2-Tol(D2))
Mean Distance	(D1+D2+D3)/3	(D1-Tol(D1)+D2-Tol(D2)+ D3-Tol(D3))/3	(D1+Tol(D1)+D2+ Tol(D2)+D3Tol(D3))/3
Ellipse Circumference	$\pi\{1/2[D1^2+D2^2]\}^{1/2}$	$\pi\{1/2[(D1-Tol(D1))^2+ (D2-Tol(D2))^2]\}^{1/2}$	$\pi\{1/2[(D1+Tol(D1))^2+ (D2+Tol(D2))^2]\}^{1/2}$
Ellipse Area	$\pi(D1)(D2)/4$	$\pi(D1-Tol(D1))(D2-Tol(D2))/4$	$\pi(D1+Tol(D1))$ $(D2+Tol(D2))/4$
Trace Area	0 cm^2 – 1170 cm^2	A-Tol(A)	A+Tol(A)
% Stenosis by Area	100(A1-A2)/A1	100(A1-Tol(A1)-A2- Tol(A2))/(A1+Tol(A1))	100(A1+Tol(A1)- A2+Tol(A2))/(A1-Tol(A1))
% Stenosis by Diam.	100(D1-D2)/D1	100(D1-Tol(D1)-D2- Tol(D2))/(D1+Tol(D1))	100(D1+Tol(D1)- D2+Tol(D2))/(D1-Tol(D1))
Amniotic Fluid Index	AFI=D1+D2+D3+D4	D1-Tol(D1)+D2-Tol(D2)+ D3-Tol(D3)+D4-Tol(D4)	D1+Tol(D1)+D2+Tol(D2)+ D3+Tol(D3)+D4+Tol(D4)
Strain Ratio	M_{ROI1}/M_{ROI2}	---	---

Legend

Abbreviation	Definition
D	Distance
Tol	Tolerance
A	Area
AFI	Amniotic Fluid Index
MROI	Mean strain in a region of interest

Doppler Measurements

Doppler Measurements	Range or Formula	Minimum Value	Maximum Value
Velocity	1 cm/sec – 2000 cm/sec	V-Tol(V)	V+Tol(V)
Time Averaged Maximum Velocity; TAMx	$(MxVel_1+MxVel_2+\ldots+MxVel_N)/N$	$(MxVel_1-Tol(MxVel_1)+MxVel_2-Tol(MxVel_2)+\ldots+MxVel_n-Tol(MxVel_n))/N$	$(MxVel_1+Tol(MxVel_1)+MxVel_2+Tol(MxVel_2)+\ldots+MxVel_n+Tol(MxVel_n))/N$
Time Averaged Mean Velocity; TAMn	$(MnVel_1+MnVel_2+\ldots+MnVel_N)/N$	$(MnVel_1-Tol(MnVel_1)+MnVel_2-Tol(MnVel_2)+\ldots+MnVel_n-Tol(MnVel_n))/N$	$(MnVel_1+Tol(MnVel_1)+MnVel_2+Tol(MnVel_2)+\ldots+MnVel_n+Tol(MnVel_n))/N$
Time Averaged Mode Velocity; TAMd	$(MnVel_1+MnVel_2+\ldots+MnVel_N)/N$	$(MdVel_1-Tol(MdVel_1)+MdVel_2-Tol(MdVel_2)+\ldots+MdVel_n-Tol(MdVel_n))/N$	$(MdVel_1+Tol(MdVel_1)+MdVel_2+Tol(MdVel_2)+\ldots+MdVel_n+Tol(MdVel_n))/N$
Resistivity Index	(PS-ED)/PS	(PS-Tol(PS)-ED-Tol(ED))/(PS+Tol(PS))	(PS+Tol(PS)-ED+Tol(ED))/(PS-Tol(PS))
Pulsatility Index	(PS-MD)/TAMx	(PS-Tol(PS)-MD-Tol(MD))/(TAMx+Tol(TAMx))	(PS+Tol(PS)-MD+Tol(MD))/(TAMx-Tol(TAMx))
Slope (Acceleration)	(V1-V2)/T	(V1-Tol(V1)-V2-Tol(V2))/(T+Tol(T))	(V1+Tol(V1)-V2+Tol(V2))/(T-Tol(T))
Systolic/Diastolic Ratio	S/D	(PS-Tol(PS))/(ED+Tol(ED))	(PS+Tol(PS))/(ED-Tol(ED))

Legend

Abbreviation	Definition
V	Velocity
sec	Seconds
Tol	Tolerance
T	Time
MxVel	Maximum velocity
N	Number of velocities averaged
MnVel	Mean velocity
MdVel	Mode velocity
PS	Peak systolic velocity
ED	End diastolic velocity
MD	Minimum diastole
S/D	Peak systolic velocity to end diastolic velocity calculation

M-Mode Measurements

M-Mode Measurements	Range or Formula	Minimum Value	Maximum Value
Distance	0 cm – 40 cm	D-Tol(D)	D+Tol(D)
Heart Rate	60 bpm – 240 bpm	N/Time for N beats - N/(Time for N beats+Tol(T)) N = 1, 2, 3, 4, or 5	N/Time for N beats - N/(Time for N beats-Tol(T)) N = 1, 2, 3, 4, or 5

Legend

Abbreviation	Definition
D	Distance
Tol	Tolerance
T	Time
N/Time for N beats	Number of heart beats/number of heart beats per minute
N = 1, 2, 3, 4, or 5	Number of heart beats = 1, 2, 3, 4, or 5

AI Measure Measurements

AI Measure includes a set of semi-automated cardiac measurements for 2D-mode, Doppler, and M-mode acquisitions. The AI Measure algorithm achieved an accuracy of 89.6% based on an acceptance criteria of pass or pass with edit. Testing datasets from different acquisition imaging modes provided an accuracy of 88.1% or higher.

Image datasets included the following parameters:

- 1,354 samples were collected from 392 images across 32 individual patient studies at five different institutions
- Samples include 15 measurement views from 2D-mode, Doppler, and M-mode acquisitions
- Samples were acquired using the following transducers: 5V1, 8V3, 10V4, 5Z1, Z6T
- Demographic distribution:
  - Age: 4 to 79 years
  - Gender: 44% female, 51% male, 5% unknown
  - Ethnicity/country: USA, Mexico
  - Body mass index (BMI): 14 to 41.2
    - 49% normal (BMI ≤25 kg/m²)
    - 51% overweight/obese (BMI >25 kg/m²)

2D-Mode Measurements

Measurement Label	Measurement Type	Range	Accuracy	Accuracy Without Edits
LV d				
LVID d	Distance	2.9 cm – 5.66 cm	5%	10%
LVPW d	Distance	0.54 cm – 1.22 cm	10%	15%
IVS d	Distance	0.48 cm – 1.28 cm	10%	15%
LV s PLAX	Distance	1.9 cm – 4.24 cm	5%	10%

M-Mode Measurements

Measurement Label	Measurement Type	Range	Accuracy	Accuracy Without Edits
Ao/LA	Distance	1.8 cm – 4.1 cm	5%	10%
LV	Distance	2.0 cm – 4.0 cm	5%	10%
IVS	Distance	0.7 cm – 1.2 cm	10%	15%
LVID d	Distance	3.3 cm – 5.6 cm	5%	10%
LVPW d	Distance	0.5 cm – 1.2 cm	15%	20%

Doppler Measurements

Measurement Label	Measurement Type	Range	Accuracy	Accuracy Without Edits
AoV Vmax	**Vmax**	0.7 m/sec – 4.74 m/sec	5%	10%
AoV VTI	**VTI**	15.4 cm – 106.8 cm	5%	10%
AR PHT	**Slope**	1.3 m/s² – 3.0 m/s²	15%	20%
DTI Lat	**Vmax**	3.2 m/sec – 18.9 m/sec	5%	10%
DTI Med	**Vmax**	3.4 m/sec – 15.0 m/sec	5%	10%
DTI RV	**Vmax**	4.3 m/sec – 23.5 m/sec	5%	10%
LVOT Vmax	**Vmax**	0.35 m/sec – 1.43 m/sec	5%	10%
LVOT VTI	**VTI**	6.63 cm – 31.6 cm	5%	10%
MR Vmax	**Vmax**	87.14 m/sec – 210.3 m/sec	5%	10%
MR VTI	**VTI**	2.6 cm – 6.6 cm	5%	10%
MV Inflow	**Vmax**	0.3 m/sec – 1.5 m/sec	5%	10%
	Time	129.7 ms – 501.0 ms	10%	15%
PV Vmax	**Vmax**	12.4 m/sec – 43.69 m/sec	5%	10%
PV VTI	**VTI**	0.47 cm – 2.1 cm	5%	10%
RVOT Vmax	**Vmax**	8.1 m/sec – 22.8 m/sec	5%	10%
RVOT VTI	**VTI**	0.4 cm – 0.9 cm	5%	10%
TR Vmax	**Vmax**	0.2 m/sec – 3.2 m/sec	5%	10%

Legend

Abbreviation	Definition
Ao/LA	Aorta/left atrium measurements
AoV Vmax	Aortic valve maximum velocity
AoV VTI	Aortic valve, velocity time integral
AR PHT	Aortic regurgitation, pressure half-time
DTI Lat	Doppler tissue imaging, lateral
DTI Med	Doppler tissue imaging, medial
DTI RV	Doppler tissue imaging, right ventricle
IVS d	Interventricular septum thickness, diastole
LV	Left ventricle measurements
LV d	Left ventricular, diastole measurements
LV s PLAX	Left ventricular, systole, parasternal long axis view
LVID d	Left ventricular internal dimension, diastole
LVOT Vmax	Left ventricular outflow tract, maximum velocity
LVOT VTI	Left ventricle outflow tract, velocity time integral
LVPW d	Left ventricular posterior wall, diastole
MR Vmax	Mitral regurgitation maximum velocity
MR VTI	Mitral regurgitation velocity time integral
MV Inflow	Mitral valve inflow
PV Vmax	Pulmonary valve maximum velocity
PV VTI	Pulmonary valve velocity time integral
RVOT Vmax	Right ventricular outflow tract, maximum velocity
RVOT VTI	Right ventricular outflow tract, velocity time integral
TR Vmax	Tricuspid regurgitation maximum velocity
Vmax	Maximum velocity
VTI	Velocity time integral

2D Heart AI Measurements

The accuracy of the 2D Heart AI algorithm with comparison of 2D Heart AI with edits by the user compared to a reference standard ground truth on a dataset has a Pearson correlation coefficient of 0.81 or higher with a minimal bias by Bland-Altman analysis of less than 5.2.

For subjects with a normal body mass index (BMI), the performance of the 2D Heart AI algorithm was 0.84 or higher. For subjects with a BMI of >25 kg/m² (obese), performance was greater than 0.82.

Image datasets included the following parameters:

- 90 images were extracted from 45 studies at five different institutions
- Image acquisition included different views (apical 2, 3, and 4 chamber views) with frame rates greater than 17 frames per second (fps)
- Contrast was used in 12 studies
- Samples were acquired using the following transducers: 5V1, 8V3, 10V4, 5Z1
- Demographic distribution:
  - Age: 42 to 74 years
  - Gender: 24% female, 76% male
  - Ethnicity/country: USA, Mexico
  - Body mass index (BMI): 18 to 36
    - 29% normal (BMI ≤25 kg/m²)
    - 71% overweight/obese (BMI >25 kg/m²)

Chamber	Measurement	Range	Accuracy	Accuracy Without Edits
LV	**EDV**	39.2 ml – 525.7 ml	10%	15%
	ESV	14.7 ml – 396.1 ml	10%	15%
	EF	21.2% – 71.0%	10%	15%
	GLS	-25.6% – -5.7%	8 percentage points	9 percentage points
LA	**ESV**	13.9 ml – 146.7 ml	10%	15%
	ES Axis	3.3 cm – 7.6 cm	10%	15%
	GLS	5.0% – 52.9%	9 percentage points	10 percentage points
RV	**GLS FW**	-5.6% – -34.3%	9 percentage points	10 percentage points
	FAC	9.7% – 42.4%	10%	15%
	EDA	9.0 cm^2 – 41.1 cm^2	10%	15%
	ESA	7.2 cm^2 – 31.8 cm^2	10%	15%
RA	**GLS**	3.7% – 65.9%	9 percentage points	10 percentage points
	ESV	6.6 ml – 102.4 ml	10%	15%
	ES Axis	2.8 cm – 6.4 cm	10%	15%

Legend

Abbreviation	Definition
EDA	End diastolic area
EDV	End diastolic volume
EF	Ejection fraction
ES Axis	End systolic major axis
ESA	End systolic area
ESV	End systolic volume
FAC	Fractional area change
GLS	Global longitudinal strain
GLS FW	Global longitudinal strain, free wall
LA	Left atrium
LV	Left ventricle
RA	Right atrium
RV	Right ventricle

4D Heart AI Measurements

The accuracy of the 4D Heart AI algorithm with comparison of 4D Heart AI with edits by the user compared to a reference standard ground truth on a dataset has a Pearson correlation coefficient of 0.87 or higher with a minimal bias by Bland-Altman analysis of less than 13.3.

For subjects with a normal body mass index (BMI), the performance of the 4D Heart AI algorithm was 0.98 or higher. For subjects with a BMI of >25 kg/m² (obese), performance was greater than 0.81.

Image datasets included the following parameters:

- 64 volumes were extracted from 32 studies at five different institutions
- Image acquisition included volume rates of greater than 13.4 volumes per second (vps)
- Samples were acquired using the following transducers:
  - 5Z1: 17 transthoracic echocardiograms (TTE) studies
  - Z6T: 15 transesophageal echocardiograms (TEE) studies
- Demographic distribution:
  - Age: 28 to 77 years
  - Gender: 32% female, 68% male
  - Ethnicity/country: USA, Mexico
  - Body mass index (BMI): 21 to 34
    - 15% normal (BMI ≤25 kg/m²)
    - 85% overweight/obese (BMI >25 kg/m²)

Chamber	Measurement	Range	Accuracy	Accuracy Without Edits
LV, LA, RV, RA	**EDV**	11.0 ml – 298.4 ml	10%	15%
	ESV	20.9 ml – 167.2 ml	10%	15%
	EF	9.0% – 69.0%	10%	15%
	GLS	-34.9% – 80.9%	9 percentage points	10 percentage points

Legend

Abbreviation	Definition
EDV	End diastolic volume
EF	Ejection fraction
ESV	End systolic volume
GLS	Global longitudinal strain
LA	Left atrium
LV	Left ventricle
RA	Right atrium
RV	Right ventricle

AI Assist

The AI Assist algorithm achieved an accuracy of 99.3% for placement of 12 views in up to four anatomy locations for each view, with a total of 42 supported placement locations. Testing on datasets from different scanning views provided an accuracy of 92% or higher for any placement location.

Image datasets included the following parameters:

- Cardiac views using either the 5V1 or 5Z1: 12
- Two patients included an additional 12 cardiac views using the 8V3
- For each case, 16 frames of data evenly spaced over 1 second were collected, for a total of 168 samples from 14 studies for 12 patients
- Samples were acquired using the following transducers:
  - 5V1: 72
  - 5Z1: 72
  - 8V3: 24
- Demographic distribution:
  - Age: 18 to 81 years
  - Gender: 17% female, 83% male
  - Ethnicity/country: USA
  - Body mass index (BMI): 17.7 to 30.9
    - 58% normal (BMI ≤25 kg/m²)
    - 42% overweight/obese (BMI >25 kg/m²)

System Requirements

Power Supply Requirements

Mains Voltage:	100V~ to 240V~
Maximum Current:	5.4 to 13.0 amps
Frequency:	50 to 60 Hz

Possible Combinations with Other Equipment

⚠ **WARNING:** Accessory equipment connected to the analog and digital interfaces must be certified according to the respective EN or IEC standards (for example, EN 60950 or IEC 60950 for data processing equipment and EN 60601-1 or IEC 60601-1 for medical equipment). Anyone who connects additional equipment to any of the signal input or signal output ports configures a medical system and is therefore responsible that the system complies with the requirements of the system standards EN 60601-1 or IEC 60601-1. Siemens Healthineers can only guarantee the performance and safety of the devices listed in the *Instructions for Use*. If in doubt, consult the Siemens Healthineers service department or your local Siemens Healthineers representative.

Only the peripheral devices listed in this chapter are approved for use with the ultrasound system. Any use of other devices with the system will be at the user's risk and may void the system warranty.

On-board peripheral devices must be installed by an authorized Siemens Healthineers representative or approved third party. Check with your sales representative.

Leakage Currents

⚠ **WARNING:** Connecting peripheral products and accessories from non-isolated sources may result in chassis leakage current exceeding safe levels.

Input and Output Signals for Audio, Video, and Data Transmission Connections

Port	Location	Example of Connection	Signal
RJ-45	On rear panel	Ethernet RJ45, 10BaseT/100BaseT/1000BaseT	Bi-directional
USB-A (four ports)	Input/output panel	Printer, footswitch, DVD/CD optical drive	Bi-directional
DisplayPort	Input/output panel	External monitor	Input
USB-A (two ports)	Left side of the touch screen	USB storage device	Bi-directional
ECG connector	Physio panel	ECG leads	Input
Aux connector	Physio panel	ECG external DC input	Bi-directional

Wireless Network Connections

The ultrasound system supports the following options for connection to wireless networks.

Network standard:	▪ 802.11a ▪ 802.11b ▪ 802.11ac ▪ 802.11g ▪ 802.11n
Frequency bandwidth:	▪ 2.4 GHz ▪ 5 GHz
Authentication:	▪ WPA ▪ WPA2 ▪ WPA PSK ▪ WPA2 PSK ▪ Open
Encryption:	▪ None ▪ TKIP ▪ AES
Extensible Authentication Protocol (EAP):	▪ PEAPv0 (PEAP-MSHCAPv2) ▪ TLS

Environmental Requirements

Electromagnetic Compatibility (EMC) Note: Operating the ultrasound imaging system in close proximity to sources of strong electromagnetic fields, such as radio transmitter stations or similar installations, as well as portable and mobile RF (radiated frequency) may lead to temporary degradation or interference visible on the monitor screen. A lightening of image background may be noticed while visualizing hypoechoic structures, or color spectral interference, or jitter, or horizontal lines in the image screen may occur. However, the device has been designed and tested to withstand such interference and will not be permanently damaged. Wait until the interference disappears or restart the ultrasound system.

Ultrasound System

	During Operation	During Storage or Transportation
Atmospheric pressure:	700 hPa to 1060 hPa	500 hPa to 1060 hPa
Relative humidity:	---	---
System with a luminance sensor on the monitor	20% to 80%, non-condensing	10% to 90%, non-condensing
Temperature:	---	---
System without a printer	+10°C to +40°C	-20°C to +60°C
System with a printer	+10°C to +35°C	-10°C to +60°C

Note: Print media, for example, printer paper, is excluded from the environmental requirements. Refer to the ranges included on the manufacturer's label.

Transducers

	During Operation	During Storage or Transportation
Atmospheric pressure:	---	---
All transducers, except AcuNav Lumos 4D ICE	700 hPa to 1060 hPa	500 hPa to 1060 hPa
AcuNav Lumos 4D ICE	---	Air freight only in pressurized cargo
Relative humidity:	---	---
All transducers, except AcuNav Lumos 4D ICE	10% to 80%, non-condensing	10% to 95%, non-condensing
AcuNav Lumos 4D ICE	---	Up to 90%, non-condensing
Temperature:	---	---
All transducers, except 5Z1, Z6T, AcuNav Lumos 4D ICE	+10°C to +40°C	-10°C to +50°C
5Z1, Z6T	+10°C to +35°C	-10°C to +50°C
AcuNav Lumos 4D ICE	---	Storage: 5°C (41°F) to 23°C (73.4°F) Transportation: -10°C (14°F) to +50°C (122°F)

Note: Needle guides are excluded from the environmental requirements. Refer to the ranges included on the manufacturer's label.

Protective Measures

Explosion protection: This product is not designed for operation in areas subject to explosion hazards.

System Classifications

- Type of protection against electrical shock:

  Class I, external powered
- Degree of protection against electrical shock:
  - Type BF applied part for linear, curved, and phased array transducers
  - Type BF defibrillation-proof applied part for ECG connections on the physio module
  - Type CF defibrillation-proof applied part for ECG connections on the physio module
  - Type CF defibrillation-proof applied part for the intracardiac ultrasound catheter
- Degree of protection against harmful ingress of water:

  Ordinary equipment
- 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
- Ingress protection levels:
  - Transducers: IPX8
  - Footswitch: IPX8

Standards Compliance

The diagnostic ultrasound system is in compliance with the following standards, including all applicable amendments at the time of product release.

Quality Standards

- FDA QSR 21 CFR Part 820
- EN ISO 13485 and ISO 13485
- ISO 9001

Design Standards

- ANSI/AAMI ES 60601-1
- CAN/CSA-C22.2 No. 60601-1
- EN 60601-1 and IEC 60601-1
- EN 60601-1-2 and IEC 60601-1-2 (Class A)
- EN 60601-1-6 and IEC 60601-1-6
- EN 60601-2-18 and IEC 60601-2-18
- EN 60601-2-37 and IEC 60601-2-37
- EN 62304 and IEC 62304
- EN 62366-1 and IEC 62366-1
- EN ISO 14971 and ISO 14971

Acoustic Output Standards

- IEC 62359, Test Methods for the Determination of Thermal and Mechanical Indices Related to Medical Diagnostic Ultrasonic Fields
- AIUM/NEMA UD-2, Acoustic Output Measurement Standard for Diagnostic Ultrasound Equipment
- AIUM/NEMA UD-3, Standard for Real-Time Display of Thermal and Mechanical Acoustic Output Indices on Diagnostic Ultrasound Equipment

Radio and Telecommunications Standards

- CFR 47 FCC Part 15.247
- CFR 47 FCC Part 15.107
- CFR 47 FCC Part 15.109
- ETSI EN 300 328
- ETSI EN 301 489-1
- ETSI EN 301 489-17
- ETSI EN 301 893

Appendix B Icons and Indicators

Overview **3**

System Status Indicators **3**

Network Connection Icons 3
Remote Service Icons 3
Remote Update Handling Icons 4
Recording Icons 4
Data Storage Space Indicators 4

Special Keyboard Characters **5**

Examples of Imaging Parameters and Settings **6**

Patient Information 6
General Settings 6
2D-mode Settings 7
Color Settings 7
Doppler Settings 8
M-mode Settings 8
Volume Imaging Settings 9
Contrast Settings 10

Overview

Refer to this appendix to identify icons and imaging parameters located on the ultrasound image screen, including how to access special characters on the retractable keyboard.

See also: For additional information about the image screen or touch screen, refer to Chapter 1 in this manual.

See also: For information about on-screen indicators specific to a feature, refer to the chapter supporting the feature.

System Status Indicators

The following icons are located on the lower right of the image screen.

Network Connection Icons

Prerequisite: Connect the ultrasound system to a wired or wireless network.

Icon	Description
	Indicates the ultrasound system is connected to a local area network (LAN) through a wired connection.
	Indicates the ultrasound system is connected to a wireless network. The shading in the bars indicates the strength of the wireless connection, for example, if all bars are shaded, the connection is strong. **See also:** For additional information on wired and wireless connections, refer to Chapter 4 in this manual.
	Indicates the ultrasound system is not connected to a wireless network.

Remote Service Icons

(Available only when remote customer services is enabled on your ultrasound system)

Prerequisite: Connect the ultrasound system to a wired or wireless network.

Note: You can click the remote service icon in the lower right of the image screen to access the configuration settings for remote services.

Icon	Description
	Indicates the ultrasound system is connected to the remote services. To disconnect from remote services, click the icon and then disable remote services.

Remote Update Handling Icons

(Available only when remote customer services is enabled on your ultrasound system)

Prerequisite: Connect the ultrasound system to a wired or wireless network.

Icon	Description
	Indicates a software update is available for installation on your ultrasound system. **See also:** For additional information on installing software updates, refer to Chapter 4 in this manual.

Recording Icons

Prerequisite: Connect and power on the recording device.

Icon	Description
	Indicates the device is recording.

Data Storage Space Indicators

Icon	Description
	Indicates storage space for security log files on the ultrasound system. A yellow icon indicates low storage space. A red icon indicates the storage is full and the ultrasound system will be locked from further access. **See also:** For information about user privileges to bypass a blocked system, refer to Chapter 7 in the System Reference.

Special Keyboard Characters

The system supports special characters for some languages through the use of a combination of keys on the retractable keyboard.

To access special characters on the retractable keyboard:

- Press and hold the **Alt** key and then press one of the following keys on the keyboard:

Spanish		German		French	
Key	**Character**	**Key**	**Character**	**Key**	**Character**
1	¡	**p**	Ä	**n**	Ç
/	¿	**-**	ä	**j**	ç
l	Ñ	**0 (zero)**	ö	**z**	à
9	ñ	**[**	Ü	**x**	è
a	á	**=**	ü	**s**	é
s	é	**'**	ß	**b**	ù
d	í				
f	ó				
g	ú				

Italian		Scandinavian		Other	
Key	**Character**	**Key**	**Character**	**Key**	**Character**
z	à	**m**	Æ	**u**	Œ
x	è	**k**	æ	**8**	œ
s	é	**.** (period)	Ø	**q**	α
c	ì	**;**	ø	**w**	β
v	ò	**,**	Å	**e**	μ
b	ù	**l**	å	**r**	θ

Examples of Imaging Parameters and Settings

The image screen displays mode-dependent imaging parameters and settings.

Use the configuration settings to enable or disable the display of the mode-specific and image preset-specific imaging parameters and settings.

Patient Information

Use the configuration settings to enable the display of patient information on a saved or printed image or clip. You can include the following patient information in the imaging parameters section on the image screen:

- Name of the institution
- Patient's last name and first name or last name only
- Identification number for the patient
- Date and time of the exam
- Operator
- Age
- Date of birth

If the patient information exceeds the available space, the system displays an ellipsis (…).

General Settings

Example	Description
DAX	Transducer name
Abdomen	Image preset
TIB:0.36	Bone tissue thermal index
TIC:2.03	Cranium bone thermal index
TIS:0.36	Soft tissue thermal index
MI:1.21	Mechanical index
8fps	Frame rate in frames per second (FPS)
12vps	(Available only during volume imaging) Frame rate of the acquisition in volumes per second (vps)
100%	Transmit power, a percentage of the maximum acoustic intensity and mechanical index for the active transducer

2D-mode Settings

Example	Description
2D	Operating mode
High	Transmit frequency
0dB/DR50	Gain and dynamic range
c=1540	Speed of sound Available speed of sound values are dependent on the active image preset and transducer.
LD 1	Line density
UA 2	UltraArt universal image processing
MapE/T1	Map and tint
P3	Persistence
Clarify 1	(Available only during Clarify) Clarify level
Compound	Compounding

Color Settings

Example	Description
C	Operating mode
High	Transmit frequency
0dB/High	Gain and flow state
P3/LD1	Persistence and line density
PRF 1984	Pulse repetition frequency (PRF)
MapF/F2	Map and filter
S2/Pr2	Smoothing and priority
Color only	Color display
Pr1	(Available only during volume imaging with color) Priority (3D)
Th15/Op70	(Available only during volume imaging with color) 3D Threshold/Opacity
Vol:	(Available only during volume imaging with color) Volume color display (3D)
MapA	Volume map
Color Only	Color display

Doppler Settings

Example	Description
D	Operating mode
PW	Doppler modes ▪ **PW** indicates pulsed wave ▪ **CW** indicates continuous wave ▪ **DTI** indicates pulsed wave Doppler tissue imaging
High	Transmit frequency
0dB/DR55	Gain and dynamic range
MapD/T1	Map and tint
GS3.0	Size of the Doppler gate
PRF0	Pulse repetition frequency (PRF)
F 200	Filter

M-mode Settings

Example	Description
M	Operating mode
29 dB / DR 75	Gain and dynamic range
MapE/T1	Map and tint
E1	Edge enhancement

Volume Imaging Settings

Example	Description
3D	3D volume imaging mode
4D	4D volume imaging mode
0dB/DR65	Gain and dynamic range
Q Mid	Volume sweep quality
V 80°	Volume sweep angle
Th15	Threshold
Op60	Opacity
S1	Smoothing
Br6	Brightness
Con65	Contrast
MPR:	Multiplanar reconstruction
MapC	Map
T5	Tint
2D + Color	Color display
Vol:	Volume
T3	Tint
2D + Color	Color display

Clinical Data

Examples marked with an asterisk (*) require a fetal selection in the patient registration form.

Example	Description
Clinical Data	Name of the section in the imaging parameters
LMP or **DOC**	Last menstrual period or the date of conception followed by a date
Age (EDD)	Expected date of delivery followed by a date
(date)	Date of last menstrual period or date of conception
(weeks, days)*	Clinical age
(date)*	Expected delivery date
(grams, ±grams)*	Estimated fetal weight

Contrast Settings

Example	Description
Contrast	Imaging feature
Low	Transmit frequency
0 dB/DR50	Gain and dynamic range
LD 1	Line density
UA OFF	UltraArt universal image processing
MapF/T0	Map and tint
P3	Persistence or peak hold
Contrast Only	Contrast display

Appendix C Cybersecurity

Overview **3**
Ultrasound System Security 3
Anti-Virus Protection 3
Firewall Policy 3
Protecting Patient Confidentiality 4

Security Responsibilities and Guidance **5**
Recommendations for Your Hospital, Clinic, or Facility 5
Preventing, Detecting, and Removing Malware 6
Hardening the Ultrasound System 7
Managing User Accounts and Configuring Roles 8
Accessing the Ultrasound System for Emergency Use 9
Preventing Physical Access 9
Removing or Hiding Patient-Identifying Information 10
Assuring Integrity and Confidentiality during Data Transmission 10
Backing Up Data and Disaster Recovery 11
Configuring Audit Controls and Managing Log Files 12

Third-Party Components **13**

Security Product Updates **13**

Overview

At the time of publication, the following information and recommendations provide measures for helping secure the operating environment of the ultrasound system and prevent unauthorized access.

Ultrasound System Security

The ultrasound system protects against security threats without disrupting the workflow or performance of the ultrasound system.

Anti-Virus Protection

The ultrasound system uses Whitelisting software as an anti-virus solution. The anti-virus protection is preinstalled and activated on the ultrasound system before shipment. Whitelisting provides the following protection against security threats and vulnerabilities.

- Prevents execution of unauthorized software, scripts, and dynamic-link libraries (DLLs)
- Runs only trusted applications on the ultrasound system
- Accepts ultrasound system product updates through an authorized process
- Protects against threats from networks and infected USB storage devices

See also: Preventing, Detecting, and Removing Malware, page C-6

Firewall Policy

The ultrasound system is configured to use the operating system firewall as an added layer of protection.

Use the configuration settings to open or close communication through a port on the ultrasound system.

See also: For information on configuring the ports, refer to the security checklist in Chapter 1 in the System Reference.

Protecting Patient Confidentiality

The ultrasound system integrates security capabilities and security controls for assuring confidentiality of patient health information before, during, and after an exam.

Patient data on the ultrasound system includes specific private, patient-identifying information, for example, patient demographics, biometric data, and information used for diagnosis, including text comments entered on images captured on the system and in patient reports.

- The image screen displays the patient data.
- Users can generate a hardcopy and electronic copy of images and reports.
- Users can also retrieve patient data from or save to removable media or a device on the network.

The ultrasound system can temporarily maintain the privacy of patient data in volatile memory until the system is powered off. Patient data can be persistently stored on local media and imported or exported through wired or wireless networks or through connected storage devices. The ultrasound system maintains the privacy of patient data during power service interruptions.

- You can protect patient confidentiality by using the security capabilities described in this appendix.
- Additionally, you can purchase a license for your service representative to encrypt data storage on the ultrasound system.

Security Responsibilities and Guidance

According to international standards for medical devices, the security of a medical device is the responsibility of the medical device manufacturer and your hospital, clinic, or facility as the delivery organization for healthcare.

- The ultrasound system has an underlying operating system. The operating system may be vulnerable to typical attacks, such as malware or denial-of-service.
- The following responsibilities of the medical device manufacturer prevent installation of unapproved software on the ultrasound system.
  - At the time of shipment to your hospital, clinic, or facility, the ultrasound system is current with applicable security patches for software from Siemens Healthineers.
  - Security updates are offered for the ultrasound system to address critical vulnerabilities.

    Use the configuration settings on the ultrasound system to view the Windows hotfixes installed on the system.

    See also: For additional information, refer to the security checklist in Chapter 1 in the System Reference.
  - At the time of initial installation of the ultrasound system in your hospital, clinic, or facility, your service representative will confirm the integrity of the ultrasound system is the same as documented prior to shipment from the medical device manufacturer.
- Unintended consequences of data loss, misuse, or corruption not under the control of the ultrasound system, for example, after electronic communication from the ultrasound system to an information network or to storage devices are the responsibility of your hospital, clinic, or facility.

Recommendations for Your Hospital, Clinic, or Facility

- Apply appropriate administrative and physical safeguards to ensure the physical and electronic security of the network in your hospital, clinic, or facility, and with all medical devices on the network.
- Restrict access to medical devices by authorized users.
- Apply a firewall between the network of your hospital, clinic, or facility and external networks. Optionally, connect a hardware firewall between the network of your hospital, clinic, or facility and the ultrasound system.
- Monitor security incidents on your network.
- Prevent access of medical devices to the internet.
- Read the topics on the following pages of this appendix for an overview of the security capabilities of the ultrasound system. Each topic contains additional recommended actions for your hospital, clinic, or facility.

Preventing, Detecting, and Removing Malware

The ultrasound system supports an anti-malware protection mechanism for the prevention of malware.

- The ultrasound system incorporates Windows Defender Application Control software; only software signed by the medical device manufacturer is executable.
- Anti-malware settings are not user configurable.
- Detection of malware is not incorporated into the user interface.
- The ultrasound system captures security-related activities in a security log file.
- Ultrasound systems connected to remote customer services receive security updates when they become available.

Recommended Actions for Your Hospital, Clinic, or Facility

Recommendations	Location of Additional Information
▪ Ensure all removable storage media is free of malware. ▪ Report any malware intrusion of the ultrasound system to the network administrator at your hospital, clinic, or facility and your service representative. ▪ Schedule periodic maintenance with your service representative. ▪ Perform software updates when they become available.	Refer to the policies of your hospital, clinic, or facility.

Hardening the Ultrasound System

Basic protection ensures the ultrasound system is not compromised while maintaining the intended use of the ultrasound system.

- Each ultrasound system includes a BIOS password.
  - UEFI (Unified Extended Firmware Interface) provides secure system startup.
  - The default password can be changed after system installation.
- A software-based firewall is configured with restrictions and activated.
- The ultrasound system is implemented with file-level access controls.
- All user accounts not required for the intended use of the ultrasound system are disabled or deleted.
- Shared resources not required for the intended use of the medical device are disabled.
- Unnecessary network ports are closed (disabled).
- Unnecessary services are disabled.
- Unauthorized software or hardware cannot be installed on the ultrasound system without tools.
- Components on the ultrasound system are sustainable within their life cycle according to internal quality systems and external regulations for medical device manufacturers.
- The ultrasound system provides anti-virus protection.

  See also: Anti-Virus Protection, page C-3
- In the event of a malfunction, the ultrasound system cannot be powered on, and users cannot access the secured desktop.

Recommended Actions for Your Hospital, Clinic, or Facility

Recommendations	Location of Additional Information
▪ Install the ultrasound system in a secure physical location. ▪ Install the ultrasound system behind a firewall in your hospital, clinic, or facility. ▪ Store removable media in a secure location.	Refer to the policies of your hospital, clinic, or facility.
(Available only for the ultrasound system administrator) Configure the firewall settings and data export capabilities, including DICOM devices and shared network locations.	Chapter 1, System Reference Chapter 6, System Reference
(Available only for the ultrasound system administrator) Enable the Federal Information Processing Standard (FIPS) in the configuration settings for the ultrasound system.	Chapter 7, System Reference
Configure rigorous password requirements.	Chapter 7, System Reference

Managing User Accounts and Configuring Roles

The security package on the ultrasound system provides configuration settings for managing user accounts and establishing data access permissions and functional privileges. Users have access to patient data and functions only as necessary to perform the tasks required by your hospital, clinic, or facility.

- A user login is required to access the ultrasound system.
- The ultrasound system authenticates each user with a unique user name and password.

  Note: Ultrasound systems connected to a smart card reader require an Active Directory domain controller for public key infrastructure (PKI) authentication.
- Only personnel assigned to an Administrator account can define (add, edit, or delete) user groups and user roles. The groups and roles limit access to patient data.
- Administrator privileges are not required to operate the ultrasound system.

Recommended Actions for Your Hospital, Clinic, or Facility

Recommendations	Location of Additional Information
Assign an authorized user to an Administrator account for setting up and modifying security features on the ultrasound system.	Chapter 7, System Reference
(Available only for the ultrasound system administrator) ▪ Configure user accounts to restrict user access to the ultrasound system by requiring unique user names and passwords. ▪ Configure user accounts with a domain controller to restrict access to the ultrasound system by requiring unique user names and passwords or public key infrastructure (PKI) authentication.	Chapter 4, Instructions for Use Chapter 7, System Reference
Configure rigorous password requirements. ▪ Require complex passwords. ▪ Establish periodic expirations of the passwords. ▪ Establish the quantity of unsuccessful login attempts prior to locking out a user.	Chapter 7, System Reference Refer to the policies of your hospital, clinic, or facility.
Maintain user accounts for only those who need access to the ultrasound system. Remove authorization for users who no longer require access to the ultrasound system.	Refer to the policies of your hospital, clinic, or facility.
Ensure users do not share user names and passwords.	Refer to the policies of your hospital, clinic, or facility.
▪ Control user names and accounts centrally in your hospital, clinic, or facility, but not on the ultrasound system. ▪ Discuss the use of Lightweight Directory Access Protocol (LDAP) with your service representative for a centralized location to store user names and passwords.	Refer to the policies of your hospital, clinic, or facility.

Accessing the Ultrasound System for Emergency Use

Users can perform an emergency exam on the ultrasound system with an emergency login account. Access to all aspects of the system other than the functions required to perform the exam are restricted; for example, an emergency account does not have access to any other patient data on the ultrasound system.

Recommended Actions for Your Hospital, Clinic, or Facility

Recommendations	Location of Additional Information
(Available only for the ultrasound system administrator) ▪ Define and configure an emergency account and define access rights for an emergency user. ▪ Track the use of the emergency user account with the audit trail logs.	Chapter 7, System Reference
▪ Maintain control of the emergency user account and monitor usage of the account. ▪ Inform authorized users about the policies for utilizing an emergency user account.	Refer to the policies of your hospital, clinic, or facility.

Preventing Physical Access

The ultrasound system includes an automatic screen lock feature to prevent physical access by unauthorized users when the system is left idle for a period of time.

You also cannot remove device components, other than removable media, from the ultrasound system without specific tools. This design prevents physical access by unauthorized users.

Your hospital, clinic, or facility can provide additional safeguards against physical access by unauthorized users.

Recommended Actions for Your Hospital, Clinic, or Facility

Recommendations	Location of Additional Information
▪ Install the ultrasound system in a secure location. ▪ Store removable media in a secure location.	Refer to the policies of your hospital, clinic, or facility.
Position the ultrasound system to prevent the viewing of patient data by unauthorized users.	Chapter 4, Instructions for Use
Configure the length of time the ultrasound system is inactive before activating the screen saver on the image screen.	Chapter 1, System Reference
▪ Manually lock the image screen to restrict physical access to the ultrasound system. A locked screen requires a user name and password to access the system. ▪ Train authorized personnel in your hospital, clinic, or facility to use the lock screen feature when the ultrasound system is powered on and unattended.	Chapter 5, Instructions for Use

Removing or Hiding Patient-Identifying Information

The ultrasound system is designed with features to hide patient-identifying information.

Media containing patient data is under the control of your hospital, clinic, or facility.

Recommended Actions for Your Hospital, Clinic, or Facility

Recommendations	Location of Additional Information
▪ Temporarily hide patient-identifying information on the image screen during a study. ▪ Temporarily hide a list of patient studies.	Chapter 5, Instructions for Use
Remove (anonymize) patient-identifying information from a study, as required, before exporting patient data.	Chapter B2, Advanced Imaging Manual

Assuring Integrity and Confidentiality during Data Transmission

The ultrasound system is designed to ensure the integrity and confidentiality of transmitted patient data.

- Supports encryption of patient data sent in a secure DICOM transmission
  - Supports DICOM transfer from and communication with only trusted and defined sources
  - Authenticates communication nodes. Node authentication uses Secure DICOM to assure both the sender and the receiver of data are known to each other and are authorized to receive transferred information.
- Media containing patient data is under the control of your hospital, clinic, or facility.

Recommended Actions for Your Hospital, Clinic, or Facility

Recommendations	Location of Additional Information
▪ Send and receive patient data using secure DICOM transmission. ▪ Configure trusted sources with certificates. Communication to a PACS device can use TLS (Transport Layer Security) certificates.	Chapter 6, System Reference
▪ Ensure the network used to transfer patient data is not accessible by non-authorized persons. ▪ Do not send patient data over an insecure network or to an insecure network device.	Refer to the policies of your hospital, clinic, or facility.

Backing Up Data and Disaster Recovery

The ultrasound system provides capabilities to recover system data and patient data. The ultrasound system is not intended as a storage device for patient data.

Recommended Actions for Your Hospital, Clinic, or Facility

Recommendations	Location of Additional Information
Minimize the amount of patient data stored on the ultrasound system. ▪ Archive patient data to a remote DICOM archive or PACS device following acquisition of the data. ▪ Back up locally saved patient data to a DICOM archive or PACS device.	Chapter B2, Advanced Imaging Manual
Back up and store the settings of the ultrasound system on external media. Your ultrasound system administrator can subsequently restore the saved system settings.	Backing up and restoring settings is available in the service section of the configuration settings on the ultrasound system.
(Available only for the ultrasound system administrator) ▪ Archive audit logs to an external device or server. ▪ Back up and delete audit logs on a routine basis.	Chapter 7, System Reference
Remove all patient data prior to decommissioning a medical device.	Refer to the policies of your hospital, clinic, or facility.

Configuring Audit Controls and Managing Log Files

The security features of the ultrasound system provide a reliable audit of activity on the system by user, date, and time. The system generates an audit log and encrypts the information in the audit log.

Recommended Actions for Your Hospital, Clinic, or Facility

Recommendations	Location of Additional Information
(Available only for the ultrasound system administrator) Configure audit controls and specify the user activities to track in an audit log.	Chapter 7, System Reference
(Available only for the ultrasound system administrator) Manage the log files on the ultrasound system. Archive and delete the log files on a regular basis.	Chapter 7, System Reference
(Available only for the ultrasound system administrator) Archive the audit logs to a removable storage device or to a device on the network; for example, a server.	Chapter 7, System Reference
Routinely review the audit logs according to the policies of your hospital, clinic, or facility.	Refer to the policies of your hospital, clinic, or facility.

Third-Party Components

The ultrasound system is maintainable and supported during the estimated life of the product. A list of open-source third-party applications is available in the configuration settings.

See also: For information about open-source software included on the ultrasound system, refer to the security checklist in Chapter 1 in the System Reference.

Security Product Updates

Remote customer services can monitor the vulnerability of the ultrasound system and offer product updates of relevant operating system and product security patches.

Remote customer services encrypts all communication to and from the ultrasound system and provides the following services for your system through a virtual private network.

- Monitoring the ultrasound system by periodically collecting system properties
- Retrieving log files
- Enabling remote sessions for troubleshooting
- Auditing and documenting all changes to critical system files

Recommended Actions for Your Hospital, Clinic, or Facility

Recommendations	Location of Additional Information
▪ Immediately contact your service representative if you detect any vulnerability with the ultrasound system. ▪ Accept remote product updates.	Contact your service representative for additional information about the remote connectivity capability.

Appendix D Acoustic Output Reference

Display Resolution and Measurement Accuracy 3

Track 3, FDA 510(k) and IEC 60601-2-37 Acoustic Output Reporting 4

Summary Table for Acoustic Output 4

Definitions 6

Legend 7

Display Resolution and Measurement Accuracy

When a transducer is capable of exceeding a mechanical index (MI) of 0.01 or thermal index (TI) of 0.1, the ultrasound imaging system displays indices starting from 0.01 (MI) or 0.1 (TI) in increments of 0.01 (MI) or 0.1 (TI) for all displayed values.

A number of factors contribute to the estimation error for the displayed index. Variation among transducers and systems, approximation for real-time index calculations, and measurement errors contribute to the index display error. The measurement uncertainty for acoustic pressure, power, and center frequency is within 12%, 12%, and 7% respectively. The total estimated display accuracy is ±15% for MI and ±30% for TI. Definitions for these parameters can be found in the AIUM/NEMA document entitled *Standard for Real-Time Display of Thermal and Mechanical Acoustic Output Indices on Diagnostic Ultrasound Equipment* (also known as the Output Display Standard).

Track 3, FDA 510(k) and IEC 60601-2-37 Acoustic Output Reporting

Data presented in Track 3 and IEC 60601-2-37 format represents the average MI/TI values of each transducer model measured under worst-case acoustic output conditions. The on-screen MI/TI values are based on measurements on one transducer rounded up to the nearest display increment. It is possible that the values displayed on screen may exceed the MI/TI values presented in the Track 3 and IEC 60601-2-37 format.

Summary Table for Acoustic Output

An "**X**" indicates that either the MI index or TI indices is greater than 1.0 for each transducer/mode. A Track 3 and IEC 60601-2-37 format acoustic output table is supplied for each transducer/mode combination marked with an "**X**."

	Operating Mode									
Transducer Model	**B-mode (2D)**	**2D with Color**	**PW Doppler**	**2D with PW Doppler**	**2D with Color and PW Doppler**	**2D with M-mode**	**M-mode with Color**	**CW Doppler**	**2D with CW Doppler**	**Contrast**
(Available only on the ACUSON Origin system)										
7L2	X	X	X	X	X	X				X
10L4	X	X	X	X	X	X	X			X
14L5	X	X	X	X	X	X	X			X
DAX	X	X	X	X	X	X	X			X
5C1	X	X	X	X	X	X	X			X
9C2	X	X	X	X	X	X	X			X
4V1	X	X	X	X	X	X	X			X
5V1	X	X	X	X	X	X	X	X	X	
5Z1	X	X	X			X	X	X		
8V3	X	X	X	X	X	X	X	X	X	X
10V4	X	X	X	X	X	X	X	X	X	X
Z6T	X	X	X			X	X	X		
AcuNav Lumos 4D ICE	X	X	X	X	X			X	X	
CW2								X		
CW5								X		

Note: For the 5V1 transducer, 2D-mode is equivalent to 2D-mode with Contrast.

The following rules apply to the summary table:

B-mode (2D)	No other mode active. Only MI (when larger than 1.0) is reported for this mode.
M-mode	May include simultaneous B-mode.
PW Doppler / CW Doppler	In duplex modes, the largest displayed TIS (scanned or non-scanned) is reported if it is larger than 1.0.
Color Flow or Power	Includes simultaneous color flow M-mode, B-mode, and Doppler. In combined modes, the largest displayed TIS (scanned or non-scanned) is reported if it is larger than 1.0.
Combined modes	The output is reported as a separate mode if the largest formulation of TIS, TIB, or TIC (if an intended use) is greater than the corresponding value reported for all constituent modes.
Other	The output is reported as a separate mode if the largest formulation of TIS, TIB, or TIC (if an intended use) is greater than the corresponding value reported for all constituent modes. TIC is reported if the transducer is intended for transcranial or neonatal cephalic use.

Definitions

Symbol		Definition		Units
FDA	**IEC**	**FDA**	**IEC**	
MI	*MI*	Mechanical Index	Same as FDA	n/a
TIS	*TIS*	Soft Tissue Thermal Index	Same as FDA	n/a
TIB	*TIB*	Bone Thermal Index	Same as FDA	n/a
TIC	*TIC*	Cranial Thermal Index	Same as FDA	n/a
$p_{r.3}$	$p_{r,\alpha}$ at z_{MI}	Derated peak rarefactional pressure associated with the transmit pattern giving rise to the value reported under MI	Same as FDA	MPa
W_o	*P*	Ultrasonic power, except for TIS_{scan} in which case it is the ultrasonic power passing through a one centimeter window	Output power	mW
---	P_{1x1}	---	Bounded output power	mW
z_1	z_s	Axial distance corresponding to the location of max[min ($W_{.3}(z)$, $I_{TA.3}(z)$ x 1 cm²)], where z ≥ z_{bp}	Depth for *TIS*	cm
z_{sp}	z_b	Axial distance at which TIB is a global maximum (i.e., $z_{sp} = z_{B.3}$)	Depth for *TIB*	cm
---	z_{MI}	---	Depth for mechanical index	cm
$z@PII_{.3max}$	$z_{pii,\alpha}$	Axial distance corresponding to the maximum of the derated spatial-peak pulse intensity integral (megapascals)	Depth at the point where the free-field, attenuated pulse intensity integral is a maximum	cm
f_c	f_{awf}	Center frequency	Acoustic working frequency	MHz
PRF	*prr*	Pulse repetition frequency	Pulse repetition rate	Hz
---	*srr*	---	Scan repetition rate	Hz
---	n_{pps}	---	Number of pulses per ultrasonic scan line	---
$I_{PA.3}@PII_{.3max}$	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	Derated pulse-average intensity at the maximum of the derated spatial-peak pulse intensity integral	Same as FDA	W/cm²
---	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	---	Attenuated spatial-peak temporal-average intensity at depth for peak attenuated pulse intensity integral	mW/cm²
---	I_{spta} at z_{pii} or z_{sii}	---	Spatial-peak temporal-average intensity at depth for peak pulse intensity integral	mW/cm²
$p_r@PII_{max}$	p_r at z_{pii}	Peak rarefactional pressure at the point where the free-field, spatial-peak pulse intensity integral is a maximum	Same as FDA	MPa

Note: Pulse-average intensity (I_{pa}) is the ratio of the pulse-intensity integral (I_{pi}) to the pulse duration (t_d).

Legend

English	Translations for languages other than English
Acoustic Output Reporting Table – Track 3, FDA 510(k) and IEC 60601-2-37	n/a
(Per transducer/mode that exceeds MI or TI value of 1.0)	n/a
Transducer Model	n/a
Operating Mode	n/a
Acoustic Parameters	n/a
Index label	n/a
At surface	n/a
Below surface	n/a
Units	n/a
Maximum Index Value	n/a
Index Component Value	n/a
Other Information	n/a
Operating Control Conditions	n/a
Frequency	n/a
Focus	n/a
Line Density	n/a
Gate Size	n/a
Scale	n/a
H Low (Harmonics low frequency)	n/a
H Mid (Harmonics mid-level frequency)	n/a
H High (Harmonics high frequency)	n/a
Low (low frequency)	n/a
Mid (mid-level frequency)	n/a
High (high frequency)	n/a
Pen (penetration)	n/a
Res (resolution)	n/a
# No data is provided for this operation condition.	n/a

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **7L2** Operating mode: **2D-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.42	1.40		1.40		2.12
Index Component Value				1.40	1.40	1.40	1.40	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.84					
	P	(mW)		114.13		114.13		127.50
	P_{1x1}	(mW)		74.66		74.66		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	2.80					
	$z_{pii,\alpha}$	(cm)	2.80					
	f_{awf}	(MHz)	4.02	3.94		3.94		3.99
Other Information	prr	(Hz)	#					
	srr	(Hz)	92.46					
	n_{pps}	---	2					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	447.00					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	74.06					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	115.71					
	p_r at z_{pii}	(MPa)	4.08					
Operating Control Conditions	Frequency	---	H High	H High		H High		H High
	Focus	(cm)	3.00	4.50		4.50		11.00
	Line Density	---	1	2		2		2

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **7L2** Operating mode: **2D with Color**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.42	1.62		1.62		1.32
Index Component Value				1.40	1.40	1.40	1.40	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.83					
	P	(mW)		103.12		103.12		20.35
	P_{1x1}	(mW)		73.49		73.49		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	2.30					
	$z_{pii,\alpha}$	(cm)	2.30					
	f_{awf}	(MHz)	4.62	4.00		4.00		3.92
Other Information	prr	(Hz)	#					
	srr	(Hz)	13.93					
	n_{pps}	---	17					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	333.36					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	49.20					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	94.74					
	p_r at z_{pii}	(MPa)	3.92					
Operating Control Conditions	Frequency	---	High	Mid		Mid		Mid
	Focus	(cm)	3.31	14.00		14.00		0.50
	Line Density	---	1	1		1		1
	Scale	---	661	833		833		2778

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **7L2** Operating mode: **PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.52	1.22		3.35		2.29
Index Component Value				1.22	1.15	1.24	3.35	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.76					
	P	(mW)		110.10		102.24		109.97
	P_{1x1}	(mW)		77.39		79.56		
	z_s	(cm)			1.80			
	z_b	(cm)					1.90	
	z_{MI}	(cm)	0.50					
	$z_{pii,\alpha}$	(cm)	1.20					
	f_{awf}	(MHz)	3.30	3.31		3.29		3.31
Other Information	*prr*	(Hz)	60.61					
	srr	(Hz)	#					
	n_{pps}	---	33					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	167.11					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	375.78					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	500.56					
	p_r at z_{pii}	(MPa)	2.18					
Operating Control Conditions	Frequency	---	Low	Low		Low		Low
	Focus	(cm)	0.50	7.96		5.50		7.80
	Gate Size	(cm)	0.05	0.35		0.05		0.35
	Scale	---	500	7576		10417		7813

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **7L2** Operating mode: **2D with PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.35	1.65		3.17		4.11
Index Component Value				1.56	1.25	1.56	3.08	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.11					
	P	(mW)		111.04		111.04		40.58
	P_{1x1}	(mW)		82.08		82.08		
	z_s	(cm)			1.90			
	z_b	(cm)					1.90	
	z_{MI}	(cm)	1.20					
	$z_{pii,\alpha}$	(cm)	1.20					
	f_{awf}	(MHz)	3.30	4.00		4.00		3.92
Other Information	*prr*	(Hz)	79.87					
	srr	(Hz)	#					
	n_{pps}	---	119					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	42.01					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	447.18					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	606.60					
	p_r at z_{pii}	(MPa)	1.26					
Operating Control Conditions	Frequency	---	Low	Mid		Mid		Mid
	Focus	(cm)	1.00	14.00		14.00		0.50
	Gate Size	(cm)	0.05	0.50		0.50		0.50
	Scale	---	6250	4808		4808		4167

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **7L2** Operating mode: **2D with Color and PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.35	1.66		3.15		4.43
Index Component Value				1.53	1.23	1.53	3.03	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.16					
	P	(mW)		109.08		109.08		44.15
	P_{1x1}	(mW)		80.58		80.58		
	z_s	(cm)			1.90			
	z_b	(cm)					1.90	
	z_{MI}	(cm)	1.20					
	$z_{pii,\alpha}$	(cm)	1.20					
	f_{awf}	(MHz)	3.30	4.00		4.00		3.92
Other Information	prr	(Hz)	76.52					
	srr	(Hz)	#					
	n_{pps}	---	113					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	46.74					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	452.58					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	611.57					
	p_r at z_{pii}	(MPa)	1.32					
Operating Control Conditions	Frequency	---	Low	Mid		Mid		Mid
	Focus	(cm)	1.00	14.01		14.01		0.50
	Gate Size	(cm)	0.05	0.35		0.35		0.05
	Scale	---	3788	1603		1603		19231

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **7L2** Operating mode: **2D with M-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.42	1.71		1.99		2.35
Index Component Value				0.26	0.17	0.34	0.93	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.84					
	P	(mW)		10.76		21.47		17.18
	P_{1x1}	(mW)		10.13		17.63		
	z_s	(cm)			1.30			
	z_b	(cm)					2.80	
	z_{MI}	(cm)	2.80					
	$z_{pii,\alpha}$	(cm)	2.80					
	f_{awf}	(MHz)	4.02	5.37		4.02		4.37
Other Information	prr	(Hz)	60.39					
	srr	(Hz)	#					
	n_{pps}	---	20					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	447.00					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	174.54					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	386.84					
	p_r at z_{pii}	(MPa)	4.08					
Operating Control Conditions	Frequency	---	H High	Mid		H High		Low
	Focus	(cm)	3.00	5.50		3.30		7.99

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **7L2** Operating mode: **Contrast**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.38	1.22		1.22		1.85
Index Component Value				0.65	0.65	0.65	0.65	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.46					
	P	(mW)		58.52		58.52		61.48
	P_{1x1}	(mW)		41.91		41.91		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	1.70					
	$z_{pii,\alpha}$	(cm)	2.10					
	f_{awf}	(MHz)	3.19	3.23		3.23		3.23
Other Information	prr	(Hz)	#					
	srr	(Hz)	2.00					
	n_{pps}	---	3					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	200.80					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	15.10					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	24.00					
	p_r at z_{pii}	(MPa)	2.59					
Operating Control Conditions	Frequency	---	Low	High		High		High
	Focus	(cm)	13.00	3.00		3.00		3.00

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **10L4** Operating mode: **2D-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.30	1.49		1.49		1.53
Index Component Value				1.49	1.49	1.49	1.49	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.58					
	P	(mW)		84.62		84.62		128.41
	P_{1x1}	(mW)		53.27		53.27		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	3.00					
	$z_{pii,\alpha}$	(cm)	3.00					
	f_{awf}	(MHz)	3.97	5.88		5.88		4.83
Other Information	prr	(Hz)	#					
	srr	(Hz)	18.60					
	n_{pps}	---	2					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	400.97					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	9.08					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	20.32					
	p_r at z_{pii}	(MPa)	3.75					
Operating Control Conditions	Frequency	---	H Low	Mid		Mid		H High
	Focus	(cm)	3.00	3.00		3.00		5.00
	Line Density	---	1	2		2		1

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **10L4** Operating mode: **2D with Color**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.43	1.60		1.60		2.01
Index Component Value				1.47	1.47	1.47	1.47	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.81					
	P	(mW)		58.31		58.31		54.60
	P_{1x1}	(mW)		57.74		57.74		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	0.60					
	$z_{pii,\alpha}$	(cm)	1.20					
	f_{awf}	(MHz)	6.73	5.33		5.33		4.00
Other Information	prr	(Hz)	#					
	srr	(Hz)	21.85					
	n_{pps}	---	13					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	87.76					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	21.82					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	97.58					
	p_r at z_{pii}	(MPa)	1.57					
Operating Control Conditions	Frequency	---	Res	Mid		Mid		Pen
	Focus	(cm)	2.39	2.31		2.31		1.04
	Line Density	---	1	1		1		1
	Scale	---	381	1116		1116		2976

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **10L4** Operating mode: **PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.09	1.78		2.39		2.10
Index Component Value				1.78	1.20	0.77	2.39	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.17					
	P	(mW)		95.57		46.07		112.84
	P_{1x1}	(mW)		70.27		46.07		
	z_s	(cm)			1.90			
	z_b	(cm)					1.00	
	z_{MI}	(cm)	0.80					
	$z_{pii,\alpha}$	(cm)	0.80					
	f_{awf}	(MHz)	4.00	5.31		3.53		3.99
Other Information	prr	(Hz)	60.61					
	srr	(Hz)	#					
	n_{pps}	---	33					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	217.76					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	394.74					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	496.78					
	p_r at z_{pii}	(MPa)	2.32					
Operating Control Conditions	Frequency	---	Low	Mid		Pen		Low
	Focus	(cm)	1.00	6.05		1.51		6.95
	Gate Size	(cm)	0.05	0.05		0.15		0.25
	Scale	---	500	19231		19231		16667

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **10L4** Operating mode: **2D with PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.43	1.72		2.48		1.98
Index Component Value				1.64	1.11	0.77	2.40	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	0.83					
	P	(mW)		88.39		46.09		21.72
	P_{1x1}	(mW)		64.99		46.09		
	z_s	(cm)			1.90			
	z_b	(cm)					1.00	
	z_{MI}	(cm)	3.50					
	$z_{pii,\alpha}$	(cm)	3.50					
	f_{awf}	(MHz)	5.30	5.31		3.53		3.51
Other Information	*prr*	(Hz)	80.13					
	srr	(Hz)	#					
	n_{pps}	---	74					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	31.23					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	504.53					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	2493.87					
	p_r at z_{pii}	(MPa)	1.60					
Operating Control Conditions	Frequency	---	Mid	Mid		Pen		Pen
	Focus	(cm)	4.84	6.05		1.51		0.45
	Gate Size	(cm)	0.20	0.05		0.15		0.25
	Scale	---	1953	16667		16667		16667

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **10L4** Operating mode: **2D with Color and PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.42	1.62		2.54		2.32
Index Component Value				1.23	0.79	0.71	2.17	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.02					
	P	(mW)		48.52		42.34		20.08
	P_{1x1}	(mW)		48.52		42.34		
	z_s	(cm)			1.20			
	z_b	(cm)					1.10	
	z_{MI}	(cm)	2.90					
	$z_{pii,\alpha}$	(cm)	2.90					
	f_{awf}	(MHz)	5.27	5.33		3.51		3.51
Other Information	*prr*	(Hz)	86.58					
	srr	(Hz)	#					
	n_{pps}	---	95					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	52.28					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	532.70					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	1841.50					
	p_r at z_{pii}	(MPa)	1.72					
Operating Control Conditions	Frequency	---	Mid	Mid		Pen		Pen
	Focus	(cm)	3.27	2.45		1.95		0.45
	Gate Size	(cm)	0.10	0.40		0.40		0.40
	Scale	---	2500	3623		2315		1276

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **10L4** Operating mode: **2D with M-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.30	1.45		1.64		1.56
Index Component Value				0.27	0.18	0.26	0.53	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.58					
	P	(mW)		15.43		13.68		13.68
	P_{1x1}	(mW)		12.61		12.17		
	z_s	(cm)			2.00			
	z_b	(cm)					3.00	
	z_{MI}	(cm)	3.00					
	$z_{pii,\alpha}$	(cm)	3.00					
	f_{awf}	(MHz)	3.97	4.42		4.54		4.54
Other Information	prr	(Hz)	60.10					
	srr	(Hz)	#					
	n_{pps}	---	20					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	400.97					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	158.79					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	357.40					
	p_r at z_{pii}	(MPa)	3.75					
Operating Control Conditions	Frequency	---	H Low	H High		H High		H High
	Focus	(cm)	3.00	4.14		3.13		3.13

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **10L4** Operating mode: **M-mode with Color**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.27	1.81		3.83		2.62
Index Component Value				1.68	0.98	1.10	3.63	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.89					
	P	(mW)		70.00		43.22		43.22
	P_{1x1}	(mW)		67.31		43.22		
	z_s	(cm)			1.60			
	z_b	(cm)					1.60	
	z_{MI}	(cm)	0.50					
	$z_{pii,\alpha}$	(cm)	1.20					
	f_{awf}	(MHz)	6.75	5.25		5.33		5.33
Other Information	prr	(Hz)	55.80					
	srr	(Hz)	#					
	n_{pps}	---	26					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	91.40					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	61.02					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	77.31					
	p_r at z_{pii}	(MPa)	1.56					
Operating Control Conditions	Frequency	---	Res	Mid		Mid		Mid
	Focus	(cm)	2.04	6.99		1.04		1.04
	Scale	---	1563	7576		19231		19231

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **10L4** Operating mode: **Contrast**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.35	1.47		1.47		1.31
Index Component Value				0.75	0.75	0.75	0.75	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.81					
	P	(mW)		46.16		46.16		25.11
	P_{1x1}	(mW)		28.98		28.98		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	2.00					
	$z_{pii,\alpha}$	(cm)	2.00					
	f_{awf}	(MHz)	4.61	5.43		5.43		4.61
Other Information	prr	(Hz)	#					
	srr	(Hz)	58.28					
	n_{pps}	---	3					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	500.32					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	89.14					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	134.75					
	p_r at z_{pii}	(MPa)	3.87					
Operating Control Conditions	Frequency	---	Low	Mid		Mid		Low
	Focus	(cm)	2.00	3.00		3.00		2.00

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **14L5** Operating mode: **2D-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.45	0.87		0.87		1.22
Index Component Value				0.87	0.87	0.87	0.87	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	3.88					
	P	(mW)		41.19		41.19		59.15
	P_{1x1}	(mW)		26.46		26.46		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	1.00					
	$z_{pii,\alpha}$	(cm)	1.00					
	f_{awf}	(MHz)	7.21	6.89		6.89		6.89
Other Information	prr	(Hz)	#					
	srr	(Hz)	36.76					
	n_{pps}	---	1					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	1052.67					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	19.05					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	28.36					
	p_r at z_{pii}	(MPa)	4.98					
Operating Control Conditions	Frequency	---	Low	H High		H High		H High
	Focus	(cm)	1.00	3.50		3.50		3.50
	Line Density	---	1	2		2		1

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **14L5** Operating mode: **2D with Color**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.42	1.03		1.03		1.34
Index Component Value				0.75	0.75	0.75	0.75	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.83					
	P	(mW)		25.09		25.09		30.45
	P_{1x1}	(mW)		25.09		25.09		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	0.70					
	$z_{pii,\alpha}$	(cm)	0.70					
	f_{awf}	(MHz)	7.43	6.32		6.32		6.31
Other Information	*prr*	(Hz)	#					
	srr	(Hz)	13.79					
	n_{pps}	---	13					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	400.56					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	44.10					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	63.81					
	p_r at z_{pii}	(MPa)	3.18					
Operating Control Conditions	Frequency	---	Res	Mid		Mid		Mid
	Focus	(cm)	2.72	1.51		1.51		1.75
	Line Density	---	1	1		1		1
	Scale	---	381	4808		4808		2232

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **14L5** Operating mode: **PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.06	1.33		2.13		1.46
Index Component Value				1.33	0.89	1.26	2.13	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.46					
	P	(mW)		49.57		41.03		49.57
	P_{1x1}	(mW)		38.48		36.28		
	z_s	(cm)			1.30			
	z_b	(cm)					1.10	
	z_{MI}	(cm)	0.60					
	$z_{pii,\alpha}$	(cm)	0.60					
	f_{awf}	(MHz)	5.43	7.28		7.30		7.28
Other Information	*prr*	(Hz)	59.64					
	srr	(Hz)	#					
	n_{pps}	---	32					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	255.22					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	387.00					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	484.52					
	p_r at z_{pii}	(MPa)	2.76					
Operating Control Conditions	Frequency	---	Low	Mid		Mid		Mid
	Focus	(cm)	0.74	7.74		7.95		7.74
	Gate Size	(cm)	0.05	0.40		0.10		0.40
	Scale	---	477	7813		6250		3906

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **14L5** Operating mode: **2D with PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.41	1.34		2.13		1.43
Index Component Value				1.34	0.86	1.28	2.10	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.03					
	P	(mW)		45.06		41.42		44.57
	P_{1x1}	(mW)		38.58		36.96		
	z_s	(cm)			1.20			
	z_b	(cm)					1.10	
	z_{MI}	(cm)	1.90					
	$z_{pii,\alpha}$	(cm)	1.90					
	f_{awf}	(MHz)	5.34	7.29		7.29		7.29
Other Information	*prr*	(Hz)	80.17					
	srr	(Hz)	#					
	n_{pps}	---	88					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	49.74					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	436.76					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	879.86					
	p_r at z_{pii}	(MPa)	1.46					
Operating Control Conditions	Frequency	---	Low	Mid		Mid		Mid
	Focus	(cm)	1.99	6.49		7.56		6.49
	Gate Size	(cm)	0.10	0.50		0.25		0.50
	Scale	---	2315	3788		8065		6098

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **14L5** Operating mode: **2D with Color and PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.42	1.27		1.64		1.41
Index Component Value				1.20	0.78	1.03	1.54	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.11					
	P	(mW)		41.05		31.24		35.78
	P_{1x1}	(mW)		34.66		29.71		
	z_s	(cm)			1.20			
	z_b	(cm)					1.00	
	z_{MI}	(cm)	1.10					
	$z_{pii,\alpha}$	(cm)	1.10					
	f_{awf}	(MHz)	7.29	7.29		7.29		7.31
Other Information	*prr*	(Hz)	83.93					
	srr	(Hz)	#					
	n_{pps}	---	64					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	49.49					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	330.29					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	382.54					
	p_r at z_{pii}	(MPa)	0.95					
Operating Control Conditions	Frequency	---	Mid	Mid		Mid		Mid
	Focus	(cm)	5.02	6.68		5.00		5.78
	Gate Size	(cm)	0.10	0.25		0.65		0.65
	Scale	---	6757	13158		1838		2315

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **14L5** Operating mode: **2D with M-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.45	0.82		1.10		1.06
Index Component Value				0.14	0.10	0.13	0.38	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	3.62					
	P	(mW)		4.50		4.04		2.71
	P_{1x1}	(mW)		4.46		4.00		
	z_s	(cm)			0.90			
	z_b	(cm)					1.40	
	z_{MI}	(cm)	1.00					
	$z_{pii,\alpha}$	(cm)	1.00					
	f_{awf}	(MHz)	7.23	6.80		6.88		7.09
Other Information	*prr*	(Hz)	60.10					
	srr	(Hz)	#					
	n_{pps}	---	10					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	920.14					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	133.70					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	220.12					
	p_r at z_{pii}	(MPa)	4.64					
Operating Control Conditions	Frequency	---	Low	H High		H High		H High
	Focus	(cm)	1.01	1.49		1.51		1.01

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **14L5** Operating mode: **M-mode with Color**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.30	1.16		1.88		1.52
Index Component Value				1.12	0.71	1.02	1.82	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.45					
	P	(mW)		31.88		33.97		35.49
	P_{1x1}	(mW)		31.88		33.97		
	z_s	(cm)			0.90			
	z_b	(cm)					0.90	
	z_{MI}	(cm)	0.60					
	$z_{pii,\alpha}$	(cm)	0.60					
	f_{awf}	(MHz)	7.47	7.35		6.28		6.28
Other Information	*prr*	(Hz)	85.85					
	srr	(Hz)	#					
	n_{pps}	---	13					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	87.93					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	36.46					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	51.92					
	p_r at z_{pii}	(MPa)	1.59					
Operating Control Conditions	Frequency	---	Res	Res		Mid		Mid
	Focus	(cm)	0.72	7.54		7.54		7.54
	Scale	---	1202	7813		3472		7813

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **14L5** Operating mode: **Contrast**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.45	0.90		0.90		1.02
Index Component Value				0.44	0.44	0.44	0.44	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	3.70					
	P	(mW)		18.22		18.22		21.54
	P_{1x1}	(mW)		13.38		13.38		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	1.00					
	$z_{pii,\alpha}$	(cm)	1.00					
	f_{awf}	(MHz)	7.06	6.89		6.89		6.89
Other Information	*prr*	(Hz)	#					
	srr	(Hz)	40.22					
	n_{pps}	---	3					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	701.42					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	29.75					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	43.92					
	p_r at z_{pii}	(MPa)	4.72					
Operating Control Conditions	Frequency	---	Mid	Mid		Mid		Mid
	Focus	(cm)	1.00	2.25		2.25		5.25

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **DAX** Operating mode: **2D-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.38	1.84		1.84		4.24
Index Component Value				1.84	1.84	1.84	1.84	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.78					
	P	(mW)		317.89		317.89		654.67
	P_{1x1}	(mW)		183.40		183.40		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	6.30					
	$z_{pii,\alpha}$	(cm)	6.30					
	f_{awf}	(MHz)	1.66	2.10		2.10		1.58
Other Information	*prr*	(Hz)	#					
	srr	(Hz)	7.85					
	n_{pps}	---	1					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	192.26					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	12.01					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	18.10					
	p_r at z_{pii}	(MPa)	2.54					
Operating Control Conditions	Frequency	---	H Mid	Low		Low		Pen
	Focus	(cm)	6.00	6.00		6.00		12.00
	Line Density	---	1	1		1		1

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **DAX** Operating mode: **2D with Color**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.48	1.98		1.98		5.33
Index Component Value				1.51	1.51	1.51	1.51	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.68					
	P	(mW)		176.01		176.01		484.51
	P_{1x1}	(mW)		145.58		145.58		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	3.10					
	$z_{pii,\alpha}$	(cm)	3.10					
	f_{awf}	(MHz)	1.50	2.17		2.17		1.50
Other Information	prr	(Hz)	#					
	srr	(Hz)	10.96					
	n_{pps}	---	13					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	117.39					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	72.54					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	99.83					
	p_r at z_{pii}	(MPa)	1.98					
Operating Control Conditions	Frequency	---	Pen	Res		Res		Pen
	Focus	(cm)	3.00	3.00		3.00		1.00
	Line Density	---	1	1		1		3
	Scale	---	237	7813		7813		977

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **DAX** Operating mode: **PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.33	1.69		4.86		4.64
Index Component Value				1.56	1.69	1.27	4.86	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.62					
	P	(mW)		359.67		408.07		541.74
	P_{1x1}	(mW)		148.92		178.46		
	z_s	(cm)			5.30			
	z_b	(cm)					4.20	
	z_{MI}	(cm)	1.20					
	$z_{pii,\alpha}$	(cm)	2.00					
	f_{awf}	(MHz)	1.48	2.20		1.50		1.28
Other Information	prr	(Hz)	60.61					
	srr	(Hz)	#					
	n_{pps}	---	33					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	63.50					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	319.52					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	392.03					
	p_r at z_{pii}	(MPa)	1.48					
Operating Control Conditions	Frequency	---	Low	High		Low		Pen
	Focus	(cm)	1.50	20.00		16.00		24.00
	Gate Size	(cm)	0.10	0.50		0.50		1.00
	Scale	---	500	3378		4032		2778

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **DAX** Operating mode: **2D with PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.38	1.69		5.33		4.74
Index Component Value				1.47	1.59	0.55	5.20	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	0.62					
	P	(mW)		339.31		470.86		470.86
	P_{1x1}	(mW)		140.49		90.55		
	z_s	(cm)			5.30			
	z_b	(cm)					9.90	
	z_{MI}	(cm)	2.70					
	$z_{pii,\alpha}$	(cm)	4.50					
	f_{awf}	(MHz)	1.52	2.20		1.28		1.28
Other Information	*prr*	(Hz)	79.82					
	srr	(Hz)	#					
	n_{pps}	---	99					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	9.85					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	194.38					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	311.45					
	p_r at z_{pii}	(MPa)	0.67					
Operating Control Conditions	Frequency	---	Low	High		Pen		Pen
	Focus	(cm)	39.95	20.00		18.00		18.00
	Gate Size	(cm)	0.10	0.65		0.65		0.65
	Scale	---	2604	3333		3623		3623

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **DAX** Operating mode: **2D with Color and PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.47	1.81		5.36		4.70
Index Component Value				1.12	1.51	0.42	4.93	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.08					
	P	(mW)		346.27		347.60		451.95
	P_{1x1}	(mW)		157.23		69.52		
	z_s	(cm)			4.10			
	z_b	(cm)					9.00	
	z_{MI}	(cm)	1.20					
	$z_{pii,\alpha}$	(cm)	2.00					
	f_{awf}	(MHz)	1.48	1.50		1.28		1.28
Other Information	*prr*	(Hz)	37.29					
	srr	(Hz)	#					
	n_{pps}	---	159					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	26.90					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	401.36					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	492.44					
	p_r at z_{pii}	(MPa)	1.00					
Operating Control Conditions	Frequency	---	Low	Low		Pen		Pen
	Focus	(cm)	1.50	14.00		14.00		20.00
	Gate Size	(cm)	0.10	0.65		0.65		0.65
	Scale	---	1953	4386		4464		3333

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **DAX** Operating mode: **2D with M-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.38	1.79		4.89		4.24
Index Component Value				0.66	0.63	1.19	4.76	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.78					
	P	(mW)		102.81		362.84		19.84
	P_{1x1}	(mW)		67.38		155.86		
	z_s	(cm)			3.30			
	z_b	(cm)					4.30	
	z_{MI}	(cm)	6.30					
	$z_{pii,\alpha}$	(cm)	6.30					
	f_{awf}	(MHz)	1.66	2.04		1.60		1.63
Other Information	prr	(Hz)	59.38					
	srr	(Hz)	#					
	n_{pps}	---	20					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	192.26					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	300.47					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	622.86					
	p_r at z_{pii}	(MPa)	2.54					
Operating Control Conditions	Frequency	---	H Mid	Low		H Mid		Pen
	Focus	(cm)	6.00	7.76		10.32		3.88

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **DAX** Operating mode: **M-mode with Color**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.48	1.72		5.19		3.76
Index Component Value				1.36	1.65	1.04	4.30	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.68					
	P	(mW)		387.66		306.69		371.36
	P_{1x1}	(mW)		160.51		146.15		
	z_s	(cm)			4.30			
	z_b	(cm)					8.70	
	z_{MI}	(cm)	3.10					
	$z_{pii,\alpha}$	(cm)	3.10					
	f_{awf}	(MHz)	1.50	1.77		1.50		1.50
Other Information	prr	(Hz)	73.49					
	srr	(Hz)	#					
	n_{pps}	---	13					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	117.39					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	277.34					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	382.36					
	p_r at z_{pii}	(MPa)	1.98					
Operating Control Conditions	Frequency	---	Pen	Mid		Pen		Pen
	Focus	(cm)	3.00	20.00		12.00		16.56
	Scale	---	1029	2778		3846		3425

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **DAX** Operating mode: **Contrast**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.41	1.50		1.50		4.07
Index Component Value				0.68	0.68	0.68	0.68	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.78					
	P	(mW)		202.10		202.10		457.42
	P_{1x1}	(mW)		86.68		86.68		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	6.30					
	$z_{pii,\alpha}$	(cm)	6.30					
	f_{awf}	(MHz)	1.66	1.66		1.66		1.66
Other Information	prr	(Hz)	#					
	srr	(Hz)	2.00					
	n_{pps}	---	3					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	192.26					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	5.79					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	8.73					
	p_r at z_{pii}	(MPa)	2.54					
Operating Control Conditions	Frequency	---	Mid	Mid		Mid		Mid
	Focus	(cm)	6.00	8.00		8.00		12.00

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **5C1** Operating mode: **2D-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.35	1.61		1.61		4.35
Index Component Value				1.61	1.61	1.61	1.61	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.73					
	P	(mW)		392.74		392.74		438.93
	P_{1x1}	(mW)		150.82		150.82		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	3.40					
	$z_{pii,\alpha}$	(cm)	3.40					
	f_{awf}	(MHz)	1.65	2.25		2.25		1.99
Other Information	prr	(Hz)	#					
	srr	(Hz)	20.56					
	n_{pps}	---	2					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	111.84					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	14.38					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	21.07					
	p_r at z_{pii}	(MPa)	2.07					
Operating Control Conditions	Frequency	---	H Low	H High		H High		Low
	Focus	(cm)	4.00	8.00		8.00		10.00
	Line Density	---	2	1		1		1

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **5C1** Operating mode: **2D with Color**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.22	2.18		2.18		4.96
Index Component Value				2.08	2.08	2.08	2.08	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.46					
	P	(mW)		204.00		204.00		485.33
	P_{1x1}	(mW)		136.53		136.53		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	3.10					
	$z_{pii,\alpha}$	(cm)	3.10					
	f_{awf}	(MHz)	1.44	3.19		3.19		2.49
Other Information	prr	(Hz)	#					
	srr	(Hz)	16.67					
	n_{pps}	---	13					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	76.09					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	324.26					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	428.00					
	p_r at z_{pii}	(MPa)	1.45					
Operating Control Conditions	Frequency	---	Pen	High		High		Mid
	Focus	(cm)	15.01	10.45		10.45		12.41
	Line Density	---	2	1		1		3
	Scale	---	1016	347		347		392

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **5C1** Operating mode: **PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.39	1.91		4.63		3.82
Index Component Value				1.91	1.80	0.66	4.63	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.75					
	P	(mW)		253.50		325.22		253.43
	P_{1x1}	(mW)		120.71		86.73		
	z_s	(cm)			3.50			
	z_b	(cm)					3.70	
	z_{MI}	(cm)	0.60					
	$z_{pii,\alpha}$	(cm)	2.40					
	f_{awf}	(MHz)	1.59	3.32		1.60		3.32
Other Information	prr	(Hz)	60.61					
	srr	(Hz)	#					
	n_{pps}	---	33					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	51.17					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	238.53					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	311.53					
	p_r at z_{pii}	(MPa)	1.32					
Operating Control Conditions	Frequency	---	Pen	Mid		Pen		Mid
	Focus	(cm)	1.00	15.00		15.38		15.00
	Gate Size	(cm)	0.05	0.80		0.05		0.80
	Scale	---	500	2404		3676		2427

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **5C1** Operating mode: **2D with PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.35	1.91		4.62		4.52
Index Component Value				1.89	1.78	0.68	4.59	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.19					
	P	(mW)		250.78		400.39		308.82
	P_{1x1}	(mW)		119.42		88.97		
	z_s	(cm)			3.50			
	z_b	(cm)					3.60	
	z_{MI}	(cm)	3.70					
	$z_{pii,\alpha}$	(cm)	3.70					
	f_{awf}	(MHz)	1.60	3.32		1.60		1.60
Other Information	*prr*	(Hz)	80.24					
	srr	(Hz)	#					
	n_{pps}	---	35					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	58.27					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	386.34					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	578.79					
	p_r at z_{pii}	(MPa)	1.45					
Operating Control Conditions	Frequency	---	Pen	Mid		Pen		Pen
	Focus	(cm)	4.08	15.00		25.34		20.98
	Gate Size	(cm)	0.20	0.40		0.05		0.05
	Scale	---	3731	1984		2000		2000

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **5C1** Operating mode: **2D with Color and PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.39	2.18		4.61		4.30
Index Component Value				1.17	1.14	0.61	4.45	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.75					
	P	(mW)		141.51		313.98		292.93
	P_{1x1}	(mW)		75.47		80.31		
	z_s	(cm)			2.90			
	z_b	(cm)					3.70	
	z_{MI}	(cm)	0.60					
	$z_{pii,\alpha}$	(cm)	2.40					
	f_{awf}	(MHz)	1.59	3.26		1.60		1.59
Other Information	*prr*	(Hz)	45.98					
	srr	(Hz)	#					
	n_{pps}	---	33					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	51.03					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	180.44					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	235.66					
	p_r at z_{pii}	(MPa)	1.32					
Operating Control Conditions	Frequency	---	Pen	Mid		Pen		Pen
	Focus	(cm)	0.99	9.50		15.38		15.38
	Gate Size	(cm)	0.05	0.05		0.05		0.05
	Scale	---	2000	4310		4310		4310

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **5C1** Operating mode: **2D with M-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.35	1.88		2.97		3.31
Index Component Value				0.63	0.97	0.41	2.59	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.56					
	P	(mW)		151.59		129.60		156.69
	P_{1x1}	(mW)		61.61		56.68		
	z_s	(cm)			3.20			
	z_b	(cm)					3.00	
	z_{MI}	(cm)	4.80					
	$z_{pii,\alpha}$	(cm)	4.80					
	f_{awf}	(MHz)	1.66	2.15		1.51		1.52
Other Information	*prr*	(Hz)	60.24					
	srr	(Hz)	#					
	n_{pps}	---	20					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	113.91					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	207.12					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	358.35					
	p_r at z_{pii}	(MPa)	2.05					
Operating Control Conditions	Frequency	---	H Low	H High		H Pen		H Pen
	Focus	(cm)	5.82	9.00		12.00		26.00

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **5C1** Operating mode: **M-mode with Color**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.36	2.59		4.91		5.05
Index Component Value				2.56	2.04	2.10	4.61	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.16					
	P	(mW)		206.87		270.74		270.74
	P_{1x1}	(mW)		172.39		180.49		
	z_s	(cm)			1.90			
	z_b	(cm)					4.20	
	z_{MI}	(cm)	3.60					
	$z_{pii,\alpha}$	(cm)	3.60					
	f_{awf}	(MHz)	2.50	3.11		2.45		2.45
Other Information	*prr*	(Hz)	74.38					
	srr	(Hz)	#					
	n_{pps}	---	13					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	290.58					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	397.04					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	738.75					
	p_r at z_{pii}	(MPa)	2.94					
Operating Control Conditions	Frequency	---	Mid	High		Mid		Mid
	Focus	(cm)	5.03	8.03		21.59		21.59
	Scale	---	1042	1563		1553		1553

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **5C1** Operating mode: **Contrast**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.41	1.64		1.64		4.40
Index Component Value				1.28	1.28	1.28	1.28	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.10					
	P	(mW)		296.72		296.72		351.87
	P_{1x1}	(mW)		121.50		121.50		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	4.20					
	$z_{pii,\alpha}$	(cm)	4.20					
	f_{awf}	(MHz)	2.22	2.21		2.21		2.00
Other Information	prr	(Hz)	#					
	srr	(Hz)	21.77					
	n_{pps}	---	3					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	184.15					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	230.13					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	395.99					
	p_r at z_{pii}	(MPa)	2.71					
Operating Control Conditions	Frequency	---	Mid	Mid		Mid		High
	Focus	(cm)	18.00	10.00		10.00		10.00

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **9C2** Operating mode: **2D-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.34	1.97		1.97		4.04
Index Component Value				1.97	1.97	1.97	1.97	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.29					
	P	(mW)		137.02		137.02		389.50
	P_{1x1}	(mW)		99.78		99.78		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	2.20					
	$z_{pii,\alpha}$	(cm)	2.20					
	f_{awf}	(MHz)	2.92	4.15		4.15		2.87
Other Information	prr	(Hz)	#					
	srr	(Hz)	14.60					
	n_{pps}	---	1					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	283.00					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	5.04					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	8.59					
	p_r at z_{pii}	(MPa)	2.76					
Operating Control Conditions	Frequency	---	Low	Mid		Mid		H Mid
	Focus	(cm)	2.00	4.00		4.00		8.00
	Line Density	---	1	3		3		1

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **9C2** Operating mode: **2D with Color**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.31	2.15		2.15		3.66
Index Component Value				2.05	2.05	2.05	2.05	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.41					
	P	(mW)		101.86		101.86		291.11
	P_{1x1}	(mW)		96.71		96.71		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	0.50					
	$z_{pii,\alpha}$	(cm)	1.00					
	f_{awf}	(MHz)	3.40	4.46		4.46		3.37
Other Information	prr	(Hz)	#					
	srr	(Hz)	13.33					
	n_{pps}	---	13					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	154.37					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	79.08					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	99.97					
	p_r at z_{pii}	(MPa)	2.14					
Operating Control Conditions	Frequency	---	Mid	High		High		Mid
	Focus	(cm)	0.60	1.70		1.70		8.10
	Line Density	---	1	3		3		2
	Scale	---	355	947		947		714

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **9C2** Operating mode: **PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.46	2.45		4.95		3.69
Index Component Value				1.78	2.45	1.29	4.95	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.32					
	P	(mW)		272.47		241.86		259.10
	P_{1x1}	(mW)		110.15		106.87		
	z_s	(cm)			2.50			
	z_b	(cm)					2.60	
	z_{MI}	(cm)	0.80					
	$z_{pii,\alpha}$	(cm)	2.00					
	f_{awf}	(MHz)	2.51	3.40		2.53		2.50
Other Information	prr	(Hz)	60.61					
	srr	(Hz)	#					
	n_{pps}	---	33					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	118.27					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	349.97					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	501.98					
	p_r at z_{pii}	(MPa)	1.93					
Operating Control Conditions	Frequency	---	Low	Mid		Low		Low
	Focus	(cm)	1.00	14.00		9.00		23.26
	Gate Size	(cm)	0.10	0.05		0.25		1.00
	Scale	---	500	17857		1852		500

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **9C2** Operating mode: **2D with PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.40	2.42		5.06		3.78
Index Component Value				1.70	2.34	1.32	4.99	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	0.74					
	P	(mW)		260.02		241.43		263.78
	P_{1x1}	(mW)		105.12		109.22		
	z_s	(cm)			2.50			
	z_b	(cm)					2.60	
	z_{MI}	(cm)	0.80					
	$z_{pii,\alpha}$	(cm)	1.30					
	f_{awf}	(MHz)	4.48	3.40		2.53		2.50
Other Information	*prr*	(Hz)	80.13					
	srr	(Hz)	#					
	n_{pps}	---	74					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	13.03					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	349.43					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	522.38					
	p_r at z_{pii}	(MPa)	0.76					
Operating Control Conditions	Frequency	---	High	Mid		Low		Low
	Focus	(cm)	0.96	13.98		8.00		29.68
	Gate Size	(cm)	0.35	0.05		0.05		0.40
	Scale	---	1953	19231		20833		6579

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **9C2** Operating mode: **2D with Color and PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.32	2.37		4.84		3.83
Index Component Value				1.57	2.16	1.23	4.67	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.28					
	P	(mW)		240.05		225.83		244.85
	P_{1x1}	(mW)		97.04		102.16		
	z_s	(cm)			2.50			
	z_b	(cm)					2.60	
	z_{MI}	(cm)	0.80					
	$z_{pii,\alpha}$	(cm)	2.00					
	f_{awf}	(MHz)	2.51	3.40		2.53		2.50
Other Information	*prr*	(Hz)	82.57					
	srr	(Hz)	#					
	n_{pps}	---	82					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	35.07					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	351.32					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	501.66					
	p_r at z_{pii}	(MPa)	1.16					
Operating Control Conditions	Frequency	---	Low	Mid		Low		Low
	Focus	(cm)	0.99	14.02		7.96		24.46
	Gate Size	(cm)	0.10	0.15		0.15		0.20
	Scale	---	4310	3788		14706		2717

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **9C2** Operating mode: **2D with M-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.34	2.09		2.95		4.02
Index Component Value				0.64	0.46	0.80	1.89	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.57					
	P	(mW)		46.05		75.44		13.07
	P_{1x1}	(mW)		39.66		58.28		
	z_s	(cm)			2.00			
	z_b	(cm)					2.70	
	z_{MI}	(cm)	3.60					
	$z_{pii,\alpha}$	(cm)	3.60					
	f_{awf}	(MHz)	2.98	3.38		2.87		2.89
Other Information	prr	(Hz)	60.10					
	srr	(Hz)	#					
	n_{pps}	---	10					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	150.83					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	43.00					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	87.45					
	p_r at z_{pii}	(MPa)	2.25					
Operating Control Conditions	Frequency	---	Low	H High		H Mid		H Mid
	Focus	(cm)	14.00	4.50		8.00		0.50

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **9C2** Operating mode: **M-mode with Color**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.31	2.04		4.08		3.54
Index Component Value				1.84	1.70	1.62	3.21	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.41					
	P	(mW)		168.89		149.02		183.25
	P_{1x1}	(mW)		114.60		101.12		
	z_s	(cm)			2.00			
	z_b	(cm)					2.90	
	z_{MI}	(cm)	0.50					
	$z_{pii,\alpha}$	(cm)	1.00					
	f_{awf}	(MHz)	3.40	3.37		3.37		3.37
Other Information	prr	(Hz)	51.31					
	srr	(Hz)	#					
	n_{pps}	---	26					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	154.37					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	217.39					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	274.84					
	p_r at z_{pii}	(MPa)	2.14					
Operating Control Conditions	Frequency	---	Mid	Mid		Mid		Mid
	Focus	(cm)	0.60	8.02		8.00		8.24
	Scale	---	1437	7353		6579		1429

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **9C2** Operating mode: **Contrast**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.35	2.01		2.01		2.92
Index Component Value				2.01	2.01	2.01	2.01	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.41					
	P	(mW)		181.24		181.24		192.73
	P_{1x1}	(mW)		131.26		131.26		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	3.80					
	$z_{pii,\alpha}$	(cm)	3.80					
	f_{awf}	(MHz)	3.21	3.21		3.21		3.21
Other Information	*prr*	(Hz)	#					
	srr	(Hz)	6.95					
	n_{pps}	---	3					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	379.30					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	9.28					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	16.42					
	p_r at z_{pii}	(MPa)	3.59					
Operating Control Conditions	Frequency	---	Mid	Mid		Mid		Mid
	Focus	(cm)	4.00	6.00		6.00		10.00

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **4V1** Operating mode: **2D-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.52	0.75		0.75		2.10
Index Component Value				0.75	0.75	0.75	0.75	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.20					
	P	(mW)		85.93		85.93		184.43
	P_{1x1}	(mW)		39.13		39.13		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	3.90					
	$z_{pii,\alpha}$	(cm)	3.90					
	f_{awf}	(MHz)	2.10	4.03		4.03		2.07
Other Information	*prr*	(Hz)	#					
	srr	(Hz)	19.13					
	n_{pps}	---	1					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	151.13					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	4.66					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	8.29					
	p_r at z_{pii}	(MPa)	2.94					
Operating Control Conditions	Frequency	---	H High	High		High		H High
	Focus	(cm)	4.00	2.00		2.00		24.00
	Line Density	---	1	1		1		1

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **4V1** Operating mode: **2D with Color**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.45	1.05		1.05		2.32
Index Component Value				0.97	0.97	0.97	0.97	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.09					
	P	(mW)		83.41		83.41		196.22
	P_{1x1}	(mW)		61.70		61.70		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	4.80					
	$z_{pii,\alpha}$	(cm)	4.80					
	f_{awf}	(MHz)	2.56	3.29		3.29		2.57
Other Information	prr	(Hz)	#					
	srr	(Hz)	18.39					
	n_{pps}	---	9					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	217.89					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	35.78					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	60.77					
	p_r at z_{pii}	(MPa)	3.18					
Operating Control Conditions	Frequency	---	Mid	Res		Res		Mid
	Focus	(cm)	5.02	0.68		0.68		27.19
	Line Density	---	3	1		1		1
	Scale	---	211	679		679		839

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **4V1** Operating mode: **PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.42	1.04		3.62		1.78
Index Component Value				0.87	1.04	0.57	3.62	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.58					
	P	(mW)		116.09		113.52		107.00
	P_{1x1}	(mW)		56.51		64.36		
	z_s	(cm)			2.40			
	z_b	(cm)					3.20	
	z_{MI}	(cm)	0.90					
	$z_{pii,\alpha}$	(cm)	1.70					
	f_{awf}	(MHz)	3.29	3.22		1.86		3.10
Other Information	prr	(Hz)	60.61					
	srr	(Hz)	#					
	n_{pps}	---	33					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	70.51					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	167.25					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	245.97					
	p_r at z_{pii}	(MPa)	1.52					
Operating Control Conditions	Frequency	---	Mid	Mid		Low		Mid
	Focus	(cm)	1.00	29.95		3.02		5.99
	Gate Size	(cm)	0.05	0.10		0.10		0.05
	Scale	---	500	2427		880		10000

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **4V1** Operating mode: **2D with PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.45	1.04		3.83		1.88
Index Component Value				0.83	1.00	0.47	3.79	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.12					
	P	(mW)		111.55		98.80		69.76
	P_{1x1}	(mW)		54.30		54.78		
	z_s	(cm)			2.40			
	z_b	(cm)					3.50	
	z_{MI}	(cm)	1.90					
	$z_{pii,\alpha}$	(cm)	1.90					
	f_{awf}	(MHz)	3.32	3.21		1.81		3.11
Other Information	*prr*	(Hz)	79.87					
	srr	(Hz)	#					
	n_{pps}	---	119					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	47.44					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	538.21					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	842.44					
	p_r at z_{pii}	(MPa)	1.36					
Operating Control Conditions	Frequency	---	Mid	Mid		Low		Mid
	Focus	(cm)	2.02	29.95		3.45		5.99
	Gate Size	(cm)	0.10	0.10		0.40		0.05
	Scale	---	4167	2427		4167		2500

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **4V1** Operating mode: **2D with Color and PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.49	1.01		3.35		1.99
Index Component Value				0.85	0.74	0.46	3.26	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.08					
	P	(mW)		72.35		96.48		56.50
	P_{1x1}	(mW)		53.59		52.02		
	z_s	(cm)			1.90			
	z_b	(cm)					4.00	
	z_{MI}	(cm)	1.80					
	$z_{pii,\alpha}$	(cm)	1.90					
	f_{awf}	(MHz)	3.28	3.34		1.86		3.10
Other Information	*prr*	(Hz)	77.64					
	srr	(Hz)	#					
	n_{pps}	---	119					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	38.52					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	485.48					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	746.72					
	p_r at z_{pii}	(MPa)	1.33					
Operating Control Conditions	Frequency	---	Mid	Mid		Low		Mid
	Focus	(cm)	2.01	2.20		4.02		16.01
	Gate Size	(cm)	0.10	0.10		0.10		0.05
	Scale	---	4167	4167		5952		2155

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **4V1** Operating mode: **2D with M-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.40	0.98		2.01		2.05
Index Component Value				0.57	0.92	0.57	1.96	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.82					
	P	(mW)		43.02		162.68		104.88
	P_{1x1}	(mW)		57.83		57.86		
	z_s	(cm)			3.90			
	z_b	(cm)					5.00	
	z_{MI}	(cm)	6.70					
	$z_{pii,\alpha}$	(cm)	6.70					
	f_{awf}	(MHz)	1.69	2.07		2.08		2.07
Other Information	prr	(Hz)	60.10					
	srr	(Hz)	#					
	n_{pps}	---	20					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	154.31					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	263.66					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	584.72					
	p_r at z_{pii}	(MPa)	2.65					
Operating Control Conditions	Frequency	---	H Low	H High		H High		H High
	Focus	(cm)	8.00	12.00		11.14		28.06

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **4V1** Operating mode: **M-mode with Color**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.44	1.17		4.93		2.32
Index Component Value				0.66	1.13	0.57	4.69	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.26					
	P	(mW)		44.47		152.07		171.97
	P_{1x1}	(mW)		45.00		58.88		
	z_s	(cm)			3.10			
	z_b	(cm)					2.70	
	z_{MI}	(cm)	3.50					
	$z_{pii,\alpha}$	(cm)	3.50					
	f_{awf}	(MHz)	2.60	3.10		2.04		2.57
Other Information	prr	(Hz)	79.69					
	srr	(Hz)	#					
	n_{pps}	---	13					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	182.34					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	331.55					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	620.76					
	p_r at z_{pii}	(MPa)	3.09					
Operating Control Conditions	Frequency	---	Mid	Res		Pen		Mid
	Focus	(cm)	3.51	6.01		2.41		28.45
	Scale	---	1116	1894		4630		1250

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **4V1** Operating mode: **Contrast**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.38	0.68		0.68		1.97
Index Component Value				0.27	0.27	0.27	0.27	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.00					
	P	(mW)		61.21		61.21		102.29
	P_{1x1}	(mW)		24.83		24.83		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	5.50					
	$z_{pii,\alpha}$	(cm)	5.50					
	f_{awf}	(MHz)	2.10	2.29		2.29		2.07
Other Information	prr	(Hz)	#					
	srr	(Hz)	4.65					
	n_{pps}	---	3					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	154.86					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	6.01					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	11.54					
	p_r at z_{pii}	(MPa)	2.99					
Operating Control Conditions	Frequency	---	Low	Mid		Mid		Low
	Focus	(cm)	6.00	4.00		4.00		24.00

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **5V1** Operating mode: **2D-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.30	1.73		1.73		3.80
Index Component Value				1.73	1.73	1.73	1.73	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.79					
	P	(mW)		240.92		240.92		264.24
	P_{1x1}	(mW)		133.25		133.25		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	4.00					
	$z_{pii,\alpha}$	(cm)	4.00					
	f_{awf}	(MHz)	1.88	2.72		2.72		2.15
Other Information	prr	(Hz)	#					
	srr	(Hz)	10.33					
	n_{pps}	---	2					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	104.12					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	35.31					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	55.33					
	p_r at z_{pii}	(MPa)	2.18					
Operating Control Conditions	Frequency	---	H High	Mid		Mid		Pen
	Focus	(cm)	20.00	12.00		12.00		10.00
	Line Density	---	2	1		1		1

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **5V1** Operating mode: **2D with Color**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.40	1.62		1.62		3.66
Index Component Value				0.82	0.82	0.82	0.82	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.07					
	P	(mW)		161.33		161.33		67.53
	P_{1x1}	(mW)		68.72		68.72		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	4.60					
	$z_{pii,\alpha}$	(cm)	4.60					
	f_{awf}	(MHz)	2.51	2.51		2.51		2.01
Other Information	*prr*	(Hz)	#					
	srr	(Hz)	32.20					
	n_{pps}	---	9					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	327.74					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	86.13					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	218.97					
	p_r at z_{pii}	(MPa)	3.07					
Operating Control Conditions	Frequency	---	Mid	Res		Res		Pen
	Focus	(cm)	4.80	4.10		4.10		4.10
	Line Density	---	2	1		1		1
	Scale	---	4545	1190		1190		833

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **5V1** Operating mode: **PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.44	2.56		4.15		4.03
Index Component Value				2.56	2.22	1.68	4.15	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.94					
	P	(mW)		216.42		170.82		216.42
	P_{1x1}	(mW)		154.11		141.13		
	z_s	(cm)			2.00			
	z_b	(cm)					1.80	
	z_{MI}	(cm)	1.00					
	$z_{pii,\alpha}$	(cm)	1.80					
	f_{awf}	(MHz)	1.81	3.48		2.51		3.48
Other Information	*prr*	(Hz)	59.52					
	srr	(Hz)	#					
	n_{pps}	---	35					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	30.81					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	132.58					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	166.10					
	p_r at z_{pii}	(MPa)	1.01					
Operating Control Conditions	Frequency	---	Low	Mid		Low		Mid
	Focus	(cm)	1.00	0.99		0.99		0.99
	Gate Size	(cm)	0.10	1.50		0.10		1.50
	Scale	---	2083	12500		12500		12500

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **5V1** Operating mode: **2D with PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.35	2.24		3.58		4.09
Index Component Value				2.04	1.85	0.96	3.36	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.98					
	P	(mW)		180.10		134.48		180.10
	P_{1x1}	(mW)		123.28		111.23		
	z_s	(cm)			2.00			
	z_b	(cm)					1.80	
	z_{MI}	(cm)	3.00					
	$z_{pii,\alpha}$	(cm)	3.00					
	f_{awf}	(MHz)	3.42	3.48		1.82		3.48
Other Information	prr	(Hz)	79.37					
	srr	(Hz)	#					
	n_{pps}	---	24					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	154.90					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	363.69					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	751.17					
	p_r at z_{pii}	(MPa)	2.83					
Operating Control Conditions	Frequency	---	Mid	Mid		Low		Mid
	Focus	(cm)	3.00	1.00		0.99		1.00
	Gate Size	(cm)	0.10	1.50		1.50		1.50
	Scale	---	2500	15625		12500		15625

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **5V1** Operating mode: **2D with Color and PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.32	1.63		4.19		3.54
Index Component Value				1.22	1.15	0.88	3.73	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	0.97					
	P	(mW)		147.79		145.15		145.15
	P_{1x1}	(mW)		104.03		101.74		
	z_s	(cm)			2.40			
	z_b	(cm)					3.50	
	z_{MI}	(cm)	3.70					
	$z_{pii,\alpha}$	(cm)	3.70					
	f_{awf}	(MHz)	1.82	2.47		1.82		1.82
Other Information	prr	(Hz)	82.67					
	srr	(Hz)	#					
	n_{pps}	---	38					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	37.61					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	414.05					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	657.55					
	p_r at z_{pii}	(MPa)	1.18					
Operating Control Conditions	Frequency	---	Low	Low		Low		Low
	Focus	(cm)	4.00	12.00		16.00		16.00
	Gate Size	(cm)	0.30	0.10		0.40		0.40
	Scale	---	3968	2809		3731		3731

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **5V1** Operating mode: **2D with M-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.43	1.06		1.98		3.52
Index Component Value				0.24	0.43	0.24	1.35	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.84					
	P	(mW)		69.42		69.42		69.42
	P_{1x1}	(mW)		27.72		27.72		
	z_s	(cm)			2.70			
	z_b	(cm)					3.40	
	z_{MI}	(cm)	4.20					
	$z_{pii,\alpha}$	(cm)	4.20					
	f_{awf}	(MHz)	1.66	1.83		1.83		1.83
Other Information	prr	(Hz)	60.10					
	srr	(Hz)	#					
	n_{pps}	---	20					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	136.23					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	239.66					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	389.52					
	p_r at z_{pii}	(MPa)	2.23					
Operating Control Conditions	Frequency	---	H Mid	H Mid		H Mid		H Mid
	Focus	(cm)	5.00	12.00		12.00		12.00

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **5V1** Operating mode: **M-mode with Color**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.26	1.87		4.82		4.07
Index Component Value				1.10	1.51	0.80	3.79	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.78					
	P	(mW)		227.71		204.66		227.71
	P_{1x1}	(mW)		92.86		83.46		
	z_s	(cm)			3.40			
	z_b	(cm)					3.40	
	z_{MI}	(cm)	2.00					
	$z_{pii,\alpha}$	(cm)	2.40					
	f_{awf}	(MHz)	1.99	2.49		2.01		2.49
Other Information	prr	(Hz)	69.44					
	srr	(Hz)	#					
	n_{pps}	---	18					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	94.80					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	163.56					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	227.23					
	p_r at z_{pii}	(MPa)	1.93					
Operating Control Conditions	Frequency	---	Pen	Mid		Pen		Mid
	Focus	(cm)	2.01	11.99		11.99		11.99
	Scale	---	1389	5102		4237		5102

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **5V1** Operating mode: **CW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			0.16	1.53		5.00		4.44
Index Component Value				1.53	1.47	1.53	5.00	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	0.21					
	P	(mW)		213.41		213.41		213.41
	P_{1x1}	(mW)		177.84		177.84		
	z_s	(cm)			1.80			
	z_b	(cm)					1.80	
	z_{MI}	(cm)	1.00					
	$z_{pii,\alpha}$	(cm)	1.80					
	f_{awf}	(MHz)	1.81	1.81		1.81		1.81
Other Information	*prr*	(Hz)	59.81					
	srr	(Hz)	#					
	n_{pps}	---	30400					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	0.37					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	365.14					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	457.18					
	p_r at z_{pii}	(MPa)	0.12					
Operating Control Conditions	Frequency	---	Low	Low		Low		Low
	Focus	(cm)	1.01	0.99		0.99		0.99
# No data is provided for this operation condition.								

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **5V1** Operating mode: **2D with CW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.30	1.46		4.19		4.50
Index Component Value				1.21	1.16	1.21	3.94	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	0.13					
	P	(mW)		168.57		168.57		168.57
	P_{1x1}	(mW)		140.48		140.48		
	z_s	(cm)			1.80			
	z_b	(cm)					1.80	
	z_{MI}	(cm)	3.20					
	$z_{pii,\alpha}$	(cm)	3.20					
	f_{awf}	(MHz)	1.81	1.81		1.81		1.81
Other Information	*prr*	(Hz)	80.05					
	srr	(Hz)	#					
	n_{pps}	---	17280					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	0.57					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	435.04					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	648.77					
	p_r at z_{pii}	(MPa)	0.16					
Operating Control Conditions	Frequency	---	Low	Low		Low		Low
	Focus	(cm)	4.00	0.99		0.99		0.99
# No data is provided for this operation condition.								

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **5Z1** Operating mode: **2D-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.19	0.62		0.62		2.84
Index Component Value				0.62	0.62	0.62	0.62	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.42					
	P	(mW)		199.65		199.65		199.65
	P_{1x1}	(mW)		81.11		81.11		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	4.10					
	$z_{pii,\alpha}$	(cm)	4.10					
	f_{awf}	(MHz)	1.42	1.61		1.61		1.61
Other Information	prr	(Hz)	#					
	srr	(Hz)	34.86					
	n_{pps}	---	1					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	76.09					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	39.25					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	50.59					
	p_r at z_{pii}	(MPa)	1.68					
Operating Control Conditions	Frequency	---	Low	Mid		Mid		Mid
	Focus	(cm)	5.50	20.00		20.00		20.00
	Line Density	---	1	1		1		1

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **5Z1** Operating mode: **2D with Color**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.33	0.46		0.46		1.48
Index Component Value				0.43	0.43	0.43	0.43	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.07					
	P	(mW)		95.60		95.60		95.60
	P_{1x1}	(mW)		38.84		38.84		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	3.80					
	$z_{pii,\alpha}$	(cm)	3.80					
	f_{awf}	(MHz)	2.40	2.32		2.32		2.32
Other Information	prr	(Hz)	#					
	srr	(Hz)	35.95					
	n_{pps}	---	9					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	266.32					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	93.20					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	177.32					
	p_r at z_{pii}	(MPa)	2.80					
Operating Control Conditions	Frequency	---	Mid	Mid		Mid		Mid
	Focus	(cm)	3.99	5.00		5.00		5.00
	Line Density	---	2	3		3		3
	Scale	---	4545	4808		4808		4808

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **5Z1** Operating mode: **PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.28	0.58		3.02		1.43
Index Component Value				0.48	0.58	0.41	3.02	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.79					
	P	(mW)		90.46		95.35		95.50
	P_{1x1}	(mW)		40.95		43.16		
	z_s	(cm)			3.60			
	z_b	(cm)					4.90	
	z_{MI}	(cm)	0.70					
	$z_{pii,\alpha}$	(cm)	0.80					
	f_{awf}	(MHz)	1.96	2.47		1.98		1.98
Other Information	*prr*	(Hz)	60.44					
	srr	(Hz)	#					
	n_{pps}	---	44					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	115.40					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	392.88					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	437.45					
	p_r at z_{pii}	(MPa)	1.93					
Operating Control Conditions	Frequency	---	Low	Mid		Low		Low
	Focus	(cm)	2.00	8.02		8.00		8.00
	Gate Size	(cm)	0.10	0.20		0.20		0.20
	Scale	---	2660	1748		1256		1208

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **5Z1** Operating mode: **2D with M-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.31	0.53		1.08		1.52
Index Component Value				0.09	0.15	0.09	0.70	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.00					
	P	(mW)		21.39		21.39		21.39
	P_{1x1}	(mW)		8.69		8.69		
	z_s	(cm)			2.70			
	z_b	(cm)					5.00	
	z_{MI}	(cm)	4.50					
	$z_{pii,\alpha}$	(cm)	4.50					
	f_{awf}	(MHz)	2.32	2.29		2.29		2.29
Other Information	*prr*	(Hz)	60.39					
	srr	(Hz)	#					
	n_{pps}	---	10					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	325.16					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	130.20					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	268.62					
	p_r at z_{pii}	(MPa)	2.86					
Operating Control Conditions	Frequency	---	Mid	Mid		Mid		Mid
	Focus	(cm)	5.00	6.50		6.50		6.50

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **5Z1** Operating mode: **M-mode with Color**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.31	0.66		2.24		1.45
Index Component Value				0.44	0.62	0.44	2.05	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	0.98					
	P	(mW)		94.70		94.70		94.70
	P_{1x1}	(mW)		38.47		38.47		
	z_s	(cm)			3.40			
	z_b	(cm)					6.20	
	z_{MI}	(cm)	6.40					
	$z_{pii,\alpha}$	(cm)	6.40					
	f_{awf}	(MHz)	2.93	2.40		2.40		2.40
Other Information	prr	(Hz)	56.31					
	srr	(Hz)	#					
	n_{pps}	---	54					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	62.41					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	185.80					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	695.88					
	p_r at z_{pii}	(MPa)	1.75					
Operating Control Conditions	Frequency	---	High	Mid		Mid		Mid
	Focus	(cm)	8.00	9.00		9.00		9.00
	Scale	---	3378	5682		5682		5682
# No data is provided for this operation condition.								

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **5Z1** Operating mode: **CW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			0.31	0.33		2.60		1.02
Index Component Value				0.31	0.33	0.28	2.60	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	0.43					
	P	(mW)		43.84		38.91		43.84
	P_{1x1}	(mW)		32.88		29.18		
	z_s	(cm)			1.60			
	z_b	(cm)					2.70	
	z_{MI}	(cm)	1.00					
	$z_{pii,\alpha}$	(cm)	1.60					
	f_{awf}	(MHz)	1.99	1.99		1.99		1.99
Other Information	prr	(Hz)	59.88					
	srr	(Hz)	#					
	n_{pps}	---	33400					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	0.32					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	324.91					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	404.85					
	p_r at z_{pii}	(MPa)	0.10					
Operating Control Conditions	Frequency	---	Low	Low		Low		Low
	Focus	(cm)	1.01	5.01		4.01		5.01
# No data is provided for this operation condition.								

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **8V3** Operating mode: **2D-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.46	1.20		1.20		2.20
Index Component Value				1.20	1.20	1.20	1.20	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.95					
	P	(mW)		104.61		104.61		130.82
	P_{1x1}	(mW)		62.14		62.14		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	2.90					
	$z_{pii,\alpha}$	(cm)	2.90					
	f_{awf}	(MHz)	4.05	4.05		4.05		2.90
Other Information	*prr*	(Hz)	#					
	srr	(Hz)	34.23					
	n_{pps}	---	1					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	373.99					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	6.09					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	10.96					
	p_r at z_{pii}	(MPa)	4.33					
Operating Control Conditions	Frequency	---	Mid	Mid		Mid		Low
	Focus	(cm)	3.00	3.00		3.00		8.00
	Line Density	---	1	1		1		2

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **8V3** Operating mode: **2D with Color**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.46	1.58		1.58		2.34
Index Component Value				1.47	1.47	1.47	1.47	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.69					
	P	(mW)		84.76		84.76		132.14
	P_{1x1}	(mW)		64.30		64.30		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	2.50					
	$z_{pii,\alpha}$	(cm)	2.50					
	f_{awf}	(MHz)	3.47	4.79		4.79		3.46
Other Information	*prr*	(Hz)	#					
	srr	(Hz)	14.85					
	n_{pps}	---	9					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	245.67					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	19.33					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	31.20					
	p_r at z_{pii}	(MPa)	3.63					
Operating Control Conditions	Frequency	---	Mid	High		High		Mid
	Focus	(cm)	2.49	1.40		1.40		15.06
	Line Density	---	1	3		3		3
	Scale	---	274	391		391		4167

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **8V3** Operating mode: **PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.41	1.93		3.61		2.98
Index Component Value				1.93	1.52	1.33	3.61	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.62					
	P	(mW)		138.05		105.64		138.05
	P_{1x1}	(mW)		116.81		79.23		
	z_s	(cm)			1.70			
	z_b	(cm)					1.80	
	z_{MI}	(cm)	1.00					
	$z_{pii,\alpha}$	(cm)	1.80					
	f_{awf}	(MHz)	3.45	3.47		3.52		3.51
Other Information	prr	(Hz)	60.61					
	srr	(Hz)	#					
	n_{pps}	---	33					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	17.92					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	46.25					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	71.03					
	p_r at z_{pii}	(MPa)	0.93					
Operating Control Conditions	Frequency	---	Mid	Mid		Mid		Mid
	Focus	(cm)	1.00	1.00		1.50		1.00
	Gate Size	(cm)	0.05	1.25		0.10		1.25
	Scale	---	500	17857		19231		17857

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **8V3** Operating mode: **2D with PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.46	1.88		3.59		2.58
Index Component Value				1.81	1.42	0.78	3.43	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.40					
	P	(mW)		128.04		86.85		115.50
	P_{1x1}	(mW)		108.34		65.14		
	z_s	(cm)			1.70			
	z_b	(cm)					1.80	
	z_{MI}	(cm)	2.10					
	$z_{pii,\alpha}$	(cm)	2.10					
	f_{awf}	(MHz)	3.52	3.51		2.50		2.50
Other Information	prr	(Hz)	80.13					
	srr	(Hz)	#					
	n_{pps}	---	74					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	71.01					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	506.81					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	843.91					
	p_r at z_{pii}	(MPa)	1.80					
Operating Control Conditions	Frequency	---	Mid	Mid		Low		Low
	Focus	(cm)	2.00	1.01		1.41		1.01
	Gate Size	(cm)	0.10	1.25		1.25		1.25
	Scale	---	1953	17857		15625		16667

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **8V3** Operating mode: **2D with Color and PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.45	1.80		3.32		2.55
Index Component Value				1.59	1.25	0.63	2.95	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	0.90					
	P	(mW)		113.72		71.71		106.02
	P_{1x1}	(mW)		96.22		52.59		
	z_s	(cm)			1.70			
	z_b	(cm)					1.90	
	z_{MI}	(cm)	3.90					
	$z_{pii,\alpha}$	(cm)	3.90					
	f_{awf}	(MHz)	3.52	3.47		2.50		2.50
Other Information	*prr*	(Hz)	73.70					
	srr	(Hz)	#					
	n_{pps}	---	80					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	50.22					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	540.22					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	1432.02					
	p_r at z_{pii}	(MPa)	1.45					
Operating Control Conditions	Frequency	---	Mid	Mid		Low		Low
	Focus	(cm)	4.00	1.00		1.51		1.00
	Gate Size	(cm)	0.15	1.25		1.25		1.25
	Scale	---	1953	17857		12500		16667

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **8V3** Operating mode: **2D with M-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.46	1.13		2.09		2.15
Index Component Value				0.68	0.84	0.75	2.04	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.95					
	P	(mW)		53.75		111.56		56.05
	P_{1x1}	(mW)		47.89		57.52		
	z_s	(cm)			2.20			
	z_b	(cm)					3.30	
	z_{MI}	(cm)	2.90					
	$z_{pii,\alpha}$	(cm)	2.90					
	f_{awf}	(MHz)	4.05	2.97		2.73		2.97
Other Information	*prr*	(Hz)	60.10					
	srr	(Hz)	#					
	n_{pps}	---	10					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	373.99					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	97.58					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	234.00					
	p_r at z_{pii}	(MPa)	4.33					
Operating Control Conditions	Frequency	---	Mid	Low		H High		Low
	Focus	(cm)	3.00	22.83		8.00		22.83

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **8V3** Operating mode: **M-mode with Color**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.45	1.37		2.40		2.30
Index Component Value				1.29	1.11	1.18	2.25	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.65					
	P	(mW)		61.84		87.46		114.62
	P_{1x1}	(mW)		55.10		51.54		
	z_s	(cm)			2.20			
	z_b	(cm)					3.10	
	z_{MI}	(cm)	3.30					
	$z_{pii,\alpha}$	(cm)	3.30					
	f_{awf}	(MHz)	3.47	4.93		4.82		3.46
Other Information	prr	(Hz)	51.91					
	srr	(Hz)	#					
	n_{pps}	---	26					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	305.33					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	448.86					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	1043.01					
	p_r at z_{pii}	(MPa)	3.89					
Operating Control Conditions	Frequency	---	Mid	High		High		Mid
	Focus	(cm)	3.61	4.73		3.25		15.17
	Scale	---	1453	4902		1276		2551

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **8V3** Operating mode: **CW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			0.09	1.30		3.72		2.17
Index Component Value				1.30	0.89	1.03	3.72	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	0.18					
	P	(mW)		74.82		87.24		88.05
	P_{1x1}	(mW)		74.82		87.24		
	z_s	(cm)			1.50			
	z_b	(cm)					1.70	
	z_{MI}	(cm)	1.10					
	$z_{pii,\alpha}$	(cm)	1.50					
	f_{awf}	(MHz)	3.64	3.64		2.49		2.49
Other Information	prr	(Hz)	59.81					
	srr	(Hz)	#					
	n_{pps}	---	60800					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	0.23					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	231.26					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	336.90					
	p_r at z_{pii}	(MPa)	0.10					
Operating Control Conditions	Frequency	---	Mid	Mid		Low		Low
	Focus	(cm)	1.03	1.01		1.37		1.01

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **8V3** Operating mode: **2D with CW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.40	1.21		2.85		2.09
Index Component Value				1.03	0.71	0.63	2.63	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	0.14					
	P	(mW)		59.37		52.88		41.32
	P_{1x1}	(mW)		59.37		52.88		
	z_s	(cm)			1.50			
	z_b	(cm)					2.20	
	z_{MI}	(cm)	2.20					
	$z_{pii,\alpha}$	(cm)	2.20					
	f_{awf}	(MHz)	2.49	3.64		2.49		2.49
Other Information	prr	(Hz)	78.59					
	srr	(Hz)	#					
	n_{pps}	---	23750					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	0.59					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	439.42					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	640.81					
	p_r at z_{pii}	(MPa)	0.17					
Operating Control Conditions	Frequency	---	Low	Mid		Low		Low
	Focus	(cm)	2.01	1.01		2.01		8.01

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **8V3** Operating mode: **Contrast**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.46	1.25		1.25		2.19
Index Component Value				0.70	0.70	0.70	0.70	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.49					
	P	(mW)		65.90		65.90		129.79
	P_{1x1}	(mW)		48.84		48.84		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	2.90					
	$z_{pii,\alpha}$	(cm)	2.90					
	f_{awf}	(MHz)	3.01	3.01		3.01		3.01
Other Information	prr	(Hz)	#					
	srr	(Hz)	16.14					
	n_{pps}	---	1					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	224.95					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	3.33					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	5.61					
	p_r at z_{pii}	(MPa)	3.33					
Operating Control Conditions	Frequency	---	High	High		High		Low
	Focus	(cm)	3.00	1.50		1.50		9.00

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **10V4** Operating mode: **2D-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			0.82	1.48		1.48		1.71
Index Component Value				1.48	1.48	1.48	1.48	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.85					
	P	(mW)		52.74		52.74		68.34
	P_{1x1}	(mW)		40.69		40.69		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	2.20					
	$z_{pii,\alpha}$	(cm)	2.20					
	f_{awf}	(MHz)	5.10	7.62		7.62		6.08
Other Information	prr	(Hz)	#					
	srr	(Hz)	16.67					
	n_{pps}	---	2					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	86.51					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	29.60					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	57.07					
	p_r at z_{pii}	(MPa)	2.69					
Operating Control Conditions	Frequency	---	H Low	High		High		Low
	Focus	(cm)	10.50	8.00		8.00		8.00
	Line Density	---	1	2		2		2

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **10V4** Operating mode: **2D with Color**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.20	1.65		1.65		1.84
Index Component Value				0.92	0.92	0.92	0.92	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.66					
	P	(mW)		36.66		36.66		39.32
	P_{1x1}	(mW)		34.03		34.03		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	1.90					
	$z_{pii,\alpha}$	(cm)	1.90					
	f_{awf}	(MHz)	4.88	5.65		5.65		4.90
Other Information	prr	(Hz)	#					
	srr	(Hz)	34.90					
	n_{pps}	---	13					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	332.33					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	50.17					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	152.48					
	p_r at z_{pii}	(MPa)	3.60					
Operating Control Conditions	Frequency	---	Mid	High		High		Mid
	Focus	(cm)	1.99	1.50		1.50		5.00
	Line Density	---	2	1		1		1
	Scale	---	8065	3571		3571		2500

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **10V4** Operating mode: **PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.35	2.10		2.90		2.91
Index Component Value				2.10	1.09	1.95	2.90	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.70					
	P	(mW)		60.68		82.11		89.70
	P_{1x1}	(mW)		60.68		82.11		
	z_s	(cm)			1.30			
	z_b	(cm)					1.30	
	z_{MI}	(cm)	0.50					
	$z_{pii,\alpha}$	(cm)	0.90					
	f_{awf}	(MHz)	4.02	7.28		5.00		5.00
Other Information	prr	(Hz)	60.61					
	srr	(Hz)	#					
	n_{pps}	---	33					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	47.20					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	115.63					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	148.44					
	p_r at z_{pii}	(MPa)	1.16					
Operating Control Conditions	Frequency	---	Low	High		Mid		Mid
	Focus	(cm)	0.50	13.68		1.00		0.82
	Gate Size	(cm)	0.10	0.10		0.25		1.25
	Scale	---	500	5000		12500		19231

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **10V4** Operating mode: **2D with PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.15	1.73		2.44		2.25
Index Component Value				1.09	0.59	1.48	2.19	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	0.61					
	P	(mW)		31.21		62.14		63.53
	P_{1x1}	(mW)		31.21		62.14		
	z_s	(cm)			1.20			
	z_b	(cm)					1.30	
	z_{MI}	(cm)	1.90					
	$z_{pii,\alpha}$	(cm)	1.90					
	f_{awf}	(MHz)	5.01	7.31		5.00		5.00
Other Information	prr	(Hz)	79.87					
	srr	(Hz)	#					
	n_{pps}	---	119					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	15.31					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	360.64					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	865.40					
	p_r at z_{pii}	(MPa)	0.89					
Operating Control Conditions	Frequency	---	Mid	High		Mid		Mid
	Focus	(cm)	2.00	5.00		1.00		1.00
	Gate Size	(cm)	0.20	0.40		0.20		0.40
	Scale	---	2500	2841		4167		4167

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **10V4** Operating mode: **2D with Color and PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.36	1.85		2.55		2.34
Index Component Value				1.34	0.86	1.42	2.14	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	0.72					
	P	(mW)		56.33		59.83		60.59
	P_{1x1}	(mW)		56.33		59.83		
	z_s	(cm)			1.30			
	z_b	(cm)					1.30	
	z_{MI}	(cm)	1.90					
	$z_{pii,\alpha}$	(cm)	1.90					
	f_{awf}	(MHz)	5.01	5.00		5.00		5.00
Other Information	*prr*	(Hz)	76.69					
	srr	(Hz)	#					
	n_{pps}	---	124					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	21.26					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	366.23					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	878.80					
	p_r at z_{pii}	(MPa)	1.05					
Operating Control Conditions	Frequency	---	Mid	Mid		Mid		Mid
	Focus	(cm)	2.01	0.99		0.99		0.99
	Gate Size	(cm)	0.15	0.40		0.30		0.40
	Scale	---	4167	25000		25000		25000

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **10V4** Operating mode: **2D with M-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.37	1.46		1.68		1.68
Index Component Value				0.30	0.15	0.14	0.32	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.80					
	P	(mW)		7.85		5.87		5.87
	P_{1x1}	(mW)		7.70		4.71		
	z_s	(cm)			1.30			
	z_b	(cm)					2.00	
	z_{MI}	(cm)	1.00					
	$z_{pii,\alpha}$	(cm)	1.30					
	f_{awf}	(MHz)	4.18	8.12		6.04		6.04
Other Information	*prr*	(Hz)	60.10					
	srr	(Hz)	#					
	n_{pps}	---	20					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	58.34					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	29.05					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	42.28					
	p_r at z_{pii}	(MPa)	1.50					
Operating Control Conditions	Frequency	---	H Mid	High		Low		Low
	Focus	(cm)	1.00	1.00		2.00		2.00

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **10V4** Operating mode: **M-mode with Color**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.34	1.39		1.91		1.83
Index Component Value				1.16	0.84	0.78	1.59	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.97					
	P	(mW)		55.32		50.73		60.22
	P_{1x1}	(mW)		42.35		39.46		
	z_s	(cm)			1.50			
	z_b	(cm)					3.40	
	z_{MI}	(cm)	2.40					
	$z_{pii,\alpha}$	(cm)	2.40					
	f_{awf}	(MHz)	4.90	5.76		4.15		4.95
Other Information	*prr*	(Hz)	45.09					
	srr	(Hz)	#					
	n_{pps}	---	26					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	423.68					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	394.70					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	887.90					
	p_r at z_{pii}	(MPa)	4.46					
Operating Control Conditions	Frequency	---	Mid	High		Low		Mid
	Focus	(cm)	2.50	8.02		4.22		8.00
	Scale	---	1263	5682		3906		4717
# No data is provided for this operation condition.								

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **10V4** Operating mode: **CW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			0.11	1.44		1.68		2.31
Index Component Value				1.44	1.02	1.20	1.68	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	0.21					
	P	(mW)		60.84		63.13		63.13
	P_{1x1}	(mW)		60.84		63.13		
	z_s	(cm)			1.00			
	z_b	(cm)					1.50	
	z_{MI}	(cm)	0.50					
	$z_{pii,\alpha}$	(cm)	1.50					
	f_{awf}	(MHz)	4.00	4.99		4.00		4.00
Other Information	*prr*	(Hz)	59.88					
	srr	(Hz)	#					
	n_{pps}	---	66800					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	0.17					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	169.24					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	258.52					
	p_r at z_{pii}	(MPa)	0.09					
Operating Control Conditions	Frequency	---	Low	Mid		Low		Low
	Focus	(cm)	0.50	0.50		0.56		0.50
# No data is provided for this operation condition.								

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **10V4** Operating mode: **2D with CW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.09	1.39		2.29		1.92
Index Component Value				0.61	0.43	0.59	1.49	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	0.10					
	P	(mW)		25.65		24.64		24.88
	P_{1x1}	(mW)		25.65		24.64		
	z_s	(cm)			1.00			
	z_b	(cm)					1.00	
	z_{MI}	(cm)	1.90					
	$z_{pii,\alpha}$	(cm)	1.90					
	f_{awf}	(MHz)	4.99	4.99		4.99		4.99
Other Information	prr	(Hz)	78.78					
	srr	(Hz)	#					
	n_{pps}	---	47500					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	0.38					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	285.38					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	569.14					
	p_r at z_{pii}	(MPa)	0.15					
Operating Control Conditions	Frequency	---	Mid	Mid		Mid		Mid
	Focus	(cm)	1.99	4.99		0.99		0.99

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **10V4** Operating mode: **Contrast**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.36	1.51		1.51		1.71
Index Component Value				1.51	1.51	1.51	1.51	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	3.27					
	P	(mW)		68.07		68.07		68.23
	P_{1x1}	(mW)		54.68		54.68		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	2.00					
	$z_{pii,\alpha}$	(cm)	2.00					
	f_{awf}	(MHz)	5.79	5.79		5.79		5.80
Other Information	prr	(Hz)	#					
	srr	(Hz)	2.00					
	n_{pps}	---	3					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	475.99					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	1.25					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	2.71					
	p_r at z_{pii}	(MPa)	4.87					
Operating Control Conditions	Frequency	---	Low	H Mid		H Mid		H Mid
	Focus	(cm)	2.00	2.00		2.00		3.00

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **Z6T** Operating mode: **2D-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.17	0.78		0.78		1.00
Index Component Value				0.78	0.78	0.78	0.78	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.49					
	P	(mW)		39.74		39.74		39.73
	P_{1x1}	(mW)		39.74		39.74		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	1.20					
	$z_{pii,\alpha}$	(cm)	1.20					
	f_{awf}	(MHz)	4.53	4.14		4.14		4.14
Other Information	prr	(Hz)	#					
	srr	(Hz)	28.41					
	n_{pps}	---	11					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	274.27					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	44.91					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	54.19					
	p_r at z_{pii}	(MPa)	2.92					
Operating Control Conditions	Frequency	---	Mid	Pen		Pen		Pen
	Focus	(cm)	5.50	5.00		5.00		5.00
	Line Density	---	1	3		3		1

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **Z6T** Operating mode: **2D with Color**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.27	0.84		0.84		1.31
Index Component Value				0.78	0.78	0.78	0.78	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.32					
	P	(mW)		49.24		49.24		49.24
	P_{1x1}	(mW)		49.24		49.24		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	2.40					
	$z_{pii,\alpha}$	(cm)	2.40					
	f_{awf}	(MHz)	3.33	3.33		3.33		3.33
Other Information	prr	(Hz)	#					
	srr	(Hz)	24.67					
	n_{pps}	---	11					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	304.98					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	119.56					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	193.59					
	p_r at z_{pii}	(MPa)	3.00					
Operating Control Conditions	Frequency	---	Low	Low		Low		Low
	Focus	(cm)	3.00	3.00		3.00		3.00
	Line Density	---	1	1		1		1
	Scale	---	4310	1389		1389		1389

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **Z6T** Operating mode: **PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.28	0.78		1.93		1.28
Index Component Value				0.78	0.55	0.78	1.93	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.33					
	P	(mW)		49.39		49.39		51.17
	P_{1x1}	(mW)		49.39		49.39		
	z_s	(cm)			1.50			
	z_b	(cm)					3.10	
	z_{MI}	(cm)	1.00					
	$z_{pii,\alpha}$	(cm)	1.00					
	f_{awf}	(MHz)	3.32	3.33		3.33		3.32
Other Information	prr	(Hz)	58.64					
	srr	(Hz)	#					
	n_{pps}	---	21					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	203.12					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	275.04					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	345.77					
	p_r at z_{pii}	(MPa)	2.61					
Operating Control Conditions	Frequency	---	Low	Low		Low		Low
	Focus	(cm)	2.00	6.01		6.01		6.01
	Gate Size	(cm)	0.05	0.25		0.25		0.15
	Scale	---	1232	1244		1244		600

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **Z6T** Operating mode: **2D with M-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.47	0.78		1.12		1.00
Index Component Value				0.13	0.09	0.13	0.39	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	3.06					
	P	(mW)		6.63		6.28		6.63
	P_{1x1}	(mW)		6.63		6.28		
	z_s	(cm)			1.50			
	z_b	(cm)					2.40	
	z_{MI}	(cm)	2.40					
	$z_{pii,\alpha}$	(cm)	2.40					
	f_{awf}	(MHz)	4.31	4.14		4.31		4.14
Other Information	prr	(Hz)	60.39					
	srr	(Hz)	#					
	n_{pps}	---	10					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	613.41					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	126.54					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	263.43					
	p_r at z_{pii}	(MPa)	4.30					
Operating Control Conditions	Frequency	---	Pen	Pen		Pen		Pen
	Focus	(cm)	3.00	6.50		3.00		6.50

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **Z6T** Operating mode: **M-mode with Color**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.27	0.87		1.21		1.34
Index Component Value				0.84	0.57	0.82	1.14	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.32					
	P	(mW)		46.25		52.49		52.48
	P_{1x1}	(mW)		46.25		52.49		
	z_s	(cm)			1.50			
	z_b	(cm)					1.50	
	z_{MI}	(cm)	2.40					
	$z_{pii,\alpha}$	(cm)	2.40					
	f_{awf}	(MHz)	3.33	3.83		3.27		3.27
Other Information	*prr*	(Hz)	86.81					
	srr	(Hz)	#					
	n_{pps}	---	11					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	304.98					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	324.89					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	571.31					
	p_r at z_{pii}	(MPa)	3.00					
Operating Control Conditions	Frequency	---	Low	Mid		Low		Low
	Focus	(cm)	3.00	16.00		16.00		16.00
	Scale	---	1042	1689		1389		2604

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **Z6T** Operating mode: **CW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			0.08	0.70		2.01		1.51
Index Component Value				0.70	0.54	0.70	2.01	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	0.14					
	P	(mW)		44.06		44.06		44.06
	P_{1x1}	(mW)		44.06		44.06		
	z_s	(cm)			1.10			
	z_b	(cm)					1.20	
	z_{MI}	(cm)	0.90					
	$z_{pii,\alpha}$	(cm)	1.10					
	f_{awf}	(MHz)	3.33	3.33		3.33		3.33
Other Information	*prr*	(Hz)	59.87					
	srr	(Hz)	#					
	n_{pps}	---	55680					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	0.48					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	478.87					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	616.64					
	p_r at z_{pii}	(MPa)	0.14					
Operating Control Conditions	Frequency	---	Low	Low		Low		Low
	Focus	(cm)	0.99	3.75		3.75		3.75

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **AcuNav Lumos 4D ICE** Operating mode: **2D-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			0.91	1.92		1.92		3.51
Index Component Value				1.92	1.92	1.92	1.92	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.17					
	P	(mW)		70.11		70.11		70.11
	P_{1x1}	(mW)		70.11		70.11		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	0.70					
	$z_{pii,\alpha}$	(cm)	0.70					
	f_{awf}	(MHz)	5.76	5.75		5.75		5.75
Other Information	prr	(Hz)	#					
	srr	(Hz)	250.00					
	n_{pps}	---	1					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	142.02					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	198.21					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	261.72					
	p_r at z_{pii}	(MPa)	2.50					
Operating Control Conditions	Frequency	---	Low	Low		Low		Low
	Focus	(cm)	24.00	10.00		10.00		10.00
	Line Density	---	1	2		2		2

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **AcuNav Lumos 4D ICE** Operating mode: **2D with Color**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.20	2.01		2.01		4.80
Index Component Value				1.59	1.59	1.59	1.59	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.95					
	P	(mW)		55.92		55.92		55.25
	P_{1x1}	(mW)		55.92		55.92		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	0.80					
	$z_{pii,\alpha}$	(cm)	0.80					
	f_{awf}	(MHz)	5.98	5.99		5.99		5.98
Other Information	prr	(Hz)	#					
	srr	(Hz)	29.89					
	n_{pps}	---	9					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	276.89					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	430.51					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	574.80					
	p_r at z_{pii}	(MPa)	3.35					
Operating Control Conditions	Frequency	---	High	High		High		High
	Focus	(cm)	15.00	3.00		3.00		1.50
	Line Density	---	1	1		1		1
	Scale	---	4310	10000		10000		1984

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **AcuNav Lumos 4D ICE** Operating mode: **PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.28	0.62		2.31		2.20
Index Component Value				0.62	0.49	0.69	2.31	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	2.86					
	P	(mW)		25.95		36.19		36.19
	P_{1x1}	(mW)		25.95		36.19		
	z_s	(cm)			0.70			
	z_b	(cm)					0.70	
	z_{MI}	(cm)	0.70					
	$z_{pii,\alpha}$	(cm)	0.70					
	f_{awf}	(MHz)	5.03	5.01		4.02		4.02
Other Information	prr	(Hz)	59.81					
	srr	(Hz)	#					
	n_{pps}	---	20					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	320.19					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	469.61					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	600.15					
	p_r at z_{pii}	(MPa)	3.13					
Operating Control Conditions	Frequency	---	High	High		Low		Low
	Focus	(cm)	2.50	11.99		12.00		12.00
	Gate Size	(cm)	0.10	0.40		0.40		0.40
	Scale	---	1196	4808		3676		3676
# No data is provided for this operation condition.								

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **AcuNav Lumos 4D ICE** Operating mode: **2D with PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.34	0.95		2.50		2.51
Index Component Value				0.67	0.55	0.67	2.24	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	3.01					
	P	(mW)		34.80		35.11		35.11
	P_{1x1}	(mW)		34.80		35.11		
	z_s	(cm)			0.70			
	z_b	(cm)					0.70	
	z_{MI}	(cm)	0.70					
	$z_{pii,\alpha}$	(cm)	0.70					
	f_{awf}	(MHz)	5.03	4.02		4.02		4.02
Other Information	prr	(Hz)	80.00					
	srr	(Hz)	#					
	n_{pps}	---	19					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	354.45					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	406.53					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	519.54					
	p_r at z_{pii}	(MPa)	3.29					
Operating Control Conditions	Frequency	---	High	Low		Low		Low
	Focus	(cm)	2.50	12.00		12.00		12.00
	Gate Size	(cm)	0.05	0.40		0.40		0.40
	Scale	---	2000	4464		4464		4464
# No data is provided for this operation condition.								

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **AcuNav Lumos 4D ICE** Operating mode: **2D with Color and PW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.43	1.02		2.46		2.77
Index Component Value				0.51	0.42	0.65	2.11	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	1.17					
	P	(mW)		26.81		33.67		33.67
	P_{1x1}	(mW)		26.81		33.67		
	z_s	(cm)			0.70			
	z_b	(cm)					0.70	
	z_{MI}	(cm)	0.70					
	$z_{pii,\alpha}$	(cm)	0.70					
	f_{awf}	(MHz)	4.21	4.02		4.03		4.03
Other Information	prr	(Hz)	85.11					
	srr	(Hz)	#					
	n_{pps}	---	19					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	48.77					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	81.71					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	100.13					
	p_r at z_{pii}	(MPa)	1.29					
Operating Control Conditions	Frequency	---	Low	Low		Low		Low
	Focus	(cm)	0.76	4.00		13.00		13.00
	Gate Size	(cm)	0.05	0.40		0.40		0.40
	Scale	---	2000	3676		4717		4717

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **AcuNav Lumos 4D ICE** Operating mode: **CW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			0.06	0.43		1.40		1.23
Index Component Value				0.43	0.33	0.28	1.40	
Acoustic Parameters	IEC	Units						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	0.11					
	P	(mW)		17.92		14.55		14.55
	P_{1x1}	(mW)		17.92		14.55		
	z_s	(cm)			0.70			
	z_b	(cm)					0.80	
	z_{MI}	(cm)	0.80					
	$z_{pii,\alpha}$	(cm)	0.80					
	f_{awf}	(MHz)	4.00	4.99		4.00		4.00
Other Information	prr	(Hz)	59.88					
	srr	(Hz)	#					
	n_{pps}	---	66800					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	0.42					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	417.25					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	520.33					
	p_r at z_{pii}	(MPa)	0.13					
Operating Control Conditions	Frequency	---	Low	High		Low		Low
	Focus	(cm)	5.99	11.99		5.99		5.99

No data is provided for this operation condition.

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **AcuNav Lumos 4D ICE** Operating mode: **2D with CW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			0.89	0.67		1.61		1.55
Index Component Value				0.39	0.31	0.26	1.33	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	0.13					
	P	(mW)		16.63		13.84		13.96
	P_{1x1}	(mW)		16.63		13.84		
	z_s	(cm)			0.70			
	z_b	(cm)					0.80	
	z_{MI}	(cm)	0.80					
	$z_{pii,\alpha}$	(cm)	0.80					
	f_{awf}	(MHz)	4.00	4.99		4.00		4.00
Other Information	prr	(Hz)	80.00					
	srr	(Hz)	#					
	n_{pps}	---	38000					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	0.53					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	406.31					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	506.69					
	p_r at z_{pii}	(MPa)	0.14					
Operating Control Conditions	Frequency	---	Low	High		Low		Low
	Focus	(cm)	5.99	11.99		5.99		5.99
# No data is provided for this operation condition.								

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **CW2** Operating mode: **CW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			0.08	0.96		4.02		3.57
Index Component Value				0.96	0.89	0.96	4.02	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	0.11					
	P	(mW)		139.53		139.53		139.53
	P_{1x1}	(mW)		101.11		101.11		
	z_s	(cm)			2.90			
	z_b	(cm)					1.60	
	z_{MI}	(cm)	2.90					
	$z_{pii,\alpha}$	(cm)	2.90					
	f_{awf}	(MHz)	1.99	1.99		1.99		1.99
Other Information	prr	(Hz)	59.88					
	srr	(Hz)	#					
	n_{pps}	---	33400					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	0.41					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	34.48					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	52.31					
	p_r at z_{pii}	(MPa)	0.14					
Operating Control Conditions	Frequency	---	Pen	Pen		Pen		Pen
	Focus	(cm)	6.10	6.10		6.10		6.10
# No data is provided for this operation condition.								

Acoustic Output Reporting Table — Track 3, FDA 510(k) and IEC 60601-2-37

(Per transducer/mode that exceeds MI or TI value of 1.0)

Transducer model: **CW5** Operating mode: **CW Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			0.04	0.65		1.49		0.97
Index Component Value				0.65	0.49	0.65	1.49	
Acoustic Parameters	**IEC**	**Units**						
	$p_{r,\alpha}$ at z_{MI}	(MPa)	0.10					
	P	(mW)		30.90		30.90		30.90
	P_{1x1}	(mW)		27.35		27.35		
	z_s	(cm)			1.20			
	z_b	(cm)					1.30	
	z_{MI}	(cm)	1.70					
	$z_{pii,\alpha}$	(cm)	1.70					
	f_{awf}	(MHz)	4.99	4.99		4.99		4.99
Other Information	*prr*	(Hz)	59.88					
	srr	(Hz)	#					
	n_{pps}	---	83500					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm²)	0.31					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm²)	311.45					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm²)	559.02					
	p_r at z_{pii}	(MPa)	0.13					
Operating Control Conditions	Frequency	---	Mid	Mid		Mid		Mid
	Focus	(cm)	9.05	9.05		9.05		9.05

No data is provided for this operation condition.

SIEMENS Healthineers

ACUSON Origin
Diagnostic Ultrasound System
Advanced Imaging Manual

US

CE
0123

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ACUSON Origin

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Contents

Chapter A1 **Biopsy and Puncture Procedures**

Explanation of the biopsy (puncture) function. Includes a procedure for needle path verification.

Chapter A2 **Panoramic Imaging**

Procedures for scanning an extended field of view with the panoramic imaging feature.

Chapter A3 **Contrast Agent Imaging**

Procedures for activating and using the contrast agent imaging feature.

Chapter A4 **Modality Compare**

Procedures for comparing images or clips from multiple exams and multiple imaging modalities.

Chapter B1 **Review**

Procedures for reviewing images and clips in the current or previous examination.

Chapter B2 **Export and Import**

Procedures for copying patient studies to and from the ultrasound system. Includes a procedure for removing or hiding patient-identifying information.

Chapter C1 **Physiologic Function**

Procedures for activating and adjusting ECG, auxiliary ECG, and respiration traces. Includes an explanation of the physio panel and a troubleshooting guide.

Chapter C2 **Stress Echo**

Procedures for capturing and reviewing images and clips using stress echo protocols.

Chapter C3 **Transesophageal Transducer**

Prerequisite chapter for reading and understanding prior to the use of any transesophageal transducer. Includes recommendations for leakage current testing, electrical safety, exam considerations, and cleaning and care information.

Chapter C4 **Z6T Transesophageal Transducer**

Descriptions and illustrations of the articulation controls and on-screen indicators and messages for the Z6T transesophageal transducer. Includes information on temperature controls and safeguards.

Chapter D1 **Reserved for Future Use**

Chapter D2 **Cardiac Volume Imaging**

Procedures for acquiring three-dimensional volumes (3D) or for simultaneously acquiring and viewing three-dimensional images in real-time (4D) of the heart.

Chapter D3 **2D Heart AI**

Procedures for activating and using the clinical software program to perform left heart volume measurements using 2D-mode data from two image frames.

Includes the 2D Heart+ AI feature, which includes procedures to visualize, measure, and asses myocardial motion and mechanics using acquired 2D clips during live imaging or from review.

Chapter D4 **4D Heart AI**

Procedures for activating and using the clinical software program to detect, evaluate, and quantify the shape, size and function of the heart chambers.

Note: Not all features and options described in this publication are available to all users. Please check with your Siemens Healthineers representative to determine the current availability of features and options.

See also: For a list of available options and features, refer to Appendix A in the Instructions for Use.

About the User and Reference Manuals

The user and reference manuals consist of the following publications.

Publication	Includes
Instructions for Use	▪ Conventions and typographical conventions used in the manuals ▪ Intended audience ▪ Introduction to the ultrasound system ▪ Safety and care information for the ultrasound system and compatible transducers ▪ Procedures for setting up and preparing the system for use ▪ Procedures for registering a patient and activating an operating mode ▪ Procedures for acquiring, optimizing, annotating, measuring, printing, and recording images ▪ Technical description of the ultrasound system ▪ Acoustic output data
Advanced Imaging Manual	This manual is a companion to the Instructions for Use publication and contains additional instructions for use for the safe and proper use of advanced imaging features on the ultrasound system. ▪ Description of the biopsy function ▪ Procedures for specialty imaging – Panoramic imaging – Contrast agent imaging – Comparing images from multiple modalities ▪ Procedures for reviewing images and clips ▪ Description of features for cardiology – Procedures for the physiologic function – Procedures for the stress echo function – Description of the transesophageal transducer, including cleaning and care of the transducer – Cardiac volume imaging – 2D Heart AI – 4D Heart AI
*System Reference**	▪ Description of customizable system settings ▪ Description of all measurement labels configurable for the ultrasound system ▪ Information about DICOM connectivity, network capabilities, and external devices ▪ Clinical references ▪ Information regarding the electromagnetic compatibility (EMC) testing of this ultrasound system

*Languages supported by the user interface include a translation of this publication.

Conventions

The user and reference manuals include the following conventions.

Convention	Description
Warnings and Cautions	⚠ **WARNING:** Warnings are intended to alert you to the importance of following the correct operating procedures where risk of injury to the patient or system user exists. ⚠ **Caution:** Cautions are intended to alert you to the importance of following the correct operating procedures to prevent the risk of damage to the ultrasound system.
Notes and Prerequisites	**Prerequisite:** Prerequisites contain tasks the user must complete or information the user needs prior to performing a procedure. **Note:** Notes contain information concerning the proper use of the ultrasound system or correct execution of a procedure.
Cross-references	Examples: **See also:** For information about cleaning and disinfecting a transducer, refer to Chapter 3 in this manual. **See also:** For information about customizing the measurement function, refer to Chapter 2 in the System Reference. **See also:** For additional information about the measurement function, refer to Chapter 10 in the Instructions for Use. **See also:** For information about exporting and importing images, refer to Chapter B2 in the Advanced Imaging Manual. **See also:** Alphanumeric Keyboard, page 1-26 **See also:** Chapter 2, Instructions for Use
Customizable Ultrasound System Settings	Settings for configuring and customizing the ultrasound system are described in the System Reference. When customization is available, the user manual provides a reference to the configuration settings. Example: Use the configuration settings to customize the measurement function.

Typographical Conventions

The following typographical conventions are in descriptions and procedures within your user and reference manuals. Use the conventions to identify the location of a control or selection on the ultrasound system.

Control or Selection	Description
Controls on the Control Panel	Controls located on the control panel are indicated by uppercase boldface type. Examples: ▪ Rotate **2D** to adjust the 2D gain. ▪ Press **ABC** to activate or exit the annotation function. ▪ Double-click **UPDATE** to display the 2D image.
Trackball and Trackball Keys	Right and left trackball keys are located on the control panel. The function assigned to the trackball and trackball keys is indicated by labels on the image screen. Examples: ▪ Adjust the size or position of the field of view and then press a trackball key. ▪ Position the measurement marker and then press a trackball key. ▪ Press the right trackball key.
Selections on the Image Screen	On-screen selections are indicated by boldface type. Roll the trackball to position the pointer on the control or object on the image screen and then press a trackball key. Examples: ▪ Click **Correct** on the patient registration form. ▪ Double-click a thumbnail. ▪ Select the check box for the required entries and then click **Delete**.
Controls on the Control Panel for the Touch Screen	Press and rotate controls on the control panel are labeled on the touch screen. The selection assigned to these controls is indicated by boldface type. Examples: ▪ Rotate **Tint**. ▪ Press **Steer**.
Selections on the Touch Screen	Touch screen selections are indicated by boldface type. Tap the touch screen to access a selection. Drag an object on the touch screen to reposition the object. Swipe the screen to display a separate page of selections. Examples: ▪ Tap **Workflow**. ▪ Drag the tail of the arrow on the touch screen to adjust the length.

A1 Biopsy and Puncture Procedures

Overview 3

Activating the Biopsy (Puncture) Guideline Function 5

Verifying the Needle Path Before a Procedure 6

Overview

Refer to the in-box instructions for attachment and care procedures for all needle guide accessories, including information on reprocessing the reusable bracket.

⚠ **WARNING:** Percutaneous procedures always involve heightened risk to the patient and to the operator handling biopsy needle guides. Clinicians using Siemens Healthineers recommended biopsy devices under ultrasound guidance should be trained and must observe proper needle insertion sequencing with the needle guide in order to avoid undue discomfort and unnecessary risk and injury to the patient.

⚠ **WARNING:** The ultrasound system displays guidelines on the image to indicate an anticipated needle path. The guidelines do not account for a bent or deflected needle and are not intended as an absolute reference. It is the user's responsibility to verify correct positioning of the needle during a biopsy or puncture procedure.

⚠ **WARNING:** To reduce the risk of injury to the patient, conduct a biopsy procedure during real-time imaging. When an image is frozen, the correct positioning of the needle cannot be assured.

⚠ **WARNING:** The ultrasound system displays a warning message if the image refresh rate is too low to support visualization of the needle. This is a temporary condition. Pause the procedure until the system resumes real-time imaging. If the image refresh rate remains too low for visualization of the needle, discontinue the procedure.

> **The frame rate is too low to support visualization of the needle.**
>
> **Adjust the imaging parameters to increase the frame rate or discontinue the procedure.**

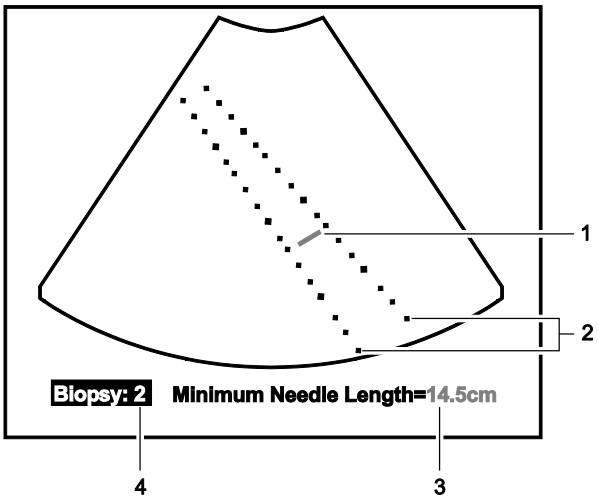
⚠ **Caution:** Visually inspect the biopsy device before use. Do not attach a damaged biopsy device to a transducer.

See also: For a list of compatible reusable bracket and disposable needle guides, refer to Appendix A in the Instructions for Use.

The biopsy function is available for transducers compatible with needle guide attachments. The ultrasound system displays guidelines on the image to indicate an anticipated needle path. You must verify the angle of the needle guide on the biopsy device matches the angle selection on the image screen before performing any procedure.

You can also use the biopsy function to estimate the minimum length of a needle required for the intended procedure.

Note: The minimum needle length is dependent on the biopsy device attached to the transducer and the position of the target area of interest. The minimum needle length is an estimate of the distance from the top of the needle guide attached to the transducer to the needle length marker along the needle path guideline. The target of interest is selectable using a positionable marker within the guidelines on the image screen.



Example of the on-screen guidelines with a proposed minimum needle length.

1 Needle length marker
Identifies the target area of interest within the guidelines
2 Guidelines
Displays an anticipated needle path on the image
3 Minimum needle length
Displays the proposed minimum length of the needle in centimeters (cm)
4 Angle selection
Displays the angle selected on the touch screen

Activating the Biopsy (Puncture) Guideline Function

You can activate the biopsy function during real-time imaging in the following modes:

- 2D-mode with full field of view
- 2D-mode with color
- 2D-mode with contrast

While using the biopsy function, you can activate another compatible mode or freeze the image. The color of the guidelines changes from green to yellow when you freeze the image.

If you request an action not allowed during the biopsy function or attempt to activate the biopsy function from an incompatible mode, the system displays a message indicating the action is not allowed.

To activate the biopsy function:

Prerequisite: Refer to the needle guide manufacturer's instructions for attachment and care procedures for all needle guide accessories.

Note: Before performing any patient procedure using a needle guide, you must verify the needle path.

1. Tap **Biopsy**.

   The ultrasound system may display a message indicating the image format is incompatible and requires a format change.
2. To accept any required format changes, click **OK**. To cancel activation of the biopsy function, click **Cancel**.
3. To specify the angle of the needle path, tap the required angle setting.
4. Confirm the target area of interest is within the guidelines.

   The system displays the following message as a precaution:

   Verify the angle selected on the needle guide attached to the transducer matches the selection on the touch screen.
5. Verify the angle locked on the needle guide attached to the transducer matches the selection on the touch screen and then tap **OK**.
6. To determine the minimum length of the needle required for the intended procedure:
   a. Tap **Minimum Needle Length**, if necessary.
   b. Roll the trackball to position the needle length marker at the target area of interest.

      The system displays the proposed minimum length of the needle on the image screen.
7. To exit the biopsy function and remove the guidelines from the image:
   a. Tap **Biopsy**.
   b. Tap **Off**.

   Note: Disconnecting the active transducer from the ultrasound system exits the biopsy function.

Verifying the Needle Path Before a Procedure

⚠ **WARNING:** Do not use a needle guide if the path of the needle is not accurately indicated by the guidelines on the image. The path of the needle must display within the guideline. Contact your Siemens Healthineers service representative if the needle path is not accurately indicated.

Before performing any patient procedure using a needle guide, you must verify that the path of the needle is accurately indicated by the guidelines on the image.

The needle guide is ready for patient use ***only after the path of the needle has been verified***.

Checklist of items required for needle path verification:

- Transducer with attached needle guide
- Water-based coupling agent (gel)
- Sterile transducer sheath
- New, straight, biopsy needle
- Sterilized container of sterilized and degassed water

To verify the path of the needle:

1. Attach the needle guide to the transducer.

   See also: For attachment and care procedures for all needle guide accessories, refer to the needle guide manufacturer's instructions.

2. Connect the transducer to the system and activate the transducer, if necessary.
3. Activate the biopsy function and then confirm the angle on the image screen matches the angle locked on the needle guide attached to the transducer.

   See also: Activating the Biopsy (Puncture) Guideline Function, page A1-5

4. Immerse the head of the transducer into the degassed water and insert the needle into the needle guide.
5. Verify the path of the needle displays according to the guidelines on the image.

   After verification, the needle guide is ready for use.

A2 Panoramic Imaging

Overview **3**

Acquiring a Panoramic Image **4**

Avoiding Artifacts During Acquisition 8

Measuring a Panoramic Image **9**

Technique Tips During Measurements 9

Overview

⚠ **WARNING:** To avoid technique-related artifacts and measurement inaccuracies, read this entire chapter before using the Panoramic imaging feature.

Panoramic imaging acquires two-dimensional ultrasound images with a composite, extended field of view for the following use:

- Imaging any structure where a field of view larger than standard real-time imaging is required, for example, large organs, masses, and long lengths of a vessel
- Depicting anatomic relationships over a larger area than provided by standard 2D-mode imaging

Color Panoramic imaging acquires a panoramic image with color for the following use:

- Depicting vascular studies with vein mapping or grafts
- Showing the presence of blood flow and 2D anatomy in exams, for example, for obstetric exams or for abdominal vascularity to characterize aortic abdominal aneurysms

All color data is preserved during image acquisition and the peak of the signal is saved for the color panoramic image.

Compatible transducers (linear preferred): 7L2, 10L4, 14L5, 5C1, DAX, 9C2

Acquiring a Panoramic Image

You can activate Panoramic imaging during 2D-mode, 2D-mode with power, or 2D-mode with color.

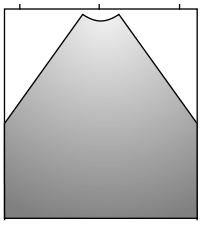
Image creation begins with a standard field of view and extends the view during steady, forward motion scanning. When the memory buffer is full, the ultrasound system stops acquisition and freezes the image.

You can confine the created image within a single scan plane; for example, a transverse scan of the abdomen, or not confine the image to a single plane, for example, when following the path of a tortuous vessel.

To acquire a panoramic image:

1. Optimize the 2D image.
2. To select Color Panoramic imaging, activate color imaging.
3. Tap **Workflow**.
4. Tap **Panoramic**.

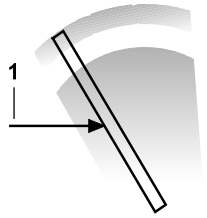
   The system displays a bounding box on the 2D image. This indicates the section of the image used to create the panoramic image.



5. To fill the bounding box with the image, decrease the image depth to increase the image size, if necessary.

6. Press **UPDATE**.

   The system builds the panoramic image as you move the transducer and indicates the status of the scan with a region of interest.

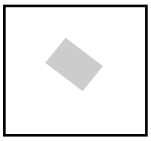


1 Region of interest

7. Slowly and steadily scan in the required direction.

   Note: As you scan, ensure the system displays the anatomy and structures as contiguous on the image screen.

   The reference indicator provides a "snapshot" of the entire panoramic image. Data displays in the reference indicator only during acquisition.



8. To erase a section of the panoramic image within the region of interest, reverse the direction of scanning.
9. To continue image acquisition, resume a forward scanning motion.
10. To suspend or resume image acquisition, press **UPDATE**.
11. To stop image acquisition before the buffer is full, press **FREEZE**.

To	Do this
Review panoramic images during CINE	**Prerequisite:** The CINE memory capacity is sufficient to display a large panoramic image. 1. Rotate **Cine**. The system displays a thumbnail of the selected frame from the panoramic image on the right side of the image screen with a standard 2D-mode frame on the left side. 2. To review all available 2D-mode CINE frames, rotate **Cine**. 3. To redisplay the panoramic image in the size and rotation selected prior to entering CINE, tap **Redisplay**.
Rotate a panoramic image	(Not available when **Best Fit** is selected) ▪ Roll the trackball to adjust the image and then press a trackball key.

To	Do this
Resize the panoramic image after acquisition	1. To adjust the magnification of the image, rotate **ZOOM**. 2. To scale the image to fit the image area, tap **Best Fit**. 3. To scale the image to the previous size and rotation, tap **Restore**.
Display a flexible ruler	▪ Tap **Flex Ruler**. A flexible ruler displays along the skin line and lateral margins of the acquired image in 1 cm increments with a larger marker every 5 cm. The ruler includes markers for the contours of the image and the depth direction.
Display or remove power data in the real-time image	(Available only during Color Panoramic imaging) ▪ Tap **All Power**.
Activate or exit continuous capture of power data in the panoramic image	(Available only during Color Panoramic imaging) 1. Place the transducer on the required location and do not move the transducer. 2. Tap **Color Capture**. After the color data is captured, you can begin moving the transducer.
Display or remove color data in the panoramic image	(Available only during Color Panoramic imaging) ▪ Tap **Flow**. When you pause and then continue image acquisition, the captured data will still contain color data.
Adjust the selection of the color region of interest in the panoramic image	(Available only during Color Panoramic imaging) 1. To maximize the selection area and display 100% of the region of interest, tap **Acquisition Fraction**. 2. To minimize the selection area and display 30% of the region of interest, tap **Acquisition Fraction** again.

12. To exit, tap **Exit**.

Avoiding Artifacts During Acquisition

Artifact	Technique Tips
▪ Contour of the skin line has a "waving flag" appearance with folds ▪ Jagged, broken skin line ▪ Abrupt changes in boundaries or boundaries are not aligned ▪ A structure visible in the real-time image abruptly disappears at the composite boundary	The transducer has moved off plane or off the required path. Stop your forward scanning motion and correct your orientation in the real-time 2D image before continuing acquisition of the composite image. To confine the image to a single plane or correctly follow a vessel, observe the trailing edge of the real-time image area, located in the region of interest. Use the remainder of the real-time image as a guide to correct the rotation of the transducer while scanning in a forward motion.
Shadowing and bending	Balance the gain throughout the image to avoid a bending artifact. Low gain in the far field decreases the amount of data needed to ensure a geometrically correct composite image. Keep the transducer perpendicular and in full contact with the skin surface to avoid excessive bending and ensure a constant elevation position. A forward scanning motion avoids an image-compounding effect, which appears as a brighter, distorted section of the composite image. Scanning over a long length of superficial bone, occupying the full width of a single frame, creates shadowing. There is not enough data in the lower half of the image, causing excessive bending of the composite image. Scan a flat or gently curved surface for optimal results.
Swirl (image overlaps in depth)	Avoid performing a tightly curved scan (for example, transverse slice through the calf) may cause a swirl compounding artifact where the image overlaps in depth. Set the depth as shallow as possible. The depth should be less than the radius of the target being scanned. This leaves a blank "hole" in the image. If the depth is too deep, the bottom of the image appears swirled. Do not measure an image with a swirl at the bottom. Optimal Good Bad  Large Hole "Hole" Swirl Artifact *Example of curved panoramic images.*

Measuring a Panoramic Image

⚠ **WARNING:** To ensure accuracy, measurements should only be made on panoramic images acquired in a single scan plane.

Note: You cannot activate the measurement function with the **FREEZE** key during Panoramic imaging.

You can make general 2D measurements on a frozen, full-sized, or best fit panoramic image. If the structure requiring measurement is contained within the boundary of a single, standard 2D frame, make the measurement on the corresponding frame retrieved from CINE and not on the panoramic image.

You can make angle, linear, elliptical, auto trace, and trace 2D-mode measurements on a frozen, full-sized or best fit, composite image.

Technique Tips During Measurements

Avoid measurements on the following composite images.

- Images not following a single plane, for example, when tracking a tortuous vessel. An out-of-plane image depicts the contour pattern of the skin line and the appearance of internal structures.
- Images with a swirl artifact at the bottom
- Across a large shadow in a panoramic image
- Across gaps in an image, for example, gaps encountered with a tightly curved scan
- Across a disrupted area of the image, indicated by a jagged flexible ruler along the skin line

A3 Contrast Agent Imaging

Overview **3**

Using Contrast Agent Imaging **4**

Techniques for Contrast Agent Destruction 6

Configuring the Flash Sequence 7

Basic Measurements 8

Overview

⚠ **WARNING:** Carefully follow the contrast agent manufacturer's instructions for use, including indications and contraindications, when administering ultrasound contrast agents.

⚠ **WARNING:** Cardiac rhythm disturbances during perfusion studies using gas ultrasound contrast agents have been observed in the diagnostic range of the Mechanical Index (MI) values. For details, refer to the specific package insert for the contrast agent being used.

Contrast agent imaging, also referred to as contrast-enhanced ultrasound (CEUS), is a harmonic imaging feature intended to maximize the display of the contrast signal from the ultrasound contrast agent while minimizing the signal from tissue.

Contrast agent imaging provides preconfigured settings for filters, overall gain, and other parameters coordinated with patented data sequencing techniques for optimal viewing of contrast agent.

During contrast agent imaging, the system displays the mechanical index (MI) and the thermal indices (TI) in the imaging parameters.

During a cardiac study, you can perform left ventricular opacification (LVO) with CEUS to delineate the borders of the heart and obtain volumes for ejection fractions (EF) and the left ventricle (LV).

The following operating modes are compatible with contrast agent imaging:

- 2D-mode, 2D-mode with color, 2D-mode with power
- During a cardiac study: Color flow Doppler, pulsed wave (PW) Doppler, continuous wave (CW) Doppler

To activate contrast agent imaging:

Prerequisite: Activate a compatible operating mode. During a cardiac study, a physio signal is required to display end diastole (ED) and end systole (ES).

1. Press **CEUS**. Or, press **CONTRAST**.
   The system activates a dual display format.

   During a cardiac study, the system activates a full-screen layout.
2. To exit, press **CEUS**. Or, press **CONTRAST**.

Using Contrast Agent Imaging

Use the configuration settings to specify the default clip capture settings for contrast agent imaging.

To adjust parameters for contrast agent imaging:

Prerequisite: Activate contrast agent imaging.

To	Do This
Adjust the gain	▪ Rotate **CEUS**. ▪ Rotate **CONTRAST**. ▪ Rotate **2D**.
Set the maximum transmit power by limiting the mechanical index (MI)	▪ Rotate **MI Limit**.
Enhance areas of low contrast agent concentration	(Not available during a cardiac study) ▪ Tap **Peak Hold** to enable maximum intensity projection.
Adjust the frame rate	(Not available during a cardiac study) ▪ Rotate **Frame Rate**.
Identify the ultrasound contrast agent	▪ Tap **Agent Type** and then select a setting. – **Low MI** to optimize the settings for low-range MI contrast agents. – **Mid MI** to optimize the settings for mid-range MI contrast agents.
Start the timer	(Available only during real-time imaging) 1. Tap **Timer**. The system displays the elapsed time on the image screen. 2. To stop the timer, tap **Timer** again.
Display the recorded time during CINE	▪ Activate the control assigned to CINE. The system displays the recorded time in 1/100 seconds below the timer.
Emphasize the contrast agent, the tissue, or both	▪ Tap the required setting. – **Contrast Only** to emphasize the contrast agent. – **2D Only** to emphasize the tissue. – **2D + Contrast** to combine the contrast agent and tissue. In a dual display format, the setting applies to the left image.
Alternate between a live dual format and a full-screen format	(Not available during a cardiac study) ▪ Tap **Live Dual**. Or, press **DUAL**.

To	Do This
Specify the mechanical index limit (maximum power) during flash	(Available only during a cardiac study) ▪ Rotate **Flash MI**.
Specify the duration of the flash, in number of frames	(Available only during a cardiac study) ▪ Rotate **Flash Period**.
Specify the delay from flash to clip capture	(Available only during a cardiac study) 1. Tap **Clip Capture on Flash**. 2. Press **Flash Delay** to select an option and then rotate the control to select a setting. – **Off** indicates there is no delay. Clip capture occurs at time of flash. – **Beats** indicates clip capture occurs in the indicated number of heart beats after flash. Requires a physio signal. – **Seconds** indicates clip capture occurs in the indicated number of seconds after flash. Requires no physio signal. A message displays indicating the selection does not increase the clip capture time.

Techniques for Contrast Agent Destruction

You can use a high mechanical index technique to destroy the contrast agent microbubbles and then observe reperfusion of the bubbles into the anatomy.

Contrast agent imaging includes the following techniques for contrast agent destruction:

- Burst or flash is a high mechanical index technique for rapid destruction of contrast agent microbubbles for observation of the time required for reperfusion of the contrast agent.
- Flash sequencing is a high mechanical index non-imaging mode technique for rapid destruction of contrast agent and observation of the reperfusion of the contrast agent into the anatomy.

To perform contrast-enhanced ultrasound imaging:

Prerequisite: Activate contrast agent imaging and then adjust the parameters.

To	Do This
Use the flash destruction technique	(Available only during cardiac imaging) ▪ Tap **Flash**.
Use the burst destruction technique	(Not available during cardiac imaging) ▪ Tap **Burst**. ▪ To stop the process, tap **Burst** again.
Use the flash sequence technique	(Not available during cardiac imaging) 1. Configure the flash sequence, if necessary. 2. Tap **Flash Sequence**. The system activates the continuous burst of the contrast agent destruction and reperfusion sequences.

Configuring the Flash Sequence

(Not available during a cardiac study)

You can configure the flash sequence using selections on the touch screen.

To configure the Flash Sequence:

1. Tap **Configure Flash Sequence**.
2. **Step 1 Burst**: Select the first step of the sequence.
   - Tap **Clip Capture on Flash** to capture a clip at the start of the flash.

     Note: You can specify a flash delay to indicate the delay between flash and clip capture.
3. **Step 2 Contrast Imaging**: Select the second step of the sequence; tap an option.
   - **Peak Hold** starts maximum intensity projection when Burst is complete.
   - **Live Imaging** resumes real-time imaging when Burst is complete.
4. **Step 3 End of Sequence**: Select the third step of the sequence; tap an option.
   - **Stay Live** continues real-time imaging when acquisition is complete.
   - **Auto Freeze** freezes the image when acquisition is complete.
5. When configuration is complete, tap **Exit**.

Basic Measurements

You can perform all basic measurements during contrast agent imaging on either image in a dual screen layout or simultaneously on both images using the shadow function.

Note: The shadow function is not available for a cardiac study.

See also: For information about measurements and calculations, refer to Chapter 10 in the Instructions for Use.

See also: For information about cardiac measurements and calculations, refer to Chapter 11 in the Instructions for Use.

To perform a measurement using the shadow function:

1. Activate the measurement function.
2. Tap the required measurement tool.
3. Tap **Shadow**, if necessary.
4. Measure the area of interest on either image.
   The ultrasound system duplicates and displays the measurement on the other image.
5. To exit the shadow function, tap **Shadow**.

A4 Modality Compare

Overview **3**

Comparing Images and Clips **5**

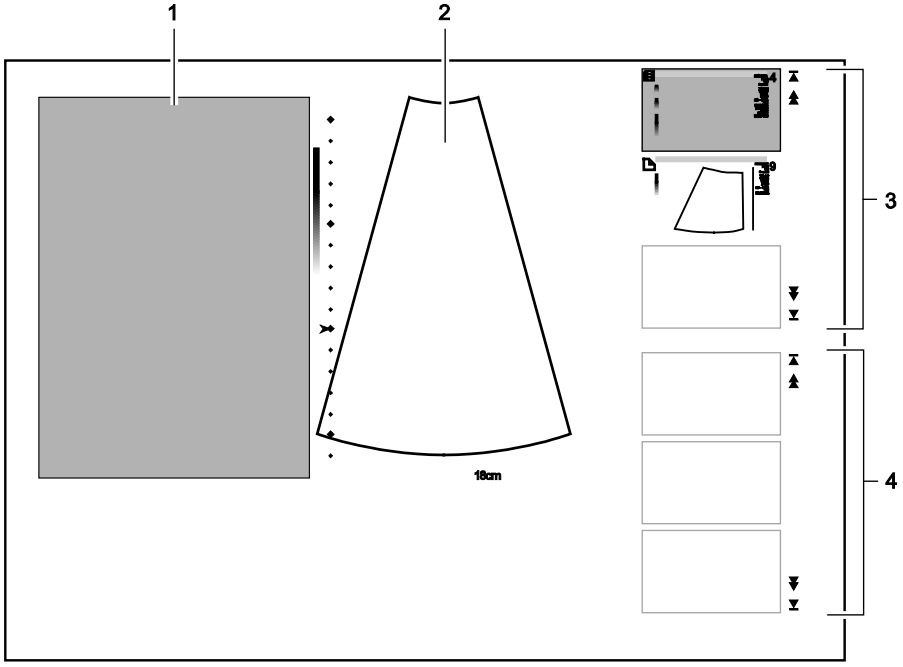
Overview

Note: Reference images displayed on the ultrasound system are informational only and not intended for diagnosis.

The modality compare feature displays images or clips from multiple exams and the following imaging modalities.

- Mammography
- Computed tomography
- Magnetic resonance
- Ultrasound

You can view the reference data in a side-by-side format with ultrasound images from the current study during real-time imaging or review.



Example of the components of the image screen for the modality compare feature.

1 Reference data
2 Ultrasound image
3 Thumbnail panel with reference images from modality compare
4 Thumbnail panel with ultrasound images for the active study

To activate modality compare:

1. Tap **Workflow**.
2. Tap **Modality Compare**.
3. To exit modality compare, tap **Exit**.

Comparing Images and Clips

During modality compare, the ultrasound system displays the reference image and the ultrasound image in a side-by-side format.

The patient name, patient ID, date of birth, and gender for the reference data must match the entries on the patient registration form for the current study. These entries are case sensitive.

See also: For information about correcting patient information, refer to Chapter 5 in the Instructions for Use.

To review images and clips:

Prerequisite: Import the required reference data to the ultrasound system before you load the reference data to a study.

See also: For information about importing reference data, refer to Chapter B2 in this manual.

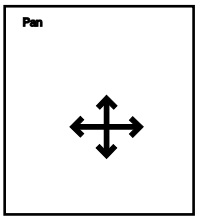
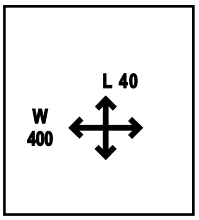
1. Tap **Workflow**.
2. Tap **Modality Compare**.

   The system displays a list of studies stored in the local database on the ultrasound system for the registered patient.

   – **Studies** lists the patient studies for the current patient.

   – **Images** lists the images for the selected study.
3. Click the required study.
4. To display a preview of a reference image, position the pointer on the required thumbnail.
5. Select the reference images.
   – To select one or multiple images, click the thumbnail.
   – To select all of the displayed thumbnails, click **Select All**.
   – To cancel the selection of thumbnails, click **Select None**.

6. Click **OK**.

To	Do this
Select the next or previous reference image	▪ Rotate **Image**.
Display the next or previous frame of the reference clip	▪ Rotate **Frame**.
Magnify the reference image	▪ Rotate **Zoom**.
Adjust the position of the reference image	▪ Tap the pan control and then drag your finger horizontally. 
Adjust the contrast and brightness of the reference image	(Available only for static, gray scale images, excluding ultrasound images) 1. Tap the window and level control.  – To adjust the brightness, drag your finger up or down. – To adjust the contrast, drag your finger left or right. 2. To apply the changes to all static images, tap **Apply to All**. 3. To restore the previous window and level settings, tap **Reset to Default**.

To	Do this
Select additional reference images during imaging	1. Tap **Select Images**. 2. Click the study and then select the reference images. 3. Click **OK**. 4. To cancel the selection of images, click **Cancel**.
Remove a reference image from the thumbnail panel	▪ Select the thumbnail and then tap **Remove Image**.
Compare modality images with stored images	1. Tap **Review**. 2. Tap **Compare**. 3. Select the images for comparison: a. Click the reference image in the thumbnail panel and then click the required location on the review screen. b. Click the ultrasound image in the thumbnail panel and then click the required location on the review screen.

B1 Review

Overview **3**
Activating Review 3
Reviewing Images **4**
Comparing Images **6**

Overview

Use the review function to view and evaluate images from the current study or previous studies. Images printed, but not stored, during a patient study are also available during review.

See also: For information on reviewing volumes, refer to Chapter A7 in this manual.

See also: For information on reviewing cardiac volumes, refer to Chapter D2 in this manual.

See also: For information on reviewing stress echo images and clips, refer to Chapter C2 in this manual.

See also: For information on playing back CINE data and clips during review, refer to Chapter 7 in the Instructions for Use.

Activating Review

When you activate review, the ultrasound system displays thumbnails of images saved with the study. You can insert images during review of an active study or append a stored study.

To review an active study:

1. Tap **Review**. Or, double-click a thumbnail.
2. To exit review, press **2D**.

To review a stored study:

1. Access the patient browser and then select the required patient study.

   See also: For information about accessing the patient browser or patient registration, refer to Chapter 5 in the Instructions for Use.

   – To review the study, tap **Load to Review**. Or, double-click the study.

   – To review a stored patient study and insert images, tap **Append Study**.

     Note: You can append to a study stored in the local database within 24 hours of starting the study.

   – To review a paused study, tap **Resume Study** and then tap **Review**.
2. To exit review, press **2D**.

Reviewing Images

You can view archived reports and insert measurements and annotations on an image during review.

To review images:

1. Activate review.
2. To select images for review:
   - To select a single image, tap **Single Select** and then select the required image.
   - To select multiple images, tap **Multiple Select** and then select each required image.
   - To select all images, tap **Select All**.
   - To cancel the current selection of images, tap **Select None**.

To	Do This
Display an image in full-screen format	▪ Double-click a thumbnail.
Select the display format	▪ Tap a selection. – 1:1 layout displays one clip.  – 2:1 layout displays two clips side-by-side.  – 2:2 layout displays four clips.  – 3:2 layout displays six clips.  – 3:3 layout displays nine clips.  – 4:4 layout displays sixteen clips. 
Store a copy of the currently displayed image as a DICOM image	(Available only in full-screen format during review of an active study) ▪ Press the key assigned to the store function.
Select the previous or next thumbnail	▪ Rotate **Page**.
Show or hide a protocol view name	▪ Tap **Protocol Text**. – **On** displays the protocol view name on the image – **Off** hides the protocol view name on the image
Sort protocol images	▪ Tap **Sort By**. – **Time** displays the images in the sequence captured during the protocol. – **View** displays images in the sequence specified in the configuration settings.

To	Do This
Mark or unmark images for attention	▪ Select an image and then tap **Flag**. The system displays the following icon on the image. 
Mark or unmark images for deletion	1. Select the images. 2. To mark images for deletion, tap **Delete Image(s)**. Or, press **DELETE**. The system displays the following red icon on the image and removes the images from the study when you exit review.  3. To unmark images for deletion, tap **Delete Image(s)**.
Save a screen capture of the currently displayed images (secondary DICOM clip capture)	(Available only during review of an active study) ▪ Press the key assigned to the store function.
Magnify an image	▪ Select the required image and then rotate **ZOOM**.

Comparing Images

You can compare ultrasound images for the active study and images and clips from a stored study.

To compare images and clips:

1. Activate review.
2. Tap **Multiple Select** and then select images for comparison.
3. Tap **Compare**.

   The ultrasound system displays the images on a single page in the sequence the images were selected.

To	Do This
Insert an image for comparison	▪ Click a thumbnail and then click a location on the review screen.
Hide an image currently selected for comparison	1. Click the image. 2. Tap **Remove**.
Exit the compare function	▪ Tap **Compare**.

B2 Export and Import

Overview **3**

Exporting Patient Data **4**

Exporting Patient Data from the Patient Browser 5

Sending Patient Data to a Network Server 6

Importing Patient Data **7**

Retrieving Studies from a Network Server 7

Querying and Retrieving Patient Data 8

Confirming Transfer of Patient Data using a Virtual Workstation **9**

Overview

You can access and import patient data stored in DICOM format. You can also export images in DICOM or personal computer (PC) format. The system stores images in the following PC format files.

Type	Format
Images	JPEG, single-frame DICOM
Panoramic images, if available	Composite, single-frame JPEG
Clips	AVI, multi-frame DICOM

Use the configuration settings to configure selections for exporting patient data. For example, you can export patient data during a study or at the end of the study, and select the destination device.

See also: For information about importing and exporting workflow protocols, refer to Chapter 1 in the System Reference.

See also: For information about the status of transfer jobs, refer to Appendix B in the System Reference.

Exporting Patient Data

You can export patient data for the active study to a configured picture archiving and communication system (PACS) device.

To export patient data for the active study to a PACS:

Prerequisite: A PACS device is configured for the transfer of patient data at the end of the study.

1. Tap the additional selections button.



2. Tap **Send to Store Server**.

To view the status of a patient data transfer:

1. Tap the additional selections button.



2. Tap **Job Status**.

   The system displays the following information about the patient studies:

Selection	Description
Type	Indicates the type of operation, for example, **Store** (storage) or **Commitment** (storage commitment).
Patient Name	Indicates the patient name from patient registration.
Object	Indicates the type of job and the number of items in the job.
Posted	Indicates the date and time when the job started.
Destination	Identifies the destination of the job.
Status	Provides information about the job, for example, in-progress or successful.
Description	Provides a description of the job, for example, an error description if the job failed.

3. To restart a transfer, select the job and then click **Retry**.
4. To pause a transfer, select the job and then click **Pause**.
5. To delete a transfer, select the job and then click **Delete**.
6. To pause all transfer jobs in the list, click **Pause**.
7. To select all jobs in the list, click the triangle at the top of the list.
8. To refresh the list of jobs, click **Refresh**.
9. To exit the dialog box, click **Close**.

Exporting Patient Data from the Patient Browser

You export patient studies from the local database on the ultrasound system to a connected external storage device.

During export, you can remove patient-identifying information from the DICOM header by deidentifying a study. Acquired images retain the date and time indicated in the study.

See also: For information about compatible external storage devices, refer to Appendix A in the Instructions for Use.

To export patient data:

Prerequisite: Insert storage media into the external storage device.

1. Tap **Patient**.
2. Tap **Patient Browser**.
3. Select **Local Database** from the **Source Media** list.
4. Select the required patient data to export.
   - Select check boxes in the **Study List** to select patient studies.
   - Click thumbnails to select or deselect images and clips.

     Note: Press and hold the shift key on the keyboard to select a contiguous range of thumbnails. Press and hold the control key on the keyboard to select multiple non-contiguous thumbnails. Select another study to reset the thumbnail selection.
5. Click **Export**.

   The system displays the selected studies in the export dialog box.
6. Select the external storage device from the **Available Media** list, for example, **USB**.

   Note: The total space required for the selected studies displays on the dialog box. If the storage device has insufficient space, deselect studies or insert a storage device with sufficient space available.
7. Select the required options.

To	Do This
Export patient data in a DICOM format	▪ Select **DICOM** and then select an option. – **Acoustic Data** exports acoustic data, for example, volume data when exporting volume images. – **Include DICOM Viewer** includes a DICOM image viewer with the patient data. – **Enable DICOM GSDF** enables or disables the DICOM Grayscale Standard Display Function (GSDF). This selection applies an image quality standard to images exported from the ultrasound system to an external storage device or DICOM storage server.
De-identify a study	1. Select the **De-identify** check box. 2. Enter a replacement name in the **Prefix** text box, for example, anonymous.

To	Do This
Export patient data in personal computer (PC) format	▪ Select **PC Format (JPEG/AVI)**.
Finalize and eject disc media	▪ Select the required DVD options. – **Finalize** closes the directory on the disc and prepares the disc for play back on other devices. – **Eject** ejects the external storage device after all files are fully written to the device.
Enter the path for saving patient data on the external media	▪ Enter a unique path name in the **Path** text box.
Export patient data	▪ Click **Export**. The system displays a progress bar indicating the status of the export process.
Close the dialog box after export is complete	▪ Click **Close**.

Sending Patient Data to a Network Server

You can send completed patient studies and DICOM structured reports (SR) to a connected server after an exam is complete.

See also: For information about configuring system-driven transfers, refer to Chapter 5 and Chapter 6 in the System Reference.

To send patient data to a network server:

1. Tap **Patient Browser**.
2. Select the required patient studies from the local database.
3. Select the required server from the **Send** list and then click **Send**.
   The system adds the studies to the list of network jobs.

Importing Patient Data

You can import patient data to the local database on the ultrasound system.

See also: For information about querying a database, refer to Appendix E in the Instructions for Use.

To import patient data from an external storage device:

Prerequisite: Connect an external storage device to the ultrasound system.

1. Tap **Patient**.
2. Tap **Patient Browser**.
3. Select the external storage device from the **Source Media** list.
4. Click **Import**.
   The ultrasound system imports the data to the local database on the ultrasound system.

Retrieving Studies from a Network Server

To import patient data from a network location:

Prerequisite: Connect a network server, for example, a DICOM storage server.

1. Tap **Patient**.
2. Tap **Patient Browser**.
3. Click **Import from Off-line**.
4. Select the required patient studies and then click **Import**.
   The ultrasound system imports the data to the local database on the ultrasound system.

Querying and Retrieving Patient Data

You can query and retrieve patient data from a connected DICOM archive, worklist, or picture archiving and communication system (PACS) using DICOM attributes.

To	Do This
Define a new query	1. Tap **Query/Retrieve**. Or, click **Query/Retrieve**. 2. Select the type of query and then enter the selection criteria. – **Basic Search** queries the selected database studies by patient name, identification number, or accession number, – **Advanced Search** queries the selected database using advanced search attributes. – **Reporting Search** queries the selected database using reporting attributes. **See also:** For information about the query/retrieve selection criteria, refer to Appendix A in the System Reference. 3. To query the selected database, click **Search**. The system displays the query results.
Select a study from the query results	1. Define a new query or access a saved query. 2. Select the required study from the study list. 3. Tap **Retrieve**.
Clear the query selections	▪ Click **Clear**.
Refresh the query results	▪ Click **Retrieve**.
Save a query	1. Define a query. 2. Enter a unique name in the **Type New Query Name** text box. 3. Click **Save**. The system saves the query.
Access a saved query	1. Tap **Query/Retrieve**. Or, click **Query/Retrieve**. 2. Select an existing query. 3. Click **Retrieve**. The system displays the query results.
Delete a query	1. Tap **Query/Retrieve**. Or, click **Query/Retrieve**. 2. Select an existing query. 3. Click **Delete**. The system deletes the query.
Close the query dialog box	▪ Click **Close**.

Confirming Transfer of Patient Data using a Virtual Workstation

(Requires a wireless network connection)

You can remotely access your facility's archival and information system from a virtual workstation on the ultrasound system. You can use the virtual workstation to confirm the status and transfer of patient data, images, and reports.

Use the configuration settings to configure a virtual workstation on the ultrasound system.

See also: For information about configuring a virtual workstation, refer to Chapter 5 in the System Reference.

To access the virtual workstation:

Prerequisite: A user account on your facility's archival and information system.

1. Tap the additional selections button.

2. Tap **Virtual Workstation**.
3. If more than one virtual workstation is configured, select a virtual workstation and then click **OK**. To cancel the connection, click **Cancel**.
4. Access your facility's archival and information system.
   a. Double-click your archival and information system application.

      Virtual Workstation displays on the touch screen and a virtual desktop displays on the monitor screen.

   b. Enter your user name and password for your PACS application.

   For instructions on using your archival and information system, refer to the system manufacturer's instructions.

   Note: When the virtual workstation is active, the only active controls on the control panel are the operating mode controls and the freeze control.

C1 Physiologic Function

Overview **3**
Activating Physio on the Ultrasound System 4
Connecting Leads to the Patient 5
Activating an ECG or Auxiliary ECG Trace **6**
Adjusting the ECG, Auxiliary ECG, or Respiration Trace 7
Troubleshooting Guide **9**
Configuring Physio Settings **10**

Overview

⚠ **WARNING:** Use the ECG trace for timing purposes only. It is not intended for diagnostic use or patient monitoring.

⚠ **WARNING:** Do not use the ECG function in conjunction with electrosurgery or diathermy equipment.

⚠ **WARNING:** To reduce the risk of electric shock and burns, use only the cable and patient leads supplied for use with the physiologic module. Use of other cables and patient leads could defeat the current-limiting and electrical safety features of the physiologic module.

⚠ **Caution:** To avoid possible damage to the cables used with the physio panel, do not pull on the cable when disconnecting the connector from the system. Always grasp the connector housing.

Electromagnetic Compatibility (EMC) Note: Operating the ultrasound imaging system in close proximity to sources of strong electromagnetic fields, such as radio transmitter stations or similar installations, as well as portable and mobile RF (radiated frequency) may lead to temporary degradation or interference visible on the monitor screen. However, the device has been designed and tested to withstand such interference and will not be permanently damaged. Wait until the interference disappears or restart the ultrasound system.

Note: If the physio module detects abnormal input due to electrical interference, the module is designed to shut down to prevent the incorrect display of the physio signals on the image screen. If the physio module shuts down, you must restart the ultrasound system to reset the physio module.

Note: The ECG leads are defibrillation proof. However, in the event of defibrillation while using the ECG function, the ECG inputs may become saturated (overloaded). An ECG pattern may not be visible for up to 30 seconds. After 30 seconds, the ECG trace displays on the screen.

The physiologic module provides the following channels for monitoring signals:

- Electrocardiogram (ECG) displays a trace on the image screen from a three-lead ECG cable attached to the patient.
- A transthoracic impedance respirometer (TIR) provides respiratory monitoring through the ECG leads attached to the patient. The ultrasound system obtains a respiration signal by tracking changes in the patient's chest impedance data and then calculates the breathing rate.
- Auxiliary input (AUX) optionally provides monitoring for signals delivered from external equipment, for example, amplified ECG signals, a digital trigger, or other physiological inputs from external medical devices. Auxiliary input provides an analog output which is selectable from the three analog input channels.

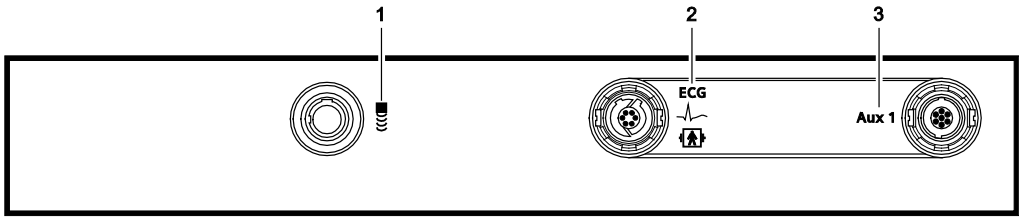
Each channel provides a continuous stream of signals to the ultrasound system. The ultrasound system uses these signals to derive the R-wave trigger output. You can monitor a patient's respiration relative to their cardiac function, and these waveforms are visible during 2D-mode, M-mode, color Doppler, pulsed wave Doppler, and continuous wave Doppler.

The electrical activity controlling the heart muscle is detected by placing ECG electrode patches in specific locations on the patient and amplifying the electrical signals that produce the ECG trace display on the ultrasound system monitor.

Activating Physio on the Ultrasound System

The ultrasound system has two versions of physio modules.

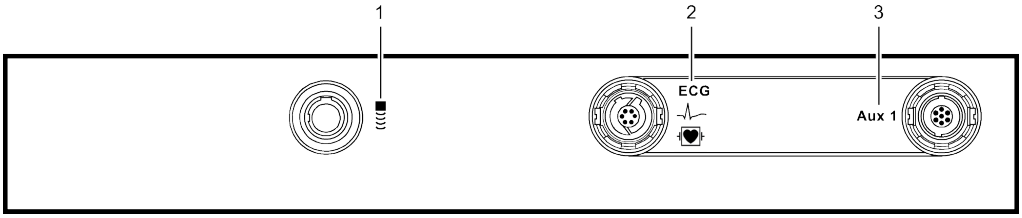
Physio modules marked with a Type BF symbol on the panel provide protection from defibrillator voltages for components in contact with the body (for example, ECG leads).



Example of the physio panel, defibrillation-proof Type BF device.

1 Auxiliary continuous wave Doppler transducer port
2 ECG port
3 Auxiliary In/Out port

Physio modules marked with a Type CF symbol on the panel provide protection from defibrillator voltages for components in contact with the heart.



Example of the physio panel, defibrillation-proof Type CF device.

1 Auxiliary continuous wave Doppler transducer port
2 ECG port
3 Auxiliary In/Out port

See also: For information about patient safety and the user of defibrillators, refer to Chapter 2 in the Instructions for Use.

To activate the physiologic function:

1. Tap **Workflow**.
2. Tap **Physio**.
3. To exit, disconnect the leads from the patient and then disconnect the ECG cable.

Connecting Leads to the Patient

In keeping with existing international standards, the ECG leads for systems that operate at 115V (for example, North and South America) are red, white, and black. The leads are labeled RA (right arm), LA (left arm), and LL (left leg). Leads for systems that operate at 230V (for example, Europe) are green, red, and yellow. The leads are labeled R (right arm), L (left arm), and F (left leg).

Patient Location	100V	115V	230V
Left leg	Green	Red	Green
Right arm	Red	White	Red
Left arm	Yellow	Black	Yellow

Note: Attach the patient electrodes in the 3-lead configuration for Leads I, II, III, using the right arm (RA), left arm (LA), and left leg (LL) attachment for optimal monitoring of the ECG and Transthoracic Impedance Respirometer (TIR) trace. Use the RA-LA electrodes in either polarity for TIR monitoring.

Activating an ECG or Auxiliary ECG Trace

Note: The ultrasound system uses the electrodes placed on the patient's body to detect impedance change and display the respiratory waveform.

Note: Allow a few seconds for the ultrasound system to average several heart beats and display the normalized ECG trace. If the ultrasound system displays a message indicating the lead is off, the ECG cable may be loose, incorrectly positioned, or has lost contact with the patient electrode. To restore the signal for auxiliary ECG trace, check the placement of the leads and reconnect the auxiliary ECG device cable to the output connector on the auxiliary input/output cable.

See also: Adjusting the ECG, Auxiliary ECG, or Respiration Trace, page C1-7

To activate an ECG trace:

1. Connect the ECG cable to the ECG port on the physio panel.
2. Attach the ECG electrode patches to the patient.
3. Connect each lead to the appropriate patch.
4. Activate **Physio**, if necessary.
5. Tap **ECG**.
6. Tap **ECG Trace**.
7. Adjust the ECG trace, if necessary.

   Note: The system cannot display a trace unless all three leads are connected to the patient.
8. To exit, disconnect the leads from the patient and then disconnect the ECG cable.

To activate an auxiliary ECG trace:

1. Activate the auxiliary ECG device, including the attachment of ECG electrode patches to the patient and the connection of leads to the patches, according to the manufacturer's instructions.
2. Connect the auxiliary input/output cable to the auxiliary port on the physio panel.
   - To activate the auxiliary in (Aux In) ECG trace, connect the input connector on the auxiliary input/output cable to an auxiliary ECG device.
   - To activate the auxiliary out (Aux Out) ECG trace, connect the output connector on the auxiliary input/output cable to an external device (for example, a monitor).
3. Activate **Physio**, if necessary.
4. Tap **AUX**.
5. Tap **AUX Trace**.
6. Adjust the auxiliary ECG trace, if necessary.
7. To exit, disconnect the leads from the patient and then disconnect the ECG cable.

Adjusting the ECG, Auxiliary ECG, or Respiration Trace

The ultrasound system displays the trace for each signal in a different color and position. For example, an ECG trace displays in teal, an auxiliary trace displays in orange, and a respiratory trace displays in green.

To	Do This
Select a trace	▪ To display a trace from a 3-lead ECG cable inserted in the ECG port, tap **ECG**. ▪ To display a trace from an auxiliary ECG device, for example, a stress treadmill, tap **Aux**. ▪ To display respiratory function changes, tap **Resp**.
Select the trace to use as the R-wave trigger	(ECG traces only) ▪ Tap **Set QRS**. **Note:** If only one ECG trace is enabled, the system selects the enabled ECG trace as the R-wave trigger. The system recognizes R-waves if they are inverted.
Position the selected trace up or down on the screen	▪ Rotate **Position**.
Adjust the scrolling speed of the trace	▪ Rotate **Sweep Speed**. **Note:** During Doppler, the trace has the same scrolling speed as the Doppler spectrum.
Display or hide the trace on an image	▪ Tap **ECG Trace**.
Display or hide the auxiliary trace on an image	▪ Tap **Aux Trace**.
Display or hide the R-wave markers on the trace	(ECG traces only) 1. Select a trace with an R-wave trigger. 2. Tap **R-wave Marker**.
Adjust the wave amplitude of the trace	▪ Rotate **Size**.

To	Do This
Select a different lead for monitoring the ECG trace	1. Tap **ECG**. 2. Tap **ECG Trace**, if necessary. 3. Tap a different lead: **Lead I**, **Lead II**, or **Lead III**.
Select a lead for monitoring the patient's breathing rate	1. Tap **Resp**. 2. Tap **Resp Trace**, if necessary. 3. Tap a different lead: **Lead I**, **Lead II**, or **Lead III**.
Invert the polarity of the ECG trace during imaging	**Note:** You can invert the polarity of the ECG trace on the ultrasound system during image acquisition only if the signal from the auxiliary ECG device is inverted. You cannot change the polarity of an inverted trace during review. ▪ Tap **Invert**.
Invert the respiration trace during imaging	▪ Tap **Invert**. The default respiration trace ascends during inhalation and descends during exhalation. When inverted, the respiration trace ascends during exhalation and descends during inhalation.

Troubleshooting Guide

Symptom	Possible Cause	Recommended Action
▪ An ECG trace is not present or displays as a flat line ▪ The ultrasound system displays a "Lead Off" message on the image screen	▪ The ECG cable is loose or not properly attached to the ultrasound system. ▪ The ECG cable has lost contact with the patient electrode. ▪ All three leads are not connected to the patient. ▪ Leads are poorly connected to the cable. ▪ Leads are poorly connected to the patient.	▪ Check all cable and lead connections. ▪ Reposition or replace the leads or cable.
	Leads are incorrectly placed on the patient.	▪ Remove the ECG patch, clean the skin, and attach a new ECG patch to the patient.
The R-wave markers are not visible on an ECG trace. Or, the R-wave markers identify peaks that are not R-waves.	The ECG trace of interest is not selected as the QRS source.	▪ Select the ECG trace of interest.
	The R-wave marker is not activated.	▪ Confirm the R-wave marker is enabled.
	The ultrasound system may not be able to detect the R-waves because the signal quality is insufficient.	▪ See the "ECG trace is noisy, ragged, or erratic" instructions included in this table. ▪ Reposition or replace the leads or cable. ▪ Select a different lead.
	Too much movement by the patient.	▪ Recheck the trace of interest for the R-wave markers at least 30 seconds after the patient's movements have relaxed.
An ECG trace is noisy, ragged, or erratic	A lead or leads may be detecting muscle movement.	▪ Inspect the ECG patch placement and reposition the lead(s) on the patient as necessary.
	The conductive gel pad of an ECG patch has evaporated (dried out).	▪ Replace the ECG patch with a new one (check the expiration date of the new patch).
An ECG trace is inverted during imaging	▪ The ECG leads were placed on the patient incorrectly. ▪ The signal from the auxiliary ECG device is inverted.	**See also:** Adjusting the ECG, Auxiliary ECG, or Respiration Trace, page C1-7
Asterisks (*******) are displayed instead of the heart rate	The ultrasound system may not be able to detect the R-waves because the signal quality is insufficient.	1. Wait for the signal to stabilize. 2. Reposition or replace the leads or cable.

Configuring Physio Settings

You can configure the physio settings using selections on the touch screen.

To modify configuration settings for the physiologic function:

1. Activate the physiologic function.
2. To assign the default lead, tap **Lead I**, **Lead II**, or **Lead III**.
3. To assign the auxiliary input type, tap **ECG** or **General**.
4. To assign the auxiliary output type, tap **ECG**, **Resp**, **Aux Input**, or **R-wave**.

C2 Stress Echo

Overview **3**
Terminology Used in this Chapter 3
Working with Stress Echo 4
Stress Echo Indicators and Icons 6

Activating a Stress Echo Protocol **7**
Acquiring Images and Clips during a Stress Echo Protocol 10
Selecting Preferred Images and Clips for Analysis 11
Sorting and Comparing Images and Clips 14
Performing Measurements 15
Wall Motion Scoring 16

Stress Echo Report **17**

Overview

Prerequisite: A working knowledge of stress echo examinations is necessary before acquiring stress echo clips.

Use stress echo to capture and review cardiac clips for predefined mulitple-stage protocols for your stress echo workflow. A cardiac clip displays motion from end diastole (ED) to end systole (ES) or from R-wave to R-wave as indicated by the R-wave of the ECG trace.

Use the configuration settings to define stress echo protocols.

See also: For information about acquiring ECG traces with the physiologic function, refer to Chapter C1 in this manual.

Terminology Used in this Chapter

Term	Definition
acquisition	A clip or static image acquired during a stress echo protocol. Use the configuration settings to set the default capture settings for the stage.
clip	A 2D stress echo acquisition.
compare task	Displays preferred images and clips in a side-by-side format for analysis. If the selection task is incomplete for a view, all acquired images and clips display for the view.
continuous	An acquisition method where stages are limited to a maximum number of clips per capture. Acquisition can be retrospective or prospective. Continuous acquisition can capture up to 750 clips.
exam review	A review function available for all ultrasound studies.
non-continuous	An acquisition method where stages are limited by the total number of clips (750) that can be acquired during the exam. Acquisition is always prospective. The navigation panel indicates the number of clips acquired during continuous capture.
preferred	Indicates a clip or image is identified for review and analysis.
protocol	A workflow protocol or predefined checklist for a stress echo study.
selection task	Displays all images and clips acquired during the stress echo exam for identifying preferred clips and images.
stage	A phase within a stress echo protocol, for example, a rest stage. Depending on the protocol configuration, you can acquire multiple images during each stage.
stress echo review	A review function specific to stress echo studies.
task	A defined step in a protocol, for example, acquiring a view or selecting preferred images and clips.
view	A step within a stage of a stress echo protocol, for example, a short axis view.

Working with Stress Echo

The system includes the following predefined stress echo protocols:

Protocol	Description
Pharmacology	Pharmacology
Treadmill	Treadmill
Bicycle	Bicycle
Regurgitant Volume	Regurgitant volume
PISA	Proximal iso-velocity surface area
Mitral Stenosis	Mitral stenosis
Aortic Stenosis	Aortic stenosis

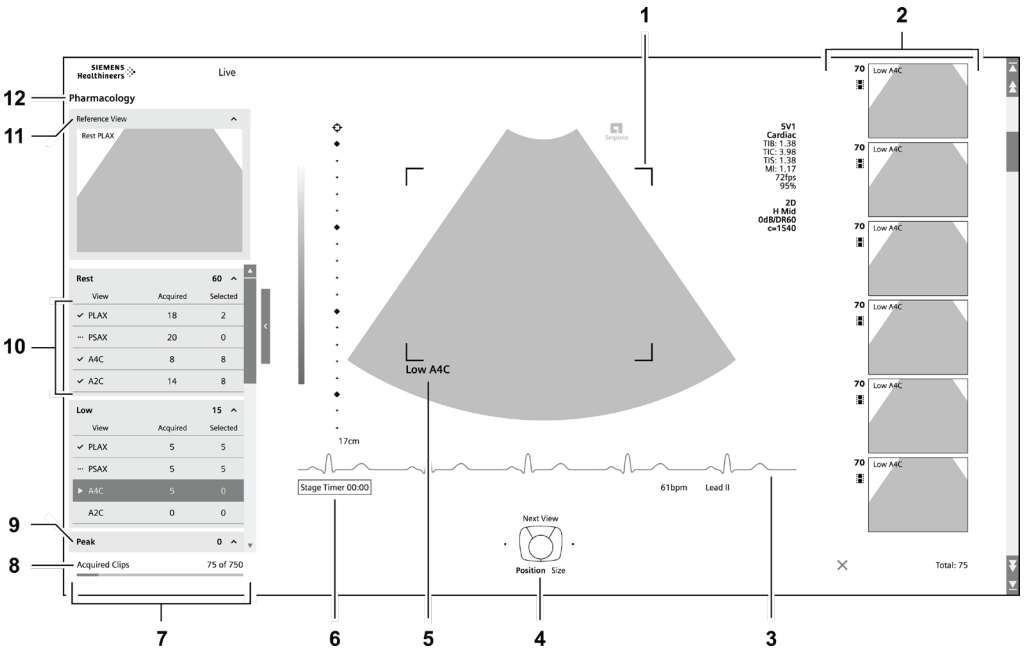
One protocol is available for each study. Each protocol can include a maximum of 20 stages and 20 views.

After completing the acquistion for a stage during a stress echo protocol, the system advances to the next task defined in the protocol configuration settings.

You can customize the following workflow settings for stress echo:

- Define the image display area.
- Select the activation method for progression of stages.
- Specify the review settings for a stress echo protocol.
- Customize the stages and views of a stress echo protocol.
- Select the segment model for wall motion scoring.

See also: For information about configuring stress echo, refer to Chapter 4 in the System Reference.



Example of the stress echo screen during a 2D stress echo protocol.

1 Region of interest (ROI)
A solid blue outline indicates the ROI.
2 Thumbnail panel
3 ECG trace
4 Trackball legend
5 Reference view label
6 Stage timer
Indicates the elapsed time for the active stage, depending on the protocol configuration.
7 Navigation panel
Displays the predefined stages and views for the stress echo protocol.
8 Acquired clips
Displays the acquired and maximum number of clips acquired during a continuous protocol.
9 Stages
Displays the total number of clips acquired for the stage during a continuous protocol.
10 Views
Displays the total number of clips acquired and selected for the view during a continuous protocol.
11 Reference View
Displays an image or clip from the rest acquisition for the active view.
12 Active protocol
Displays the name of the active protocol.

Stress Echo Indicators and Icons

The following icons display on the navigation panel and image screen during stress echo.

An undefined view cannot display an icon but can display the number of acquired clips.

Note: When the category of stages is collapsed, position the pointer over an icon to display the name of the view.

Icon	Description
^	Collapse a category of stages in the navigation panel
v	Expand a category of stages in the navigation panel
<	Hide the left panel
>	Show the left panel
▶	Indicates the view is active.
•••	Indicates the view is acquired, but no clip is selected as preferred.
✓	Indicates acquisition is complete for the view. Indicates an image or clip selected as preferred. (green icon)
✕	Indicates an unselected image or clip. (red icon)

See also: For information about icons in the thumbnail panel, refer to Chapter 5 in the Instructions for Use.

Activating a Stress Echo Protocol

You can activate a stress echo study only with compatible transducers and image presets. Enter a patient name in the patient registration form before you start a stress echo study,

See also: For a list of compatible transducers and image presets, refer to Appendix A in the Instructions for Use.

To activate a stress echo protocol:

1. Tap **Workflow** and then select **Stress Echo**, if necessary.
   The system displays the **Stress Echo** tab with the available protocols.
2. Tap the required protocol.

To	Do This
Select a protocol stage	▪ Tap **Stage** and then select the required stage.
Select a view	▪ Tap the required **View**. **Note:** You can change the view during a continuous capture.
Advance to the next predefined stage	▪ Tap **Stage** and then select the required stage.
Advance to the next view in the protocol stage	▪ Rotate **FORWARD/BACKWARD** clockwise. **Note:** Once the last view in the stage is complete, rotating the control advances to the first view in the next stage.
Show or hide the region of interest (ROI)	▪ Tap **ROI**. – **On** shows the ROI. – **Off** hides the ROI.
Show or hide the ECG trace	(Available only when the ROI is shown) ▪ Tap **ECG in ROI**.
Display the rest view and live image for the active view in a side-by-side format	▪ Click the arrow next to **Reference View** in the left panel. **Note:** Image capture acquires only the live image.
Pause a stress echo protocol	▪ Tap **Pause Protocol**. The system hides the ROI and suspends the feature.
Resume a stress echo protocol	▪ Tap **Resume Protocol**.
Add a stage during a stress echo protocol	(Available only when clips are not acquired for the next stage) 1. Tap **Add Stage**. 2. Tap the required **Stage Property**. The system duplicates the configuration settings of the selected stage. 3. Enter a unique name in the **Stage Name** text box. 4. Tap **Save**. The system adds the new stage to the list of stages for the protocol. The system displays a message when the maximum number of stages is reached. 5. To exit without saving the new stage, tap **Cancel**.

To	Do This
Add a view during a stress echo protocol	1. Tap **Add View**. 2. Tap the required **View Property**. 3. Enter a unique name in the **View Name** text box. 4. To save the view to the active stage, tap **Save**. The system adds the new view to the list of views for the stage. The system displays a message when the maximum number of views is reached. 5. To add the view to all stages, tap **Save to all stages**. 6. To exit without saving the new view, tap **Cancel**.
Delete a completed view	1. Tap the name of the completed view. 2. Tap **Delete**. The system marks the thumbnail image with a red X.
End the protocol and exit stress echo	**Note:** You cannot modify or resume a completed stress echo study. Complete the views, select preferred images and clips, and modify the stress echo protocol, if necessary, before ending the study. 1. Tap **End Protocol**. If any views are incomplete, the system displays a dialog box asking if you want to omit the views and end the protocol. If a protocol is incomplete, the system displays a dialog box alerting you that unselected images will be deleted. 2. To end the study, click **OK**. If you did not acquire clips, the system displays the protocol list. If you acquired clips, the system activates stress echo review. 3. To cancel and return to the study, click **Cancel**.
Cancel the stress echo protocol	1. Tap **Cancel Protocol**. The system displays the list of available protocols. If images and clips are present, the system displays a confirmation dialog box. 2. To confirm the cancellation, click **OK**. The system deletes all captured data from the cancelled protocol. 3. To resume the stress echo protocol, click **Cancel**. 4. To select another protocol, tap the name of the protocol. **Note:** You can only select another protocol if the active protocol has no captured images.
Begin a different stress echo protocol	▪ Complete the stress echo protocol and then select a new study. **Note:** Only one stress echo protocol is available for each study.

To	Do This
Access 2D Heart AI	▪ Tap **2D Heart AI**. **See also:** For information about 2D Heart AI, refer to Chapter D3 in this manual.
Access 4D Heart AI	▪ Tap **4D Heart AI**. **See also:** For information about 4D Heart AI, refer to Chapter D5 in this manual.
Pause a stress echo study	**See also:** For information about pausing a study, refer to Chapter 5 in the Instructions for Use.
Resume a stress echo study	**See also:** For information about resuming a study, refer to Chapter 5 in the Instructions for Use.
Export a completed stress echo protocol	**See also:** For information about exporting a stress echo protocol, refer to Chapter B2 in this manual.

Acquiring Images and Clips during a Stress Echo Protocol

You can acquire images and clips of anatomical views during a stress echo protocol. You can also change views during a continuous capture.

During clip capture, the system acquires and labels the clip and starts the stage timer, if configured for the active protocol. If you pause a protocol, the stage timer continues to count the elapsed time. When capture is complete, the system displays the selection screen and the reference view label changes to three dots (…).

The system displays an icon on clips captured during a stress echo protocol.



Use the configuration settings to customize capture settings.

See also: For information about capturing images and playing clips, refer to Chapter 5 in the Instructions for Use.

To acquire an image or clip:

- Adjust the region of interest (ROI) and image depth, if necessary.

  Note: The system applies the position, size, and depth to subsequent acquisitions of the view.

To	Do This
Capture an image	▪ Press **FREEZE** and then press **CAPTURE**.
Capture a clip during a non-continuous protocol	▪ Press **CAPTURE**. The system stops acquisition of clips as indicated by the settings for capture.
Capture a clip during a continuous protocol	1. To start or resume the capture, press **CAPTURE**. 2. To stop the capture, press **CAPTURE** again.
Specify the duration of a recorded clip	1. Press **Clip Capture** to select a setting. – **Seconds** sets the clip length to seconds. – **Beats** sets the clip length to heart beats. 2. Rotate **Clip Capture** to select a duration.
Specify a method for capturing data	▪ Tap **Capture Type** and then select a setting. – **Prospective** acquires a clip of the newly acquired images. – **Retrospective** acquires a clip of the previously acquired images. – **Continuous** acquires a clip of continuously acquired images, up to 750 clips.
Access another stage or view in the protocol	▪ Rotate **FORWARD/BACKWARD**.
Start or stop the manual timer	▪ Tap **Stage Timer**.
Reacquire clips for the active view	1. Select the label for the required view during acquisition. 2. Acquire additional images or clips.
Show or hide text overlays on the image	▪ Tap **Text Overlays**.
Change the ECG setting	**See also:** For information about ECG settings, refer to Chapter C1 in this manual.

Selecting Preferred Images and Clips for Analysis

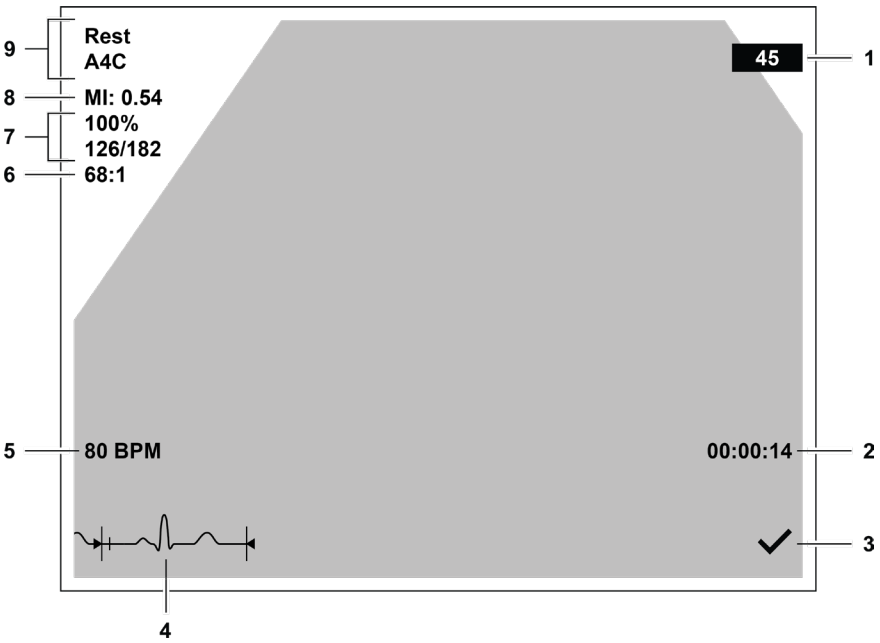
Use preferred images and clips for comparison and analysis. You can select preferred images and clips after capture or during stress echo review.

The system activates the selection task as indicated by the protocol configuration, for example, at the end of each view, at the end of each stage, or at the end of all stages.

The selection screen displays the acquired images and clips for views and stages. Images and clips are numbered in the sequence of acquisition.

The system deletes unselected images and clips when you end the stress echo study. If the selection task is incomplete when you end the study, the system saves all acquired clips.

Use the configuration settings to setup the selection task.



Example of overlays on image views from the stress echo review screen.

1 Sequence of clips
2 Stage timer
3 Clip selection indicator
A green check mark indicates the clip is selected (preferred).
A red X indicates the clip is not selected.
4 ECG trace
5 Heart rate
6 Compression rate
7 Playback speed and number of frames
Displays the number of the current frame and the total number of frames.
8 Mechanical index
9 Captured stage and view

To select preferred images and clips:

Prerequisite: Capture a view or stage.

- Tap the **Selection** tab, if necessary.

  Note: To identify images and clips as preferred, you must select and save the required images and clips. The system deletes unselected images and clips when the protocol is complete.

To	Do This
Select preferred images or clips	▪ Click the required images and clips in the thumbnail panel. The system outlines the selected thumbnails. ▪ To deselect an image or clip, click the thumbnail again. The system removes the outline from the thumbnail.
Save preferred images and clips	(Available only for non-continuous clips during a stress echo protocol or the compare task) ▪ Tap **Accept Selected**. The system activates the next stage or view.
Save preferred images and clips	(Available only for continuous clips during a stress echo protocol or the compare task) ▪ Tap **Accept**. The system displays the **Compare** tab on the touch screen.
Select another stage	▪ Rotate **Page**.
Save all images and clips for the active view	(Available only during a stress echo protocol or the compare task) ▪ Tap **Accept All**. The system outlines all thumbnails and activates the next stage or view.
Postpone the selection of preferred images and clips	(Available only during a stress echo protocol) ▪ Tap **Defer Selection**. The system activates the next stage or view.
Acquire additional images and clips for the active view	1. Tap **Add**. 2. Tap the required **Stage Property** and then select a **View Property**, if necessary. The system reactivates acquisition for the active view and appends newly acquired clips to the selected stage.
Replace all images and clips for the active view	(Available only for non-continuous clips during a stress echo protocol) ▪ Tap **Reject**. The system discards all images and clips for the active view and reactivates acquisition for capturing of images and clips.

To	Do This
Change the display layout for clips on the image screen	**Note:** You can view images or clips from a stress echo protocol on the image screen. ▪ Tap a selection. – 1:1 layout displays one clip in a full-screen layout. Or, double-click the required image or clip.  – 2:1 layout displays two clips side-by-side.  – 2:2 layout displays four clips.  – 3:2 layout displays six clips.  – 4:2 layout displays eight clips.  – 3:3 layout displays nine clips. 
Access exam review	▪ Tap **Exam Review**.

Sorting and Comparing Images and Clips

You can sort and compare preferred images and clips during stress echo review.

Note: When selecting a stress echo study for review from the patient browser, the system displays a progress bar and indicates the study is loading.

See also: For information about reviewing a study, refer to Chapter B1 in this manual.

See also: For information about CINE playback, refer to Chapter 7 in the Instructions for Use.

To sort and compare images and clips:

Prerequisite: Activate stress echo review.

- Tap the **Compare** tab.

To	Do This
Cycle through a set of selected clips	〈1/8〉 *Example of a pagination indicator. Displays the active page and the total number of pages for navigating through pages of images during stress echo review.* ▪ Click the right arrow to view clips in a forward sequence. ▪ Click the left arrow to view clips in a reverse sequence.
Sort images and clips	▪ Tap **Sort By** and then select an option. – **Stage** sorts images and clips for the first stage, followed by the subsequent stages. – **View** sorts images and clips for the first view for all stages, followed by each subsequent view for all stages.
Select two images of the same view for comparison	1. Tap **Compare**. 2. Tap **Reference** and then select an option. 3. Tap **Compare to** and then select an option. 4. To remove clips, tap **Remove**.
Change a view label	(Available only during the selection task) (Not available in 1:1 layout) 1. Click the required image and then press **UPDATE**. The system displays a list of view labels. 2. Click the required view label.
Rename a view	(Available only during the selection task) (Not available in 1:1 layout) 1. Click the required image and then press **UPDATE**. The system displays a list of view labels. 2. Select a label.
Display the review screen without exiting a stress echo protocol	▪ Tap **Exam Review**. ▪ To exit exam review and return to stress echo review, tap **Stress Echo Review**.
Return to stress echo acquisition	▪ Press **2D**. Or, tap **Imaging**.
Complete the protocol	▪ Tap **End Protocol**.

Performing Measurements

You can create a trace to measure the volume of the left ventricle (LV) for stress echo.

Note: The measure-then-label method is not available during a stress echo protocol.

See also: For information about cardiac measurements and calculations, refer to Chapter 11 in the Instructions for Use.

To activate measurements:

Prerequisite: Activate stress echo review.

1. Select the required clip in a single display format.
2. Press **FREEZE**.
3. Press **MEASURE**.
4. Tap the required measurement label.
   The system activates the measurement cursor.
5. Position and anchor the required measurement markers.
6. To finalize the measurement, press **UPDATE**. Or, press a trackball key.
   The system places a check mark on the measurement.

Wall Motion Scoring

You can assign wall motion scores (WMS) to segments within each view (representative loop).

Use the configuration settings to select the default segment model for wall motion scoring.

See also: For information about bullseye and view plane segments, refer to Appendix D in the System Reference.

To assign wall motion scores:

Prerequisite: Activate stress echo review.

1. Tap the **Compare** tab.
2. Tap **Wall Motion Scoring**.
   The system displays selections for scoring.
3. Select a segmental format, if necessary.
   Note: You can position the pointer over a segment to display the name of the view.

Icon	Description
	**Bullseye** Displays segments in a bullseye format.
	**View Plane** Displays segments in a view plane format.

4. Click the required segment and then select a score for the segment.

Selection	Description
1 Normal	Normal Indicates normal wall thickening and endocardial excursion
2 Hypokinetic	Hypokinetic Indicates reduced wall thickening and reduced endocardial excursion
3 Akinetic	Akinetic Indicates an absence of wall thickening or endocardial excursion
4 Dyskinetic	Dyskinetic Indicates systolic outward stretching or thinning
5 Aneurysmal	Aneurysmal Indicates abnormal wall motion, such as bulging during systole and diastole
X Unable to interpret	Unable to interpret
Set not scored segments to Normal	Set the not scored segments to Normal
Set all segments to Normal	Set all segments to Normal
Clear all segments	Clear all segments

Stress Echo Report

The patient report displays a maximum of 20 stages for a stress echo protocol.

Note: The measurement report for stress echo is only available during a stress echo protocol.

See also: For information about reports, refer to Chapter 12 in the Instructions for Use.

See also: For information about stress echo results in the report, refer to Appendix D in the System Reference.

To display the stress echo report:

Prerequisite: Score the wall segments.

1. Tap **Report**.
2. To view stress echo results, click **Stress Echo**.
3. To view wall motion scoring results, click **Wall Motion Scoring** and then select an option.
   - **Bull's Eye** displays the results in a bullseye plot.
   - **View Plane** displays the results in a view plane plot.
   - **Both** displays both bullseye and view plane results.

C3 Transesophageal Transducer

Introduction to the Transesophageal Transducers 3

Preparation for Use 4
- Prior to First Use 5
- Prior to Each Use 5
  - Inspecting the Transducer 6
  - Using a Transducer Sheath (Transducer Cover) 7
  - Using Protective Drapes 7
- Electrical Safety Considerations 7
  - Implantable Devices 7
  - Defibrillators 8
  - Punctures or Cracks 9
  - Electrosurgical Units 9
- Exam Considerations 10
  - Bite Guards 10
  - Exam Procedures 10

Caring for the Transesophageal Transducer 12
- Cleaning and Storage 12
  - Approved Cleaners and Disinfectants for the Transesophageal Transducer 12
  - Cleaning and Disinfecting the Transducer 13
  - Cleaning a Transducer at the Point of Use 14
  - Cleaning a Transducer 15
  - Disinfecting a Transducer 16
  - Storing and Handling 18
- Electrical Safety: Leakage Current Test 19
- Service and Repair 20

Preventing Injury and Equipment Damage 21

Introduction to the Transesophageal Transducers

⚠ **WARNING:** Do not use this transducer unless you are thoroughly trained in transesophageal echocardiography and are familiar with the orientation of cardiac images obtained through a TEE procedure. The transesophageal transducer should be used only by a licensed physician.

⚠ **WARNING:** Before attempting to use this transducer, you should be thoroughly familiar with the safe operation of the ultrasound system and this transducer. Refer to the content of this chapter and to the Safety and Care chapter in the Instructions for Use manual for ultrasound system and transducer-related safety information.

See also: For general ultrasound system and transducer-related safety information, refer to Chapter 2 and Chapter 3 in the Instructions for Use. For information about the articulation controls, brakes, on-screen messages, temperature controls, and safeguards for a specific transesophageal transducer, refer to the following chapter in this manual:

– Chapter C4, Z6T Transesophageal Transducer

⚠ **WARNING:** The leakage current test for transesophageal transducers must be done prior to each use in order to reduce the likelihood of harm to the patient. Unsafe leakage current could result in electrical burns to the patient during use, including during defibrillation. Refer to the manufacturer's instructions included with the tester.

The transesophageal transducer can be introduced into the esophagus of the patient to obtain images of the heart structure. This procedure, known as transesophageal echocardiography (TEE), can provide virtually unobstructed views of the heart and surrounding tissue.

Preparation for Use

⚠ **WARNING:** When using an endocavity or intraoperative transducer with a Type BF or Type CF applied part, the patient leakage currents may be additive.

⚠ **WARNING:** The leakage current test for transesophageal transducers must be done prior to each use in order to reduce the likelihood of harm to the patient. Refer to the manufacturer's instructions included with the tester.

⚠ **WARNING:** Prior to each use, inspect the endocavity or intraoperative transducer for signs of mechanical damage such as cracks, cuts, tears, perforations, or protrusions. Do not use the transducer if the transducer appears damaged in any way. A damaged transducer could cut the patient or user and compromise the electrical safety of the transducer, causing possible patient or user injury. Contact your local Siemens Healthineers representative.

⚠ **WARNING:** To prevent injury to you or the patient from electrical shock and burns when you connect or disconnect the transducer, do not touch the components on the transducer connector intended for insertion into the port on the ultrasound system. Grasp the transducer connector and avoid contact with the surface of the ultrasound system and any part of the transducer that touches the ultrasound system when disconnecting or connecting the transducer.

Prior to First Use

Proper precautions reduce risks to the patient and the equipment.

- Review the Safety and Care section.
- Thoroughly understand the features and operation of the transesophageal transducer, particularly the use of the flex controls and friction brakes.
- Clean and high-level disinfect the transesophageal transducer prior to its first use.
- Perform a leakage current test on the transducer. Refer to the manufacturer's instructions included with the tester.

Prior to Each Use

Review this checklist before each use of the transesophageal transducer to ensure patient safety, comfort, and confidence.

- Review patient history to ensure contraindications do not apply.
- Thoroughly inspect the transducer for mechanical damage.
- Familiarize yourself with the articulation controls.
- Ensure that the transducer has been properly cleaned and has been high-level disinfected, if disinfection is necessary.
- Perform a leakage current test on the transducer. Refer to the manufacturer's instructions included with the tester.
- Place a sheath on the transducer, if indicated.
- If necessary, place a drape over the transducer handle, cable, connector and the ultrasound system.

Inspecting the Transducer

To inspect the transducer before use:

1. Examine by look and touch the entire surface of the flexible shaft all the way to the distal tip for cuts, scrapes, protrusions, holes, dents, or cracks.

   If you discover the surface of the transducer has been compromised, do not use the transducer. Contact your local Siemens Healthineers representative.

2. Rotate the flex controls through the full range of motion and observe that the control movement is smooth and easy.

   If the range of motion is tight or binding, or if the transducer controls make an unusual noise, do not use the transducer. Contact your local Siemens Healthineers representative.

   If the distal tip appears to sag slightly when the flex controls are in the neutral position, this may be a sign of stretched or damaged control cables. Do not use the transducer. Contact your local Siemens Healthineers representative.

3. Test the brakes:
   – Engage the brakes (deflection locking mechanism) by pressing each ratchet button.

     The brakes hold the distal tip at the appropriate articulation angle when locked.

Using a Transducer Sheath (Transducer Cover)

See also: For information about transducer sheaths, refer to Chapter 3 in the Instructions for Use.

⚠ **WARNING:** There have been reports of severe allergic reactions to medical devices containing latex (natural rubber). Health care professionals are advised to identify latex-sensitive patients and be prepared to treat allergic reactions promptly. For additional information in the U.S.A., refer to FDA Medical Alert MDA91-1.

For greatest patient and operator safety, cover a transducer with a transducer sheath. Siemens Healthineers recommends that you use market-cleared transducer sheaths specifically designed for TEE applications. Follow the instructions provided by the manufacturer of the transducer sheath.

Disposal

While wearing protective gloves, remove the transducer sheath from the transducer. Dispose of the transducer sheath according to local, state, and regional laws and regulations for biohazardous waste.

Using Protective Drapes

Follow your hospital's guidelines regarding equipment use in the presence of infectious disease.

Electrical Safety Considerations

For safe use of this device, ensure an electrical safety procedure is in place for periodically inspecting the grounding system in the examination area and that this procedure is performed routinely.

Implantable Devices

⚠ **WARNING:** Ultrasound systems, like other medical equipment, use high-frequency electrical signals that can interfere with implantable devices such as pacemakers and implantable cardioverter-defibrillators (ICDs). When using a transesophageal transducer on a patient who has an implantable device, pay special attention to the performance of the implantable device. Stop the examination if there is interference.

Defibrillators

⚠ **WARNING:** Disconnect the transducer during defibrillation because a malfunction of the safety controls could otherwise result in electrical burns for the patient. Complete the leakage current test for transesophageal transducers in order to reduce the likelihood of harm to the patient during use.

The transesophageal transducer is designed to withstand the effects of defibrillation. There are no exposed conductive surfaces distal to the handle. Within the flexible shaft, a chassis ground shield covers all active circuits and conductors. The shield runs along the entire length of the transducer.

The transesophageal transducer is not tested to meet certification requirements for a Type BF defibrillator-proof device per the IEC 60601-1 Standard for Safety of Medical Equipment.

Transesophageal transducers with this label are not certified as defibrillation proof:



Type BF Applied Part.

Examples of Risks

Follow the protocols of your clinic or hospital to determine the safest response for your patient before starting defibrillation: disconnecting the transesophageal transducer from the ultrasound system or removing the transesophageal transducer from the patient.

Transducer in the Patient during Defibrillation

- Defibrillation might not be as effective because the transesophageal transducer may absorb or divert the current required to restart the heart.
- If the electrical insulation surrounding the insertable portion of the transesophageal transducer becomes damaged during intubation, the patient could suffer burns to the esophagus. For example:
  - If the bite guard moves during intubation, the patient could bite into the inserted portion of the transesophageal transducer, exposing the transesophageal transducer's electrical circuitry to the patient's esophagus.
  - The inserted portion of the transesophageal transducer could become stressed during intubation, introducing cracks in the electrical insulation and exposing the transesophageal transducer's electrical circuitry to the patient's esophagus.

Transducer Removed from the Patient before Defibrillation

- Delay in defibrillation while the transesophageal transducer is removed from the patient.
- Injury to the esophagus, vocal cords, or teeth resulting from removing the transesophageal transducer too quickly.

Punctures or Cracks

Punctures or cracks in the outer layer of the transducer could expose the patient's esophagus to chassis leakage current and cause the patient to be at the chassis ground potential. If this occurs, the transducer will no longer meet the requirements of a Type BF classification. The transducer would no longer be a "floating" part and would fail a dielectric test. Provided that the internal grounding mechanism within the ultrasound system's power cord is intact and the cord is connected to a properly grounded wall outlet, there is little hazard to the user or patient from the system's leakage current. However, since the patient would now be at ground potential, leakage currents from other devices within the patient's environment could travel through the patient, compromising the safety to the patient or operator. If punctures or cracks in the outer layer of the transducer are observed, contact your local Siemens Healthineers representative.

Electrosurgical Units

⚠ **WARNING:** Use only isolated output electrosurgical units with the transesophageal transducer and disconnect the transducer when it is not in use. Failure to follow these procedures can result in esophageal burns for the patient, damage to the equipment, and unreliable data.

Use only electrosurgical units that have isolated outputs. If possible, use return-fault/ground-fault detection circuits, which provide extra protection.

Electrosurgical units and other operating room devices that do not have isolated outputs can introduce radio frequency electromagnetic fields or currents into the patient. The transducer is susceptible to these radio frequencies, which can interfere with the 2D-mode image and can completely override the color flow image, making it useless for diagnostic purposes.

In addition, any failure to an electrosurgical unit or other device, including the transesophageal transducer, could cause electrosurgical currents to return along the transducer's conductors. As a result, the patient could suffer from burns to the esophageal membranes. This arcing could also damage the transducer. To reduce the risk of leakage currents and electrosurgical interference, disconnect the transesophageal transducer from the ultrasound system when it is not in use.

Where isolation of electrosurgical units is in question, consult the manual for each electrosurgical unit or contact the biomedical engineering group.

Exam Considerations

Bite Guards

⚠ **WARNING:** Follow the bite guard manufacturer's instructions to clean, disinfect, and rinse the bite guard if you use a reusable bite guard. Any disinfectant remaining on the reusable bite guard can burn the patient's mouth.

Bite guards are provided with the transducer for use with patients who will be awake during the exam. These guards are also available from third-party providers.

Do not use the provided bite guard with anesthetized patients. Use a separately purchased bite guard that has a space for taping an endotracheal tube to the guard.

Exam Procedures

⚠ **WARNING:** Ensure that the friction brakes are unlocked and the flex controls are in the neutral alignment position when you insert or withdraw the transducer. Advancing or withdrawing the transducer while the transducer tip is bent and/or rigid can result in patient injury or death.

⚠ **WARNING:** Do not use excessive force to advance or withdraw the transducer. Using excessive force to advance or withdraw the transducer can result in patient injury or death. If you encounter strong resistance during transducer articulation, discontinue the procedure. Identify and address the cause of the resistance before resuming the procedure. Withdraw and redirect the transducer as needed.

⚠ **WARNING:** To reduce the risk of pressure necrosis, put the transducer in the neutral position when inserting or withdrawing it. Minimize pressure applied to the articulating section and distal tip. Do not let the distal tip displace tissue for more than five minutes.

⚠ **WARNING:** Do not use the transesophageal transducer for any procedure requiring hyperextension of the neck. Improper patient positioning can cause paralysis of the vocal cord.

⚠ **WARNING:** Always use a bite guard to prevent damage to the transducer from the patient's teeth, which could, as a result, create potential mechanical and electrical hazards for the patient. Using a bite guard also protects the patient's teeth.

Exam Procedures

Prerequisite: Connect the transducer to the ultrasound system and then activate the transducer prior to inserting the transducer into the patient.

1. Remove dentures, if present, and place them in a protected area until after the procedure.
2. Place a transducer sheath on the transducer, if needed.
3. Place a bite guard around the distal end of the transducer.
4. Ensure that both friction brakes are unlocked and both flex controls are in the neutral alignment position before inserting the transducer so that the transducer can bend to accommodate the path of the esophagus.
5. Place the transducer in the patient's mouth, and secure the bite guard into place before further advancing the transducer.
6. When the transducer has been inserted, press the array rotation control to change the scan plane.
7. As necessary, adjust the anterior/posterior and the left/right deflection using the flex controls. Position the transducer for optimal acoustical contact and the required viewing scan plane.
8. When the required scan plane is achieved and good acoustical contact is made, engage both the anterior/posterior and the left/right friction brakes.
9. Unlock both friction brakes and move both flex controls to the neutral position to acquire new echocardiographic views, which necessitate further advancement or withdrawal of the transducer, or change in the deflection.
10. Unlock both friction brakes and move both flex controls to the neutral position to remove the transducer.

Caring for the Transesophageal Transducer

See also: For general ultrasound system and transducer-related safety information, refer to Chapter 2 and Chapter 3 in the Instructions for Use.

Cleaning and Storage

You must properly clean and disinfect a transducer before the first use and after each use of a transducer.

Approved Cleaners and Disinfectants for the Transesophageal Transducer

⚠ **WARNING:** The use of any cleaners and disinfectants other than those specified here may damage the transducer and, as a result, may create electrical hazards for patients and/or users.

⚠ **WARNING:** Disinfectants and cleaning methods listed are recommended by Siemens Healthineers for compatibility with product materials, not for biological effectiveness. Refer to disinfectant label instructions for guidance on disinfection efficacy and appropriate clinical uses.

⚠ **WARNING:** Refer to the disinfectant manufacturer's instructions for guidance on proper rinsing of the disinfectant from the transesophageal transducer. Any disinfectant remaining on the transesophageal transducer can burn the patient's mouth or esophagus.

The Federal Republic of Germany prohibits the use of wipes for disinfection of transesophageal transducers and any transducer used in a semi-critical procedure.

See also: For an additional list of approved cleaners and disinfectants, refer to the Cleaners and Disinfectants Addendum.

Transducer	Approved Cleaners	Approved Disinfectants
Z6T	ANIOSYME DD1	CIDEX OPA
	ENZOL	gigasept FF (new)
	Protex ULTRA Disinfectant Wipes	TD-5[1]
	Virex II 256	TD-8[1]

[1]For use only with the TD-100 Automated TEE Probe Disinfector according to the device manufacturer's instructions for use.

Cleaning and Disinfecting the Transducer

⚠ **WARNING:** To avoid electrical shock and damage to the system, disconnect the transducer prior to cleaning or disinfecting.

⚠ **WARNING:** Never use Steam Heat or Ethylene Oxide for disinfecting the transesophageal transducer. These disinfection methods may damage the jacketing material, the transducer array, or the articulation controls, making the device unsafe to use on a patient.

⚠ **WARNING:** Never use iodine or solutions containing iodine for cleaning or disinfecting the transesophageal transducer. Iodine will cause degradation of the shaft material and of the distal tip resulting in a dangerous electrical hazard.

⚠ **Caution:** Never clean the transducer with bleach. Cleaning with bleach will damage the flexible shaft jacketing material, which will invalidate the manufacturer's warranty and could increase leakage current.

⚠ **Caution:** The distal tip is very sensitive to pressure. Care must be taken not to damage the tip while cleaning and disinfecting the distal tip.

⚠ **Caution:** Do not bend the flexible shaft into a curve of less than 30.5 cm in diameter.

⚠ **Caution:** The transducers 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.

⚠ **Caution:** Never immerse the entire transesophageal transducer in any solution. Immersion of the transducer handle could introduce fluid into the housing and cause damage to the controls or steering cables.

⚠ **Caution:** Do not clean the transducer with ethanol or methanol. Ethanol and methanol can damage the transducer.

⚠ **Caution:** Do not immerse the transducer above 100 cm from the distal tip; doing so may damage the controls.

Cleaning a Transducer at the Point of Use

Cleaning a transducer immediately after each use prevents soil and contaminants from drying on the surface of the transducer and facilitates subsequent cleaning.

To immediately clean a transesophageal transducer after each use:

1. Disconnect and remove the transducer from the ultrasound system.
2. Remove the transducer sheath.
3. Immediately clean the transducer in close proximity to the point of use.
   a. Moisten a clean gauze pad or lint-free cloth with water or an approved cleaner. Or, use an approved cleaning wipe or sponge.

      See also: For a list of approved cleaners, refer to page C3-12.

   b. Carefully wipe the transducer surface intended for contact with the patient. Avoid touching the electrical components on the connector.
4. Perform subsequent cleaning of the transducer according to the next procedure.

Cleaning a Transducer

Cleaning a transducer removes soil and contaminants from the surface of the transducer and prepares the transducer for disinfection.

To clean a transesophageal transducer:

Prerequisite: The transducer is disconnected and removed from the ultrasound system. The transducer sheath is removed from the transducer.

1. Select an approved cleaner. Follow the manufacturer's instructions for concentration and temperature of the solution and contact time when cleaning the surface of the transducer.

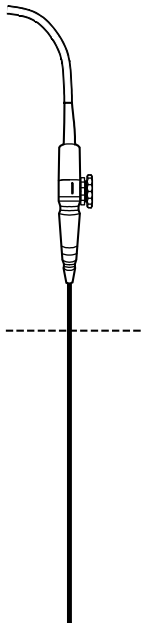
   See also: For a list of approved cleaners, refer to page C3-12.

2. Clean the distal tip and flexible shaft of the transducer using one of the following cleaning methods. Avoid touching the electrical components on the connector.
   - If immersion is required, submerge the distal tip and flexible shaft up to the 100-cm mark. Do not allow the handle, controls, cable, or connector to become wet.
   - If wiping is required, carefully wipe the distal tip and flexible shaft.
   - If spraying is required, do not spray the distal tip and flexible shaft near the ultrasound system. Never spray the transducer connector.
3. Clean the handle, controls, cable, and connector of the transducer. Keep the electrical components on the connector dry.
   a. Moisten a clean gauze pad or lint-free cloth with an approved cleaner. Or, use an approved cleaning wipe.
   b. Carefully wipe the handle, controls, cable, and connector.
4. Rinse the distal tip and flexible shaft up to the 100-cm mark according to the cleaner manufacturer's instructions. Do not rinse the handle, controls, cable, and connector. Keep the electrical components on the connector dry.

   Note: If the cleaner manufacturer does not provide rinsing instructions, thoroughly rinse the distal tip and flexible shaft up to the 100-cm mark with deionized water at room temperature.
5. Disinfect the transducer.

Disinfecting a Transducer

Immediately after cleaning, disinfect a transducer to destroy pathogens and other microorganisms and to prepare the transducer for storage or the next clinical use.



Submerge only to the 100-cm mark.

To disinfect a transesophageal transducer:

Prerequisite: Clean the transducer.

1. Select an approved disinfectant for high-level disinfection. Follow the disinfectant manufacturer's instructions for concentration and temperature of the solution and contact time when high-level disinfecting the surface of the transducer.

   See also: For a list of approved disinfectants, refer to page C3-12.

2. Disinfect the distal tip and flexible shaft of the transducer using one of the following disinfection methods. Avoid touching the electrical components on the connector.
   - If immersion is required, submerge the distal tip and flexible shaft up to the 100-cm mark. Do not allow the handle, controls, cable, or connector to become wet.
   - If wiping is required, carefully wipe the distal tip and flexible shaft.
   - If spraying is required, do not spray the distal tip and flexible shaft near the ultrasound system. Never spray the transducer connector.
   - If a reprocessing device is required, use a device compliant with ISO 15883 and follow the reprocessing device manufacturer's instructions.

3. Disinfect the handle, controls, cable, and connector of the transducer. Keep the electrical components on the connector dry.
   a. Moisten a clean gauze pad or lint-free cloth with an approved high-level disinfectant. Or, use an approved disinfectant wipe.
   b. Carefully wipe the handle, controls, cable, and connector.
4. Rinse the distal tip and flexible shaft of the transducer up to the 100-cm mark according to the disinfectant manufacturer's instructions. Do not rinse the handle, controls, cable, and connector. Keep the electrical components on the connector dry.

   Note: If the disinfectant manufacturer does not provide rinsing instructions, thoroughly rinse the distal tip and flexible shaft up to the 100-cm mark with deionized water at room temperature.
5. Follow the disinfectant manufacturer's instructions for drying the transducer. Do not use heated air.

   Note: If the disinfectant manufacturer does not provide drying instructions, dry the transducer with a clean, lint-free, soft cloth.
6. Apply an approved disposable tip protector to the distal tip before storage.
7. Store the transducer in a clean, dry, protected environment. The transesophageal transducer is fragile and should not be stored in the transducer holders on the system.

Storing and Handling

The transesophageal transducer is a mechanically sensitive device. The distal tip is especially sensitive to bumps, scrapes, and jarring. Take extreme care when handling and storing the transducer. Never move the distal tip by hand. Always use the flex controls.

When you store the transesophageal transducer, ensure that the friction brakes are off, the distal tip is straight, and the cables and flexible shaft are free of kinks.

Use an approved disposable tip protector on the distal tip during storage.

Store the transducer in a clean, dry, protected environment. The transesophageal transducer is fragile and should not be stored in the transducer holders on the system.

Transporting the Transducer

Use the case for shipping or for moving the disinfected transducer from one site to another. Take care that the distal tip is straight and that the cable is free of kinks as you carefully place the transducer in the foam padding. Before you close the lid, ensure that nothing protrudes from the case.

Electrical Safety: Leakage Current Test

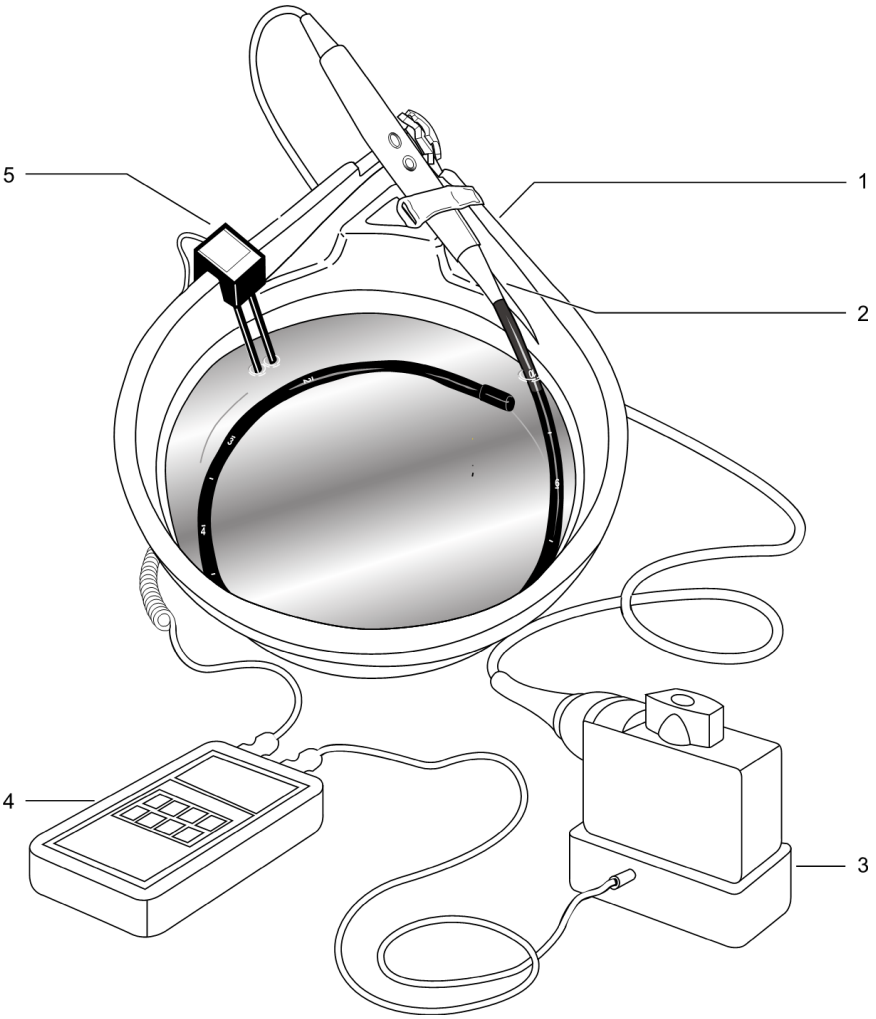
⚠ **WARNING:** The leakage current test for transesophageal transducers must be performed prior to each use in order to reduce the likelihood of harm to the patient. Unsafe leakage current could result in electrical burns to the patient during use, including during defibrillation. Refer to the manufacturer's operating instructions for the leakage current tester.

⚠ **WARNING:** To avoid damage to the transducer, observe the immersion levels. Do not allow the transducer handle, controls, strain relief, cable, and system connector to become wet. Keep the handle, flex controls, strain relief, cable, and connector dry to prevent introducing fluid into the housing and damage to the controls or steering cables.

⚠ **WARNING:** To prevent electric shock and possible injury to anyone near the leakage current tester, avoid touching the conductivity probe when the tester is on. Refer to the manufacturer's operating instructions for the leakage current tester.

You must perform the leakage current test prior to each use of the transesophageal transducer. Passing the test assures the leakage current is within acceptable limits at the time of the test.

See also: For information about performing the required tests, refer to the manufacturer's operating instructions for the leakage current tester.



1 Basin with disinfectant or sterile saline solution
2 Transesophageal transducer with the entire liquid-tight portion immersed to, but not beyond, the last depth mark
3 Transducer adapter
4 Leakage current tester
5 Conductivity probe (rods) immersed at least 25 mm (1 inch) into the disinfectant or sterile saline solution

Example of a leakage current tester setup with a transesophageal transducer.

To prepare for the leakage current test:

Prerequisite: A compatible leakage current tester and a compatible transducer adapter.

1. Connect the transesophageal transducer to a compatible transducer adapter.
2. Immerse the liquid-tight portion of the transducer into a bath of disinfectant or sterile saline solution up to, but not beyond, the last depth mark. Keep the handle, flex controls, strain relief, cable, and system connector dry.

   Note: For the Z6T transesophageal transducer, the last depth mark is at 100 cm.

   See also: For a list of approved disinfectants, refer to page C3-12.
3. Place the conductivity probe in the disinfectant or sterile saline solution bath to a minimum depth of 25 mm (1 inch).
4. Connect the transducer adapter and conductivity probe to the leakage current tester as indicated in the manufacturer's operating instructions for the leakage current tester.

To perform the leakage current test:

Prerequisite: Prepare for the leakage current test.

1. Carefully follow the manufacturer's operating instructions for the leakage current tester as you perform all required tests, for example:
   a. Enter the required test voltage and leakage current test values. or, Select the default test settings for the Z6T transducer.
   b. Test the leakage current tester.
   c. Test the bath conductivity, if necessary.

      Note: Your compatible leakage current tester may simultaneously test the bath conductivity and the transesophageal transducer.

   d. Test the transesophageal transducer.
2. Obtain the leakage current results for the transducer.
   – A passing result indicates you can prepare the transducer for use.
   – A failing result indicates the transducer did not pass the leakage current test. Check all connections and then re-test the transducer. If a failure occurs again, do not use the transducer for a patient study and contact your Siemens Healthineers service representative.
3. To prepare the transducer for use, rinse the distal tip and flexible shaft of the transducer up to the 100-cm mark according to the disinfectant manufacturer's instructions. Do not rinse the handle, flex controls, strain relief, cable, and connector. Keep the electrical components on the connector dry.

   Note: If the disinfectant manufacturer does not provide rinsing instructions, thoroughly rinse the distal tip and flexible shaft up to the 100-cm mark with deionized water at room temperature.

Service and Repair

Do not attempt to repair or alter any part of the transesophageal transducer. Contact your local Siemens Healthineers service representative office immediately if your transducer appears to be damaged or malfunctions in any way.

Preventing Injury and Equipment Damage

Following the preventive measures outlined below will help ensure patient safety.

Preventive Measure	Problem	Potential Harm to Patient/Potential Damage
Place the transesophageal transducer's flex controls in the neutral alignment position, without applying the friction brakes, when you insert or withdraw the transducer. Do not force the transducer.	Improper insertion or withdrawal	Esophageal cuts, bruising, bleeding, ligament damage, perforations
Inspect the transesophageal transducer prior to each use to ensure that it is functioning properly and that it has no cuts, tears, fraying, loose parts, or rough edges.	Mechanical damage, electrical damage, leakage current	Severe trauma, esophageal cuts, bleeding, perforation, electrical burns, serious electrical hazards
Use only isolated output electrosurgical units with the transesophageal transducer. Disconnect the transducer when it is not in use.	Non-isolated electrosurgical units	Electrical burns
Adjust the Transmit Voltage (dB or %) as low as clinically useful. Observe the on-screen temperature warning messages and respond accordingly.	Improper transducer temperature and/or acoustic output	Esophageal burns
For maximum safety, disconnect the transesophageal transducer from the system prior to defibrillation rather than relying on the transducer's built-in safeguards.	Defibrillation	Electrical burns
Maintain a regimen of electrical safety checks.	Electrical damage, leakage current	Esophageal burns, electrical damage
Put the transducer in the neutral position, without either friction brake applied, when inserting or withdrawing it. Minimize pressure applied to the articulating section and distal tip. Do not let the distal tip displace tissue for more than five minutes.	Pressure necrosis	Permanent damage to esophageal lining

Preventive Measure	Problem	Potential Harm to Patient/Potential Damage
Do not use the transesophageal transducer if a patient has esophageal varices or masses or strictures are present.	Esophageal Varices	Excessive bleeding
Do not use the transesophageal transducer for any procedure requiring hyperextension of the neck.	Improper patient position	Paralysis of the vocal cord
Be aware that a patient with a loose tooth could lose the tooth in a TEE procedure.	Improper assessment of dental risk	Tooth loss
Use a bite guard.	No dental protection, leakage current	Dental damage, electrical damage
Follow the bite guard manufacturer's instructions to clean, disinfect and rinse the bite guard if you use a reusable bite guard. Refer to the disinfectant manufacturer's instructions for guidance on proper rinsing of the disinfectant from the transesophageal transducer	Disinfectant residue on the bite guard and transesophageal transducer	Burns in the mouth and esophagus
Never use Steam Heat or Ethylene Oxide for disinfecting the transesophageal transducer. Do not use any disinfectants other than those specified. Do not use iodine or solutions containing iodine for cleaning or disinfecting the transesophageal transducer.	Improper cleaning resulting in electrical damage	Esophageal burns
Immerse the transesophageal transducer no longer than the time required by the manufacturer for high-level disinfection. Never immerse transducer controls or the system connector in liquids.	Improper disinfection, exposing electrical workings to liquids	Nosocomial infection, electrical damage affecting image quality, electrical safety, or mechanical operation
Do not force distal tip articulation. Always use the controls to alter articulation.	Forcing the deflection control	Stretching or breaking deflection controls
Store the transesophageal transducer in a clean, dry, protected environment, for example, suspended from a wall rack. Do not store the transducer in a tight coil.	Improper storage	Damage to array elements, cuts and abrasions to the flexible shaft

C4 Z6T Transesophageal Transducer

About the Z6T Transducer 3
Transducer Articulation Controls 4
Flex Controls 5
Friction Brakes 7
Smart Controls 10

Imaging with the Z6T Transducer 11
Rotating the Scan Plane 12
Temperature Controls and Safeguards 13
Temperature Sensor 13
Transducer Temperature Limit 14
Temperature Sensor Failure 14
Additional Thermal Safeguard 15
Managing the Lens Surface Temperature 15
Optimizing Imaging 15
Biplane Imaging 16
Enhanced Resolution Imaging 19
Mitral Valve View 19
Dual V 20

Z6T Transducer Technical Description 22

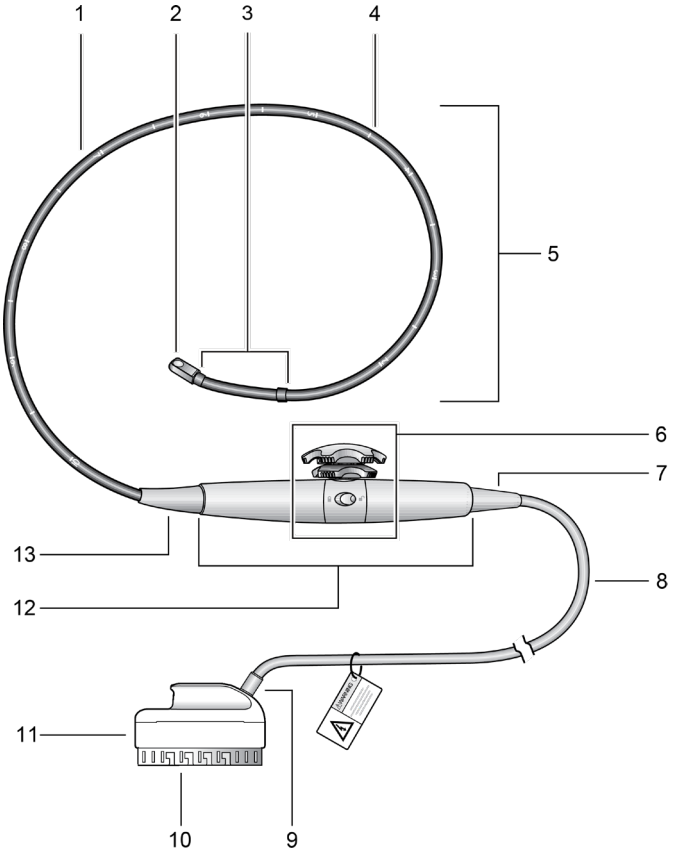
About the Z6T Transducer

⚠ **WARNING:** Before attempting to use this transducer, you should be thoroughly familiar with the safe operation of the ultrasound system and this transducer.

See also: For general ultrasound system and transducer-related safety information, refer to Chapter 2 in the Instructions for Use. For safety and care information specific to using transesophageal transducers, refer to Chapter C3 in this manual.

The Z6T transesophageal transducer is a 4D, multi-frequency, multi-plane, phased sector array transducer with dual view and biplane viewing capabilities.

See also: Z6T Transducer Technical Description, page C4-22



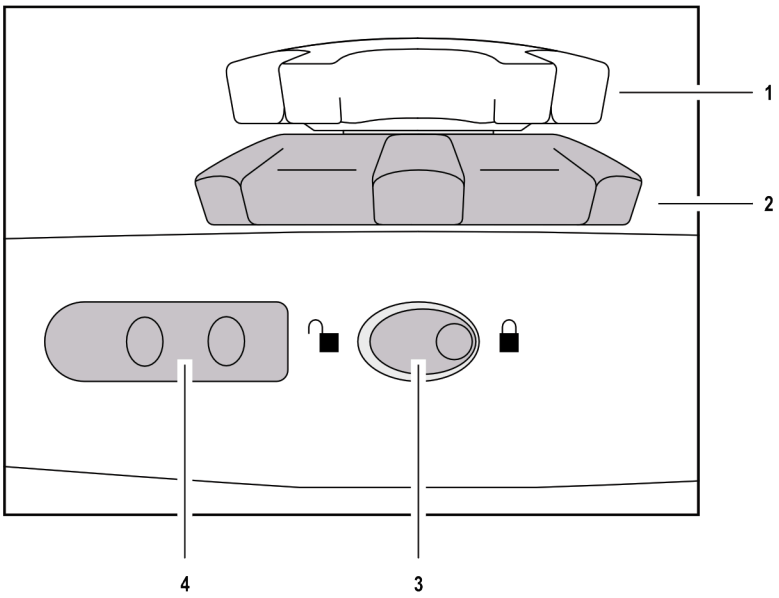
Example of transesophageal transducer components.

1 Flexible shaft
2 Distal tip
3 Articulating section
4 Depth markings (in centimeters)
5 Transducer surface in contact with the patient (flexible shaft with depth markings, articulating section, and distal tip)
6 Controls
7 Strain relief for the handle
8 Cable
9 Strain relief for the connector
10 Electrical component on the connector
11 Connector
12 Handle
13 Strain relief for the handle

Transducer Articulation Controls

⚠ **Caution:** Do not use your hands or fingers to bend or manipulate the articulating section of the transesophageal transducer. To avoid severe damage to the articulating mechanism, use only the transducer controls to change the articulation angle.

The flex controls, smart controls, and friction brakes are located on the handle of the transducer.



Example of Z6T transducer controls.

1 Anterior/posterior flex control (white)
Manipulates the forward and backward movement of the distal tip.

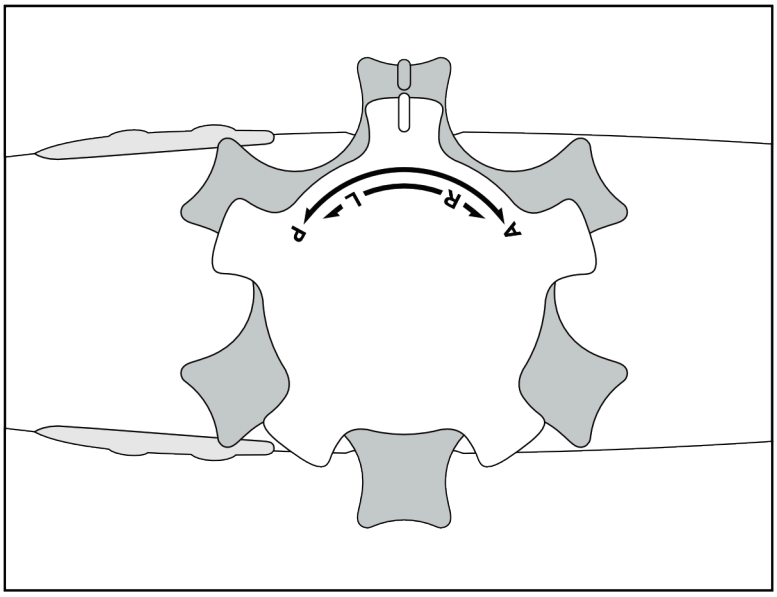
2 Left/right flex control (gray)
Manipulates the left to right movement of the distal tip.

3 Friction brakes (one on each side of the transducer)
Locks the flex controls.

4 User-configurable smart controls (two on each side of the transducer)
When configured, provides access to user-assigned functions, for example, freeze/unfreeze, clip capture, or biplane image rotation.

Flex Controls

The flex controls manipulate the movement of the distal tip.



Example of markings located on the flex controls.

Anterior/Posterior Deflection

For anterior deflection (anteflexion) of the distal tip, rotate the flex control toward the **A** marking to move the tip anteriorly.

For posterior deflection (retroflexion) of the distal tip, rotate the flex control toward the **P** marking to move the tip posteriorly.

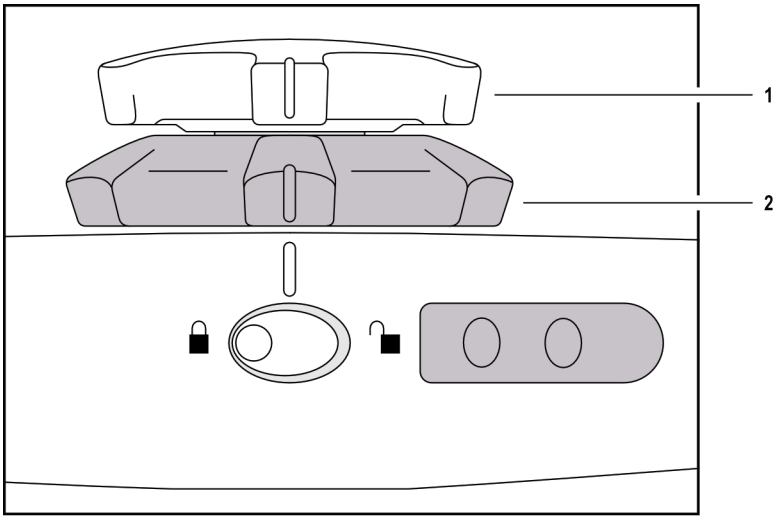
Right/Left Deflection

For right deflection of the distal tip, rotate the flex control toward the **R** marking to move the tip right.

For left deflection of the distal tip, rotate the flex control toward the **L** marking to move the tip left.

Neutral Position

To place the distal tip in the neutral position, rotate the anterior/posterior flex control and the right/left flex control to align the raised reference lines with the raised reference line on the handle of the transducer.



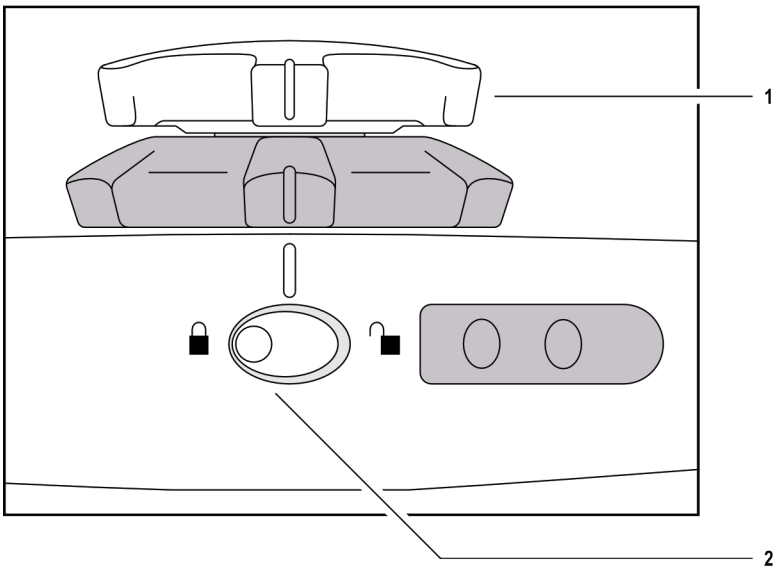
Example of the flex controls in neutral position.

1 Anterior/posterior flex control
2 Left/right flex control

Friction Brakes

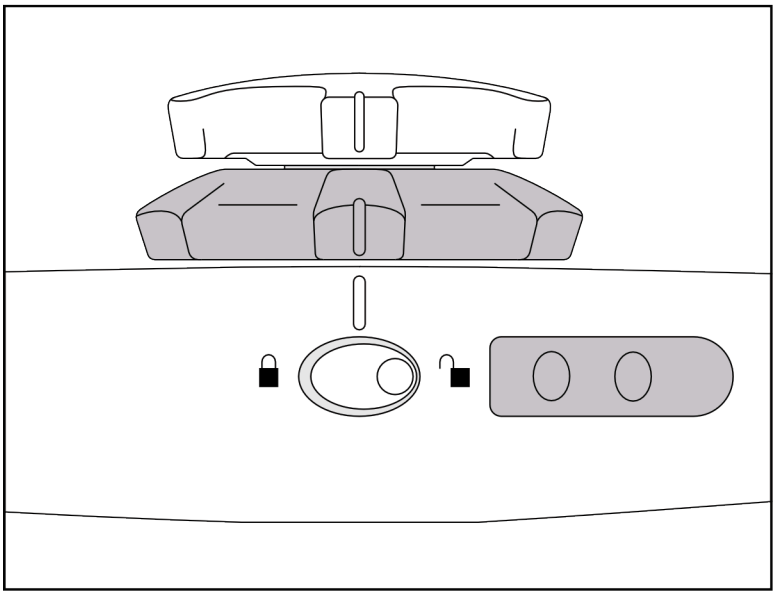
The friction brakes lock the deflection positions of the distal tip. When the brakes are engaged, you can change the scan plane without losing acoustical contact.

A friction brake is located on each side of the transducer handle. The friction brakes are color-coded to match their corresponding flex control.



Example of the right side of the transducer with the brake for the anterior/posterior flex control in the locked position.

1 Anterior/posterior flex control
2 Brake for anterior/posterior flex control



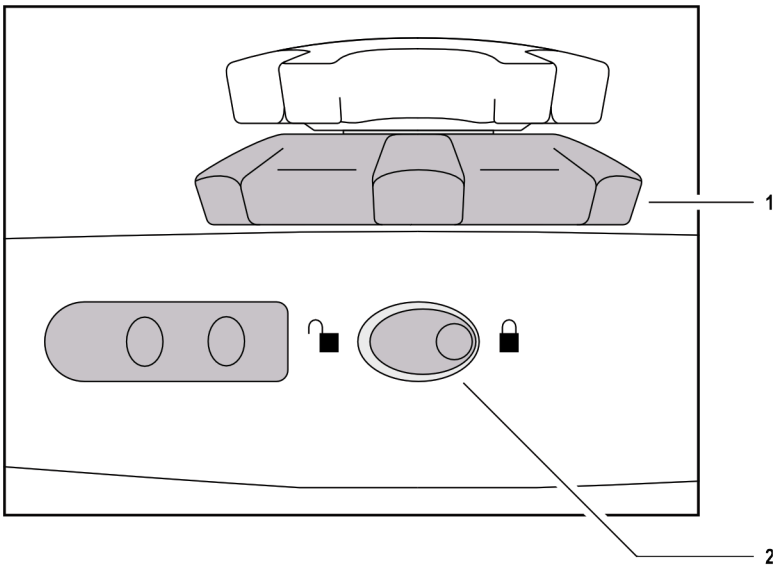
Example of the right side of the transducer with the brake for the anterior/posterior flex control in the unlocked position.

To lock the anterior/posterior deflection position of the distal tip:

- Press the raised tactile indicator located on the button of the corresponding brake.

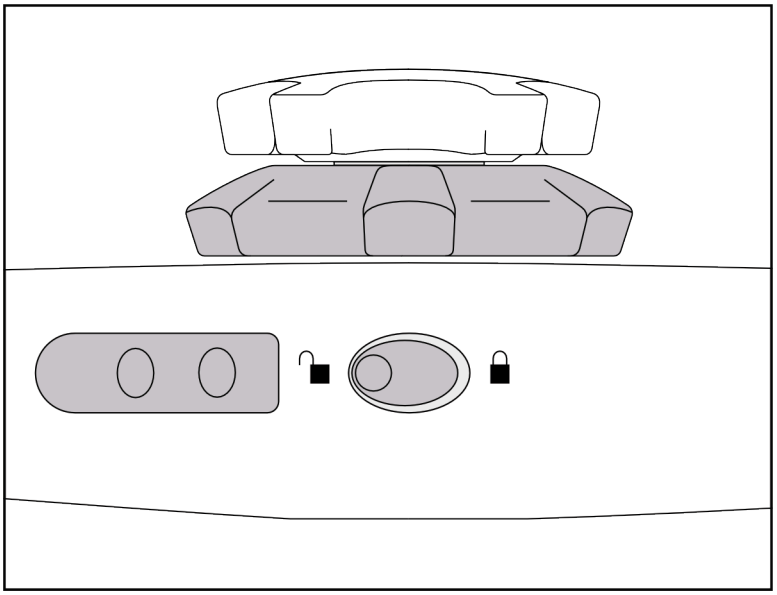
To unlock the brake:

- Press the flat portion on the button of the corresponding brake.



Example of the left side of the transducer with the brake for the left/right flex control in the locked position.

1 Left/right flex control
2 Brake for left/right flex control



Example of the left side of the transducer with the brake for the left/right flex control in the unlocked position.

To lock the left/right deflection position of the distal tip:

- Press the raised tactile indicator located on the button of the corresponding brake.

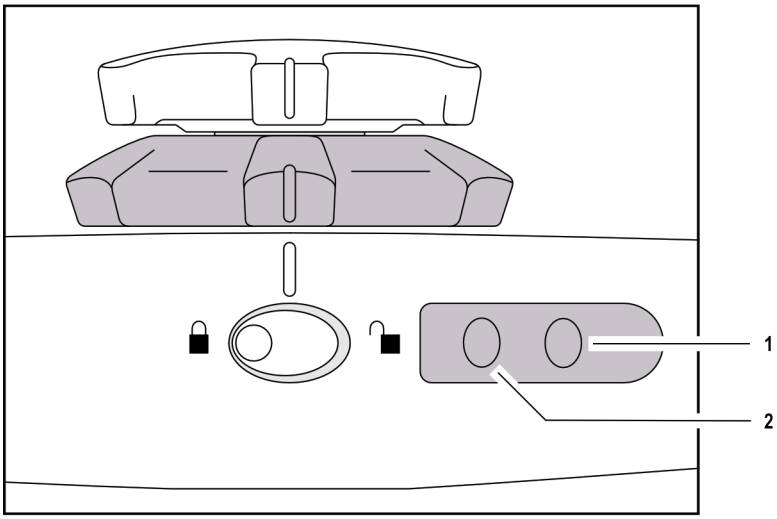
To unlock the brake:

- Press the flat portion on the button of the corresponding brake.

Smart Controls

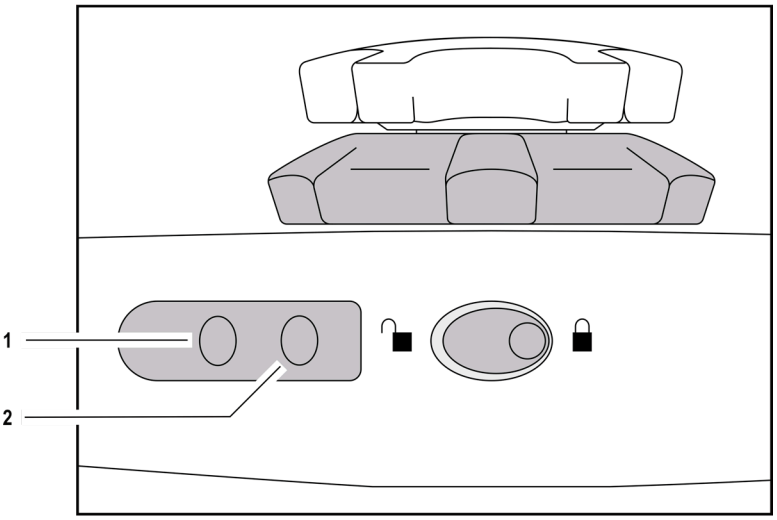
The smart controls provide access to user-assigned functions and can be configured to provide the equivalent functions of controls available on the control panel or software, for example, freeze/unfreeze, clip capture, biplane imaging, or tilt.

Use the configuration settings to assign a function to each of the smart controls.



Example of the smart controls on the right side of the transducer.

1 User-configurable Smart Control A.
2 User-configurable Smart Control B.



Example of the smart controls on the left side of the transducer.

1 User-configurable Smart Control A.
2 User-configurable Smart Control B.

Imaging with the Z6T Transducer

⚠ **WARNING:** Prior to inserting the transesophageal transducer into a sedated patient, confirm the functionality of the transducer. Connect the transducer to the ultrasound system, activate the transducer, and visually confirm the name of the transducer, scan plane icon, and temperature indicator displays on the image screen. If you cannot confirm the on-screen information, do not use the transducer and contact your service representative.

See also: For additional information about the scan plane icon, refer to page C4-12. Refer to page C4-13 for information about the temperature indicator.

When you connect a transesophageal transducer to the system, the system displays a transducer-specific message.

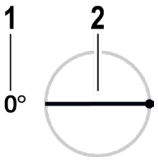
Message	Displays When	Recommended Action
Refer to the warnings and precautions in the user manual before each use of the transesophageal transducer. Review instructions for leakage current testing and for inspection, proper use, and disinfection of the transesophageal transducer.	The transesophageal transducer is selected.	Click **OK**.

During imaging, the system displays information on the image screen regarding the direction and rotation angle and the temperature at the lens surface of the transducer array.

Rotating the Scan Plane

You can use the controls on the control panel to rotate the scan plane during imaging.

Use the configuration settings to set up the smart controls on the transducer handle.



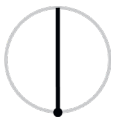
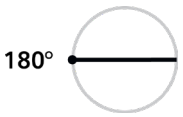
Example of the scan plane icon.

1 Numerical value of the rotation angle
2 Angle indicator

Note: The dot on the end of the angle indicator corresponds to the white transdducer orientation marker on the screen and indicates the starting point for image acquisition. The gold transducer orientation marker is on the right side of the image, indicating image acquisition always starts from right-to-left.

The starting position for rotating the scan plane is 0°, and you can rotate the plane in a 0° to 359° range.

Use the configuration settings to limit or extend the range of scan plane rotation.

The angle of 0° is equivalent to the transverse scan plane.	The angle of 90° is equivalent to the longitudinal scan plane.	The angle of 180° provides the mirrored transverse scan plane.
		

Examples of the numerical value of the rotation angle corresponding to the position of the angle indicator.

To rotate the scan plane:

- Choose a method:
  - Press the smart control on the transducer handle assigned to rotating the scan plane.

    Note: You must first set up the smart controls to rotate the scan plane.
  - Press **Angle** and then select an option.
    - **1°** adjusts the angle in one-degree angle increments.
    - **30°** adjusts the angle in 30-degree angle increments.
  - Rotate **Angle** clockwise to rotate the scan plane clockwise.
  - Rotate **Angle** counterclockwise to rotate scan plane counterclockwise.

  As the scan plane rotates, the relative direction of the imaging plane and the numerical value of the rotation angle are updated.

Temperature Controls and Safeguards

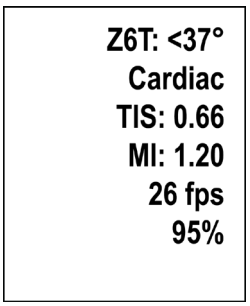
⚠ **WARNING:** Disconnect the transducer if the system displays the message indicating that the maximum thermal limit is exceeded. (The transducer temperature is 43°C or higher.) Failure to disconnect a transesophageal transducer that has exceeded the maximum thermal limit can burn the patient's esophagus. Reconnect the transducer after the transducer has cooled. Or, use a different transducer.

Because some concerns have been raised about possible thermal injury to the esophagus due to the local buildup of heat during transesophageal echocardiography, the transesophageal transducer incorporates a shut-off mechanism in the interest of patient safety in the unlikely event overheating should occur. For additional information on temperature limitation, refer to EN 60601-2-37 and IEC 60601-2-37.

Temperature Sensor

A temperature sensor mounted in the distal tip of the transducer monitors the temperature of the scanning array.

The ultrasound system displays the lens temperature in the imaging parameters.



Example of the lens temperature display.

When the temperature is 37°C or below, the system displays the temperature as **<37°C**.

When the temperature is above 37°C, the system displays the actual temperature.

If the transducer temperature is not yet 42.5°C and your patient has a temperature or is slightly warm, you can use a software setting to cool down the transducer. This allows you to continue imaging in 2D-mode or 2D-mode with color and 4D-mode or 4D-mode with color.

Note: This software setting is not available during M-mode or Doppler.

To activate the cool down setting during 2D-mode or 4D-mode:

1. Tap **Cool Down**.
2. To exit, tap **Cool Down** again.

Transducer Temperature Limit

When the transducer temperature reaches 42.5°C, the system activates the cool down state and reduces the temperature, allowing you to continue imaging. For example, during 2D-mode or 2D-mode with color imaging, the system reduces the frame rate, and during 4D-mode or 4D-mode with color imaging, the system reduces the volume rate.

At 43°C, the system displays a warning message, stops imaging, and shuts down all power to the transducer.

Message	Displays When	Recommended Action
Transducer temperature has exceeded 42.5°C. Transducer Cool Down State was enabled for continued imaging. If necessary, you can manually disable the Cool Down State setting. Cool Down State is suspended if you activate M-mode or Doppler.	The lens surface temperature has exceeded 42.5°C.	When the lens surface temperature exceeds 42.5°C, the system activates the Cool Down State. In 2D modes and 4D modes, the volume rate or 2D frame rate is reduced by 50% to lower the lens surface temperature. **Note:** This does not apply to M-mode or Doppler modes. To reduce acoustic output and lens temperature in these modes, you can reduce Transmit Power.
Transducer temperature is 43°C. Imaging has been suspended. Disconnect the transducer. Reconnect the transducer after the transducer has cooled. Or, use a different transducer.	The lens surface temperature reaches 43°C (the maximum thermal limit).	When the lens surface temperature reaches 43°C, the system stops imaging and limits the available controls. 1. Disconnect the transducer. 2. Reconnect the transducer after the transducer has cooled. Or, use a different transducer. **Note:** The system is not operable until you disconnect the transesophageal transducer or cycle power to the system.

Temperature Sensor Failure

⚠ **WARNING:** Disconnect the transducer if the system displays the message indicating a temperature monitor failure. Remove the transducer from the patient. Failure to disconnect and remove a transesophageal transducer with faulty temperature sensor can burn the patient's esophagus. Contact your Siemens Healthineers service representative.

If the system detects a temperature sensor failure, the system stops imaging and displays the following message:

A temperature monitoring error has occurred. Disconnect the transducer. Remove the transducer from the patient. Contact your Siemens service representative.

Note: The system is not operable until you disconnect the transesophageal transducer or cycle power to the system.

Additional Thermal Safeguard

⚠ **WARNING:** Disconnect the transducer if the system displays the message indicating that the acceptable thermal limit is exceeded. Remove the transducer from the patient. Failure to disconnect and remove a transesophageal transducer that has exceeded the maximum thermal limit can burn the patient's esophagus. Contact your Siemens Healthineers service representative.

If the system's hardware detects the lens surface temperature is above the acceptable limit, the system stops imaging and displays the following message:

The transducer temperature is above the acceptable limit. Disconnect the transducer. Remove the transducer from the patient. Contact your Siemens service representative.

You must observe the steps in the on-screen message.

Note: The system is not operable until you disconnect the transesophageal transducer or cycle power to the system.

Managing the Lens Surface Temperature

You can reduce the acoustic output to lower the lens surface temperature.

To reduce the acoustic output:

- Rotate **Transmit Power** counterclockwise to lower the transmit power.

See also: For information about imaging functions that change acoustic output, refer to Chapter 2 in the Instructions for Use.

Optimizing Imaging

You can reposition the volume and adjust imaging parameters during volume imaging and review.

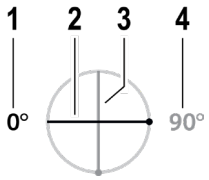
See also: For information on optimizing a cardiac volume, refer to Chapter D2 in this manual.

Biplane Imaging

Use the biplane imaging function to scan two imaging planes with different rotation and tilt angles and view the planes in a side-by-side display format. This enables individual manipulation of the planes.

- The left plane is the reference plane.
- The Free Tilt setting determines the movement of the right plane.
  - **No restrictions** enables the right plane to rotate and tilt at any angle.
  - **Perpendicular on tilt** enables the right plane to remain perpendicular to the reference plane when tilting.
- An icon indicates the tilt of the right plane.

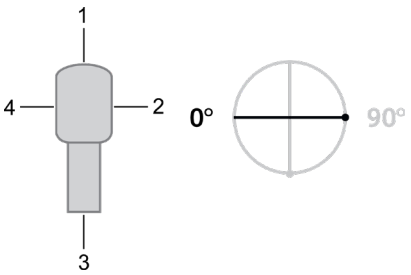
  
- A biplane angle indicator displays between the two planes.



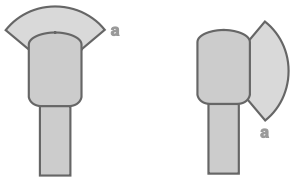
Example of the scan plane icon and the angle indicators during biplane imaging.

1 Numerical value of the rotation angle for the reference plane
2 Angle indicator for the reference plane
3 Angle indicator for the right plane
4 Numerical value of the rotation angle for the right plane

The scan plane icon orients the scan from the back of the acoustic window on the transducer tip.



The orientation of the biplane angle indicator to the transducer tip.



The image plane relative to the transducer tip at 0° and 90°.

1 Distal side of the transducer tip
2 Right side of the transducer tip
3 Proximal side of the transducer tip
4 Left side of the transducer tip

Use the configuration settings to customize biplane imaging.

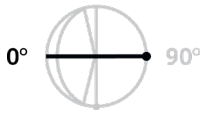
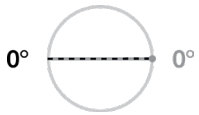
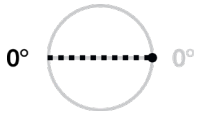
To activate biplane imaging:

Note: The ED-ES Split feature is not available during biplane imaging.

- Tap **Bi-Plane+**.

  Note: In biplane view, the planes rotate together.

To	Do This
Rotate the right plane by 180°	▪ Tap **Right Invert**.
Rotate the right plane perpendicular (90°) to the reference plane	▪ Tap **Perpendicular**.
Reset the reference plane to 0° and the right plane to the default setting	▪ Tap **Reset Angle**.
Select the reference plane for rotation	▪ Tap **Left**.
Select the right plane for rotation	▪ Tap **Right**.
Select both planes for rotation	▪ Tap **Both**.
Adjust the tilt angle	▪ Rotate **Tilt Angle**. Or, roll the trackball.
Reset the required tilt	▪ Press **Tilt Angle**.
Exit biplane imaging	▪ Tap **Bi-Plane+**.

Biplane Angle Indicator	Description
	▪ Both planes are perpendicular. ▪ The reference plane is selected. The indicator is red. ▪ The right plane is deselected and tilts relative to the reference plane. The indicator is green.
	▪ Both planes are perpendicular. ▪ Both planes are selected (locked). ▪ The indicator for the reference plane is red. ▪ The right plane tilts relative to the reference plane. The indicator is bold green.
	▪ Both planes are perpendicular. ▪ The reference plane is selected. The indicator is bold red. ▪ The right plane tilts relative to the reference plane. The indicator is green.
	▪ Both planes are parallel. ▪ Both planes are selected (locked). ▪ The indicator for the reference plane is red. ▪ The indicator for the right plane is bold green.
	▪ Both planes are parallel. ▪ The reference plane is selected. The indicator is bold red. ▪ The right plane is deselected. The indicator is green.
	▪ Both planes are parallel. ▪ The reference plane is selected. The indicator is red. ▪ The right plane is selected. The indicator is bold green.
	▪ The planes are not parallel or perpendicular (unlocked). ▪ The reference plane is selected. The indicator is red. ▪ The right plane is deselected. The indicator is green.

Enhanced Resolution Imaging

Use 4D Zoom to optimize volume rendering and resolution (both lateral and elevation).

Note: You can activate 4D Zoom directly from 2D-mode, color, volume imaging, and biplane imaging.

To activate 4D Zoom:

- Tap **4D Zoom**. Or, activate HD Zoom and then press **4D**.

To	Do This
Reposition or resize the volume of interest (VOI)	1. Press a trackball key, if necessary. – **Position** indicates the trackball is assigned to repositioning the VOI. – **Size** indicates the trackball is assigned to resizing the VOI. – **Elev Size** indicates the trackball is assigned to resizing the elevation of the VOI. 2. Roll the trackball to adjust the size or position and then press a trackball key.
Display the 4D Zoom image	▪ Press **UPDATE**. Or, press **ZOOM**.
Exit 4D Zoom	▪ Tap **4D Zoom**.

Mitral Valve View

Use the mitral valve function to display a surgical view of the mitral valve.

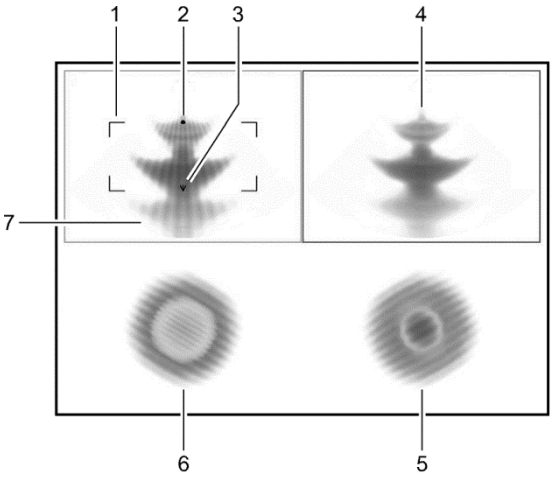
The system rotates the volume, syncs the volume to the coronal plane, and repositions the axis markers for optimized visualization of the valve.

To activate the mitral valve view:

1. Tap **Mitral Valve**.
2. Adjust the rotation and orientation, if necessary.
3. To exit the Mitral Valve view, tap **Reset Orientation**.

Dual V

Use the Dual V function to simultaneously display two views of the same volume from opposite viewing angles. The system displays two orthogonal reference planes and two opposing volume views.



Example of an image using Dual V.

1 Region of interest (ROI) box
2 Start of the Dual V arrow
3 End of the Dual V arrow
4 Reference plane orthogonal to primary imaging plane
5 Volume view from opposing viewing angle
6 Volume view of primary imaging plane
7 Primary imaging plane, indicating the viewing direction

To display two views of the same volume from opposite viewing angles:

Note: Dual V is also available during volume review.

1. Tap **Single V**.
2. Tap **Dual V**.
   The system simultaneously displays two reference images and two volumes.
3. Move the trackball to position the start point and then press a trackball button.
4. To set the size and orientation of the ROI, move the trackball to position the end point and then press **UPDATE**.

To	Do This
Reposition the region of interest	1. Press **UPDATE** to select an **Edit Single V** option, if necessary. – **Set Start** indicates the trackball is assigned to repositioning the start point of the region of interest. – **Set End** indicates the trackball is assigned to repositioning the end point of the region of interest. 2. Roll the trackball to adjust the size and position and then press a trackball key.
Change the width of the ROI	▪ Rotate **Box Width**.
Rotate the volume	1. Press **UPDATE** to select **3D Rotate**, if necessary. 2. Rotate a control: – **X** rotates around the x axis. – **Y** rotates around the y axis. – **Z** rotates around the z axis. The two volumes rotate in opposite directions.
Reset the two volumes to their start positions	▪ Tap **Reset to Start**.
Exit Dual V	▪ Tap **Dual V**. Or, press **2D**.

Z6T Transducer Technical Description

Transducer Type:	Phased Array, multiplane
Elements:	48x48 (2304)
Imaging Scan Plane Rotation:	0°–359°
Distal Tip Articulation:	120° anterior, 60° posterior 45° right, 45° left
Maximum Insertion Length:	1080 mm
Maximum Insertion Width:	15.5 mm
Frequency Bandwidth:	3.0 MHz to 6.3 MHz
2D-mode Transmit Frequencies:	5.0 MHz, 5.5 MHz, 5.8 MHz
M-mode Transmit Frequencies:	5.0 MHz, 5.5 MHz, 5.8 MHz
THI Frequencies:	2.6 MHz
Color Doppler Frequencies:	2D: 3.3 MHz, 4.0 MHz, 5.0 MHz 4D: 3.3 MHz, 4.0 MHz
PW Doppler Frequencies:	3.3 MHz, 5.0 MHz
PW DTI Frequencies:	3.3 MHz, 5.0 MHz
CW Doppler Frequencies:	3.3 MHz
4D Frequencies:	5.0 MHz
Imaging Modes:	2D-mode Color Doppler (CDV and DTV) M-mode Color M-mode (CDV and DTV) Pulsed Wave (PW) Doppler Pulsed Wave (PW) Doppler Tissue Imaging (DTI) Continuous Wave (CW) Doppler Volume imaging Volume Color Doppler (CDV) imaging
Maximum Image Field of View:	90°x90°
Image:	Sector
Operating Environment	
Temperature:	10°C to +35°C
Relative Humidity:	10% to 80%, non-condensing
Storage Environment	
Temperature:	-10°C to +50°C
Relative Humidity:	10% to 95%, non-condensing
Degree of protection against electrical shock:	 According to EN 60601-1 and IEC 60601-1, the system provides a "Level of Protection Against Electrical Shock" of "Type BF."
Degree of protection against ingress of fluid:	IPX8
Measurement Accuracy	
Temperature:	0.0°C to +1.1°C from 40°C to 43°C

EMC Note: Operating the transducer in close proximity to sources of electromagnetic fields, such as radio transmitters, may lead to temporary degradation or interference visible on the image monitor screen. A lightening of image background may be noticed while visualizing hypoechoic structures, or color spectral interference, or jitter, or horizontal lines in the image screen may occur. The transducer and system have been designed and tested to withstand such interference and will not be permanently affected.

D1 Reserved for Future Use

D2 Cardiac Volume Imaging

Overview **3**
Workflow 4

Setting Up for Volume Acquisition **5**

Acquiring Volumes **6**
4D Acquisition 6

Reviewing a Volume in CINE Playback **7**

Visualizing Anatomical Structures **8**
Orientation Indicator 9
Rotation Indicators Legend 9
Positioning and Resizing the Volume and Multiplanar Reconstructions 10
Rotating the Volume and Multiplanar Reconstructions 12
Changing the Image Screen Layout 14
Magnifying or Panning an Area of Interest 15
Adjusting Imaging Parameters 16
Restoring Original Acquisition Settings 17
Displaying Parallel Slices with Multislice 18
Removing Data from a Volume 20
Shaping a Volume with Cut Plane 20
Shaping a Volume with Color Crop 20
Shaping a Volume with Free Plane 21

Storing and Printing Images **22**
Exporting a Volume as an Image 23
Retrieving Stored Volumes 23
Exporting and Importing Acoustic Data 23

Performing a Measurement **23**

Creating a User-Defined Image Preset **23**

Overview

Prerequisite: To avoid technique-related artifacts, you must be thoroughly familiar with the techniques of 3D and 4D imaging. Read this entire chapter before performing 3D or 4D imaging.

The cardiac volume imaging feature includes controls and parameters for optimizing three-dimensional (3D) images and 4D continuously acquired clips.

Volume imaging is a collection of sequential, parallel 2D-mode images also referred to as a volumetric data set. You can acquire the data in a continuous acquisition (4D). The volumetric data set creates a volume rendering and multiplanar reconstructions.

Multiplanar reconstructions are two-dimensional image planes of the volume for simultaneous visualization of orthogonal scan planes and include imaging planes not obtainable by adjusting the transducer position during 2D-mode imaging, for example, the short axis (SAX) plane. A multiplanar reconstruction is also referred to as a plane or an arbitrary slice of the volume.

Volume imaging includes settings and tools for defining the multiplanar reconstructions and volume, including shaping the volume and repositioning planes and volumes for visualization of otherwise occluded anatomical structures. The multislice function also provides simultaneous review of the anatomy of interest in parallel slices.

You can activate cardiac volume imaging only with compatible transducers and studies.

See also: For a list of compatible transducers and supporting studies, refer to Appendix A in the Instructions for Use.

See also: For instructions on using a catheter transducer, refer to the manufacturer's user manual for the catheter.

Workflow

The clinical workflow for cardiac volume imaging includes setup, acquisition, and post-acquisition steps.

Step 1: Setting Up for Acquisition

- Connect a compatible transducer to the ultrasound system.
- Optimize the image while scanning during 2D-mode or 2D-mode with color.
  - Select a cardiac image preset.
  - Adjust the imaging parameters for the transducer.
- Define the volume and planes.
  - Size and position the region of interest and volume of interest to acquire large or small areas within the 2D field of view and volume rendering.
  - Change the curvature of the cut plane.
  - Adjust the orientation of the volume and multiplanar reconstructions.

    Note: The area of interest in 4D acquisition matches the orientation of the 2D-mode image.

Step 2: Acquiring and Viewing the Volume

- During 4D imaging, the ultrasound system processes the imaging data and simultaneously displays the volume and multiplanar reconstructions in real-time.
  - Optimize 4D images, for example, resize the volume of interest, shape the face of the volume by changing the curvature of the cut plane, and adjust imaging parameters to emphasize volume data.
  - Temporarily pause 4D acquisition to review the volume in CINE playback.
  - Store volumes and clips or print images.

Step 3: Reviewing and Storing Volumes

- Review the volume in CINE playback.
- View and define anatomical structures in the multiplanar reconstructions and volume.
- Measure structures in the multiplanar reconstructions.
- Annotate multiplanar reconstructions or volumes.
- Store volumes and clips or print images.

Setting Up for Volume Acquisition

Prepare for volume acquisition by scanning and optimizing the real-time 2D image. You can select an image preset and adjust the imaging parameters for the transducer.

Note: You can magnify (zoom) and pan an image during the setup step.

To set up for acquisition of 4D volumes:

Prerequisite: Connect a 4D transducer, select a cardiac study, and then activate 2D-mode imaging.

See also: For a list of compatible transducers and supported studies, refer to Appendix A in the Instructions for Use.

1. Optimize the 2D-mode image.

   See also: For information about optimizing 2D-mode images, refer to Chapter 8 in the Instructions for Use.

2. To activate color imaging with a compatible transducer, press **C**, tap **Color**, and then optimize the color imaging parameters.

   See also: For information about optimizing color images, refer to Chapter 8 in the Instructions for Use.

3. Press **4D**.

   The touch screen displays the **4D** tab. If color is active, the touch screen also displays the **Color (4D)** tab.

4. Define the area of interest for acquiring the volume, for example, reposition the area of interest or adjust the cut plane.

Acquiring Volumes

Each 4D acquisition produces a volume rendering and multiplanar reconstructions.

4D Acquisition

During 4D acquisition, the ultrasound system processes the volume data and displays a volume rendering, providing a real-time view of the three-dimensional image as you scan.

You can adjust settings during 4D acquisition to enhance visualization of anatomy within the volume of interest. You can also temporarily pause volume acquisition to play back and review CINE data at any time during 4D acquisition.

To acquire a 4D volume:

Prerequisite: Set up for acquisition of a 4D volume.

1. Press **4D**, if necessary.

   The ultrasound system continuously acquires and displays the volume and multiplanar reconstructions on the image screen.

2. Review and optimize the volume during acquisition.

   Note: The following tasks are described on the page indicated within this chapter.

To	Page
Change the image orientation to visualize anatomical structures within the volume	D2-9
Change the layout of the image screen	D2-14
Magnify an area of interest	D2-15
Adjust the imaging parameters	D2-16

3. To complete or temporarily pause 4D imaging and access CINE playback, press **FREEZE**.

   Note: Pressing **FREEZE** again exits CINE playback and resumes 4D acquisition.

4. To exit 4D imaging, press **2D**. Or, press **4D**.

Reviewing a Volume in CINE Playback

You can review a volume in CINE playback from a paused or completed 4D acquisition, or a retrieved stored volume.

Cardiac volume imaging supports the following CINE functionality:

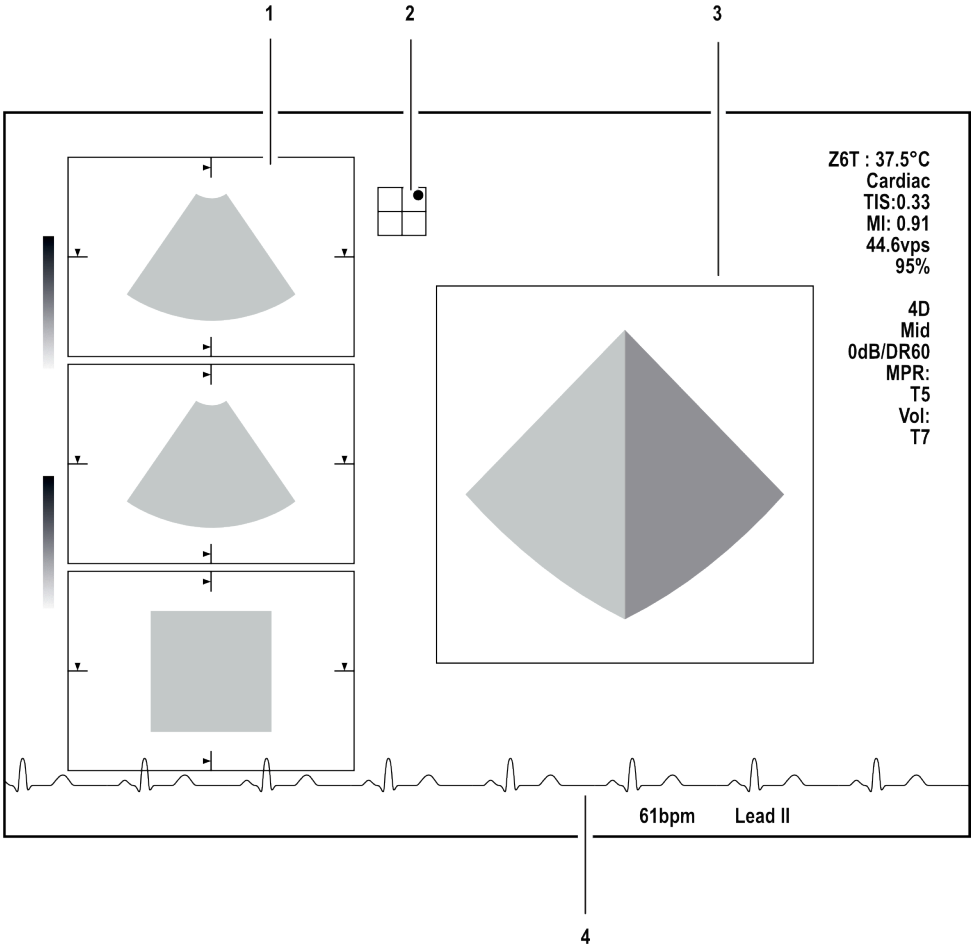
- Adjusting the left and right margin of the CINE frame set.
- Selecting frames or beats for CINE review.
- Selecting prospective or retrospective as the direction for saving clip captures.
- Viewing the current position or changing the position of the end diastole or end systole.
- Playing back and editing clips and volumes, including adjusting the playback speed.
- Repositioning the current frame marker on the ECG trace when playback is paused.

  Note: A horizontal line displays on the time axis when ECG trace data is unavailable.
- Capturing clips and static images.

See also: For information about CINE, refer to Chapter 7 in the Instructions for Use.

Visualizing Anatomical Structures

You can define the multiplanar reconstructions (MPRs) and volume to enhance the visualization of anatomical structures, for example, you can rotate planes and volumes, adjust imaging parameters, and remove data obscuring anatomical structures by reshaping the face of the volume.



Example of a cardiac volume imaging screen.

1 Multiplanar reconstructions
Each viewport includes two axes with arrows indicating the view direction.

2 Orientation indicator
Colors identify the associated multiplanar reconstruction. The yellow dot identifies the starting point of the acquisition.

3 Volume of interest (VOI)

4 Electrocardiogram (ECG) trace
Requires a physio connection during imaging.

Orientation Indicator

An orientation indicator identifies the orientation of the volume of interest and multiplanar renderings. The lines on the orientation indicator correspond to the border of the multiplanar reconstruction (MPR). The yellow dot identifies the starting point of the acquisition.

MPR	Description	Border Color
Plane A	Acquisition plane	Red
Plane B	90° orthogonal to plane A	Green
Plane C	Coronal view of plane A	Blue

Rotation Indicators Legend

During rotation of multiplanar reconstructions, lines display in two planes indicating the axis of rotation, and the view direction is indicated by an arrowhead.

Active MPR	Axis and Color
Plane A	A red line represents the X axis.
	A blue line represents the Y axis.
	A green line represents the Z axis.
Plane B	A green line represents the X axis.
	A blue line represents the Y axis.
	A red line represents the Z axis.
Plane C	A red line represents the X axis.
	A green line represents the Y axis.
	A blue line represents the Z axis.

Positioning and Resizing the Volume and Multiplanar Reconstructions

You can reposition and resize the volume of interest, color region of interest, and multiplanar reconstructions.

See also: For information about general imaging parameters for positioning images, refer to Chapter 8 in the Instructions for Use.

To	Do This
Synchronize the orientation of the volume with plane A	▪ Tap **Sync MPR A**.
Synchronize the orientation of the volume with plane B	▪ Tap **Sync MPR B**.
Synchronize the orientation of the volume with plane C	▪ Tap **Sync MPR C**.
Show or hide intersecting reference lines of the reference planes on the volume	▪ Tap **MPR Lines**.
Align the reference planes to the volume	(Available only when MPR lines are shown) ▪ Tap **Slice Sync**. **Note:** Activating Single V or Dual V disables synchronization.
Lock the orientations of the planes relative to one another	▪ Tap **MPR Lock** and then select an option. – **Unlocked** unlocks the planes, for example, to rotate an individual plane. – **Lock All** locks planes A, B, and C, for example, to simultaneously rotate all planes. – **Lock Bi-Plane** locks two planes for biplane imaging.
Display a surgical view of the mitral valve	(Available only for volume clips acquired with the AcuNav Lumos 4D ICE catheter) ▪ Tap **En Face**.
Display the segment of interest in the volume	▪ Tap **Single V**.
Simultaneously display two views of the same volume from opposite viewing angles	▪ Tap **Single V** and then tap **Dual V**. **See also:** For information about using Dual V, refer to Chapter C4 in this manual.
Resize the volume	▪ Press **Size** to select an option and then rotate the control to adjust the size. – **Vol** resizes the volume of interest. – **Lat** adjusts the lateral width of the volume of interest. – **Elev** adjusts the elevational height of the volume of interest.
Adjust the tilt of the volume	▪ Press **Position** to select an option and then rotate the control to adjust the position. – **Lat** adjusts the lateral (azimuth) position of the volume of interest. – (Available only with 4D Zoom) **Elev** adjusts the elevational position of the volume of interest.

To	Do This
Resize the color region of interest	(Available only during Color 4D imaging) ▪ Press **C ROI Size** to select an option and then rotate the control to adjust the size. – **Lat** adjusts the lateral width of the volume of interest. – **Elev** adjusts the elevational height of the volume of interest. – **Axial** adjusts the axial size of the color region of interest.
Reposition the color region of interest	(Available only during Color 4D imaging) ▪ Rotate **C ROI Position** to select an option and then rotate the control to adjust the position. – **Lat** repositions the lateral (azimuth) position of the color region of interest. – **Elev** repositions the elevational position of the color region of interest. – **Axial** repositions the axial position of the color region of interest.

Rotating the Volume and Multiplanar Reconstructions

Rotation of the volume enables visualization of an anatomical structure from any angle. The volume rotates independently of the multiplanar reconstructions.

During rotation of a multiplanar reconstruction, the rotation of the three orthogonal planes is synchronized along the axis of the active plane. You can synchronize the position of the volume to the position of any multiplanar reconstruction.

Note: When imaging with a transesophageal transducer in Dual V, the volumes rotate in opposite directions.

To rotate the volume and multiplanar reconstructions:

- During imaging, press **FREEZE**.
- During review, load a 4D clip.

To	Do This
Freely rotate a plane or volume	▪ Select a plane or the volume and then rotate a control: – **X** rotates along the x axis – **Y** rotates along the y axis – **Z** rotates along the z axis
Rotate a volume on the X-Y axis	1. Press a trackball key to select **3D Rotate**, if necessary. Or, position the pointer over the inner 90% of the volume viewport to activate 3D rotation and then press a trackball key. – **Pointer** indicates the trackball is assigned to the pointer function. – **Cine** indicates the trackball is assigned to scrolling CINE data. – **3D Rotate** indicates the trackball is assigned to rotating the volume around the X-Y axis. The 3D rotate icon displays on the volume image.  2. Roll the trackball to rotate the volume. 3. To deactivate the tool, press a trackball key. Or, activate the pointer.
Rotate the volume around the Z axis	1. Press **UPDATE**, if necessary, to select **Pointer** and then position the pointer over the outer 10% of the volume viewport to activate rotation. The volume Z rotation icon displays on the volume image.  2. Press a trackball key and then roll the trackball. 3. To deactivate the tool, press a trackball key. Or, activate the pointer.

To	Do This
Rotate a plane around the intersecting axis of another plane	**Prerequisite:** Activate the pointer. 1. Position the pointer over the required axis line on a multiplanar reconstruction to display the plane line rotation icon.  2. Press a trackball key and then roll the trackball. 3. To deactivate the tool, press a trackball key. Or, activate the pointer.
Rotate a plane around the Z axis	**Prerequisite:** Activate the pointer. 1. Position the pointer over the Z axis line on a multiplanar reconstruction to display the plane image Z rotation icon.  2. Press a trackball key and then roll the trackball. 3. To deactivate the tool, press a trackball key. Or, activate the pointer.

Changing the Image Screen Layout

You can change the layout of the image screen.

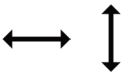
Use the configuration settings to specify the initial display layout for the multiplanar reconstructions and volume during and after volume acquisition.

To	Do This
Display planes A, B, and C and the volume	▪ Tap the 4:1 stacked layout icon.  ▪ Tap the 2:2 layout icon. 
Display planes A and B and the volume	▪ Tap the 3:1 horizontal layout icon.  ▪ Tap the 3:1 vertical layout icon. 
Display plane A in the center of the image screen	▪ Tap the plane A icon. 
Display plane B in the center of the image screen	▪ Tap the plane B icon. 
Display plane C in the center of the image screen	▪ Tap the plane C icon. 
Display the volume in the center of the image screen	▪ Tap the volume icon. 

Magnifying or Panning an Area of Interest

You can magnify or pan an area of interest in the volume and multiplanar reconstructions during setup, 4D acquisition, or review.

The planes and volume rendering synchronize at the same magnification.

To	Do This
Magnify an area of interest	1. Rotate **ZOOM** to adjust the magnification level. The system displays **4D Z** on the image screen below the image. 2. To cancel magnification, press **ZOOM**.
Identify an area of interest to magnify when activating 4D imaging mode	(Available only in 2D-mode, color, and 4D imaging) **See also:** For information about 4D Zoom, refer to Chapter C3 in this manual. 1. Tap **4D Zoom Setup**, if necessary. The system displays **4D Z** on the image screen below the image. 2. Press **4D Zoom**. Or, press **UPDATE**. The system activates volume imaging in high definition. 3. To exit 4D Zoom, tap **4D Zoom**.
Pan a plane along an axis	**Prerequisite:** Activate the pointer. 1. Position the pointer over the required axis line on a multiplanar reconstruction to display the horizontal or vertical plane line pan icon.  2. Press a trackball key and then roll the trackball to reposition the line. 3. To deactivate the tool, press a trackball key. Or, activate the pointer.
Pan a plane at the point of intersection	**Prerequisite:** Activate the pointer. 1. Position the pointer over the point of axes intersection on a multiplanar reconstruction to display the plane intersection pan icon.  2. Press a trackball key and then roll the trackball to reposition the point of intersection. 3. To deactivate the tool, press a trackball key. Or, activate the pointer.

Adjusting Imaging Parameters

You can adjust the imaging parameters to optimize the volume.

See also: For information about adjusting general and color imaging parameters, refer to Chapter 8 in the Instructions for Use.

To adjust imaging parameters:

- Select the required plane or volume, if necessary.

  Note: Imaging selections available for optimization are indicated on the touch screen in color; dimmed selections are unavailable.

To	Do This
Adjust the gain (increase or decrease the brightness of the displayed image)	▪ Rotate **4D**.
Adjust the overall contrast resolution (dynamic range)	▪ Press **DR** to select an option and then rotate the control to adjust the setting. – **MPR** applies the selected setting to the multiplanar reconstructions. – **Volume** applies the selected setting to the volume.
Select a processing curve for assigning echo amplitudes to gray levels in the image	▪ Press **Maps** to select an option and then rotate the control to select a map. – **MPR** applies the selected map to the multiplanar reconstructions. – **Volume** applies the selected map to the volume.
Optimize the volume rendering	▪ Tap **Volume Enhance** and then select a setting. The system excludes low-level signal data and adjusts the opacity and transparency of the volume image.
Change the thickness of the slices	▪ Rotate **MPR Thickness** to select a setting: – **Off** indicates a thickness of zero. – Thickness settings are in 1 mm increments and range from 0 mm to 20 mm.
Activate biplane imaging	▪ Tap **Bi-Plane+**. **See also:** For information about biplane imaging, refer to Chapter C4 in this manual.
Activate the 4D Heart AI feature	▪ Tap **4D Heart AI**. **See also:** For information about 4D Heart AI, refer to Chapter D4 in this manual.

To	Do This
Adjust the smoothness of the surface	(Available only for volumes during Color 4D imaging) ▪ Rotate **Smooth**.
Apply a hue to the volume	(Available only during Color 4D imaging) ▪ Rotate **Tint**.
Select a processing curve for assigning velocity ranges to color ranges in the multiplanar reconstructions and volume	(Available only during Color 4D imaging) ▪ Rotate **Maps**.
Adjust the amount of color pixel information overlaying the 2D image	(Available only during Color 4D imaging) ▪ Rotate **Priority**.
Emphasize the blood flow, tissue, or both	(Available only during Color 4D imaging) ▪ Tap a selection: – **2D + Color** combines the tissue and blood flow. – **2D Only** emphasizes the tissue. – **Color Only** emphasizes the blood flow.
Enhance the color volume	(Available only during Color 4D imaging) ▪ Tap **C Vol Enhance** and then select a setting.

Restoring Original Acquisition Settings

You can restore the original acquisition settings and factory-default settings of the volume and multiplanar reconstructions.

To restore the settings:

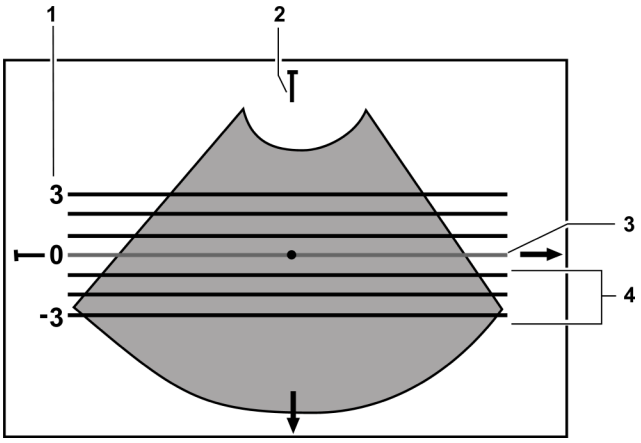
- To restore the position, rotation, and slice to the factory-default settings, tap **Reset Orientation**.

Displaying Parallel Slices with Multislice

The multislice function enables simultaneous review of anatomy of interest in multiple parallel slices of a multiplanar reconstruction.

You can view slices of a 3D volume or freeze and then view a 4D volume CINE sequence with the multislice function.

The point of intersection is the location of the central slice and is relative to the active multiplanar reconstruction. Parallel slices displaying in the multislice layout are planes in front of and behind the central slice.



Example of the reference MPR with lines representing the slices available for viewing.

1 Numbers on the lines correspond to the numbers on the slices shown in the layout.
2 View direction
3 A yellow line indicates the position of the active slice.
In this example, the active slice is labeled with a zero to indicate the relationship of the other slices available for viewing.
4 White lines indicate the slices shown in the selected layout.

To activate Multislice:

- Tap **Multislice**.

To	Do This
Change the number of slices displayed on the image screen	▪ Tap a selection: – 4:4 layout displays a reference MPR and 15 parallel slices.  – 3:3 layout displays a reference MPR and eight parallel slices.  – 2:2 layout displays a reference MPR and three parallel slices.  – 2:1 layout displays a reference MPR and the selected slice.  – 1:1 layout displays the selected slice in full-screen layout. 
View the multiple slice layout or the full-screen layout	▪ Double-click a slice.
Add or remove a pair of slices on either side of the central slice	▪ Rotate **Slices**.
Adjust the distance between slices for visualizing anatomy	▪ Rotate **Distance**.
Reposition the slice in the reference image	▪ Rotate **Position of Slices**.
View a range of parallel slices within the volume	▪ Rotate **Range Position**.
Select the initial multiplanar reconstruction as the reference plane	▪ Tap **General**.
Display the slices parallel to the parasternal reference plane	▪ Tap **Parasternal**.
Display the slices parallel to the apical C reference plane	▪ Tap **Apical C**.
Exit Multislice	▪ Tap **Multislice**.

Removing Data from a Volume

Remove data to enable visualization of anatomical structures within a volume. Rotation of the volume and planes can help you visualize an anatomical structure and determine the position of the shapes to draw and remove from the volume.

Shaping a Volume with Cut Plane

The cut plane function enables removal of 4D data from the volume rendering using a plane whose orientation is synchronized with a multiplanar rendering.

To shape a volume with cut plane:

1. Tap **Cut Plane**.
   A border representing the plane displays in the volume viewport. The color of the border identifies the plane.
2. Roll the trackball to traverse the plane and remove extraneous data from volume.

Shaping a Volume with Color Crop

The color crop function aligns the cropping of color data to the cropping of 4D data in the volume of interest.

To shape a volume with color crop:

Prerequisite: Activate color during cardiac volume imaging. Shape a volume with cut plane.

1. Tap **Color Crop**.
   The system crops color data outside the cut plane in the volume rendering.
2. To disable the function, tap **Color Crop** again.

Shaping a Volume with Free Plane

The free plane function enables visualization within a volume rendering of anatomy of interest visible in a multiplanar reconstruction but not visible on the surface of the volume.

As you reposition the free plane, the system crops the volume rendering to enable visualization of the anatomy of interest. Retaining the crop shapes and updates the volume rendering.

The position of the free plane on the volume rendering displays as a synchronized line on each multiplanar reconstruction.

The color of the free plane indicates the orientation of the volume.

- Orange indicates the anatomy is facing toward the surface of the transducer.
- Green indicates the anatomy is facing away from the surface of the transducer.

To shape a volume with free plane:

- Tap **Free Plane**.

  The free plane displays to the left of the volume.

To	Do This
Visualize anatomy of interest within the volume	1. Press **UPDATE**, if necessary. – **3D Rotate** indicates the trackball is assigned to rotating the volume on the X-Y axis. – **Free Plane** indicates the trackball is assigned to the free plane for shaping the volume. 2. Roll the trackball to rotate the volume or reposition the free plane.
Define the distance of the plane from the center of the volume	▪ Press **Position Plane** and then select a setting, in millimeters.
Rotate the free plane	▪ Press **Rotate Plane** to select an option and then rotate the control to rotate the free plane. – **X** rotates the free plane around the X axis. – **Y** rotates the free plane around the Y axis.
Reshape the volume by removing the cropped data	▪ Tap **Retain Crop**. **Note:** You can retain multiple crops to visualize the anatomy of interest within the volume.
Restore the most recently cropped data to the volume rendering	(Available only after retaining a crop) ▪ Tap **Undo Crop**.
Remove all cropping and display the original volume rendering	▪ Tap **Reset Cropping**.

Storing and Printing Images

You can convert a volume to a DICOM multi-frame clip and store clips of the currently displayed volume.

Images are captured and stored as single-frame images or within the series object containing the volume. Series objects are accessible from the patient browser.

You can print individual images of a multiplanar reconstruction or a volume. A volume is a sequence of multiple-frame images and cannot be printed as a range of images.

Use the patient browser to transfer volumes and their representative images to external storage devices.

See also: For additional information on capturing images and clips, refer to Chapter 5 in the Instructions for Use.

See also: For information on recording a patient study, refer to Chapter 13 in the Instructions for Use.

To store a volume as a clip:

- Press **CAPTURE**. Or, press the control assigned to the clip store function.

  The system displays an icon on the image.

See also: For information about CINE and clip capture settings, refer to Chapter 7 in the Instructions for Use.

Use the configuration settings to define additional clip capture settings for 4D volumes.

To store or print an image:

Note: The volume is not stored when you store or print an image. To review the volume at a later time, you must store the volume.

Prerequisite: A printer is connected to the ultrasound system.

- To save an individual image, press **FREEZE** and then press **CAPTURE**.

  The system displays an icon on the image.

- To send a screenshot of the image to the printer, tap the print icon. Or, press the control assigned to the print function.

  Example of the print icon.

Exporting a Volume as an Image

See also: For information about exporting and importing patient data, refer to Chapter B2 in this manual.

Retrieving Stored Volumes

You can select a patient study from the local database for review of multiplanar reconstructions and volume renderings.

See also: For information on loading a patient study for review, refer to Chapter 5 in the Instructions for Use.

Exporting and Importing Acoustic Data

Use the DICOM configuration settings for exporting and importing acoustic data with images or clips.

Performing a Measurement

You can perform a 2D-mode measurement on an individual multiplanar reconstruction or a slice while an acquisition is frozen, after acquisition is complete or during review. You cannot perform a measurement on a volume.

See also: For information on performing a measurement, refer to Chapter 10 in the Instructions for Use.

See also: For information about using the 3D Caliper tool, refer to Chapter 11 in the Instructions for Use.

Creating a User-Defined Image Preset

You can create a user-defined image preset to capture the optimized 3D and 4D imaging settings.

See also: For information on creating or editing a user-defined image preset, refer to Chapter 8 in the Instructions for Use.

D3 2D Heart AI

Overview **3**
- Workflow 4
- Image Screen Layout 5
  - ED-ES View Layout 6
  - Bullseye View Layout 7
  - Single View Layout 8

Activating 2D Heart AI **9**

Analyzing the Results **11**
- Saving the Results 11
- Adjusting the Tracking Parameters 11
- Editing the Contours 14
- Adjusting the Image Screen Layout 15
- Reviewing CINE Playback 16
- Reviewing Results in the Curve Graph 16
- Reviewing Results in a Bullseye Plot 17
  - Bullseye Results 17

Reviewing the Report **18**

On-Screen Messages **19**

Overview

⚠ **WARNING:** This feature uses ultrasound data collected prior to analysis. The quality of the data collected and used as input could have an effect on the output of this feature. Variability in ultrasound system performance, operator technique, patient characteristics, and other factors may affect the output. At all times, the clinician is advised to carefully review the output and confirm the information presented with clinical judgment and any other relevant sources of data.

2D Heart AI

The 2D Heart AI feature performs left heart volume measurements using 2D-mode data from two image frames. The feature detects and traces the contours of the endocardial borders on the end-diastolic (ED) and end-systolic (ES) images in an apical four-chamber (A4C) or apical two-chamber (A2C) view.

Use the 2D Heart AI feature to perform the following tasks:

- Detect, contour, and analyze the left ventricle, right ventricle, left atrium, and right atrium.
- Detect and analyze end diastole (ED) and end systole (ES) and display ED-ES images in a side-by-side format.
- Edit or manually trace the contours.
- Analyze the results summary.

2D Heart+ AI

The 2D Heart+ AI feature includes all 2D Heart AI functionality.

The 2D Heart+ AI feature visualizes, measures, and assesses myocardial motion and mechanics using acquired 2D clips during live imaging or from review.

2D Heart+ AI tracks and estimates tissue velocity and other motion and deformation parameters on every frame in the cardiac cycle and illustrates tissue velocity and direction and provides quantitative data for velocity, displacement, strain, and strain rate.

The tracking results summary, curve graph, and bullseye plot are based on every frame in the cardiac cycle.

Use the 2D Heart+ AI feature to perform all tasks available with 2D Heart AI and the following tasks:

- Detect the apical two, three, and four chamber views.
- Track the contours of the left ventricle and the left atrium throughout the cardiac cycle.
- Analyze and compare up to three clips.
- Analyze the tracking results summary, curve graph, and bullseye plot.
- Perform strain analysis with contrast for the left ventricle.

  See also: For information about contrast agent imaging, refer to Chapter A3 in this manual.

Workflow

The clinical workflow includes the following steps.

Step 1: Acquiring Cardiac Views

- During imaging, acquire clips of cardiac views with an ECG trace (a physio signal is present).

  Acquire up to five heart beats for analysis and include a minimum of one full R-R capture.

  Note: If available, include an additional heart beat or R-R acquisition. If necessary, optimize the ECG trace before activating the feature.

  See also: For information about using the physiologic function, refer to Chapter C1 in this manual.

- During imaging, acquire clips of cardiac views without an ECG trace (no physio signal).

  Note: Without a physio signal, you must identify the required end diastole (ED) and end systole (ES) frames to obtain analysis with contours and results. The feature analyzes a single beat.

- During review, open the required cardiac clips.

Step 2: Detecting and Analyzing the Cardiac Chambers

- To analyze the left and right heart chambers, access CINE during live imaging.
- To analyze only the left heart chambers, review a previously acquired cardiac clip, review a group of chamber views, or review an individual chamber view.
- 2D Heart AI detects the view, places contours, analyzes the 2D ultrasound data, and displays the results.

  Note: Available results are dependent on the acquired views.

Step 3: Reviewing, Adjusting, and Saving the Results

- **2D Heart AI**
  - Displays a two-frame analysis with contoured heart chambers in the ED-ES view.
  - Displays tracking results, including volume, ejection fraction, cardiac output, stroke volume, and global longitudinal strain (GLS).
  - Provides viewports and a tracking summary for review.
- **2D Heart+ AI**
  - Displays apical chamber viewports (A4C, A2C, A3C).
  - Displays GLS in a curve graph and bullseye plot for the left ventricle and left atrium.
  - Displays tracking results, including quantitative data, for example, velocity and strain rate.
  - Provides viewports, a curve graph, a bullseye plot, and a tracking results summary for review.
- Confirm the contour placement and manually edit the contours, if necessary.
- Confirm and adjust the tracking parameters, if necessary.
- Save the tracking results.

Image Screen Layout

The feature identifies each heart chamber by a color in the viewport, results, and curve graph.

- Green identifies the left ventricle.
- Blue identifies the left atrium.
- Orange identifies the right ventricle.
- Turquoise identifies the right atrium.
- A dashed line identifies the major axes of the chamber.

The ED-ES view is available during pre-tracking. Accessing the bullseye view or single view activates left ventricle (LV) tracking, if available.

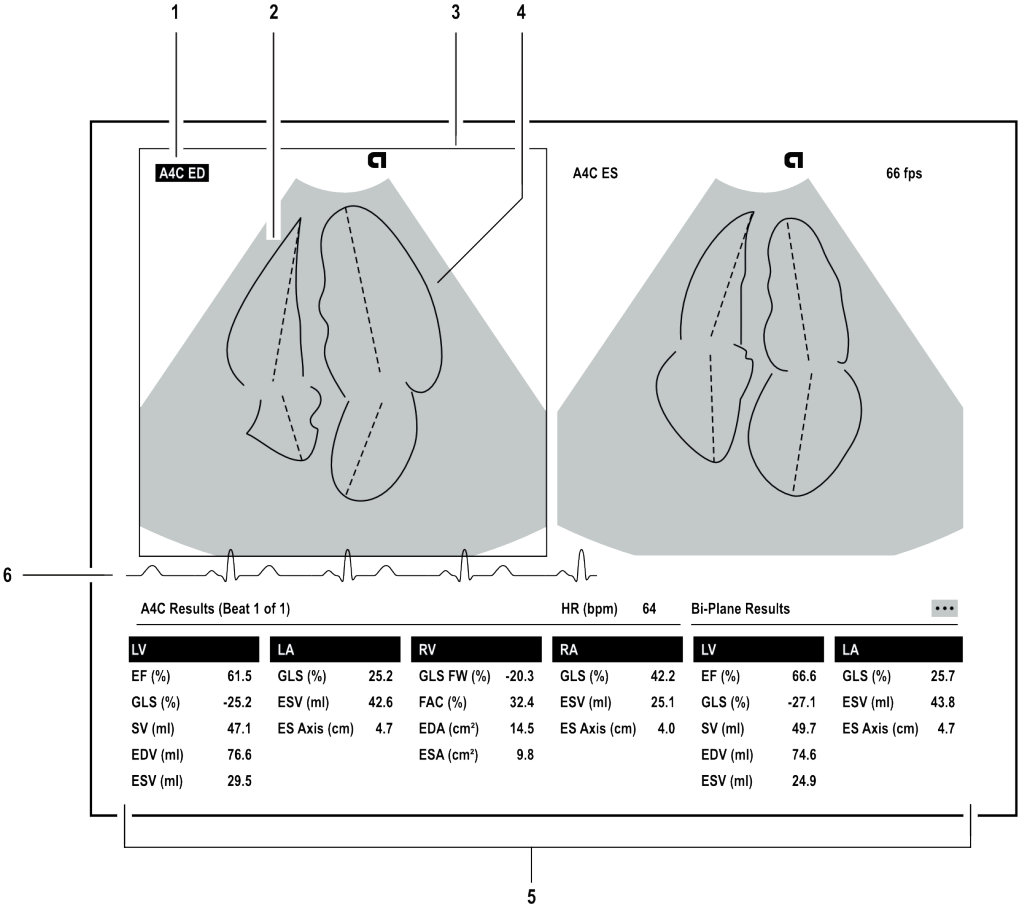
Use the configuration settings to customize the default settings for the 2D Heart AI feature.

ED-ES View Layout

The end diastole-end systole (ED-ES) view displays when you activate 2D Heart AI from the CINE workflow or when you select a single clip or view for analysis. The ED-ES viewports are in a side-by-side format and includes a results summary.

You can only edit contours in the ED-ES view.

Use the configuration settings to customize the ED-ES view.



Example of a 2D Heart AI screen, ED-ES view layout.

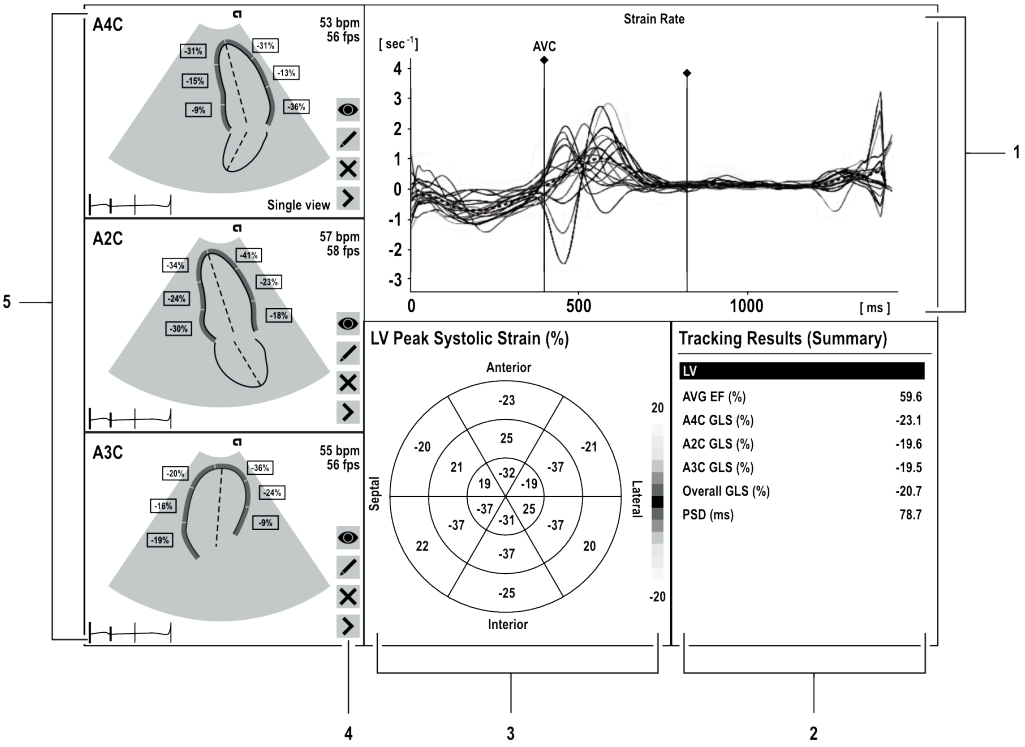
1 Viewport label
2 Contour
3 Active viewport
A blue border outlines the selected viewport.
4 2D clip with contours
5 Results summary viewport
Displays the tracking results for the heart rate and measurements.
6 ECG trace
Available only when a physio signal is present.
White flag markers identify the beginning and ending margins of CINE playback.
Pink markers identify the end diastolic and end systolic frames.

Bullseye View Layout

(Available only with 2D Heart+ AI)

The bullseye view includes left apical chamber viewports with contours and segment values on the left ventricle and/or left atrium, a curve graph, a bullseye plot, and tracking results summary.

Use the configuration settings to customize the bullseye view.



Example of a 2D Heart+ AI screen, bullseye view layout.

1 Curve graph viewport
Provides a view of the timing or phase, for example, segmental strain.

2 Tracking results viewport
Displays tracking results for the apical chamber in a summary format.

3 Bullseye viewport
Displays a bullseye plot with the following segment values: anterior, inferior, lateral, septal, coronal.
Includes a color bar with colors assigned to the parameter ranges.

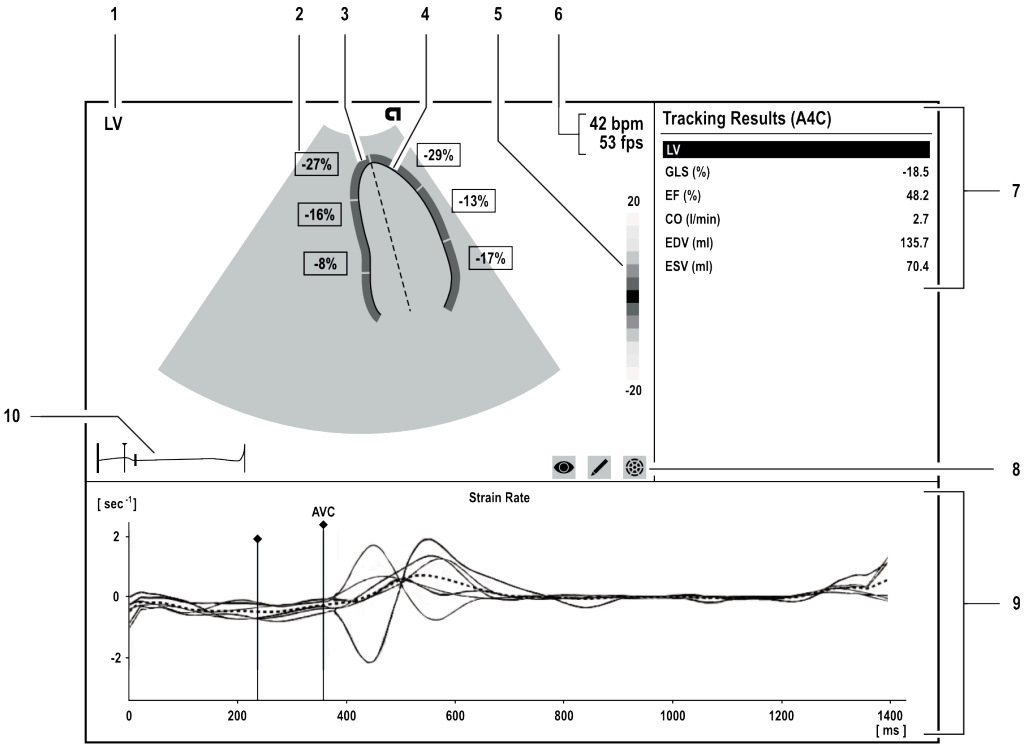
4 View controls
Provides options to show or hide the segment values, display the ED-ES view for editing contours, delete the view, display the single view for the selected chamber, and return to the bullseye view.

5 Image viewports
Displays apical four, two, and three chamber views (A4C, A2C, A3C).
Displays contours and segment values on the left ventricle and/or left atrium.
For multiple heart beats, displays an average of all beats.

Single View Layout

(Available only with 2D Heart+ AI)

The single view displays the selected chamber view with contour and segment values. The curve graph and results summary include results only for the selected chamber.



Example of a 2D Heart+ AI screen, single view layout.

1 Viewport label
2 Segment values
3 Biplane contour
Displays when biplane imaging results are included in the tracking results.
4 Chamber contour
5 Bullseye color bar
Provides colors assigned to the parameter ranges.
6 Beats per minute (bpm) and frames per second (fps)
7 Tracking results viewport
Note: Biplane imaging results display when measurements are complete for both the apical two and four chamber (A2C and A4C) views.
8 View controls
Provides options to show or hide the segment values, display the ED-ES view for editing contours, delete the view, display the single view for the selected chamber, and return to the bullseye view.
9 Curve graph viewport
Displays the segmental strain curves.
10 ECG trace
Available only when a physio signal is present.

Activating 2D Heart AI

You can activate 2D Heart AI from the review function or during imaging with a compatible transducer and imaging preset.

See also: For information about activating review, refer to Chapter B1 in this manual.

See also: For a list of compatible transducers and imaging presets, refer to Appendix A in the Instructions for Use.

Prior to activating the feature, perform the following prerequisites, as applicable.

- During live imaging in 2D-mode, obtain an ECG trace, if required.
  - A minimum of three heart beats is required for an ECG trace.
  - When an ECG trace is not available, the feature assesses a single beat, and the ED and ES frames are determined by largest and smallest sizes of the left ventricle.

  See also: For information on obtaining a physio signal, refer to Chapter C1 in this manual.
- Cardiac clips include at least five frames of 2D-mode data. If the clip contains more than 700 frames, the feature analyzes the first 700 frames acquired.
- Multiple beat analysis is required for the A4C view.
- Single heart beat analysis requires confirmation of the end diastole and end systole frames.
- For 2D Heart+ AI, select three beats to analyze the left ventricle and left atrium.

To activate 2D Heart AI:

To	Do This
Analyze the heart chambers	1. During live imaging in 2D-mode, acquire the required apical view and then press **FREEZE**. Examples of apical views: – A4C and with physio for ED-ES results – A3C with physio for ED-ES and biplane imaging results – A2C with physio for ED-ES and biplane imaging results 2. Tap **2D Heart AI**. The ultrasound system displays a progress bar as the feature activates, and the feature detects the contours, calculates the results, and displays the ED-ES view layout.
Analyze a single clip or view of the left heart chamber	**Prerequisite:** Acquire the required cardiac clips. 1. Activate review. 2. Tap **Single Select**. 3. Select only one of the following apical views: **A4C**, **A3C**, **A2C**. 4. Tap **2D Heart AI**. The ultrasound system displays a progress bar as the feature activates, and the feature detects the contours, calculates the results, and displays the single view layout.

To	Do This
Analyze multiple clips or views of the left heart chamber	**Prerequisite:** Acquire the required cardiac clips. 1. Activate review. 2. Tap **Multiple Select**. 3. Select one of each of the following apical views: **A4C**, **A3C**, **A2C**. **Note:** You cannot activate the feature if you select more than three clips or unrelated clips. 4. To review selected images before activating the feature, tap **Compare** and then select the images for comparison. 5. Tap **2D Heart AI**. The ultrasound system displays a progress bar as the feature activates, and the feature detects the contours, calculates the results, and displays the bullseye view layout.
Cancel activation of the feature	▪ Click **Cancel** while the feature is detecting the contours and calculating the results.
Exit the feature	▪ Tap **Exit**.

Analyzing the Results

Saving the Results

You can save the results to the patient report. After edits and updates are complete, be sure to reconfirm the results before saving the results to the report.

To save the results to the report:

1. Confirm the results and perform any manual adjustments to the contours or tracking parameters, if necessary.
2. Press the control assigned to the clip store function.

Adjusting the Tracking Parameters

Use the configuration settings to define the default parameters for analysis.

Note: An asterisk (*) displays next to results with manual adjustments.

To	Do This
Analyze a different number of heart beats	(Available only for multiple beats) ▪ Tap **Beats Analyzed** and then select the number of beats, up to five. The results display an average of the selected number of beats. **Note:** Increasing the number of beats moves the ECG margin to the left to include prior beats. If the clip does not include the selected number of beats, the system analyzes the available beats.
Exclude a heart beat from the analysis	(Available only for multiple beats) ▪ Select the beat and then tap **Exclude Beat**. The system removes the selected beat, including the contour and results. The results identify the excluded beat, for example, if the second beat is excluded, the results display ***Beats Excluded: 2**. ▪ To include the beat, tap **Exclude Beat** again.
Analyze an average of heart beats	▪ Tap **Average Result**. An average of the beats displays in the results. The results indicate the number of beats averaged, for example, **Average (3 beats)**. ▪ To analyze individual beats, tap **Average Result** again. The results indicate the beat analyzed, for example, **Beat 3 of 3**.
Analyze another heart beat	▪ Rotate **Cine** to select another location in the ECG trace. The beat in analysis displays in the viewports.
Select the end diastolic and end systolic frames	**See also:** For information about repositioning ED and ES markers and assigning ED and ES frames, refer to Chapter 7 in the Instructions for Use.

To	Do This
Show or hide the left ventricle (LV) epicardium	(Available only in in A4C and A2C viewports) ▪ Tap **LV Epi**. The system shows the epicardium in mesh, and the LV mass updates in the results. ▪ To remove the mesh, tap **LV Epi** again. ▪ Excluding the mesh enables visualization of the segments on the LV endocardium model.
Adjust the distance between the epicardium mesh and the left ventricle	(Available when the left ventricle epicardium mesh is shown) ▪ Rotate **LV Epi Offset** and then select a setting.
Adjust the aortic valve closure time	(Available only with 2D Heart+ AI) (Available only for the left atrial when CINE is paused) ▪ Rotate **AVC** to adjust the time in milliseconds (ms) and then press **AVC** to accept the update. The values update in the report summary.
Adjust the pre-atrial contraction time at the onset of the P-wave	(Available only with 2D Heart+ AI) ▪ Rotate **Pre-A** to adjust the time in milliseconds (ms) and then press **Pre-A** to accept the update. The values update in the report summary. **Note:** During analysis of multiple beats, the pre-atrial contraction time displays only for the current beat.

To	Do This
Select the timing or phase for the bullseye view	(Available only for the left ventricle) 1. Tap **Curve** and then select **Segmental Strain**. 2. Tap **Timing / Phase** and then select an option. – **Peak Systolic Strain** (**PSS**) displays the peak strain value during systole as measured before aortic valve closure. – **End Systolic Strain** (**ESS**) displays the strain value at end systole measured at aortic valve closure. – **Time to Peak** (**TTP**) displays the time to reach peak strain. – **Post Systolic Strain** (**PS**) displays the strain value after end systole as measured after aortic valve closure. – **Post Systolic Indexed** (**PSI**) displays the ratio between strain (deformation) after end systole divided by total strain.
Select the curve for the bullseye view	▪ Tap **Curve** and then select an option. **Note:** All options are available for the left ventricle. Only **Volume** and **Global Strain** are available for the left atrium. – **Volume** displays the change in chamber volume from end diastole to end systole as derived from the left ventricle and left atrium. – **Segmental Strain** displays the average strain value in each segment of the cardiac chamber, for example, the left ventricle. **Note:** Selecting segmental strain when the left ventricle is disabled, changes the curve to volume. – **Global Strain** displays the overall global strain or deformation for the left ventricle and left atrium. – **Strain Rate** indicates the rate of strain or how fast the deformation occurs for the left ventricle and left atrium.

Editing the Contours

The 2D Heart AI feature displays contours only on the end diastole and end systole frames for each heart chamber in the ED-ES view. You can manually adjust or delete and redraw the system-generated contours. When the contour is complete, the system reanalyzes the contour and updates the results.

Note: You can also manually draw the contours if the system could not detect the contours.

To edit a contour:

- Click the required viewport in the ED-ES view.

To	Do This
Show or hide the contours	▪ Tap **Hide Contours**.
Edit a contour	1. Position the pointer to activate the required segment of the contour. The segment displays in yellow with the active section in red. 2. Move the pointer to adjust the contour and then click the image to anchor the contour. – To edit a smaller section of the contour, move the pointer near the contour. – To edit a larger section of the contour, move the pointer further from the contour. The segment displays in green as you adjust the contour. 3. Click a trackball key to anchor the placement.
Delete a contour	▪ Tap **Delete Contour** and then select the chamber: **LA**, **LV**, **RA**, **RV**. The system deletes the selected contour and then displays options for manually adding a contour.
Draw a contour	1. Select a chamber and then tap **Add Contour**, if necessary. The system displays a message at the bottom of the image screen instructing the points to mark for drawing the contour. **See also:** On-Screen Messages, page D3-19 2. Roll the trackball to position the first marker and then press a trackball key to set the position. 3. Roll the trackball to position the second marker and then press a trackball key to set the position. 4. Roll the trackball to position the third marker and then press a trackball key to set the position. The system draws the contour on the selected chamber.
Undo the previous edit, deletion, or addition to a contour	▪ Tap **Undo**.

Adjusting the Image Screen Layout

Use the configuration settings to select the default layouts for the 2D Heart AI feature.

To	Do This
Rename the selected viewport	▪ Tap **Rename View** and then select an option. – **A2C** indicates apical two chambers – **A3C** indicates apical three chambers – **A4C** indicates apical four chambers The system updates the name of the viewport and results.
Show or hide the right ventricle	▪ Tap **RV**.
Show or hide the right atrium	▪ Tap **RA**.
Show or hide the left ventricle	▪ Tap **LV**.
Show or hide the left atrium	▪ Tap **LA**.
Activate the next viewport	▪ Press **UPDATE**.
Display the bullseye view layout	(Available only with 2D Heart+ AI) ▪ Tap **Bullseye View**.
Display the ED-ES view layout	(Available only with 2D Heart+ AI) ▪ Tap **ED-ES View**.
Hide the segment values from the viewport image	(Available only in the bullseye view) ▪ Click the hide segment values icon. 
Access the ED-ES view to edit a contour	(Available only in the bullseye view) ▪ Click the edit icon.  The system displays the ED-ES view.
Delete the view from the analysis	(Available only in the bullseye view) 1. Click the delete icon.  The system displays a message asking if you want to delete the view and all associated results. 2. To delete the view and results, click **OK**. 3. To retain the view and results, click **Cancel**.
View the analysis of an apical chamber	(Available only in the bullseye view) ▪ Click the single view icon. 
View the bullseye layout	(Available only in the bullseye view) ▪ Click the bullseye view icon. 

Reviewing CINE Playback

The feature supports the following functionality:

- Selecting frames or beats for CINE review.
- Viewing the current position or changing the position of the end diastole or end systole.
- Playing back and editing clips and volumes.
  - During playback, the volume and model view displays the active frame or beat and the corresponding results display.
  - As you scroll CINE, the frame marker in the curve graph moves in synchronicity with CINE scrolling.
- Repositioning the current frame marker on the ECG trace when playback is paused.

  Note: A horizontal line displays on the time axis when ECG trace data is unavailable.
- Capturing clips and static images.

See also: For information about playing back CINE data and clips during review, refer to Chapter 7 in the Instructions for Use.

Reviewing Results in the Curve Graph

You can display the measurement results for a curve in the summary results and display the corresponding segment in the volume model and bullseye viewports.

To display data about a curve:

- Position the pointer over a curve.

Reviewing Results in a Bullseye Plot

(Available only during review)

Each segment in the bullseye view is represented by a curve in the curve view.

See also: For information about 2D Heart AI result labels, refer to Appendix D in the System Reference.

To review results in a bullseye plot:

Prerequisite: Select the left ventricle, or select both the left ventricle and the left atrial. Select a heart cycle of one to five beats.

- Tap **Bullseye View**.

To	Do This
Activate or deactivate individual segments on the bullseye plot	▪ Click the required segments in the bullseye plot. The analysis results include segments in color and exclude segments in gray. The deactivated segments are excluded from the segmental strain curve and summary results. The deactivated segments display in gray on the volume model.
Display a corresponding segment in the volume model and segmental strain curve	▪ Position the pointer over a segment in the bullseye plot.

Bullseye Results

Each segment in the bullseye view is represented by a curve in the curve view.

Segment	Label	Description
Segment 1	**Basal Anterior**	Basal anterior
Segment 2	**Basal Anteroseptal**	Basal anteroseptal
Segment 3	**Basal Inferoseptal**	Basal inferoseptal
Segment 4	**Basal Inferior**	Basal inferior
Segment 5	**Basal Inferolateral**	Basal inferolateral
Segment 6	**Basal Anterolateral**	Basal anterolateral
Segment 7	**Mid Anterior**	Mid anterior
Segment 8	**Mid Anteroseptal**	Mid anteroseptal
Segment 9	**Mid Inferoseptal**	Mid inferoseptal
Segment 10	**Mid Inferior**	Mid inferior
Segment 11	**Mid Inferolateral**	Mid inferolateral
Segment 12	**Mid Anterolateral**	Mid anterolateral
Segment 13	**Apical Anterior**	Apical anterior
Segment 14	**Apical Anteroseptal**	Apical anteroseptal
Segment 15	**Apical Inferoseptal**	Apical inferoseptal
Segment 16	**Apical Inferior**	Apical inferior
Segment 17	**Apical Inferolateral**	Apical inferolateral
Segment 18	**Apical Anterolateral**	Apical anterolateral

Reviewing the Report

Prerequisite: Save the results to the report.

The left ventricle summary in the patient report includes the global longitudinal value for all three chambers and overall global longitudinal strain is included with the bullseye plot.

The bullseye displays the timing or phase value selected in system configuration or during the study and the last single beat analysis. You cannot remove segments from the bullseye in the report.

See also: For information about viewing the report, refer to Chapter 12 in the Instructions for Use.

See also: For information about 2D Heart AI result labels, refer to Appendix D in the System Reference.

On-Screen Messages

The system displays informational messages in dialog boxes, progress bars, or the message area on the bottom of the image screen.

Message	Description
Place Inf, Ant, Roof points to draw LA contour	Place the inferior, anterior, and roof points to draw the left atrium contour.
Place Inf, Ant, Apex points to draw LV contour	Place the inferior, anterior, and apex points to draw the left ventricle contour.
Place Post, AntSept, Apex points to draw LV contour	Place the posterior, anterior-septal, and apex points to draw the left ventricle contour.
Place Sept, Lat, Roof points to draw LA contour	Place the septal, lateral, and roof points to draw the left atrium contour.
Place Sept, Lat, Apex points to draw LV contour	Place the septal, lateral, and apex points to draw the left ventricle contour.
Place Sept, FW, Roof points to draw RA contour	Place the septal, free wall, and roof points to draw the right atrium contour.
Place Sept, FW, Apex points to draw RV contour	Place the septal, free wall, and apex points to draw the right ventricle contour.
Failed to draw contour. Please retry.	The contour failed to draw. Retry adding a contour.
Current beat excluded. Contours hidden.	The current beat is excluded. The contours are hidden.
Current beat included. Contours shown.	The current beat is included. The contours are shown.
Clips analyzed were changed	The analyzed clips were changed.
Failed to detect configured chambers. Correct manually.	Unable to detect the configured chambers. Manually correct the chambers.

Message	Description
Key frames set by ED-ES Assist	The key frames are set by ED-ES Assist.
Set ED frame with ED control	Use the ED control to set the position of the end diastole frame.
Verify the ED, ES frames and tap Analyze	Verify the end diastole and end systole frames and then tap **Analyze**.
All ED-ES frames must have LV contours (or LA contours) for Bullseye View. Please correct and proceed.	Confirm contours are drawn on the left ventricle and left atrium in the ED-ES view before selecting the Bullseye view.
Failed to detect view. Rename the view.	Unable to detect the view. Rename the view.
Undetected views removed from analysis	Undetected views were removed from the analysis. Retry or select another clip or view. For clips that cannot be identified, the clip displays in the viewport, and results are excluded from the curve graph, bullseye plot, and summary results.
Analysis failed on the selected clip. Retry or select another clip.	Unable to analyze or contour the end diastole or end systole. Retry or select another clip or view.
Speckle tracking a single beat	Speckle tracking analysis is in-progress for a single beat.
Multi-clip launch failed. Select one clip and launch the application. Repeat the same with other clips.	Unable to load the selected multiple clips for analysis. Select a single clip or select other clips and then launch the feature.
Thumbnail captured. Results not sent to report.	The thumbnail image was captured, but the results were not saved to the report. Try again.

D4 4D Heart AI

Overview **3**
Workflow 4
Image Screen Layout 5
ED-ES View Layout 6
Detailed View Layout 8
Bullseye View Layout 9

Activating 4D Heart AI **10**

Analyzing the Results **11**
Saving the Results 11
Adjusting the Analysis Parameters 11
Editing the Contours 14
Changing the Image Screen Layout 16
Rotating the Volume and Multiplanar Reconstructions 16
Magnifying or Panning an Area of Interest 16
Positioning and Resizing the Volume 17
Reviewing CINE Playback 17
Reviewing Results in the Curve Graph 17
Reviewing Results in a Bullseye Plot 18
Bullseye Results 18
Restoring Original Acquisition Settings 19

Reviewing the Report **19**

On-Screen Messages **20**

Overview

⚠ **WARNING:** This feature uses ultrasound data collected prior to analysis. The quality of the data collected and used as input could have an effect on the output of this feature. Variability in ultrasound system performance, operator technique, patient characteristics, and other factors may affect the output. At all times, the clinician is advised to carefully review the output and confirm the information presented with clinical judgment and any other relevant sources of data.

The 4D Heart AI feature is a four-dimensional (4D) image processing feature for detecting, evaluating, and quantifying the shape, size, and function of the heart chambers. The feature provides volume and strain analysis.

4D Heart AI detects the cardiac view, identifies borders (contours), and measures cardiac function for the left ventricle, left atrium, right ventricle, and right atrium. Contours indicate the positions of the three-dimensional (3D) model for the multiplanar reconstructions (MPR) or volume slice.

Measurement results are based on contours from the end diastole (ED) and end systole (ES) frames.

Use the feature to perform the following tasks:

- Visualize the left ventricle and left atrium and quantitative analysis of ejection fraction, volumes, and mechanical dyssynchrony.
- Visualize the right ventricle and right atrium for evaluation and quantification of size and function.
- Confirm the contour placement and make any adjustments, if necessary.
- Analyze measurement results based on 4D volume ultrasound data.

  Data is available in multiple formats: a curve graph for measurements over time, a bullseye plot with a graphical representation of the heart, and a textual report format.
- Analyze a single heart beat after confirming end diastole and end systole frames.
- Analyze all frames of the cardiac cycle for multiple beats captured during a physio study using a visual representation of heart motion and function.

  See also: For information about using the physiologic function, refer to Chapter C1 in this manual.

Use the configuration settings to customize the default settings for the 4D Heart AI feature.

See also: For a list of compatible transducers and imaging presets, refer to Appendix A in the Instructions for Use.

Workflow

The clinical workflow includes the following steps.

Step 1: Acquiring Cardiac 4D Volumes

- During cardiac 4D volume imaging, freeze the image.
- During review, open the required cardiac 4D volume clips.

  Note: For volume clips in review, tracking is only available for the left ventricle and left atrium chambers.
- 4D volume imaging or clips can include an ECG trace (a physio signal is present) or exclude an ECG trace (no physio signal).

  See also: For information about using the physiologic function, refer to Chapter C1 in this manual.

  Note: Without a physio signal, the feature analyzes only one beat. The feature detects end diastole (ED) and end systole (ES) frames as largest and smallest chamber sizes, and tracking is available for the left ventricle and left atrium.

Step 2: Detecting and Analyzing the Cardiac Chambers

- 4D Heart AI detects the view, places contours across all frames for the selected beats, analyzes the 4D ultrasound data, and displays the results.

  Note: Available results are dependent on the acquired views.

Step 3: Reviewing, Adjusting, and Saving the Results

- Analyze the results for single or multiple heart chambers.
- Select another heart chamber or valve.
- Select different view layouts: ED-ES, detailed, or bullseye.

  Note: Bullseye view is only available for cardiac 4D volume clips in review.
- View the multiplanar reconstruction or volume from another orientation.
- Redefine the diastolic or systolic frame.
- Edit, delete, or redraw contours on the LV, LA, RV, or RA.
- Reanalyze the views to update the results.
- Review the clips or volume in CINE playback.
- Save the tracking results.

Image Screen Layout

The feature identifies each heart chamber by a color in the viewport, results, and curve graph.

- Green identifies the left ventricle.
- Blue identifies the left atrium.
- Orange identifies the right ventricle.
- Turquoise identifies the right atrium.
- Pink and pink three-dimensional mesh identifies the epicardium.

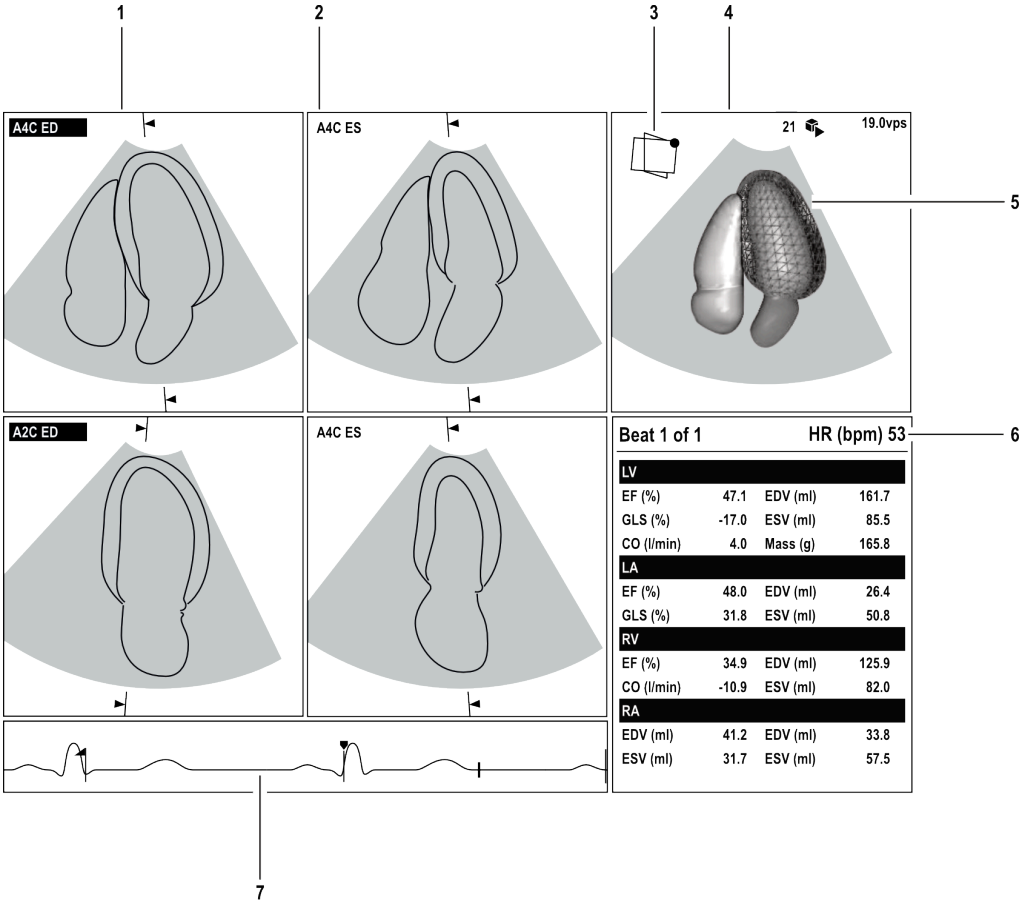
Use the configuration settings to specify the image screen layouts and select the measurements to display in the tracking results summary.

ED-ES View Layout

The end diastole-end systole (ED-ES) view displays when you activate 4D Heart AI from the CINE workflow. The ED-ES viewports display multiplanar reconstructions in a side-by-side format. The ED-ES view includes volume model and results summary viewports.

The ED and ES viewports provide the apical four chamber (A4C) view and either the apical two chamber (A2C) or the parasternal short axis (PSAX) view.

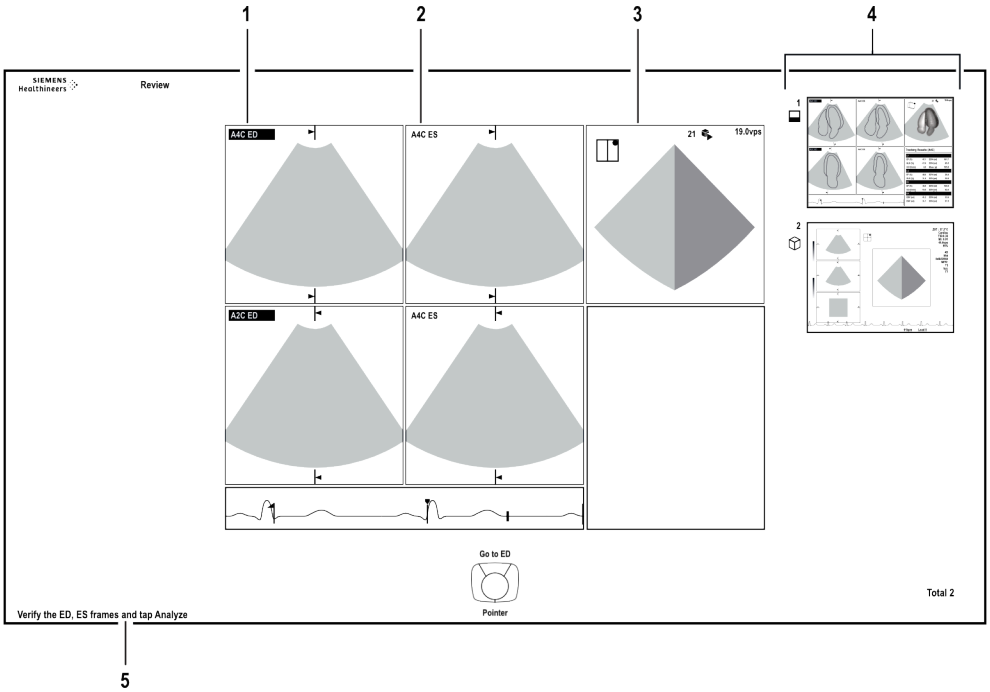
Note: The freeze control is unavailable in the ED-ES view. Use CINE to review the frames.



Example of the 4D Heart AI screen, ED-ES view layout with physio.

1 End diastole (ED) viewport
2 End systole (ES) viewport
3 Orientation indicator
4 Volume model viewport
5 Epicardium mesh
6 Results viewport
7 ECG trace

Note: Without a physio signal, you must identify the required end diastole (ED) and end systole (ES) frames to obtain analysis with contours and results. The feature analyzes a single beat.



Example of a 4D Heart AIED-ES view layout without physio.

1 End diastole (ED) viewport
2 End systole (ES) viewport
3 Volume viewport
4 Thumbnail panel
5 Message area

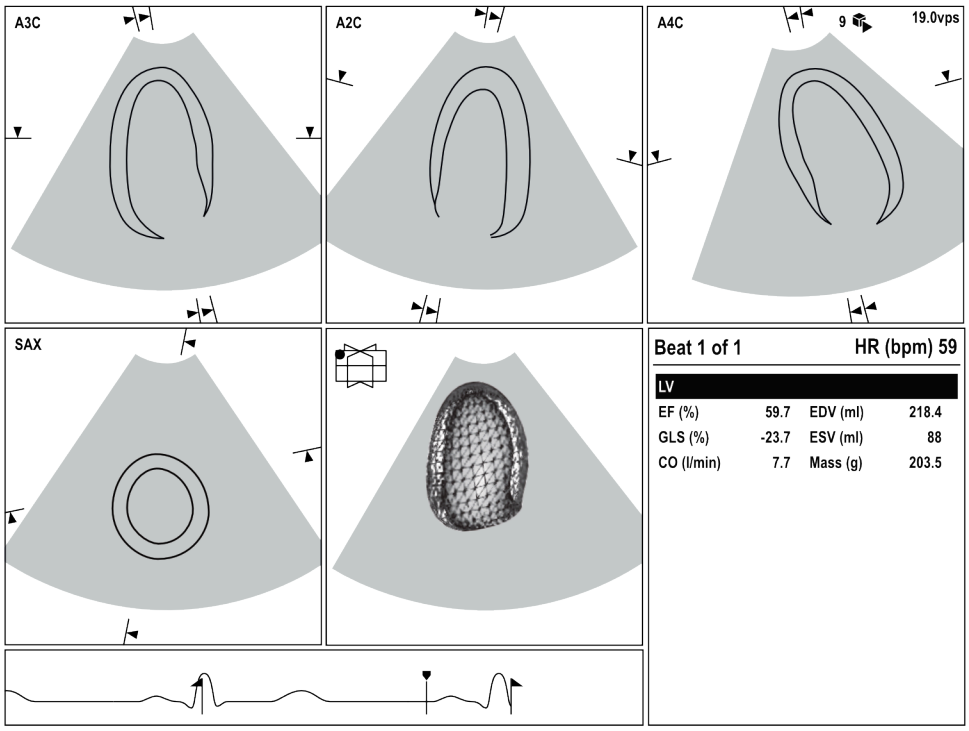
Detailed View Layout

The detailed view displays multiple viewports for a single frame for additional representations of the contours.

The layout of the detailed view is based on the selected chamber.

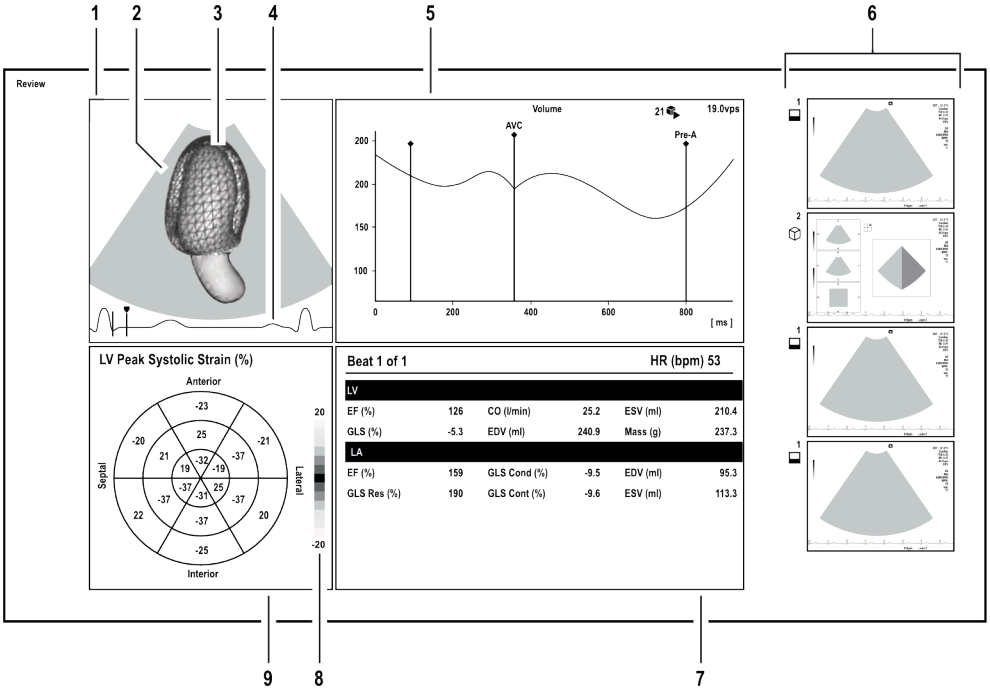
- Left ventricle: apical four chamber (A4C), apical three chamber (A3C), apical two chamber (A2C), short axis (SAX)
- Left atrium: A3C, A2C, A4C, SAX
- Right ventricle: A4C, coronal, SAX
- Right atrium: A4C, right heart apical two chamber (RH A2), SAX

Note: The freeze control is available in the detailed view.



Example of the 4D Heart AI screen, detailed view layout.

Bullseye View Layout



Example of the 4D Heart AI screen, bullseye view layout.

1 Volume model viewport
2 Volume
3 Model
   You can show or hide the epicardium mesh on the left ventricle.
   Displays segments on the left ventricle endocardium as you select segmental strain curves and segments on the bullseye.
4 ECG trace
   During playback, includes the current frame marker.
   During pause of playback, displays the ED and ES markers.
5 Curve graph viewport
   Provides a view of the timing or phase, for example, segmental strain.
   Includes volume curves, the current frame marker, aortic valve closure (AVC) time, and pre atrial (Pre-A) contraction time.
6 Thumbnail panel
   Displays reference images of previously saved images and clips.
7 Results summary view
   Displays the tracking results for the heart rate and measurements.
   Displays an asterisk (*) and footnote when the body surface area (BSA) is indexed or a beat is excluded.
8 Bullseye color bar
   Provides colors assigned to the parameter ranges.
9 Bullseye viewport
   Displays a bullseye plot with the following segment values: anterior, inferior, lateral, septal, coronal.

Activating 4D Heart AI

You can activate 4D Heart AI during 4D cardiac volume imaging or from the review function.

See also: For information about cardiac volume imaging, refer to Chapter D2 in this manual.

See also: For information about activating review, refer to Chapter B1 in this manual.

To activate 4D Heart AI:

To	Do This
Analyze the heart chambers during live imaging in 4D-mode	1. Activate cardiac volume imaging. 2. Acquire the required view and then press **FREEZE**. 3. Tap **4D Heart AI**. The ultrasound system displays a progress bar as the feature activates, and the feature detects the contours, calculates the results, and displays the ED-ES view.
Analyze the heart chambers during review	**Prerequisite:** Acquire the required cardiac clips. 1. Activate review. 2. Select the required volume clip.  *Example of an icon identifying a volume clip in the thumbnail panel.* 3. Tap **4D Heart AI**. The ultrasound system displays a progress bar as the feature activates, and the feature detects the contours, calculates the results, and displays the ED-ES view.

Analyzing the Results

Saving the Results

You can save the results to the patient report. After edits and updates are complete, be sure to reconfirm the results before saving the results to the report.

To save the results to the report:

1. Confirm the results and perform any manual adjustments to the contours or tracking parameters, if necessary.
2. Press the control assigned to the clip store function.

Adjusting the Analysis Parameters

Use the configuration settings to define the default parameters for analysis.

Note: An asterisk (*) displays next to results with manual adjustments.

To	Do This
Analyze a different number of heart beats	(Available only for multiple beats) ▪ Tap **Beats Analyzed** and then select the number of beats, up to five. The results display an average of the selected number of beats. **Note:** Increasing the number of beats moves the ECG margin to the left to include prior beats. If the clip does not include the selected number of beats, the system analyzes the available beats.
Exclude a heart beat from the analysis	(Available only for multiple beats) ▪ Select the beat and then tap **Exclude Beat**. The system removes the selected beat, including the contour, results, aortic valve closure (AVC) time, pre-atrial (Pre-A) contraction time, and bullseye plot. The results identify the excluded beat, for example, if the second beat is excluded, the results display ***Beats Excluded: 2**. ▪ To include the beat, tap **Exclude Beat** again.
Analyze an average of heart beats	▪ Tap **Average Result**. An average of the beats displays in the results. The results indicate the number of beats averaged, for example, **Average (3 beats)**. ▪ To analyze individual beats, tap **Average Result** again. The results indicate the beat analyzed, for example, **Beat 3 of 3**.
Analyze another heart beat	▪ Rotate **Cine** to select another location in the ECG trace and then tap **Analyze**. The beat in analysis displays in the viewports.

To	Do This
Select the end diastolic and end systolic frames	**See also:** For information about repositioning ED and ES markers and assigning ED and ES frames, refer to Chapter 7 in the Instructions for Use.
Show or hide the left ventricle (LV) epicardium	**Prerequisite:** Display the LV viewport. ▪ Tap **LV Epi**. The model shows the epicardium in mesh, and the LV mass updates in the results. ▪ To remove the mesh, tap **LV Epi** again. Excluding the mesh enables visualization of the segments on the LV endocardium model.
Adjust the aortic valve closure time	(Available only for the left atrial when CINE is paused) ▪ Rotate **AVC** to adjust the time in milliseconds (ms) and then press **AVC** to accept the update. The values update in the report summary.
Adjust the pre-atrial contraction time at the onset of the P-wave	(Available only for the left atrial when CINE is paused) ▪ Rotate **Pre-A** to adjust the time in milliseconds (ms) and then press **Pre-A** to accept the update. The values update in the report summary. **Note:** During analysis of multiple beats, the pre-atrial contraction time displays only for the current beat.
Perform a single-beat analysis	**Prerequisite:** Acquire volumes with a minimum of five frames. 1. Position the ED and ES markers. The system calculates the results and displays a message reminding you to verify the ED and ES frames. **See also:** For information about positioning the ED and ES markers, refer to Chapter 7 in the Instructions for Use. 2. Tap **Analyze**. The system displays a progress bar, calculates the results, and updates the results summary.

To	Do This
Select the timing or phase for the bullseye view	(Available only for the left ventricle) 1. Tap **Curve** and then select **Segmental Strain**. 2. Tap **Timing / Phase** and then select an option. – **Peak Systolic Strain** (**PSS**) displays the peak strain value during systole as measured before aortic valve closure. – **End Systolic Strain** (**ESS**) displays the strain value at end systole measured at aortic valve closure. – **Time to Peak** (**TTP**) displays the time to reach peak strain. – **Post Systolic Strain** (**PS**) displays the strain value after end systole as measured after aortic valve closure. – **Post Systolic Indexed** (**PSI**) displays the ratio between strain (deformation) after end systole divided by total strain.
Select the curve for the bullseye view	**Prerequisite:** The left ventricle is required for **Segmental Strain**. Both the left ventricle and left atrium are required for **Volume** and **Global Strain**. ▪ Tap **Curve** and then select an option. **Note:** All options are available for the left ventricle. Only **Volume** and **Global Strain** are available for the left atrium. – **Volume** displays the change in chamber volume from end diastole to end systole as derived from the left ventricle and left atrium. – **Segmental Strain** displays the average strain value in each segment of the cardiac chamber, for example, the left ventricle. **Note:** Selecting segmental strain when the left ventricle is disabled changes the curve to volume. – **Global Strain** displays the overall global strain or deformation for the left ventricle and left atrium.
Change the direction of strain analysis for the bullseye view	(Available only for the left ventricle) 1. Tap **Curve** and then select **Segmental Strain**. 2. Tap **Direction** and then select an option. – **Longitudinal** displays the strain results in the longitudinal direction. – **Circumferential** displays the strain results in the circumferential direction.

Editing the Contours

You can manually adjust or delete and redraw the system-generated contours. After the contour is drawn, the system reanalyzes the contour and updates the results.

Note: You can also manually draw the contours if the system could not detect the contours.

To edit a contour:

To	Do This
Show or hide the contours in the selected viewport	▪ Tap **Hide Contours**.
Edit a contour	1. Tap **Edit Contour**. 2. Select a viewport. Or, press **UPDATE**. 3. Position the pointer to activate the required segment of the contour. The segment displays in yellow with the active section in red. The model displays with mesh. 4. Move the pointer to adjust the contour and then click the image to anchor the contour. – To edit a smaller section of the contour, move the pointer near the contour. – To edit a larger section of the contour, move the pointer further from the contour. The segment displays in green as you adjust the contour. The mesh on the model repositions as you adjust the contour. 5. Click a trackball key to anchor the placement.
Adjust the distance between the epicardium mesh and the left ventricle	(Available only when the left ventricle epicardium mesh is shown) 1. Tap **Edit Contour**. 2. Rotate **LV Epi Offset** and then select a setting.

To	Do This
Delete a contour	1. Select the ED or ES viewport. 2. Tap **Delete Contour** and select a heart chamber: **LV**, **LA**, **RV**, **RA**. The system deletes the selected contour and then displays options for manually adding a contour.
Draw a contour	1. Select an multiplanar reconstruction viewport and then tap **Add Contour**, if necessary. The system displays the detailed view layout and a message at the bottom of the image screen instructing the points to mark for drawing the contour. **See also:** On-Screen Messages, page D4-20 2. Roll the trackball to position the first marker and then press a trackball key to set the position. 3. Roll the trackball to position the second marker and then press a trackball key to set the position. 4. Roll the trackball to position the third marker and then press a trackball key to set the position. The system draws the contour on the selected chamber.
Undo the previous edit, deletion, or addition to a contour	▪ Tap **Undo**.

Changing the Image Screen Layout

Use the configuration settings to select the default layouts for the 4D Heart AI feature.

See also: For additional information about changing the image screen layout, refer to Chapter D2 in this manual.

To	Do This
Hide or show the volume data in the model viewport	▪ Tap **Hide VR**.
Hide or show the model on the volume	▪ Tap **Hide Model**.
Show or hide the right ventricle	▪ Tap **RV**.
Show or hide the right atrium	▪ Tap **RA**.
Show or hide the left ventricle	▪ Tap **LV**.
Show or hide the left atrium	▪ Tap **LA**.
Activate the next viewport	▪ Press **UPDATE**.
Display the detailed view layout	▪ Tap **Detailed View**.
Display the ED-ES view layout	▪ Tap **ED-ES View**.
Display the bullseye view layout	**Prerequisite:** Select the left ventricle, or select both the left ventricle and the left atrial. Select a heart cycle of one to five beats. ▪ Tap **Bullseye View**. **See also:** For information about the bullseye view, refer to page D4-18.

Rotating the Volume and Multiplanar Reconstructions

Rotation of the volume enables visualization of the anatomical structure from any angle. The volume rotates independently of the multiplanar reconstructions (MPR).

During rotation of a multiplanar reconstruction, the rotation of the three orthogonal planes is synchronized along the axis of the active plane. You can synchronize the position of the volume to the position of any multiplanar reconstruction.

The axis markers display in the ED-ES and detailed views.

See also: For information about rotating the volume and multiplanar reconstructions, refer to Chapter D2 in this manual.

Magnifying or Panning an Area of Interest

(Not available for the bullseye view)

You can adjust the magnification level for the multiplanar reconstruction and the volume model viewports. You cannot magnify the bullseye view.

See also: For information about rotating the magnifying or panning an area of interest, refer to Chapter D2 in this manual.

Positioning and Resizing the Volume

You can reposition and resize the multiplanar reconstructions and volume model.

See also: For information about positioning and resizing the volume, refer to Chapter D2 in this manual.

Reviewing CINE Playback

The feature supports the following functionality:

- Selecting frames or beats for CINE review.
- Viewing the current position or changing the position of the end diastole or end systole.
- Playing back and editing clips and volumes.
  - During playback the volume model viewport displays the active frame or beat, and the corresponding results display.
  - As you scroll CINE, the frame marker in the curve graph moves in synchronicity with CINE scrolling.

  Note: CINE playback is not available for the ED-ES view.
- Repositioning the current frame marker on the ECG trace when playback is paused.

  Note: A horizontal line displays on the time axis when ECG trace data is unavailable.
- Capturing clips and static images.

See also: For information about CINE, refer to Chapter 7 in the Instructions for Use.

Reviewing Results in the Curve Graph

You can display the measurement results for a curve in the summary results and display the corresponding segment in the volume model and bullseye viewports.

To display data about a curve:

- Position the pointer over a curve.

Reviewing Results in a Bullseye Plot

(Available only during review)

Each segment in the bullseye view is represented by a curve in the curve view.

Note: If all four chambers are active, selecting the bullseye view hides the right ventricle (RV) and right atrium (RA). The RV and RA are shown again when accessing the ED-ES or detailed view.

See also: For information about 4D Heart AI result labels, refer to Appendix D in the System Reference.

To review results in a bullseye plot:

Prerequisite: Select the left ventricle, or select both the left ventricle and the left atrial. Select a heart cycle of one to five beats.

- Tap **Bullseye View**.

To	Do This
Activate or deactivate individual segments on the bullseye plot	▪ Click the required segments in the bullseye plot. The analysis results include segments in color and exclude segments in gray. The deactivated segments are excluded from the segmental strain curve and summary results. The deactivated segments display in gray on the volume model.
Display a corresponding segment in the volume model and segmental strain curve	▪ Position the pointer over a segment in the bullseye plot.

Bullseye Results

Each segment in the bullseye view is represented by a curve in the curve view.

Segment	Label	Description
Segment 1	**Basal Anterior**	Basal anterior
Segment 2	**Basal Anteroseptal**	Basal anteroseptal
Segment 3	**Basal Inferoseptal**	Basal inferoseptal
Segment 4	**Basal Inferior**	Basal inferior
Segment 5	**Basal Inferolateral**	Basal inferolateral
Segment 6	**Basal Anterolateral**	Basal anterolateral
Segment 7	**Mid Anterior**	Mid anterior
Segment 8	**Mid Anteroseptal**	Mid anteroseptal
Segment 9	**Mid Inferoseptal**	Mid inferoseptal
Segment 10	**Mid Inferior**	Mid inferior
Segment 11	**Mid Inferolateral**	Mid inferolateral
Segment 12	**Mid Anterolateral**	Mid anterolateral
Segment 13	**Apical Anterior**	Apical anterior
Segment 14	**Apical Anteroseptal**	Apical anteroseptal
Segment 15	**Apical Inferoseptal**	Apical inferoseptal
Segment 16	**Apical Inferior**	Apical inferior
Segment 17	**Apical Inferolateral**	Apical inferolateral
Segment 18	**Apical Anterolateral**	Apical anterolateral

Restoring Original Acquisition Settings

You can restore the original acquisition settings and factory-default settings of the volume and multiplanar reconstructions.

Use the configuration settings to specify the default layout for orientating the volume model.

To	Do This
Restore the position and rotation to the factory-default settings	▪ Tap **Reset Orientation**.
Restore the feature to the last state of successful detection	▪ Tap **Reset Home**.

Reviewing the Report

Prerequisite: Save the results to the report.

The bullseye displays the timing or phase value selected in system configuration or during the study and the last single beat analysis. You cannot remove segments from the bullseye in the report.

See also: For information about viewing the report, refer to Chapter 12 in the Instructions for Use.

See also: For information about 4D Heart AI result labels, refer to Appendix D in the System Reference.

On-Screen Messages

The system displays informational messages in dialog boxes, progress bars, or the message area on the bottom of the image screen.

Message	Description
Place AntSept, Post, Apex points in A3C view	Draw the left ventricle with three points. Place the anterior-septal, posterior, and apex points in the apical three chamber view.
Place AntSept, Post, Roof points in A3C view	Draw the left anterior with three points. Place the anterior-septal, posterior, and roof points in the apical three chamber view.
Place Sept, FW, Apex points in A4C view and Infund, Post, Lat points in SAX view	Draw the right ventricle with six points. Place the septal, free wall, and apex points in the apical four chamber view and the infundibular, posterior, and lateral points in the short axis view.
Place Sept, FW, Roof points in A4C view	Draw the right anterior with three points. Place the septal, free wall, and roof points in the apical four chamber view.
Verify the ED, ES frames and tap Analyze	Verify the end diastole and end systole frames and then tap **Analyze**.
Set ED frame with ED control	Use the ED control to set the position of the end diastole frame.
All ED-ES frames must have LV contours (or LA contours) for Bullseye View. Please correct and proceed.	Confirm contours are drawn on the left ventricle and left atrium in the ED-ES view before selecting the bullseye view.
Current beat excluded. Contours hidden.	The current beat is excluded. The contours are hidden.
Current beat included. Contours shown.	The current beat is included. The contours are shown.
Failed to detect configured chambers. Correct manually.	Unable to detect the configured chambers. Manually correct the chambers.
Thumbnail captured. Results not sent to report.	The thumbnail image was captured, but the results were not saved to the report. Try again.
Calculating results	The feature is calculating the results.
Detecting contours. Calculating results.	The feature is detecting the contours and calculating the results.
Detecting contours. Calculating results. Wait for completion or exit.	The feature is detecting the contours and calculating the results. You can wait for the results or exit the feature.
Loading application to captured state	The feature is launching with the selected capture data.
Low Volume Rate < 15vps	Displays under the curve viewport when the volume rate is low. Indicates the acquisition is less than 15 volumes per second (vps).

SIEMENS Healthineers

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Diagnostic Ultrasound System
System Reference

US

CE
0123

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Contents

Chapter 1 **Configuration Settings**

Description of the selections for customizing the ultrasound system using the configuration settings.

Chapter 2 **Workflow Configuration Settings**

Instructions for customizing the image presets, worklist procedures, annotations, and the measurement function for your hospital, clinic, or facility. Includes procedures for sharing the preferences within an organization.

Chapter 3 **Obstetric Measurement Configuration**

Instructions for customizing the measurement function for the obstetric exams.

Chapter 4 **Clinical Applications Configuration**

Instructions for customizing the following features using the configuration settings:

- Stress Echo
- 4D Heart AI
- 2D Heart AI
- AI Assist
- Transducers

Chapter 5 **Network Configuration**

Instructions for configuring network connections.

Chapter 6 **DICOM Configuration**

Instructions for configuring DICOM (Digital Imaging and Communications in Medicine) profiles. Includes a procedure for importing certificates for secure connections.

Chapter 7 **Security Configuration**

Information for the ultrasound system administrator. Includes procedures for creating user accounts and configuring the security log file.

Appendix A **EMC Publication**

Electromagnetic Emissions and Immunity: Guidance and Manufacturer's Declaration

Information regarding the electromagnetic compatibility (EMC) testing of this ultrasound system.

Appendix B **Patient Data Access**

Description of the selections in the patient browser.

Appendix C **Measurement and Calculation Labels**

(Excludes cardiac, obstetric, and fetal echo measurement and calculation labels)

List of the measurement and calculation labels.

Appendix D **Cardiac Measurement and Calculation Labels**

List of the measurement and calculation labels for cardiac use.

Includes a description of labels for the following features:

- Stress Echo
- 4D Heart AI
- 2D Heart AI

Appendix E **OB and Fetal Echo Measurement and Calculation Labels**

List of the measurement and calculation labels for obstetric and fetal echo use.

Appendix F **Bibliography**

A list of clinical references.

Note: Not all features and options described in this publication are available to all users. Please check with your Siemens Healthineers representative to determine the current availability of features and options.

About the User and Reference Manuals

The user and reference manuals consist of the following publications.

Publication	Includes
Instructions for Use	▪ Conventions and typographical conventions used in the manuals ▪ Intended audience ▪ Introduction to the ultrasound system ▪ Safety and care information for the ultrasound system and compatible transducers ▪ Procedures for setting up and preparing the system for use ▪ Procedures for registering a patient and activating an operating mode ▪ Procedures for acquiring, optimizing, annotating, measuring, printing, and recording images ▪ Technical description of the ultrasound system ▪ Acoustic output data
Advanced Imaging Manual	This manual is a companion to the Instructions for Use publication and contains additional instructions for use for the safe and proper use of advanced imaging features on the ultrasound system. ▪ Description of the biopsy function ▪ Procedures for specialty imaging – Panoramic imaging – Contrast agent imaging – Comparing images from multiple modalities ▪ Procedures for reviewing images and clips ▪ Description of features for cardiology – Procedures for the physiologic function – Procedures for the stress echo function – Description of the transesophageal transducer, including cleaning and care of the transducer – Cardiac volume imaging – 2D Heart AI – 4D Heart AI
*System Reference**	▪ Description of customizable system settings ▪ Description of all measurement labels configurable for the ultrasound system ▪ Information about DICOM connectivity, network capabilities, and external devices ▪ Clinical references ▪ Information regarding the electromagnetic compatibility (EMC) testing of this ultrasound system

*Languages supported by the user interface include a translation of this publication.

Conventions

The user and reference manuals include the following conventions.

Convention	Description
Warnings and Cautions	⚠ **WARNING:** Warnings are intended to alert you to the importance of following the correct operating procedures where risk of injury to the patient or system user exists. ⚠ **Caution:** Cautions are intended to alert you to the importance of following the correct operating procedures to prevent the risk of damage to the ultrasound system.
Notes and Prerequisites	**Prerequisite:** Prerequisites contain tasks the user must complete or information the user needs prior to performing a procedure. **Note:** Notes contain information concerning the proper use of the ultrasound system or correct execution of a procedure.
Cross-references	Examples: **See also:** For information about cleaning and disinfecting a transducer, refer to Chapter 3 in this manual. **See also:** For information about customizing the measurement function, refer to Chapter 2 in the System Reference. **See also:** For additional information about the measurement function, refer to Chapter 10 in the Instructions for Use. **See also:** For information about exporting and importing images, refer to Chapter B2 in the Advanced Imaging Manual. **See also:** Alphanumeric Keyboard, page 1-26 **See also:** Chapter 2, Instructions for Use
Customizable Ultrasound System Settings	Settings for configuring and customizing the ultrasound system are described in the System Reference. When customization is available, the user manual provides a reference to the configuration settings. Example: Use the configuration settings to customize the measurement function.

Typographical Conventions

The following typographical conventions are in descriptions and procedures within your user and reference manuals. Use the conventions to identify the location of a control or selection on the ultrasound system.

Control or Selection	Description
Controls on the Control Panel	Controls located on the control panel are indicated by uppercase boldface type. Examples: ▪ Rotate **2D** to adjust the 2D gain. ▪ Press **ABC** to activate or exit the annotation function. ▪ Double-click **UPDATE** to display the 2D image.
Trackball and Trackball Keys	Right and left trackball keys are located on the control panel. The function assigned to the trackball and trackball keys is indicated by labels on the image screen. Examples: ▪ Adjust the size or position of the field of view and then press a trackball key. ▪ Position the measurement marker and then press a trackball key. ▪ Press the right trackball key.
Selections on the Image Screen	On-screen selections are indicated by boldface type. Roll the trackball to position the pointer on the control or object on the image screen and then press a trackball key. Examples: ▪ Click **Correct** on the patient registration form. ▪ Double-click a thumbnail. ▪ Select the check box for the required entries and then click **Delete**.
Controls on the Control Panel for the Touch Screen	Press and rotate controls on the control panel are labeled on the touch screen. The selection assigned to these controls is indicated by boldface type. Examples: ▪ Rotate **Tint**. ▪ Press **Steer**.
Selections on the Touch Screen	Touch screen selections are indicated by boldface type. Tap the touch screen to access a selection. Drag an object on the touch screen to reposition the object. Swipe the screen to display a separate page of selections. Examples: ▪ Tap **Workflow**. ▪ Drag the tail of the arrow on the touch screen to adjust the length.

1 Configuration Settings

Overview **3**
- Navigation Buttons 3
- Configuration Categories 4

System Settings **6**
- General 6
- Display 8
- Patient Banner 10

Workflow Enhancement **11**

Imaging Settings **11**
- General 11
- Capture Settings 11
- Imaging Mode 14

Image Parameter Display **16**

Measurement & Report **17**

Annotations **17**

Features **17**
- Protocols 17
  - Protocol Selections 18
  - View Selections 19
  - Importing and Exporting Protocols 21
  - Configuring Protocols on a Personal Computer 21
- Stress Echo 22
- 4D Heart AI 22
- 2D Heart AI 22
- AI Assist 22

Transducer **22**

Connectivity & Network **22**
- Export 22

Peripheral Devices **23**
- Footswitch 23
- DVR 24
- Print/Store 25
  - Configuring Advanced Print and Store Settings 27
  - Local Printer 28

System Management 29
System Information 29
Automatic Deletion of Transferred Patient Studies 30
Criteria for Deletion 30
Study Deletion Process 30
Notification of Storage Space Availability 31

Security 32
Enabling Ports 34
Unlocking an Encrypted USB Storage Device 34

Service 35
Backing Up and Restoring Customized Settings 38
Adjusting Monitor Settings 41

Overview

You can use the configuration settings to modify factory (default) settings or customize the current settings.

The configuration settings are organized into categories, for example, ultrasound system settings, imaging settings, and networking settings.

Note: Some changes may not take effect until you restart the ultrasound system. The system displays a message to remind you to restart the system.

To access the configuration settings:

1. Tap the configuration button.

2. Click the name of the category on the left side of the image screen.

   The settings display on the right side of the image screen.

3. Modify the settings.
4. To save your changes, click the name of another category. Or, exit the configuration settings.
5. To restore the factory settings, click **Restore Defaults**.

   Note: Restoring default factory settings deletes your changes.

Navigation Buttons

Selection	Definition
	Contracts the selections in the list.
	Expands the selections in the list.
	Repositions the item to the top of the list.
	Repositions the item up one position in the list.
	Repositions the item down one position in the list.
	Repositions the item to the bottom of the list.
	Repositions the item up one position in the list.
	Repositions the item down one position in the list.
	Moves the item one position to the right.
	Moves the item one position to the left.
	Adds the item to the touch screen layout.
	Removes the item from the touch screen layout.

Configuration Categories

Category	Description
System Settings	---
General	Predefines ultrasound system settings.
Display	Predefines touch screen and image screen settings.
Patient	Predefines patient information settings.
Workflow Enhancement	**See also:** For information about configuring image presets and worklist procedures, refer to Chapter 2 in this manual.
Imaging Settings	---
General	Predefines settings for dual display format.
Capture Settings	Defines capture settings by image preset.
Imaging Mode	Predefines general imaging settings.
Image Parameter Display	Predefines the display of imaging parameters and settings. Provides selections to enable the display of patient information on a saved or printed image or clip.
Measurement & Report	**See also:** For information on measurement and report configuration settings, refer to Chapters 2 and 3 in this manual.
Annotations	**See also:** For information about configuring body markers and text labels, refer to Chapter 2 in this manual.
Features	---
Protocols	Predefines settings for user-defined workflow protocols.
Stress Echo	**See also:** For information about configuring stress echo settings, refer to Chapter 4 in this manual.
4D Heart AI	**See also:** For information about configuring 4D Heart AI settings, refer to Chapter 4 in this manual.
2D Heart AI	**See also:** For information about configuring 2D Heart AI settings, refer to Chapter 4 in this manual.
AI Assist	**See also:** For information about configuring the AI Assist feature, refer to Chapter 4 in this manual.
Transducer	**See also:** For information about configuring transducers, refer to Chapter 4 in this manual.
Connectivity & Network	**See also:** For information about configuring network or virtual workstation settings, refer to Chapter 5 in this manual. **See also:** For information on DICOM configuration settings, refer to Chapter 6 in this manual.
Export	Defines settings for exporting to a network and configuration settings for a Web application program interface.

Category	Description
Peripheral Devices	---
Foot Switch	Predefines settings for the footswitch.
DVR	Predefines settings for a DVR recording device connected to the ultrasound system.
Print / Store	Predefines settings for printing and storage devices connected to the ultrasound system.
Local Printer	Predefines settings for printing devices connected to the ultrasound system.
System Management	---
System Information	Accesses password-protected service procedures and the remote assistance function. Predefines user account access and passwords.
Security	▪ Indicates enabled or disabled security features on the ultrasound system. ▪ Provides selections for configuring security settings.
Service	Provides remote access for authorized Siemens Healthineers service representatives to troubleshoot and maintain the ultrasound system.

System Settings

General

Selection	Description
Regional Settings (Restart Required)	Identifies system settings for your region. **Note:** Changes to the regional settings require a system restart.
Language	Provides language options for the ultrasound system user interface screens. ▪ **English** ▪ **German** ▪ **French** ▪ **Italian** ▪ **Spanish**
Keyboard	Provides language characters for the touch screen keyboard.
Date Format	Specifies the date display format.
Time Format	Specifies the time display format.
Date	Specifies the current date.
Time	Specifies the current time.
Time Zone	Specifies the time zone for your region.
Units	---
Height and Weight	Specifies the type of measurement units for height and weight. ▪ **Metric (cm / kg)** displays height and weight in metric units. ▪ **English (ft. in / lb. oz)** displays height and weight in the non-metric measurement system using feet, inches, pounds, and ounces.
Institution Information	---
Institution Name	Predefines the name of the healthcare institution.
Physician or Operator	Predefines the names of physicians and operators for use during patient registration. ▪ **Performing Physicians** ▪ **Operators** ▪ **Referring Physicians**
Add	Adds a physician's or operator's name.
Delete	Removes the selected physician's or operator's name from the list.

Selection	Description
Audio	---
Confirmation Beep	---
Store Image and Clip	When enabled, provides audible feedback when an image or clip is stored.
Volume	Specifies the volume for the audible tone. ▪ **High** ▪ **Medium** ▪ **Low**
Gesture Detecting Transducer	---
Gesture Settings	Provides options for activating a transducer with gesture detection capabilities.
Enable Gesture Detecting	When enabled, activates gesture detection capability for the selected transducer.

Display

Selection	Description
Touch Screen User Defined Buttons	Adds or removes touch screen buttons for direct access to frequently-used functions. ▪ **None** indicates no user-defined button on the touch screen. ▪ **Print** sends a screenshot of the image screen to the printer.  ▪ **Full Screen** activates full-screen display format on the image screen. Full screen format increases the size of the image to hide the thumbnail panel and patient banner.  ▪ **Hide Banner** temporarily hides the patient banner on the image screen.  ▪ **Lock Screen** locks the touch screen and trackball. Pressing the freeze key unlocks the touch screen and trackball.  ▪ **Panoramic** activates Panoramic imaging. ▪ **Service Image** saves a screenshot of the current image screen and touch screen to the service image folder on the ultrasound system.  ▪ **Eject USB** disconnects the USB-compatible storage devices from the ultrasound system.  ▪ **Film Sheet** displays selections to copy images to the film sheet. ▪ **Job Status** displays the job status dialog box. ▪ **Send to Store Server** sends images and clips to all DICOM storage servers configured for transfer at the end of the exam.
Monitor Screen Saver	---
Wait Time (1 ~ 120)	Specifies the number of minutes before activating the screen saver.

Selection	Description
Control Panel User Defined Buttons	(Available only on control panels with orange backlighting)
U1	Identifies the first user-defined control on the control panel.
(List of user-defined functions)	---
None	Indicates no function is associated with the user-defined control.
CW Doppler	Activates the steerable continuous wave (CW) Doppler function.
Film Sheet	Displays selections to copy images to the film sheet.
Full Screen	Activates full-screen display format on the image screen.
Hide Banner	Temporarily hides the patient banner on the image screen.
Lock Screen	Locks the touch screen and trackball.
Network Job Status	Lists transfers of patient data and provides selections to manage the transfers.
Panoramic	Activates Panoramic imaging.
Print	Sends a screenshot of the image screen to the printer.
Send to Store Server	Sends images and clips to all DICOM storage servers configured for transfer at the end of the exam.
Service Image	Saves a screenshot of the current image screen and touch screen to the service image folder on the ultrasound system.

Patient Banner

Selection	Description
Patient Banner	Provides a preview of the current selections in the patient banner.
Rows	Predefines the layout of the selected item. ▪ **Row 1** repositions the selected item to the first row in the patient banner. ▪ **Row 2** repositions the selected item to the second row in the patient banner.
Position	Repositions the selected item horizontally in the patient banner.
Width	Edits the width of the selected item.
Prefix	Inserts text at the beginning of the selected item's name.
Properties	Predefines the patient information to include in the patient banner. When selected, the items are added to the patient banner. You can configure the layout of the banner.
Accession No	Displays the patient's accession number.
Age	Displays the patient's age.
BP [mmHg]	Displays the patient's blood pressure in mmHg.
BSA [m²]	Displays the patient's body mass index in meters squared.
Date	Displays the date of the patient study.
Date of Birth	Displays the patient's date of birth.
Date + Time (short)	Displays the date and time of the exam.
LMP	Displays the patient's last menstrual period.
EDD	Displays the patient's estimated date of delivery.
Fetal Age	Displays the age of the fetus.
First Name Last Name	Displays the patient's first and last name.
First Name Middle Name Last Name	Displays the patient's first, middle, and last name.
First Name	Displays the patient's first name.
Height	Displays the patient's height.
Institution Name	Displays the institution name.
Last Name, **First Name**	Specifies the format for the patient's last and first name.
Last Name, **First Name Middle Name**	Specifies the format for the patient's last, first, and middle name.
Last Name	Displays the patient's last name.
Middle Name	Displays the patient's middle name.

Selection	Description
No. Fetuses	Displays the number of fetuses.
Operator	Displays the initials or other identifying information of the person performing the patient study.
Patient ID	Displays the patient's identification number.
Performing Physician	Displays the performing physician's name.
Referring Physician	Displays the referring physician's name.
Request ID	Displays the request identification number.
Sex	Displays the patient's gender.
Study	Displays the type of patient study.
Time	Displays the time of the patient study.
Weight	Displays the patient's weight.

Workflow Enhancement

See also: For information on configuration settings for workflow enhancement, refer to Chapter 2 in this manual.

Imaging Settings

General

Selection	Description
Dual	Provides dual display options for images and annotations.
Enable Seamless Dual	When enabled, displays the image in a dual display format.
Display all Imaging Parameters	When enabled, displays all imaging parameters for operating modes.
Enter Full Screen When Activating Dual	When enabled, the system displays the image in full screen format when dual display format or live dual display format is activated. Applies to all operating modes and imaging presets, with the following exceptions: Doppler, Fusion imaging mode, biplane imaging, modality compare, image compare, and 4D zoom setup.

Capture Settings

Selection	Description
Exam Presets	Displays a list of image presets.
Default Capture Settings	Provides options for capturing clips for the selected image preset.
Clip Capture	Specifies the direction for capturing data. ▪ **Prospective** saves newly acquired images. ▪ **Retrospective** saves previously acquired images.

Selection	Description
Clip Length	Provides measurement options for the duration of a recorded clip.
Time	Defines the length of the clip to capture. ▪ **Seconds** displays a list of predefined clip lengths. ▪ **Custom (1 ~ 300)** defines a clip length in seconds.
Beats	Defines the length of the clip to capture. ▪ **Beats** displays a list of predefined heart cycles. ▪ **Custom (1 ~ 300)** defines a clip length in heart beats. ▪ **First R-Wave Offset** indicates the user-defined number of frames to capture before the first R-wave. ▪ **Last R-Wave Offset** indicates the user-defined number of frames to capture after the last R-wave.
Enable Compression	When enabled, the ultrasound system compresses the clip at the time of capture. **Note:** Compression reduces image quality, and the original quality of the images in the clip cannot be restored. The quality factor is stored in the DICOM tag of the clip. Quality factor is the degree of loss during compression, where 2 is the lowest compression with the highest quality image and 255 is the highest compression with the lowest quality image. When this option is disabled, clips include lossless images with a quality factor of 0.
Compression Level	Specifies the level of clip compression. ▪ **Low** provides the lowest level of compression while retaining a high-quality image, for example, to a quality factor of 10. ▪ **Medium** provides a moderate level of compression while reducing the image quality, for example, to a quality factor of 25. ▪ **High** provides the greatest compression with the greatest loss of image quality, for example, to a quality factor of 35.
Capture Definition	Provides options for decreasing the file size of a clip.
Limit Clip Capture Rate to 30Hz	When enabled, limits the clip capture frequency to 30 Hz. **Note:** Limiting the frequency stores files at a lower frame rate and creates a smaller file size. When this option is disabled, the ultrasound system captures and stores files at a higher frame rate.

Selection	Description
Contrast Capture Settings	Provides options for capturing clips during contrast agent imaging for the selected image preset.
Clip Capture	Specifies the direction for capturing data during contrast agent imaging. **Note:** Only newly acquired images are captured during contrast agent imaging.
Clip Length	Provides measurement options for the duration of a recorded clip during contrast agent imaging.
Time	Defines the length of the clip to capture during contrast agent imaging. ▪ **Seconds** displays a list of predefined clip lengths. ▪ **Custom (1 ~ 300)** defines a clip length in seconds.
Beats	Defines the length of the clip to capture during contrast agent imaging. ▪ **Beats** displays a list of predefined heart cycles. ▪ **Custom (1 ~ 300)** defines a clip length in heart beats. ▪ **First R-Wave Offset** indicates the user-defined number of frames to capture before the first R-wave. ▪ **Last R-Wave Offset** indicates the user-defined number of frames to capture after the last R-wave.
Enable Compression	When enabled, the ultrasound system compresses the clip at the time of capture. **Note:** Compression reduces image quality, and the original quality of the images in the clip cannot be restored. The quality factor is stored in the DICOM tag of the clip. Quality factor is the degree of loss during compression, where 2 is the lowest compression with the highest quality image and 255 is the highest compression with the lowest quality image. When this option is disabled, clips include lossless images with a quality factor of 0.
Compression Level	Specifies the level of clip compression. ▪ **Low** provides the lowest level of compression while retaining a high-quality image, for example, to a quality factor of 10. ▪ **Medium** provides a moderate level of compression while reducing the image quality, for example, to a quality factor of 25. ▪ **High** provides the greatest compression with the greatest loss of image quality, for example, to a quality factor of 35.
4D Capture Settings	Provides options for capturing clips during 4D imaging for the selected image preset. **Note:** The 4D and default capture settings are identical with the following exceptions: The maximum clip length for 4D volumes is 10 seconds.

Imaging Mode

Selection	Description
Exam Presets	Displays a list of image presets.
Imaging Cursor Workflow	Provides options for cursor workflow for Doppler and M-mode for the selected image preset.
Enable Cursor Mode	When enabled, activates cursor mode for both Doppler and M-mode.
Doppler and M Mode	Specifies imaging settings for 2D and Doppler for the selected image preset.
Enable Automatic Color Invert	When enabled, activates color inversion with color or PW Gate Steering.
Doppler Mode	Specifies imaging settings for Doppler for the selected image preset.
Display Format	Specifies the display format for 2D and Doppler. ▪ **1/2 2D, 1/2 Trace** ▪ **1/3 2D, 2/3 Trace** ▪ **2/3 2D, 1/3 Trace** ▪ **Side by Side**
M Mode	Provides options for imaging settings during M-mode for the selected image preset.
Display Format	Specifies the display format for 2D/M-mode images. ▪ **1/2 2D, 1/2 Trace** ▪ **1/3 2D, 2/3 Trace** ▪ **2/3 2D, 1/3 Trace** ▪ **Side by Side**
Freeze Behavior	Provides options during system freeze for the selected image preset.
Default Menu on Touch Screen	Assigns the system response to the freeze function during imaging. ▪ **Measurement Menu** activates the measurement function. ▪ **Mode Menu** activates CINE. ▪ **Text Menu** activates text annotations. ▪ **Body Marker Menu** activates body markers. ▪ **Measurement Menu with Caliper** activates the measurement function with a caliper selected. ▪ (Available only for the Cardiac preset when a cardiac transducer is connected to the system) **Measurement Menu with CINE** activates the measurement function with the CINE marker selected.
In Review	Assigns the system response to the freeze function during review. ▪ **Play/Pause CINE** assigns the play/pause clip playback function to the freeze control during review. ▪ **Exit Review** assigns the exit function to the freeze control during review.

Selection	Description
Thermal Index Display	(Requires at least one selection) Identifies the display of acoustic output data in the imaging parameters and settings for the selected image preset.
TIS	When enabled, displays the soft tissue thermal index (TIS).
TIB	When enabled, displays the bone thermal index (TIB).
TIC	When enabled, displays the cranial bone thermal index (TIC).
Doppler Auto TEQ	Provides options for using TEQ technology for Doppler for the selected image preset.
Parameters	Optimizes the selected parameters when using TEQ technology for Doppler. ▪ **Gain** optimizes TEQ gain offset for the current imaging mode. ▪ **Dynamic Range** adjusts the dynamic range. ▪ **Scale/Baseline** adjusts the scale factor of the Pulsed Repetition Frequency (PRF) and the position of the spectral or color baseline.
Mode	Specifies settings for TEQ. ▪ **Off** deactivates TEQ when you freeze the image. ▪ **Entering Freeze** optimizes the overall image brightness uniformity and reactivates real-time imaging (from a frozen image) when you freeze the image.
Doppler Auto TEQ Target Spectral Intensity	Provides options for auto TEQ technology for the selected image preset. ▪ **PW** selects pulsed wave and pulsed wave DTI intensity for gain. – **Low** – **Medium** – **High** ▪ **CW** selects continuous wave intensity for gain. – **Low** – **Medium** – **High** **Note:** The selected intensity applies to the gain when the gain is optimized using TEQ technology for Doppler.

Image Parameter Display

Selection	Description
Patient Information	When enabled, the patient information selections display in the imaging parameters.
Institution Name	Displays the institution name.
Last Name, **First Name**	Displays the patient's last and first name.
Last Name	Displays only the patient's last name.
Date of Birth	Displays the patient's date of birth.
Patient ID	Displays the patient's identification number.
Date & Time	Displays the date and time of the exam.
Operator	Displays the initials or other identifying information of the person performing the patient study.

Imaging Mode	Description
Transducer	Displays the selected transducer.
Exam	Displays the selected image preset.
Thermal Index - Bone (TIB)	Displays the bone tissue thermal index.
Thermal Index - Cranium (TIC)	Displays the cranial bone thermal index.
Thermal Index - Soft Tissue (TIS)	Displays the soft tissue thermal Index.
Mechanical Index (MI)	Displays the mechanical index during real-time imaging.
Frame Rate	When enabled, displays the frame rate.
Transmit Power	When enabled, displays the transmit power.
2D	Lists the imaging parameters and settings for 2D-mode.
3D/4D	Lists the imaging parameters and settings for 3D/4D imaging.
C	Lists the imaging parameters and settings for color imaging.
D	Lists the imaging parameters and settings for Doppler.
M	Lists the imaging parameters and settings for M-mode.
Contrast	Lists the imaging parameters and settings for contrast.

See also: For information about and examples of imaging parameters and settings, refer to Appendix B in the Instructions for Use.

Measurement & Report

See also: For information on measurement and report configuration settings, refer to Chapter 2 in this manual.

See also: For information on obstetric measurement and report configuration settings, refer to Chapter 3 in this manual.

Annotations

See also: For information on customizing body markers and text labels, refer to Chapter 2 in this manual.

Features

Protocols

Selection	Description
Protocols and View	Displays a list of the workflow protocols and associated views.
(List of protocol categories)	Displays a list of categories of protocols. ▪ **All** lists user-defined and system provided protocols. ▪ **Factory Default** lists system provided protocols. ▪ **User Defined** lists protocols created by the user.
(List of protocols)	Displays a list of the protocols and views based on the selected protocol category.
Multiple Select	When enabled, you can select multiple views to copy or delete from a protocol category.
View Details	Lists information about the view, for example, the view name and mode selection.
Add Protocol	Inserts a blank protocol in the list.
Add View	Inserts a blank view in the list. ▪ **View** lists selections for creating a new view for the protocol. ▪ **Body Markers & Text** lists selections for adding body markers and text to the new view for the protocol. ▪ **Measurements** list selections for adding measurements to the new view for the protocol.
Select All Views	Selects all the views for the protocols and applies the edits to all the views.
Replace Text	Predefines text for the selected view.
Copy	Duplicates the selected protocol or view, assigns a name that includes the copied protocol or view name with a numeric extension, and adds the new protocol or view to the list.
Delete	Deletes the selected protocol or view.
Import	Displays a dialog box to copy a protocol from an external storage device.
Export	Displays a dialog box to copy a protocol from the ultrasound system to an external storage device.

Protocol Selections

Selection	Description
Protocol Name	Displays the name of the selected protocol.
Progression	Predefines the next view in the protocol. ▪ **Automatic** activates the next view in the protocol when the current view is complete. ▪ **Manual** waits for the user to select the next view in the protocol when the current view is complete.
Append Paused Images	Predefines images in the protocol. ▪ **Within the Protocol** inserts a newly-saved image at the current location in the list of protocol views when a protocol is paused. ▪ **At the End of the Protocol** inserts a newly-saved image at the end of the list of protocol views when a protocol is paused.
End Protocol	Predefines the ending for the protocol. ▪ **Automatically end when all views completed** ends the protocol when the last view is complete.
At Exit Protocol	Predefines the next step after the protocol is complete. ▪ **Remain in acquisition** continues acquisition when the last view of the protocol is complete. ▪ **Enter Report** displays the patient report when the last view of the protocol is complete. ▪ **Enter Review** activates review when the last view of the protocol is complete.
Export Order	Predefines the sequence of protocol views exported from the ultrasound system.

View Selections

Selection	Description
View	Provides options for the selected view.
View Name	Name of the selected view.
Mode Selection	Lists available imaging modes for the selected view.
Color	Predefines the next step after the protocol is complete. ▪ **Velocity** selects color mode. ▪ **Power** selects power mode.
Color Steer	Predefines the color region of interest. ▪ **None** hides the color region of interest. ▪ Steers the color region of interest to a right angle.  ▪ Steers the color region of interest to the center position.  ▪ Steers the color region of interest to a left angle. 
Save Image With and Without Color	When enabled, saves an image with color and an image without color for a selected view with color mode or power mode. The system stores the images when the mode is activated and when an image is printed or stored.
Auto Trace	Predefines auto trace. ▪ **On** enables auto trace. ▪ **Off** disables auto trace.
Timer	Predefines the timer. ▪ **None** hides the timer when the selected view is activated, if the timer was not started on the previous view. ▪ **Start** starts the timer when the selected view is activated. ▪ **Stop** stops the timer when the selected view is activated.

Selection	Description
Body Markers & Text	Provides options for body markers and annotations for the selected view.
Annotation	Displays annotations for the selected view.
(Annotation text)	Defines the default text annotation for the protocol view.
X	Defines the default horizontal position on the image screen for the annotation.
Y	Defines the default vertical position on the image screen for the annotation.
Reset Position	Repositions text to the home position on the image screen.
Apply to all views	Predefines the location of all annotations for all views.
Body Marker	Predefines the body marker for the selected view.
Exam	Lists available body marker packages and displays the associated body markers.
Transducer Marker	Predefines the transducer marker. ▪ **On** enables a transducer marker for the body marker. ▪ **Off** disables a transducer marker for the body marker.
Orientation	Predefines the angle of the transducer marker on the body marker.
Delete Body Marker	Removes the selected body marker from the list.
Measurements	Provides options for measurements for the selected view.
Number of Measurement Labels	Predefines the quantity of measurement labels. ▪ **None** hides measurement labels. ▪ **1** selects one measurement label. ▪ **2** selects two measurement labels. ▪ **3** selects three measurement labels.
Save Image With And Without Measurements	Predefines one image with measurements and one image without measurements.
Label	Predefines the measurement label. You can predefine up to three measurement labels.
Exam	Lists available measurement packages.
Imaging Mode	Predefines imaging mode for the measurement label. ▪ **2D** activates 2D-mode with the measurement label. ▪ **D** activates Doppler with the measurement label. ▪ **M** activates M-mode with the measurement label.
Label	Predefines the measurement label.

Importing and Exporting Protocols

To import or export a protocol:

1. Connect an external storage device to the ultrasound system.
2. Activate the configuration settings.
3. Click **Features** and then click **Protocols**.
4. To import a protocol, click **Import**.
5. To export a protocol, click **Export**.
6. Select the protocol.
7. To transfer all protocols in the list, click **Select All**.
8. Click **OK**.

Configuring Protocols on a Personal Computer

You can use your personal computer to edit an existing workflow protocol or to create a new protocol.

To configure a protocol on a personal computer:

1. Export one or more protocols from the ultrasound system to an external storage device.

   The system copies the selected protocols and the protocol editor software tool to the external storage device.
2. Insert the external storage device into your personal computer.
3. Double-click **OfflineProtocolEditor.exe**.

   The offline protocol editor software provides the same **Protocol** selections as the configuration menu on the ultrasound system.
4. Use the selections to edit an existing protocol or create a new protocol.
5. Import the protocols from the external storage device to the ultrasound system.

Stress Echo

See also: For information about configuring stress echo settings, refer to Chapter 4 in this manual.

4D Heart AI

See also: For information about configuring 4D Heart AI settings, refer to Chapter 4 in this manual.

2D Heart AI

See also: For information about configuring 2D Heart AI settings, refer to Chapter 4 in this manual.

AI Assist

See also: For information about configuring the AI Assist feature, refer to Chapter 4 in this manual.

Transducer

See also: For information about configuring transducer settings, refer to Chapter 4 in this manual.

Connectivity & Network

See also: For information about configuring network or virtual workstation settings, refer to Chapter 5 in this manual.

See also: For information on DICOM configuration settings, refer to Chapter 6 in this manual.

Export

Selection	Description
Report Data Export	---
Enable Transfer	Specifies options for transferring an XML report to a network destination.
Network File Share	When enabled, defines the destination network path.
Domain/User Name	When enabled, defines the domain or user name for the network resource.
Password	Specifies the domain or user password for the network resource.
Web API	Displays configuration information for the Web application program interface (API).
Server Address	Specifies the numerical label assigned to the server connected to your computer network.
User Name	Specifies your user name.
Password	Specifies the password required to access the Web application program interface (API).
Site	Specifies the web site address.

Peripheral Devices

Footswitch

The ultrasound system supports a three-pedal footswitch. You can assign a function to each pedal.

Selection	Equivalent Control or Selection
Left, **Middle**, **Right**	Identifies the footswitch pedal to assign the control or function.
Burst	(Available only for contrast agent imaging) Starts and stops the burst of contrast agent microbubbles.
Flash Sequence	(Available only for contrast agent imaging) Starts flash sequencing.
Clip Save	Acquires and saves a clip or volume to the ultrasound system and displays the image in the thumbnail panel. Assigns the function of the **CLIP** control to the footswitch.
Color	Activates or deactivates color imaging with 2D and Doppler.
CW	Activates or deactivates the steerable continuous wave (CW) Doppler function for phased array transducers. Assigns the function of the **CW** control to the footswitch.
DVR Record	Records or pauses video.
Auto TEQ	Activates or deactivates Auto Tissue Equalization (Auto TEQ) optimization.
Freeze	Freezes or unfreezes the acquisition of an image, sweep, or spectrum. Assigns the function of the **FREEZE** control to the footswitch.
Full Screen	Activates a full-screen format on the image screen.
Image Store	Captures an image. Assigns the function of the **IMAGE** control to the footswitch.
M Mode	Activates M-mode and displays the M-mode sweep and 2D image according to the format selected in the configuration settings. Assigns the function of the **M** control to the footswitch.
Next View	Activates the next view in the protocol.
Pause/Resume Protocol	Stops or starts the protocol.
Previous View	Activates the previous view in the protocol.
PW	Activates or deactivates the pulsed wave (PW) Doppler function for linear, curved, and phased array transducers. Assigns the function of the **PW** control to the footswitch.
Review	Activates or deactivates review to view images and clips.
Harmonics	Activates or deactivates Harmonics for enhanced contrast resolution.
UD Print	Prints an image, as defined in the configuration settings for print and store.
Update	Activates a selection depending on the active function during Doppler, for example, displays an image in full-screen format during review. Assigns the function of the **UPDATE** control to the footswitch.

DVR

Note: A digital video recorder (DVR) must be connected and set up with permanent access to the ultrasound system before using the selections.

Selection	Description
Enable DVR	When enabled, displays settings for recording video.
Default Video Destination	Specifies the default storage location for video recordings.
Network File Share	Specifies the network file share.
Path	Specifies the path for the network file share.
USB Storage	Specifies the destination for video recordings is a USB compatible storage drive.
USB Device	Specifies the destination for video recordings is a USB-compatible storage device.
File Naming Convention	Specifies the file name format for saving video recordings. ▪ **Patient Last Name** includes the last name of the patient. ▪ **Patient First Name** includes the first name of the patient. ▪ **System Serial Number** includes the serial number of the ultrasound system. ▪ **Date & Time** includes the ultrasound system date and time. ▪ **Exam Type** includes the type of exam.
File names will be saved in this format:	Displays the file name format for saving video recordings.
Auto Start and Stop	Provides options for video recording.
Automatically start video recording when exam starts	When enabled, starts video recording when an exam starts.
Automatically stop video recording when an exam ends	When enabled, stops video recording when an exam ends.

Print/Store

Prerequisite: Ensure a printer or storage device is connected to the ultrasound system.

Selection	Description
Print Routing	Provides selections for configuring print and store functions. ▪ **Control Panel: Image Capture** provides selections for assigning print function to the **IMAGE** control on the control panel. ▪ **Touch Screen: UD Print Control** provides selections for assigning print function to the additional print selection on the touch screen.
BW	Assigns the print function to the designated control for sending black and white images to the selected printer.
Color Doppler	Assigns the print function to the designated control for sending images with color or power data to the selected printer.
Tinted	Assigns the print function to the designated control for sending tinted images to the selected printer.
2D Ref	Assigns the print function to the designated control for sending 2D-mode with pulsed wave Doppler images with color to the selected printer.
Misc.	Assigns the print function to the designated control for sending miscellaneous images to the selected printer. Miscellaneous images include secondary capture images, screen captures, and saved images from review containing multiple images.
Store	When enabled, assigns the store function to the designated control for storing images to the selected storage server.
Image Store	---
Store Server	Lists the storage servers available for storing images.
Image Auto Transfer	Indicates when images transfer to the storage device. ▪ **During Exam** transfers images during the exam. ▪ **End of Exam** transfers images at the end of the exam. ▪ **Disabled** does not transfer images.
Clip Auto Transfer	Indicates when clips transfer to the storage device. ▪ **During Exam** transfers clips during the exam. ▪ **End of Exam** transfers clips at the end of the exam. ▪ **Disabled** does not transfer clips.
SR Auto Transfer	Indicates when data in a Structured Report (SR) format transfers to the storage device. ▪ **End of Exam** transfers data at the end of the exam. ▪ **Disabled** does not transfer the data.
Embed Overlays	When enabled, stores graphics and text as an overlay on an image.
Advanced	Accesses advanced settings for configuring the transfer of patient data. **See also:** For configuring image compression and the number of attempts to send images to a network device, refer to page 1-27.

Selection	Description
Printers	---
Printer	Lists the available printers for printing images.
Auto Transfer	Indicates when patient images are sent to the printer. ▪ **During Exam** prints images during the exam. ▪ **End of Exam** prints images at the end of the exam. ▪ **Disabled** does not print images.
Layout	Lists the layout options for the number of images to print on each page.
Media Size	Specifies the default paper size for printing images and the size of the filming sheet. ▪ **UserDefault** indicates the factory default setting.
Orientation	Lists the print layout options. ▪ **Portrait** ▪ **Landscape**
Formatted by	Specifies the source of the page format. ▪ **System** indicates the ultrasound system as the source of the format. ▪ **Printer** indicates the printer as the source of the format.
Optimize large sheet	When enabled, prints the page without a full page of images.
Advanced	Accesses advanced settings for configuring the film sheets. **Note:** Do not change the advanced settings for transferring patient data.

Configuring Advanced Print and Store Settings

To configure advanced print settings:

Prerequisite: Ensure a printer, storage device, DICOM device, or PACS device is connected to the ultrasound system.

1. Tap the configuration button.
   
2. Click **Peripheral Devices**.
3. Click **Print / Store**.
4. Click the **Image Store** tab, if necessary.
5. To change the type of compression for images sent to a print or storage device connected to the ultrasound system:
   a. Click **Advanced**.
   b. Click the **Local Devices** tab.
   c. Select a **Compression type** setting.
      - **None** indicates exported images are not compressed. No compression is the recommended setting.
      - **Lossless JPEG** indicates exported images are compressed without loss of information. The original quality of the images can be restored.
      - **Lossy JPEG** indicates exported images are compressed with loss of information. Lossy compression is irreversible and can result in the loss of image quality.
   d. Click **OK**.
6. To change the type of compression for images sent to a DICOM or PACS device:
   a. Click **Advanced**.
   b. Click the **Network Nodes** tab.
   c. Select a **Compression type** setting.
      - **None** indicates exported images are not compressed. No compression is the recommended setting.
      - **Lossless JPEG** indicates exported images are compressed without loss of information. The original quality of the images can be restored.
      - **Lossy JPEG** indicates exported images are compressed with loss of information. Lossy compression is irreversible and can result in the loss of image quality.
   d. Click **OK**.

7. To indicate the number of retry attempts to send images to a DICOM or PACS device:
   a. Click **Advanced**.
   b. Click the **Network Nodes** tab.
   c. Select a **Retry** setting.
      - **times with** indicates the number of times the system attempts to send data to the selected network device.
      - **minutes interval** indicates the time interval between attempts to send data to the selected network device.
   d. Click **OK**.

Local Printer

See also: For information about the risks of connecting equipment to the ultrasound system, refer to Chapter 4 in the Instructions for Use.

Selection	Description
Local Printer Settings	---
Configure	Lists the printers connected to the ultrasound system.
Refresh	Refreshes the list of printers.
Add	Accesses options for configuring a printer.
Remove Printer	Deletes the selected printer from the list of printers.
Test Printer	Confirms the configuration of the selected printer.
Add Printer	---
USB Printer is automatically installed when connected.	Installs a printer connected to a USB port on the ultrasound system.

System Management

The system management section provides local and remote access for authorized Siemens Healthineers service representatives to troubleshoot and maintain the ultrasound system.

Users have limited access to the service section. The ultrasound system restricts access to additional options, for example, local service, date and time settings, and regional settings.

System Information

Selection	Description
System Information	Provides identifying information for the ultrasound system.
Serial Number	Displays the unique number identifying the ultrasound system.
Model	Displays the model of the ultrasound system.
Version Details...	Displays information about the installed software.
Detail >	Displays detailed information about the installed software version.
Automatic Disk Management	Provides options for disk management.
Enable Auto Cleanup	When enabled, activates or deactivates deletion of unprotected patient studies when the amount of used storage space reaches a system-defined threshold. Specifies the work status criteria for the deletion of patient studies. ▪ **Archived** deletes archived patient studies. ▪ **Archived & Committed** deletes patient studies archived to and confirmed as archived. ▪ **Sent** deletes patient studies sent to a PACS. ▪ **Sent & Committed** deletes patient studies sent to and confirmed as sent to a PACS.
Fusion Power Line Frequency	---
Frequency	Specifies the power frequency for the Fusion tracking system. ▪ **50 Hz** ▪ **60 Hz**

Automatic Deletion of Transferred Patient Studies

You can configure the system to automatically manage disk space by deleting transferred patient studies when space falls below the automatic deletion threshold.

When automatic disk management is enabled and the amount of used storage space on the local database reaches a system-defined threshold, the system automatically deletes the oldest studies transferred to a PACS.

Criteria for Deletion

Note: Siemens Healthineers recommends that you limit automatic deletion to data that has been sent to a PACS or archive devices only.

To qualify for deletion through automatic disk management, a study must fulfill the following requirements:

- The date on which the study (or most recent series object within the study) was stored to the system is outside the delay threshold. The delay threshold is the number of days prior to the most recent storage date that qualifies for the deletion process.
- All series objects and all images within the study are unprotected (system default).
- The study's work status meets at least one (not necessarily all) of the criteria specified for automatic disk management.

Study Deletion Process

With automatic disk management enabled, the system begins study deletion as a background operation when the amount of used storage space reaches the system's automatic deletion threshold.

Storage space is checked every time an examination ends.

The system deletes older studies first, ignoring the most recently stored studies according to the system's delay threshold.

The storage date of the most recent series object within the study matches the date of the study ("study date"). Use the patient browser to view the study date.

Note: If no studies exist for a patient after the study deletion process, then the system automatically deletes the empty patient folder.

Notification of Storage Space Availability

Regardless of the automatic disk management settings, the system displays a message if the amount of used storage space reaches any of the system's notification thresholds (low warning and full warning).

The low warning message is displayed briefly on the lower left of the screen. The full warning message is displayed within a message box at the bottom of the screen and continues to display until you dismiss the message box.

Automatic Disk Management Thresholds

Automatic Disk Management Threshold	Value
Automatic Deletion	60 percent of the storage space
Low Warning (notification)	65 percent of the storage space
Full Warning (notification)	75 percent of the storage space

Security

You can view the list of enabled and disabled security features on the ultrasound system. A check mark indicates an enabled feature and an X indicates a disabled feature. The checklist also provides selections for configuring security settings.

Selection	Description
syngo Security	Indicates the status of the security feature. (Available only for the ultrasound system administrator) ▪ **Configure** displays a dialog box to set up user accounts. **See also:** For information about configuring user accounts, refer to Chapter 7 in this manual.
Windows 10	Indicates the operating system is Windows 10.
Firewall	Indicates the firewall is active.
Ports	Indicates which ports are open or closed on the ultrasound system. ▪ **Detail** displays a list of the names and descriptions of the ports. **See also:** Enabling Ports, page 1-34
Windows Hotfixes	Indicates which Windows hotfixes are installed on the ultrasound system. ▪ **Detail** lists the name and date of the Windows hotfixes.
User Account Management	Indicates the ultrasound system includes user account management.
Audit Trail	Indicates the ultrasound system is enabled for saving security log files to the archive location. ▪ **Detail** displays additional configuration settings for the audit trail. **See also:** For information about the audit trail for user accounts, refer to Chapter 7 in this manual.
Active Directory	(Available only for the ultrasound system administrator) ▪ **Configure** displays a form for entering domain changes. **See also:** For information on connecting to a domain controller, refer to Chapter 7 in this manual.
Signed Drivers	Specifies all utilized drivers on the system are signed.
FIPS (Federal Information Processing Standard)	Specifies the configuration of the Federal Information Processing Standard (FIPS). (Available only for the ultrasound system administrator) ▪ **Enable** enables or disables FIPS.
BIOS Password	Indicates the ultrasound system has a unique BIOS (basic input/output system) password.
Memory Protection (ASLR, SEHOP, DEP)	Indicates the memory protection is enabled for the operating system. ▪ **ASLR** indicates address space layout randomization is enabled. ▪ **SEHOP** indicates structured exception handling overwrite protection is enabled. ▪ **DEP** indicates data execution prevention is enabled.

Selection	Description
Disk Encryption	Indicates the data storage on the ultrasound system is encrypted.
Unlock USB	Provides access to unlock an encrypted USB storage device connected to the ultrasound system. ▪ **Configure** displays a form for entering a password. **See also:** Unlocking an Encrypted USB Storage Device, page 1-34
Signed Install Media	Indicates the install media is signed.
MDS2	Displays the Manufacturing Disclosure Statement 2 form. ▪ **Detail** displays a file with details regarding the manufacturing disclosure statement for medical device security standard. – **Print** sends the file to the printer. – **Export (USB)** transfers a copy of the file to the external storage device.
OSS Clearance	Displays the open source software included on the ultrasound system. ▪ **Detail** displays a file with details regarding the open source software clearance. – **Print** sends the file to the printer. – **Export (USB)** transfers a copy of the file to the external USB-compatible storage device.
Secure DICOM Transfer	Indicates DICOM is configured for secure transfer. (Available only for the ultrasound system administrator) ▪ **Configure** displays a form for configuring the transfer of DICOM information and certificates. **See also:** For information about DICOM transfer, refer to Chapter 6 in this manual.

Enabling Ports

(Available only for the ultrasound system administrator)

To open or close a port:

1. Activate the configuration settings.
2. Click **System Management** and then click **Security**.
3. Click **Detail** for the **Ports**.
4. Enable or disable a port.

Port Number	Port Group	Protocol
104	**DICOM**	TCP
2762		
137	**NetBIOS Name Service**	TCP
123	**Network Time Protocol**	UDP

Note: The following ports are enabled or disabled only by a Siemens Healthineers service representative.

Port Number	Port Group	Protocol
443	**Remote Services**	TCP

Unlocking an Encrypted USB Storage Device

To unlock an encrypted USB storage device:

1. Insert an encrypted USB storage device into a USB port on the ultrasound system.
2. Tap the additional selections button.



3. Tap **Unlock USB**.
4. Select the USB port with the **[locked]** indicator from the **Available Media** list.
5. If the USB storage device is not listed, ensure the device is connected to the USB port and then click **Refresh**.
6. Enter the password for the encrypted USB storage device.
7. Click **Unlock**.

Service

This section of the configuration settings provides local and remote access for authorized Siemens Healthineers service representatives to troubleshoot and maintain the ultrasound system.

Selection	Description
Local Service	Provides options to install software, back up and restore customized settings (for example, imaging, annotation, and network settings), view service images and licenses, save service logs, and export service images.
Install Software	**Note:** When security is enabled, software installation can be performed only by an administrator. Provides options for installing the software stored on the inserted media. **Note:** Reinstalling software may not securely destroy all patient data on the ultrasound system. For assistance in removing all patient data, contact your Siemens Healthineers service representative.
View Service Images	**Prerequisite:** Insert a USB-compatible storage device into a USB port on the ultrasound system. Displays a screen to view, delete, or export captured service images.
Capture Service Logs	**Prerequisite:** Insert a USB-compatible storage device into a USB port on the ultrasound system. Displays a screen to activate capturing and saving service logs.
View Licenses	Displays a list of licenses and status for the features installed on the ultrasound system.
Event Log	Displays a window to view a record of all service activities and events for a specified time range.
Restore All Defaults	**Note:** When you restore default settings the ultrasound system deletes all customized settings (for example, imaging, annotation, and network settings). This process should be performed only by an administrator. Deletes all customized settings and restores the original factory settings.
Backup	Displays options to back up customized settings (for example, imaging, annotation, and network settings) to the inserted media.
Restore	**Note:** Restoring customized settings should be performed only by an administrator. Displays options to restore customized settings (for example, imaging, annotation, and network settings) from the inserted media.

Selection	Description
Local Service	**Note:** All local service configuration settings are in the English language. Displays a screen for logon access to service options, for example, service level 0 accesses options to back up and restore ultrasound system files, upload a license file, change the host name of the ultrasound system, or view monitor test patterns. ▪ To log on with service access level 0, click **OK**. Access to other service options, for example, hardware tests and utilities or service diagnostic support, requires the purchase of additional service access levels. ▪ To log on with service access above level 0, enter or upload the service key and then click **OK**.
Remote Service	Accesses the remote service access control dialog box.
Remote Service Access Control	The name of the remote service window.
Service Activity	Displays a list of all service activities.
Mode	Assigns the type of access to the ultrasound system. When selecting a level of access, the system briefly displays a symbol:  ▪ **Full Access** provides complete, remote access to the service diagnostic tests on the ultrasound system. **Note:** The system is unavailable for use during full access. ▪ **Remote application support** provides remote access to the ultrasound system. ▪ **Limited access permanent** provides limited remote access to the ultrasound system with no expiration date. ▪ **Limited access** provides limited remote access to the ultrasound system. ▪ **No access** provides no remote access to the ultrasound system. When selected, the system briefly displays a symbol: 
Allow patient data access	When enabled, requests remote access to the patient database for authorized Siemens Healthineers service representatives to troubleshoot the ultrasound system.
Status	Displays the current access status, service mode status, and patient data access status of the following service activities.
OK	Saves changes to the configuration settings.
Apply	Applies changes to the configuration settings.
Cancel	Cancels and removes changes to the configuration settings.
Mail	Sends an email to your Siemens Healthineers service representative.
Properties	Displays the settings configured in the remote service window.
Help	Displays information about using the ultrasound system.

Selection	Description
Local Settings	Exports and imports only the following customized configuration settings: ▪ **System Settings** ▪ **Workflow Enhancement** ▪ **Imaging Settings** ▪ **Measurement & Report** ▪ **Annotations** ▪ **Features** ▪ **Transducer** **Note:** The ultrasound system restarts after importing these settings. **See also:** Refer to the export and import procedure in Chapter 2 in this manual.

Backing Up and Restoring Customized Settings

You can back up customized configuration settings from the ultrasound system to a USB-compatible storage device. Before updating or reinstalling system software, you should back up the customized settings. The restore process overwrites existing customized settings on the ultrasound system.

The name of the backup file includes the backup date, time, ultrasound system serial number, and software version.

Note: If the backup or restore process is unsuccessful, contact your Siemens Healthineers service representative.

To back up customized settings:

Prerequisite: Insert a USB-compatible storage device into a USB port on the ultrasound system.

1. Tap the configuration button.
   
2. Click **System Management**.
3. Click **Service**.
4. Click **Backup**.
5. Select the backup location.
   a. Click the **Available Media** list and then select the location, for example, the USB port with the storage device.
   b. To refresh the list if the USB storage device is not listed, click **Refresh**.
6. Click **Backup filename** and then enter a unique name for the backup file.
7. Click **Backup**.
8. When the **Status** indicates backup is successful, click **Close**.
9. Remove the USB storage device from the ultrasound system.

To restore customized settings:

Prerequisite: Restoring settings requires a permission level of administrator. Insert a USB-compatible storage device with saved backup files into a USB port on the ultrasound system.

1. Tap the configuration button.

2. Click **System Management**.
3. Click **Service**.
4. Click **Restore**.
5. Select the backup file to restore.
   a. Click the **Available Media** list and then select the location, for example, the USB port with the storage device.
   b. To refresh the list if the USB storage device is not listed, click **Refresh**.
   c. Click the **Backup filename** list and then select the backup file.
6. Select the customized settings to copy to the ultrasound system.

Selection	Description
Select all	Selects all settings to copy or apply to the ultrasound system.
Ultrasound Specific	---
Features	Includes user-defined workflow protocols.
Annotations	Includes libraries of user-defined body markers and text annotations.
Measurement & Report	Includes user-defined measurements, measurement labels, measurement packages, exam-specific measurement settings, measurement tools, and reports.
System Settings	Includes general, display, and patient banner settings.
Connectivity & Network	Includes settings for connections to wired networks, DICOM configuration settings, and network locations for importing and exporting patient data.
Peripheral Devices	Includes settings for recording, printing, and storage devices. Also includes footswitch assignments.
System Management	Includes settings for managing the ultrasound system, for example, enabling and disabling ports.
Workflow Enhancement and Imaging Settings	Includes settings for procedures, exams, imaging, and transducers. Also includes capture settings, image display settings, general imaging settings, and settings by image preset type.
Wireless Network	Includes wireless network settings.

Selection	Description
System Service and Security	---
SW Settings02	Includes settings for security, licensing, DICOM structured reporting, print devices, network nodes, import and export directories, and log files.
Clone Package	Restores a backup from a system with a different serial number.
Auto Report	Includes customized report templates and file transfer protocol settings.
Security Settings	Includes customized security settings, for example, user account management, audit trail configuration, Active Directory domain controller settings, and certificates for encrypted DICOM communications.

7. Click **Restore**.
8. Click **OK**.

   The ultrasound system validates and saves the selected settings and then the system restarts to activate the new customized settings.
9. Remove the USB storage device from the ultrasound system.

Adjusting Monitor Settings

(Available only for monitors with a luminance sensor)

You can adjust the monitor to conform with either the image quality standard for Grayscale Standard Display Function (GSDF) or linear gamma display. You can also adjust the image screen by selecting the amount of ambient light present in the scanning environment.

To adjust the monitor settings:

Prerequisite: Obtain the GSDF setting of your picture archiving and communication system (PACS).

1. Tap the configuration button.
   
2. Click **System Management**.
3. Click **Service**.
4. Click **Local Service** and then click **OK**.
5. Click **Monitor Tools** and then click **OK**.
   Note: Monitors with or without a luminance sensor can access and use the test patterns.
6. Select the settings for viewing images.

Selection	Description
Monitor Settings	---
Enable Monitor GSDF	When enabled, the image quality standard for Grayscale Standard Display Function (GSDF) is active. Enable this selection if your PACS has GSDF selected. To enable linear gamma mode, clear the check box. **Note:** The factory-default setting is enabled for PACS with GSDF selected.
Ambient Light	(Available only when **Enable Monitor GSDF** is enabled) Provides selections for the ambient lighting in the scanning environment. Select the lighting of your most frequently used imaging environment. The brightness and contrast of the image screen is adjusted for the selected environment.
DarkRoom	Adjusts the image for a dark room with an illuminance of 0 to 5 lux.
Bedside	Adjusts the image for a patient's bedside or well-lit patient exam room with an illuminance of 120 lux.
OperatingRoom	Adjusts the image for an operating room or bright-lit room with an illuminance of 350 lux.

7. Click "x" in the upper right of each dialog box to save the changes.
8. Restart the ultrasound system to apply the changes.

2 Workflow Configuration Settings

Overview **3**

Customizing Workflow **3**

Creating an Image Preset Based on an Existing Image Preset 3

Designing a Customized Image Preset 5

Imaging Preset Selections Specific to Volume Imaging 7

Customizing Global Image Presets 8

Assigning Annotations, Measurements, and Protocols to an Image Preset 9

Assigning an Exam Association to a Procedure Description 10

Customizing Annotations **11**

Modifying the Touch Screen Layout 13

Customizing Measurements **14**

Configuring General Measurements 15

Configuring Measurement Tools and Measured Results 16

Configuring Exam-Specific Measurement Settings 17

Configuring Settings for a Measurement Label 18

Customizing a Measurement Package 19

Modifying the Touch Screen Layout 21

Creating User-defined Measurement Labels 23

Mapping a Measurement Label for DICOM Structured Reporting 25

Creating User-defined Formulas 28

Additional Selections for User-defined Formulas 29

Reports 31

Exporting and Importing Files with Customized Configuration Settings **33**

Overview

You can import and export the configuration settings described in this chapter from one ultrasound system to another ultrasound system of the same model.

Customizing Workflow

(Available only for ultrasound system administrators)

The exam association selected during patient registration is called an image preset. An image preset consists of the exam association, a transducer, and optimized imaging parameters for the transducer. You can create customized image presets to optimize the workflow of the ultrasound system.

See also: For information on configuration settings for protocols, refer to Chapter 1 in this manual.

Creating an Image Preset Based on an Existing Image Preset

A customized image preset is based on an existing image preset and can be modified. The image preset selected for customization is called a root preset.

See also: For information on designing customized image presets, refer to page 2-5.

To create a customized image preset:

1. Tap the configuration button.
   
2. Click **Workflow Enhancement**.
3. Click **Image Preset Configuration**.
4. Select an image preset from the **Image Preset** list and then click **Create Preset**.
   The system appends the name of the copied image preset with a number, for example, Abdomen (2).
5. Enter a unique name in the **Preset Name** text box.
6. To change the base preset, select another image preset to copy from the **Root Preset** list.
7. Click **OK** to save the image preset.

To modify a customized image preset:

1. Tap the configuration button.

2. Click **Workflow Enhancement**.
3. Click **Image Preset Configuration**.
4. Select an image preset from the **Image Preset** list.

To	Do This
Change the default transducer assigned to an image preset	▪ Select an image preset and then select a transducer in the **Image Presets and Default Transducers** lists. A color identifies the default transducer assigned to the image preset selected during patient registration. **Note:** If the default transducer is not connected to the ultrasound system, the system activates the next transducer in the list during patient registration.
Change the default image preset assigned to a transducer	▪ Select a transducer and then select an image preset in the **Transducers and Default Image Presets** lists. A color identifies the default image preset assigned to the transducer.
Reposition the image presets on the touch screen	**Note:** The image preset at the top of the **Transducers and Default Image Presets** list displays in the leftmost position on the touch screen. ▪ To reposition an image preset on the touch screen, select the image preset name in the list and then click the up or down arrow.
Show or hide the image preset on the touch screen	▪ To include an image preset, select the check box next to the image preset name. ▪ To hide an image preset, clear the check box next to the image preset name. ▪ To show all image presets, select the **Show All** check box. ▪ To hide all image presets, select and then clear the **Show All** check box.
Import or export image presets	**See also:** Exporting and Importing Files with Customized Configuration Settings, page 2-33
Delete a customized image preset	1. Select a customized image preset from the **Image Preset** list and then click **Delete**. The system prevents deletion of factory-defined image presets and the image preset currently in use. 2. Click **OK**.

Designing a Customized Image Preset

You can customize a default image preset, including adding transducers and changing the default image optimization settings.

Note: Actual values on the image screen may vary due to the dependency of a setting on other imaging parameters, for example, frequency of the transducer.

To add transducers to a customized image preset:

1. Tap the configuration button.
   
2. Click **Workflow Enhancement**.
3. Click **Image Preset**.
4. Select an image preset from the **Image Presets** list.
5. To add a transducer to an image preset:
   a. Click **Add transducer**.
   b. Select a transducer name from the **Transducer** list, for example, 10V4.
   c. Select a base image preset name from the **Preset** list, for example, Abdomen.
      Note: The selected image preset is the base, also known as the root preset.
   d. Click **OK**.

   See also: To change the default transducer assigned to an image preset, refer to page 2-3.
6. To delete all transducers added to the selected image preset:
   Note: You cannot restore the transducer list for an active imaging preset.
   a. Click **Restore Transducer List**.
   b. Click **OK** to confirm the deletion.

To design a customized image preset:

1. Tap the configuration button.

2. Click **Workflow Enhancement**.
3. Click **Image Preset**.
4. Select an image preset from the **Image Presets** list.
5. Select a transducer from the **Transducer** list.
6. Click a tab or place your cursor over the left or right arrow to access additional tabs, if applicable.

   Note: Configure the operating mode settings from left-to-right as settings may apply to more than one operating mode, for example, flow settings for pulsed wave and continuous wave Doppler also apply to color and power.

   See also: For information about customizing selections for volume imaging, refer to page 2-7.

7. Customize the default settings for the image preset.

   Note: The ultrasound system saves the configuration settings as you change the settings.

   – To assign the default values to imaging parameters:
     - Click the plus button to increase a setting.

     - Click the minus button to decrease a setting.

   – To assign an initial on or off setting to operating modes, features, and functions on the touch screen:
     - Click a button.

       A color indicates the setting is initially active. Gray indicates the setting is initially inactive.

     - Select settings from drop-down list boxes, for example, baseline.

   – To access additional pages of settings for the touch screen, click the right or left arrow button.

8. To restore the default settings for the image preset:
   a. Click **Restore Defaults :** image preset, transducer.
   b. Confirm the names of the image preset and transducer for deletion.
   c. Click **OK** to delete the customized settings.

Imaging Preset Selections Specific to Volume Imaging

Selection	Description
(operating mode, feature, and tool tabs)	Provides selections available for the transducer by operating mode, feature, or tool, for example: **2D**, **Clarify**, **3D/4D**.
3D/4D	Provides selections for transducers compatible with volume imaging.
3D	Provides imaging parameters specific to 3D acquisition.
4D	Provides imaging parameters specific to 4D acquisition.
Stage of Imaging	Indicates the workflow stage during volume imaging. ▪ **Setup** provides imaging parameters available only during setup. ▪ **Live** provides imaging parameters available only during acquisition.
Imaging Mode	Indicates the mode for image optimization during volume imaging. ▪ **2D Only** provides imaging parameters available only during 2D-mode. ▪ **2D + Color** provides imaging parameters available only during 2D-mode with color.
Editing	Provides selections for transducers compatible with volume imaging. The selections define the default tool for shaping a volume rendering, for example, a closed spline.
Multislice	Provides selections for transducers compatible with volume imaging. The selections define the default layout, for example, a layout of nine parallel slices.

Customizing Global Image Presets

You can apply available settings to all transducer and image preset combinations, for example, you can align the maps and tint settings with the PACS display.

To customize a transducer and image preset combination:

1. Tap the configuration button.

2. Click **Workflow Enhancement**.
3. Click **Image Preset**.
4. Select the **Global Settings** tab.
5. Adjust the settings for **Maps** or **Tint**.

   Note: You cannot undo this setting.

   – Click the plus button to increase a setting.

   – Click the minus button to decrease a setting.

6. Click a category or another tab.

   The system displays a dialog box indicating the settings will be applied to all transducer and exam settings.

7. To save the image preset, click **OK**.
8. To continue without saving the changes, click **Cancel**.

Assigning Annotations, Measurements, and Protocols to an Image Preset

Assign any measurement and report package, body marker, text package, and protocol to an image preset.

To assign preferences to an image preset:

1. Tap the configuration button.

2. Click **Workflow Enhancement**.
3. Click **Exam Association**.
4. Configure your preferences.
   - Select the name of the image preset from the **Image Preset** list.
   - Select a measurement package from the **Measurement & Report Default Calc Package** list.
   - Select a body marker package from the **Annotations Default Body Marker** list.
   - Select an annotation text package from the **Annotations Default Text Package** list.
   - Select a protocol from the **Protocols & Stress Echo Protocols** list.
5. To restore the default settings for all image presets:
   a. Click **Restore Defaults**.
   b. Click **OK** to delete all customized settings.

Assigning an Exam Association to a Procedure Description

You can assign a default exam association to a procedure description. The default exam displays on the patient registration form scheduled procedures. Scheduled procedures require a network connection to a worklist server.

You can also export a file from the ultrasound system, and use a personal computer to edit procedure descriptions.

See also: Exporting and Importing Files with Customized Configuration Settings, page 2-33

To assign an exam association to a procedure description:

Prerequisite: Obtain procedure descriptions from your PACS administrator.

1. Tap the configuration button.

2. Click **Workflow Enhancement**.
3. Click **Procedure Configuration**.

   The system lists procedure descriptions and a list of image presets assigned to the procedure descriptions.
4. Enter a procedure description in the **Requested Procedure Description** text box and then click **Add**.

   Note: The maximum number of characters including spaces is 40.
5. To assign an exam association to a procedure description, select a procedure description and then click exam name.
6. To remove a procedure description, select the procedure description and then click **Delete**.

Customizing Annotations

An annotation package is a collection of use-specific body markers or text labels.

You can select and then customize a body marker package or a text package on the ultrasound system using an annotation package as a base and then delete, group, and rearrange the position of the annotations on the touch screen. You can also add custom text to a text package.

To customize an annotation package:

1. Tap the configuration button.

2. Click **Annotations**.
3. Select the type of annotation.
   - **Body Markers** provides options for configuring a collection of body markers by exam association.
   - **Text** provides options for configuring a collection of text labels by use.

To	Do This
Create an annotation package	1. To copy an existing annotation package, select a name in the list of annotation packages and then click **Create Package**. 2. To create a new annotation package, click **Create Package**. 3. Enter a unique name in the **Package Name** text box. 4. Select a **Root Package**, if necessary. 5. To save the package, click **OK**. The system displays the **Touch Screen Layout Editor** tab. **See also:** For information on modifying the touch screen layout of an annotation package, refer to page 2-13.
Rename a custom package	1. Select a custom package. 2. Enter a unique name in the **Package Name** text box. The prior name displays in the list until you select another name.
Show or hide an annotation package on the touch screen	▪ To include a package in the list, select the checkbox next to the package name. ▪ To hide a package, clear the checkbox next to the package name. ▪ To show all packages, select the **Show All** check box. ▪ To hide all packages, select and then clear the **Show All** check box.
Reorganize the list of annotation packages on the touch screen	**Note:** The order of the package names in the list identifies the order of packages on the touch screen when the annotations feature is enabled. ▪ Select the package name and then click the up arrow or the down arrow to reposition the name in the list.

To	Do This
Delete a custom annotation package	1. Select the package name. 2. Click **Delete**. 3. To delete the package, click **OK**. 4. To cancel the deletion, click **Cancel**.
Display a label matching the first characters you enter on the image screen	▪ Select the **Auto text complete** check box.

4. To delete annotations when you unfreeze the image, select a check box:
   – **Delete Text on unfreeze** deletes text annotations when you unfreeze the image during the use of any package.
   – **Delete Body Markers on unfreeze** deletes body markers when you unfreeze the image during the use of any package.

Modifying the Touch Screen Layout

You can modify the organization of body markers or text labels on the touch screen by rearranging body markers or labels, adding categories of labels, and organizing pages of annotations.

To modify the touch screen layout:

1. Tap the configuration button.

2. Click **Annotations**.
3. Click **Body Marker** or **Text**.
4. Select the name of the annotation package.
5. Click the **Touch Screen Layout Editor** tab.

To	Do This
Add a body marker	▪ Click a body marker in the library and then click a button.
Remove a body marker	▪ Double-click the body marker button.
Select body markers from another package	**Note:** The default library of body markers or text annotations is the package designated as the **Root Label** for the custom package. ▪ Select a different package from the **Body Marker Package** list.
Add a new page of annotations	▪ Click **New Page**.
Delete a page of annotations	▪ Click **Delete Page**.
Add a text label	▪ Click any **Text** label on a button and then enter text using the keyboard.
Remove a text label	▪ Click the text label on a button and then repeatedly press backspace on the keyboard to delete the text.
Add a text group	▪ Click **Add Text Group**. The system adds a column of buttons as a text group.
Reposition a text group	1. Click a button in the text group. 2. To reposition the text group to the left, click the move left button.  3. To reposition the text group to the right, click the move right button. 
Add additional buttons to the text group	1. Click a button in the text group. 2. Click the add button.  The system adds a new column to the right of the selected button in the text group. **Note:** You can add up to six columns of buttons on each page.
Delete a column from a text group	1. Click a button in the column of the text group. 2. Click the delete column button.
Delete a text group	1. Click a button in the text group. 2. Click the delete text group button.  3. To confirm the deletion, click **OK**.

Customizing Measurements

The configuration settings include selections for predefining measurement and report preferences.

To access the configuration settings:

1. Tap the configuration button.

2. Click **Measurement & Report**.
3. Click the required selection.
   - **Measurement** includes general and use-specific measurement configuration options.
   - **Touch Screen Measurement Config** includes options for repositioning, displaying, and hiding measurement labels on the touch screen. This selection also includes options for creating and editing custom measurement categories. A measurement category is a group of measurement labels based on their use.
   - **Custom Measurement Label** includes options for creating and editing user-defined measurement labels.
   - **Custom Calculations** includes options for creating and editing user-defined formulas.
   - **Report** includes options for configuring the patient report.
   - **OB Tables** includes options for configuring gestational age, fetal growth, and estimated fetal weight tables.

     See also: For information about customizing obstetric measurements, refer to Chapter 3 in this manual.

Configuring General Measurements

You can customize measurement tools, measurements, and calculations for use with all exams on the ultrasound system.

To configure general measurements:

1. Tap the configuration button.

2. Click **Measurement & Report**.
3. Click **Measurement**.
4. Click the **General** tab.

To	Do This
Show or hide dotted lines between the beginning and ending measurement markers during 2D measurements	▪ To show the lines, select the **Draw Dotted Lines Between Calipers** check box. ▪ To hide the lines, clear the check box.
Show or hide a negative symbol for a measurement value less than zero during Doppler velocity measurements	▪ To show the symbol, select the **Show Negative Symbol** check box. ▪ To hide the symbol, clear the check box.
Configure the number of heart cycles for the heart rate tool	▪ Select a number from the **Number of Heart Cycles** list.
Show calculations in the measured results	1. Enter a label in the search text box. Or, use the scrollbar to locate a label name. 2. Select the check box next to the calculation label. 3. To remove the calculation label from the measured results, clear the check box.

Configuring Measurement Tools and Measured Results

You can configure default settings for measurement tools and the presentation of measured results for each measurement package.

To configure measurement tools and measured results:

1. Tap the configuration button.

2. Click **Measurement & Report**.
3. Click **Measurement**.
4. Click the **Exam Package** tab.
5. Select the required measurement package from the **Exam Package** list.

To	Do This
Show or hide measurement markers during CINE	▪ To show the markers, select the **Erase in CINE** check box. ▪ To hide the markers, clear the check box.
Specify default measurement tools	▪ For volumes, select an option from the **Volume Tool** list, for example, three distance measurements or an ellipse and a distance measurement. ▪ For area percentage stenosis, select an option from the **Area %Stenosis Tool** list, for example, ellipse or trace. ▪ For area ratios, select an option from the **Generic Area Ratio** list, for example, ellipse or trace. ▪ For Doppler measurements, select an option from the **Default Tool** list, for example, velocity or acceleration. ▪ For volume flow: a. Select a 2D measurement tool from the **Volume** list, for example, distance or ellipse. b. Select a Doppler measurement tool from the **Flow** list, for example, heart cycle.
Assign the unit of measure	▪ Select an option from the **Unit** list, for example, millimeters or centimeters.
Specify the precision for the measured result using whole numbers or decimals (in tenths or hundredths)	▪ Select an option from the **Precision** list, for example, 0 or 0.00, where zero represents the measured value.
Show or hide a result on the image screen	▪ To show the result, select the check box next to the result name. ▪ To hide the result, clear the check box next to the result name.

See also: For additional information about measurement tools, refer to Chapter 10 in the Instructions for Use.

Configuring Exam-Specific Measurement Settings

You can configure settings for use-specific measurements.

To configure measurement settings for an exam:

1. Tap the configuration button.

2. Click **Measurement & Report**.
3. Click **Measurement**.
4. Click the **Exam Specific** tab.

To	Do This
Configure settings for obstetric use	**See also:** For information about customizing obstetric measurements, refer to Chapter 3 in this manual.
Specify the default setting for calculating a prostate weight	▪ Select a setting for the **Prostate Specific Gravity**, for example, 1.0 or 1.05.
Specify the default settings for calculating the ratio of the internal carotid artery and common carotid artery	1. Select a setting for the **Carotid Ratio** numerator, for example, proximal or distal internal carotid artery. 2. Select a setting for the **Carotid Ratio** denominator, for example, middle or maximum common carotid artery. **Note:** You can change the numerator and denominator in the report.
Specify the number of heart cycles measured during a cardiac study by AI Measure	▪ **Doppler** specifies the number of heart cycles measured on a Doppler spectrum. ▪ **M Mode** specifies the number of heart cycles measured on an M-mode sweep.

Configuring Settings for a Measurement Label

You can configure settings for a measurement label in each measurement exam package.

See also: For additional information about measurement tools, refer to Chapter 10 in the Instructions for Use.

To configure settings for labels in a measurement exam package:

1. Tap the configuration button.

2. Click **Measurement & Report**.
3. Click **Measurement**.
4. Click the **Per Label Configuration** tab.
5. Select the required exam package from the list.
6. Enter a label in the search text box. Or, use the scrollbar to locate a label name.

   The system selects and highlights the label name.

To	Do This
Specify the default method for measuring or calculating the selected label name for each operating mode	▪ Select options from the **Default Tool and Method** list for each operating mode. – Select the default measurement tool from the list. – Select an option for using the most recent measurement or an average of measurements, for example, mean, minimum, or maximum.
Assign the unit of measure	▪ Select an option from the **Unit** list, for example, centimeters squared or centimeters per second.
Specify the precision for the measured result using whole numbers or decimals (in tenths or hundredths)	▪ Select an option from the **Precision** list, for example, 0 or 0.00, where zero represents the measured value.
Show or hide a result on the image screen	▪ To show the result, select the check box next to the result name. ▪ To hide the result, clear the check box next to the result name.
Restore the factory settings for the default method, unit of measure, and precision for the selected label	▪ Click **Restore**. **Note:** The name of the label displays on the restore button.
Apply configuration settings to similar labels	1. Click **Find Similar Labels**. The system displays all related label names. 2. To exclude a label, clear the check box next to the label name. 3. To apply the changes to all labels, click **Apply to Similar Label**.
Show or hide the caliper indicating end diastole during Doppler velocity measurements	▪ To show the caliper indicating end diastole, enable the **ED** check box. ▪ To hide the caliper, clear the check box.
Show or hide time-averaged traces during Doppler velocity measurements	▪ To show the time-averaged maximum velocity trace, enable the **TAMx** check box. ▪ To hide a time-averaged trace, clear the check box.

Customizing a Measurement Package

A measurement package is a collection of use-specific measurement labels.

You can select and then customize a measurement package on the ultrasound system. The package selected for customization is called a root package.

- **Root Package** identifies the base library of use-specific measurement labels for the custom package.
- A **Root Package** of **None** indicates there is no base measurement package. All libraries of measurement labels are available for the custom package.

To customize a measurement package:

1. Tap the configuration button.

2. Click **Measurement & Report**.
3. Click **Touch Screen Measurement Config**.

To	Do This
Create a measurement package	1. To copy an existing measurement package, select a name in the list of **Measurement Packages** and then click **Create Package**. The system appends the name of the copied measurement package with a number, for example, Abdomen (2). 2. To create a new measurement package, click **None** in the list of **Measurement Packages** and then click **Create Package**. 3. Click **Package Name** and then enter a unique name. 4. To save the package, click **OK**. The system displays the **Touch Screen Layout Editor** tab. **See also:** For information on modifying the touch screen layout of a measurement exam package, refer to page 2-21.
Rename a custom package	1. Select the package name. 2. Click **Package Name** and then enter a unique name. The prior name displays in the list until you select another name.
Show or hide a measurement package on the touch screen	▪ To include a measurement package in the list, select the check box next to the package name. **Note:** Included measurement packages are accessible on the touch screen by activating the measurement function and then tapping exam package. ▪ To hide a measurement package, clear the check box next to the package name. ▪ To show all measurement packages, select the **Show All** check box. ▪ To deselect all packages, select and then clear the **Show All** check box.

To	Do This
Reorganize the list of measurement packages on the touch screen	**Note:** The order of package names identifies the order of measurement exam packages on the touch screen when the measurement function is enabled. ▪ Select the package name and then click the up arrow or the down arrow to reposition the name in the list.
Restore a factory-defined measurement package to the original settings	1. Select the package name. 2. Click **Restore Defaults**. 3. To restore the original settings, click **OK**. **Note:** The following items are reverted: categories, subcategories, measurement labels, and layout. 4. To cancel the restoration, click **Cancel**.
Delete a custom measurement package	1. Select the package name. 2. Click **Delete**. 3. To confirm the deletion, click **OK**. 4. To cancel the deletion, click **Cancel**.

Modifying the Touch Screen Layout

You can modify the organization of measurement labels on the touch screen by rearranging labels, adding categories and subcategories of labels, and organizing pages of label selections.

See also: For an overview of the touch screen during the measurement function, refer to Chapter 10 in the Instructions for Use.

To modify the touch screen layout:

1. Tap the configuration button.

2. Click **Measurement & Report**.
3. Click **Touch Screen Measurement Config**.
4. Select the name of the measurement package.
5. Click the **Touch Screen Layout Editor** tab.

To	Do This
Access labels for an operating mode	▪ Select an **Imaging Mode**. **Note:** Available operating modes are transducer and image preset dependent.
Add a measurement label	▪ Drag a label from the list of measurement packages to a button in the layout preview. Or, double-click a label in the list to place the label on a button.
Find a label	▪ Select another package in the **Measurement Label Library** to filter the measurement labels by a use-specific library. ▪ Enter a label name in the search box. ▪ Scroll the measurement library list.
Reposition a label	▪ Drag the label to the required location in the layout preview.
Delete a label	▪ Drag the label in the layout preview to the library list.
Add a category or measurement labels	**Note:** The system allows a maximum of five categories for general imaging exams and a maximum of ten categories for cardiac exams. 1. Click **Add Group**. 2. Select a category to copy from the **Group** list. **Note:** You can select a different base package to change the list of available categories. The system appends a number to the name of a copied category, for example, Systemic Side (2). 3. To select a location on the touch screen for the category, click a placement, for example, **Placement 1**. 4. Click **Group Name (New)** and then enter a unique name for the category. 5. Click **OK**.

To	Do This
Add a subcategory of measurement labels	1. Click **Add Subgroup**. 2. Select a subcategory to copy from the **Sub Group** list. **Note:** You can select a different base package or a different group to change the list of available subcategories. The system appends a number to the name of a copied subcategory, for example, Aorta (2). 3. To select a location on the touch screen for the subcategory, click a placement, for example, **Placement 1**. 4. Click **Sub group Name (New)** and then enter a unique name for the subcategory. 5. Click **OK**.
Rename a category or subcategory of labels	▪ Select the name and then enter a new name.
Reposition a category or subcategory of labels	1. Click a button in the category or subcategory group. 2. To move the group to the left, click **<** on the group bar. 3. To move the group to the right, click **>** on the group bar.
Delete a category or subcategory of labels	1. Click a button in the category or subcategory group. 2. Click **x** on the button. 3. To confirm the deletion, click **OK**.
Add or delete a page of measurement labels	▪ To add a page of labels, click **New Page**. ▪ To remove a page of labels, **Delete Page**. ▪ To access the next page or previous page of labels, click an arrow on either side of the page number.

Creating User-defined Measurement Labels

You can create user-defined measurement labels by defining a label root and then adding system-defined modifiers and segments, for example, left, right, proximal, middle, distal, origin. The ultrasound system indicates user-defined measurement labels with an asterisk (*) in configuration settings.

Note: The following labels cannot be copied, edited, or remapped: length label, width label, and anterior-posterior labels.

To create a user-defined measurement label:

Prerequisite: Knowledge of operating modes, measurement tools for the ultrasound system, and DICOM structured reporting.

1. Tap the configuration button.

2. Click **Measurement & Report**.
3. Click **Custom Measurement Label**.
4. To create a new measurement label:
   a. Click **New**.
   b. Enter a label name, excluding modifiers and segments, in **Label Root**.

      Note: The ultrasound system displays the name on the touch screen when the selected measurement exam package is active.
5. To use an existing measurement label as a template:
   a. Select a label.

Selection	Description
Exam Package	Displays a list of the measurement exam packages, including the following categories of measurement labels. ▪ **All** displays a list of default or user-defined labels for all exam packages.
Custom Measurements	When enabled, displays a list of user-defined labels for the selected measurement exam package.
(search text box)	Enter the name of a label to filter the **Label Root** list.

   b. Click **Copy**.

6. To edit an existing user-defined measurement label, select the label in the **Label Root** list and then click **Edit**.
7. Enter or edit the following information for the measurement label.

   Note: Required selections are indicated with an asterisk (*) in the configuration settings.

Selection	Description
Label Root	Displays a list of measurement labels without modifiers or segments. You can filter the label root list using the measurement exam package list, the search text box, or the scrollbar to locate a measurement label.
Exam Package	Assigns the label to the selected measurement exam package.
Modifiers	When enabled, the ultrasound system generates modifiers for the anatomical location of the label root. ▪ **Right / Left** indicates the patient's right and left anatomy.
Segments	(Not available for obstetric, early obstetric, gynecology, and fetal echo exams) When enabled, the ultrasound system generates segment prefix modifiers to identify the anatomical location of the label root. ▪ **None** indicates no segments. ▪ **Prox** indicates proximal. ▪ **Mid** indicates mid. ▪ **Dist** indicates distal. ▪ **Origin** indicates origin.
Measurement Type	(Available only for obstetric, early obstetric, and fetal echo exams) Indicates the type of obstetrical measurement. ▪ **Fetal** indicates the label is available for all fetuses. ▪ **Maternal** indicates the label is available for the mother.
Tools	Tab of selections for defining the measurement label.
Imaging Mode	Indicates the measurement tools available for the label by mode: **2D Mode**, **Doppler Mode**, **M-Mode**.
Report Section	Indicates the section the label displays in the report. A custom measurements section is also available.
Tools	Displays a list of available tools for the selected mode. Select the check box to enable the tool for the measurement label.
Label	Displays the label root associated with the tool.
2D Mode	Displays the 2D-mode tools available for assigning to the label.
Doppler Mode	Displays the Doppler tools available for assigning to the label.
M Mode	Displays the M-mode tools available for assigning to the label.

8. To include the label in DICOM structured reporting, click the **SR Template** tab.
9. To save the label, click **Save All & Close**.

   Note: If you do not map a user-defined label for DICOM structured reporting, the measured result is excluded from the structured report.

To delete a user-defined measurement label:

1. Select a user-defined measurement label.
2. Click **Delete**.
3. Click **OK**.
4. To cancel the deletion, click **Cancel**.

Mapping a Measurement Label for DICOM Structured Reporting

You must map a user-defined measurement label to include the measured result in DICOM structured reporting (SR). The ultrasound system provides sections and codes for mapping a measurement label to a DICOM SR template structure.

You can edit the SR mapping of system-defined measurement labels, except Stenosis labels.

To include a measurement label in DICOM structured reporting:

1. Tap the configuration button.

2. Click **Measurement & Report**.
3. Click **Custom Measurement Label** and then select the required measurement label.
4. Click the **SR Template** tab.
5. Select the structured reporting template for the measurement label.

   Note: Required selections are indicated with an asterisk (*) in the configuration settings.

Selection	Description
SR Template	Identifies the DICOM structured reporting (SR) template. ▪ **OB-GYN** selects template identification (TID) 5000 OB-GYN Ultrasound Procedure Report. ▪ **Fetal Echo** selects TID 5220 Pediatric, Fetal and Congenital Cardiac Ultrasound Reports. ▪ **Vascular** selects TID 5100 Vascular Ultrasound Procedure Report. ▪ **Cardiac** selects TID 5200 Echocardiography Ultrasound Procedure Report. **Note:** The ultrasound system displays the structured reporting template for the selected measurement exam package. When more than one measurement exam package is selected, you must select one structured reporting template.
SR Template Section	Lists available sections for the selected SR template. **Note:** If the template identification (TID) sections are not applicable to the measurement label, a user-defined results section is available.
Anatomy or Vessel	(Available only for double concept codes) Lists predefined anatomical structure or a vessel for the structured report. The predefined anatomy or vessels are based on the selected SR template section. ▪ **Anatomy** lists anatomical structures. ▪ **Vessels** lists vascular structures. **Note:** You cannot modify the coding scheme designator and code value for predefined structures. To customize the coding scheme designator and code value, enter a user-defined anatomical or vascular structure. ▪ User defined anatomy or vessel.

Selection	Description
Coding Scheme Designator	Identifies the source of the code. ▪ **LN** indicates the mapping is defined by Logical Observation Identifiers Names and Code (LOINC). ▪ **SRT** indicates the mapping is defined by Systematized Nomenclature of Medicine Reference Terminology (SNOMED RT). ▪ **DCM** indicates the mapping is defined by Digital Imaging and Communications in Medicine (DICOM). ▪ **99SIEMENS** indicates the mapping is factory defined. ▪ **New** creates a user-defined coding scheme designator. Use 99 as a prefix to indicate a private coding scheme designator, for example, 99NAME, where NAME is the name of your facility. The maximum number of characters, including the prefix, is 16.
Code value	System-generated based on the selected predefined anatomy or vessel. **Note:** If you created a user-defined anatomy or vessel, you must also create a user-defined code value. The maximum number of characters is 16.

6. Click the **SR Mapping** tab.
7. Map each tool result for the measurement label.

Selection	Description
Tools & Outputs	Lists the measurement tools assigned to the measurement label and each tool result. **Note:** Map each tool result for structured reporting.
Text String for SR	Adds a user-defined description of the tool result.
Concept Code Meaning	Provides a list of concept code meanings for a tool result. When you select a predefined meaning, the system completes the following fields: **Coding Scheme Designator**, **Code value**. **Note:** If you create a user-defined concept code meaning, you must also specify the coding scheme designator and code value.
Post-prandial	(Available for vascular exams) When enabled, specifies the measurement is taken after a meal.
Measurement Orientation	(Available for obstetric, early obstetric, gynecological, and vascular exams) Specifies the position of the measurement, for example, longitudinal.
Measurement Method	(Available for fetal echo exams) Specifies the echo measurement method, for example, Planimetry.
Finding Site	(Available for fetal echo exams) Specifies the echo anatomic site, for example, Cardiac valve annulus.

Selection	Description
Flow Direction	(Available for fetal echo exams) Specifies the direction of blood flow.
Cardiac Cycle Point	(Available for fetal echo exams) Specifies the cardiac phase.
Image View	(Available for fetal echo exams) Specifies the echocardiography image view.
Previous Output	Displays the previous measured result in the **Tools & Outputs** list.
Next Output	Displays the next measured result in the **Tools & Outputs** list.

8. Click **Next Output**.
9. To exit while SR mapping is in progress, click **Cancel**.
   The ultrasound system saves only the user-defined measurement label.
10. Click **Save**.
    The ultrasound system saves the measurement label and the SR mapping definitions.

To restore system-defined SR mapping for a predefined measurement label:

1. Select the measurement label.
2. Click **Restore SR Mapping**.

Creating User-defined Formulas

You can create custom calculations (formulas) and display their calculated results in the measured results and report. You can also back up and restore custom calculations.

To create or edit a user-defined formula:

Prerequisite: Knowledge of mathematical formulas.

1. Tap the configuration button.

2. Click **Measurement & Report**.
3. Click **Custom Calculations**.

To	Do This
Create a new calculation	▪ Click **New** and then enter a name for the calculation.
Use an existing formula as a template	1. Select a calculation name in the **Custom Calculations** list and then click **Copy**. A number is appended to the name of the copied calculation. 2. Update the name of the calculation in the **Name** field.
Edit an existing formula	▪ Select a calculation name in the **Custom Calculations** list and then click **Edit**.
Enter or edit the formula in the calculation box at the point of entry	**Note:** A green arrow (^) indicates the point of data entry in the formula box. ▪ Select an exam package, measurement label, result label, and unit. ▪ Select functions, numbers, and operators on the system configuration page. ▪ Use the touch screen or keyboard to enter or edit data. ▪ Use the trackball or the arrows on the keyboard to reposition the point of data entry.
Enter or update the formula settings	▪ Select the units and precision for the calculated result. ▪ Indicate whether the result displays in the measured results. ▪ Indicate whether the result displays in the report and identify the report section.
Save the custom calculation	▪ Ensure the formula is correct and then click **Save**. **Note:** A red squiggle line indicates a formula is incomplete but does not identify any error in a formula that could provide an incorrect result.
Cancel creation or edit of the custom calculation	▪ Click **Cancel**.
Map the custom calculation for structured reporting	▪ Tap the **SR Mapping** tab. **See also:** For information about mapping the measurement label for structured reporting, refer to page 2-25.

To delete a user-defined formula:

1. Access the **Custom Calculations** configuration settings.
2. Select a calculation in the **Custom Calculations** list.
3. Click **Delete**.

Additional Selections for User-defined Formulas

Selection	Description
Custom Calculations	Lists all user-defined formulas.
Formula	---
Name	Indicates the name of the user-defined formula.
Units	Specifies the unit of the calculated result, for example, degrees (°).
Precision	Specifies the decimal placement for the formula result: ▪ **0** indicates a whole number ▪ **1** indicates the number is to the tenth decimal place ▪ **2** indicates the number is to the hundredth decimal place
Report Section	Indicates the section of the report for including the measurement and calculation result supported by the formula.
(formula box)	Provides a data entry box for the formula. A green arrow (^) indicates the point of data entry in the formula box.
Save	Adds the user-defined formula to the list of custom calculations. The system enables the save button when the calculation can be performed, but the system cannot verify the accuracy of the formula. **Note:** You must ensure the formula is correct.
Cancel	Cancels creation or edit of the formula.
Show in Measured Results	When enabled, displays measured and calculated values for the formula in the measured results.
Show in Report	When enabled, displays measured and calculated values for the formula in the report.
Exam Package	Displays a list of exam packages.
(search text box)	Provides a text box to search for measurement labels.
(list of measurement labels and calculations)	Displays a list of measurement labels and calculations.
Result Labels	Lists the measured results for the selected measurement label. **See also:** For an explanation of the abbreviations included with measured results, refer to Chapter 10 and Chapter 11 in the Instructions for Use.
Units	Lists the units for the selected measurement label. **See also:** For a list of the units included with measured results, refer to Chapter 10 and Chapter 11 in the Instructions for Use.

Selection	Description
(functions, numbers, and operators)	Provides functions, numbers, and operators for the formula, including the following selections: ▪ **ATAN** indicates the arc tangent function ▪ **TAN** indicates the tangent function ▪ **COS** indicates the cosine function ▪ **SIN** indicates the sine function ▪ **Min** indicates minimum ▪ **Max** indicates maximum ▪ **Abs** indicates the absolute value ▪ **,** indicates a comma separator ▪ **MinOfAny** indicates minimum of any ▪ **MaxOfAny** indicates maximum of any ▪ **MeanOfAny** indicates mean of any ▪ **First** indicates first ▪ **sqrt** indicates square root ▪ **ln** indicates natural logarithm ▪ **log** indicates logarithm ▪ **e** indicates the base of the natural logarithm ▪ **pi** indicates pi
Add	Adds the selected measurement label, function, number, or operator at the point of data entry in the formula box.

Reports

Selection	Description
Report Content	Provides options for displaying or hiding sections in a report.
Show	Displays or hides a specified section in the patient report. **Note:** Measured values do not display in a report if the corresponding section is hidden.
Expand All or Collapse All	Displays or hides all sections in the patient report.
Assessments	Provides options for displaying or hiding assessments in a report.
(name of the assessment)	Displays a list of the assessments in the report.
Show	Displays or hides an assessment in the patient report.
Create Custom Assessment Items	Provides selections to create and delete user-defined assessments for reuse in a report.
Type	Specifies the format for the assessment. ▪ **Checklist** selects a check box. ▪ **Comment Text Box** selects a text box.
Label	Specifies the name of the label.
Add	Inserts the user-defined assessment into the list.
Delete	Removes the selected user-defined assessment from the list.
Comments	Provides options for adding comments in a report.
Comments for Exam Package:	Provides options for the following selections.
(name of the exam package)	Displays a list of the measurement exam packages.
(text box)	Enter a name for the user-defined comment.
Add	Inserts the user-defined comment into the list.
(text box)	Displays a list of the recently added user-defined comments.
Delete	Removes the selected user-defined comment from the list.

To customize the report template:

Prerequisite: Connect a USB-compatible storage device to the ultrasound system.

1. Tap the configuration button.

2. Click **Measurement & Report**.
3. Click **Report**.
4. Select the **Report Template** tab.

To	Do This
Add your hospital, institution, or facility logo to the report template	1. Click **Load**. 2. Select a USB-compatible storage device from the **Available Media** list. 3. Select the logo. **Note:** The maximum width for the logo is 250 pixels. The maximum height for the logo is 100 pixels. 4. Click **Load Image**.
Delete the logo from the report template	1. Click **Remove**. 2. Click **OK**.
Enter additional details in the report template	1. Enter up to three lines of text, for example, the name and address of your hospital, institution, or facility. 2. Select a font size and style for each line of text from the **Font Size** list.
Specify a layout for the report template	▪ Select an option from the **Template** list, for example, the position of the text and the logo.

Exporting and Importing Files with Customized Configuration Settings

You can export files with specific configuration settings from the ultrasound system to a USB-compatible storage device and then import the files to other ultrasound systems of the same model.

See also: For information about backing up and restoring all configuration settings, refer to Chapter 1 in this manual.

To export a file with customized configuration settings:

Prerequisite: Connect a USB-compatible storage device to the ultrasound system.

1. Tap the configuration button.

2. Access the configuration settings to export a file from the ultrasound system:

To	Do This
Export scheduled procedure descriptions	1. Click **Workflow Enhancement**. 2. Click **Procedure Configuration**.
Export image presets and default transducer assignments	1. Click **Workflow Enhancement**. 2. Click **Image Preset Configuration**.
Export body marker packages	1. Click **Annotations**. 2. Click **Body Marker**.
Export text annotation packages	1. Click **Annotations**. 2. Click **Text**.
Export measurement packages	1. Click **Measurement & Report**. 2. Click **Touch Screen Measurement Config**.
Export protocols	**See also:** Refer to Chapter 1 in this manual.
Export the local settings	**Note:** Local settings do not include the following customized configuration settings: **Imaging Settings**, **Connectivity & Network**, **Peripheral Devices**, and **System Management**. **See also:** For information about backing up all customized configuration settings, refer to Chapter 1 in this manual. 1. Click **System Management**. 2. Click **Service**.

3. Click **Export**.
   a. Select the USB storage device from the **Available Media** list.
   b. If the USB storage device is not listed, ensure the device is connected to the USB port and then click **Refresh**.
4. (For packages only) If you are exporting a package, select the name of the measurement exam package. Or, click **Select all** to export all packages.
5. Enter or edit the name of the file in the **File Name** text box.
   – **.xlsx** indicates a file you can edit on your personal computer, for example, the scheduled procedure descriptions
   – **.image** indicates a file with image presets and default transducer assignments
   – **.anno** indicates a package of text annotations
   – **.body** indicates a package of body markers
   – **.calc** indicates a package of measurement labels
   – **.rp** indicates a file with specific local settings
6. Click **OK**.

To import a file with customized configuration settings:

Prerequisite: Connect a USB-compatible storage device to the ultrasound system.

1. Tap the configuration button.

2. Access the configuration settings to import a file to the ultrasound system:

To	Do This
Import scheduled procedure descriptions	1. Click **Workflow Enhancement**. 2. Click **Procedure Configuration**.
Import image presets and default transducer assignments	1. Click **Workflow Enhancement**. 2. Click **Image Preset Configuration**.
Import body marker packages	1. Click **Annotations**. 2. Click **Body Marker**.
Import text annotation packages	1. Click **Annotations**. 2. Click **Text**.
Import measurement packages	1. Click **Measurement & Report**. 2. Click **Touch Screen Measurement Config**.
Import protocols	**See also:** Refer to Chapter 1 in this manual.
Import the local settings	**Note:** Local settings do not include the following customized configuration settings: **Imaging Settings**, **Connectivity & Network**, **Peripheral Devices**, and **System Management**. **See also:** For information about restoring all customized configuration settings, refer to Chapter 1 in this manual. 1. Click **System Management**. 2. Click **Service**.

3. Click **Import**.
   a. Select the USB storage device from the **Available Media** list.
   b. If the USB storage device is not listed, ensure the device is connected to the USB port and then click **Refresh**.
4. Select the file to import from the **File Name** list and then click **OK**.
5. (For packages only) If the file contains a duplicate name existing on the ultrasound system, select an option.
   – **Update** overwrites the settings for the exam on the ultrasound system.
   – **Rename** displays selections to edit the duplicate name.
   – **Ignore** keeps the dialog box open for subsequent action.
   – **Cancel** stops the import process and closes the dialog box.
6. Remove the USB storage device from the ultrasound system.
   Note: The ultrasound system restarts after importing the local settings.

3 Obstetric Measurement Configuration

Overview **3**
Designating the Reference Author 3
Customizing Obstetric Tables 4
Selecting the Default Measurement Method 7
Customizing the Display of Fetal Information 8

Overview

You can modify features of obstetric and early obstetric measurements, including the default author used for obstetric calculations. You can also create, edit, and delete custom gestational age tables and fetal growth tables (growth curves).

The ultrasound system places an asterisk (*) next to the author's name for custom tables and measurements.

- An asterisk before the author's name identifies user-defined tables and measurement labels.
- An asterisk after the author's name identifies factory-defined custom tables, for example, a table without standard deviation data.

See also: For information about customizing general measurements, refer to Chapter 2 in this manual.

Designating the Reference Author

Each author uses a specific range of values to calculate gestational age, gestational analysis data, and estimated fetal weight.

You can change the default reference author for a fetal measurement label.

To change the default author:

1. Tap the configuration button.
   
2. Click **Measurement & Report**.
3. Click **OB Tables**.
4. Click the **Default OB Author** tab.
5. Select an author for the measurement label.
   - For simple gestational age, select an author from the **Gestational Age** list.
   - For composite gestational age, select an author from the **US Age (Ultrasound Age)** list.
   - For fetal growth charts, select an author from the **Growth Analysis** list.
   - For estimated fetal weight, select an author from the **EFW (Estimated Fetal Weight)** list.
6. To calculate the average of existing valid simple gestational ages, excluding the estimated fetal weight, select **Average** from the **US Age (Ultrasound Age)** list.

Customizing Obstetric Tables

You can create, edit, and delete user-defined obstetric tables, such as gestational age tables and fetal growth tables (growth curves). You can also assign a predefined measurement label to a user-defined obstetric table.

To create or edit a user-defined obstetric table:

1. Tap the configuration button.

2. Click **Measurement & Report**.
3. Click **OB Tables**.
4. Click the required tab.
   - **Custom GA Table** selects a gestational age table.
   - **Custom Growth Curves** selects a growth curve table.
5. Select a measurement label from the **Measurement** list.
   - To create a new table, click **New**.
   - To use an existing table as a template, select the name of the author and then click **Copy**.
   - To edit a user-defined table, select the name of a user-defined author and then click **Edit**.
6. Enter the following information.

Selection	Description
Author Name	Specifies the name of the author for the table. The name of the table is the name of the author. **Note:** For copied tables, the ultrasound system assigns a numeric extension to the existing author name. You can edit the author name.
Units	Specifies the measurement unit for the label. ▪ **mm** indicates millimeters. ▪ **cm** indicates centimeters. ▪ **cm2** indicates centimeters squared. ▪ **cm3** indicates centimeters cubed. ▪ **g** indicates grams. ▪ **lbs** indicates pounds. ▪ **°** indicates the arc of an angle in degrees. ▪ **cm/sec** indicates centimeters per seconds.

Selection	Description
Low/High Range	(Applies only to growth curves) Selects the range for the fetal growth pattern. ▪ **5%/95%** indicates a low range of 5% and a high range of 95%. ▪ **10%/90%** indicates a low range of 10% and a high range of 90%. ▪ **+/-1.5SD** indicates a standard deviation of plus or minus 1.5. ▪ **+/-1SE** indicates a standard error of plus or minus 1.0.
Row	Identifies the row of values in the table. The system renumbers the rows when you add or delete a row.
(Fetal measurement labels)	Identifies the variable values for the reference author. The lower limit for the variable value is in the first row of the table. The upper limit for the variable value is in the last row of the table. Include a table row for every variable value between the lower and upper limits. Variable values must be less than the values in the prior row. For example, if you specify a range from 10.0 (lower limit) to 11.0 (upper limit) for a gestational age table, you must create rows for 10.0, 10.1, 10.2, progressively up to 11.0. **Note:** The ultrasound system does not recognize measurements corresponding to table values outside the indicated range.
Gestational Age	(Available only for gestational age tables) ▪ **Weeks** indicates the gestational age in weeks. ▪ **Days** indicates the gestational age in days.
2SD Days	(Available only for gestational age tables) Specifies the number of days for the standard deviation (SD). An entry is not required.
GA	(Available only for growth curves) Specifies the gestational age in weeks and days.
(ranges)	(Available only for growth curves) Identifies the limits of the growth curve. ▪ **Mean** indicates the limits for the average mean. ▪ **Low** indicates the limits for the lower range. ▪ **High** indicates the limits for the upper range.

7. To add or remove table rows:
   a. Click the required row.
   b. To add a row, click **Insert Row Before** or **Insert Row After**.
   c. To delete the row, click **Delete Row**.
8. To remove all data from the table, click **Clear All**.

9. Click **Validate Table** to confirm the table.

   The system checks for invalid data and then displays a message. If the table is not valid, correct the errors and then repeat this step.

10. Click **Save**.
11. To map the validated table for DICOM structured reporting:

    Note: For additional information on DICOM structured reporting mapping, refer to Chapter 2 in this manual.

    a. Click **SR Mapping**.

       The system displays a dialog box for mapping the table.

    b. Enter a name in the **Author Name** field.
    c. Select a code in the **Coding Scheme Designator** field.
    d. Enter a value in the **Code value** field.
    e. Click **OK**.
    f. To exit without saving the changes, click **Cancel**.

12. To discard the changes and exit the table, click **Cancel**.

To delete a user-defined obstetric table:

1. Select a fetal measurement label.
2. Select the name of the table to delete.
3. Click **Delete**.
4. Click **OK**.
5. To exit without deleting the table, click **Cancel**.

Selecting the Default Measurement Method

You can customize the obstetric tools and measurement methods.

To select the default measurement method:

1. Tap the configuration button.

2. Click **Measurement & Report**.
3. Click **Measurement**.
4. Click the **Exam Specific** tab.

To	Do This
Select the BPD method for the Auto OB feature	▪ Click the required option. – **European - BPD outer to outer** measures the biparietal diameter (BPD) from outer edge to outer edge. – **US - BPD outer to inner** measures the BPD from outer edge to inner edge.

Customizing the Display of Fetal Information

You can customize the display of fetal data on the image screen, on the touch screen, and in the patient report.

To customize the display of fetal information:

1. Tap the configuration button.

2. Click **Measurement & Report**.
3. Click **Measurement**.
4. Click the **Exam Specific** tab.

To	Do This
Display fetal information on the image screen	▪ Select the check boxes next to the required selections. – **LMP/DOC** displays the date of the last menstrual period or date of conception. – **Clinical Age** displays the estimated gestational age. – **EDD** displays the estimated date of delivery. – **EFW** displays the estimated fetal weight.
Display the SD or GA on the touch screen	▪ Select an option from the **Display Averaged GA or ±SD on Touch Screen** list. – **GestationalAge** displays the averaged gestational age (GA). – **StandardDeviation** displays the standard deviation (SD). – **None** excludes the SD and the averaged GA from the touch screen.
Display the SD or GA with the measured results	▪ Select an option from the **Display Averaged GA or ±SD in Measured Results** list. – **GestationalAge** displays the averaged gestational age (GA). – **StandardDeviation** displays the standard deviation (SD).
Select the upper limit of the range for the SD	▪ Select an option from the **Display Out of Range** list. – **Off** displays the gestational age instead of the standard deviation (SD). – **1.5** indicates the upper limit of the SD is 1.5. – **2** indicates the upper limit of the SD is 2.0. – **2.5** indicates the upper limit of the SD is 2.5.

4 Clinical Applications Configuration

Overview **3**

Configuring Stress Echo Settings **4**

Customizing a Stress Echo Protocol 4

Customizing a Protocol Stage 6

Customizing a Protocol View 8

Configuring Wall Motion Scoring 9

Exporting and Importing Stress Echo Protocols 9

Configuring 4D Heart AI Settings **10**

Configuring 2D Heart AI Settings **12**

Configuring AI Assist **14**

Configuring AI Assist for Transthoracic Echocardiography (TTE) 14

Configuring the Z6T Transesophageal Transducer **15**

Configuring the 5Z1 Transducer **17**

Overview

You can use the configuration settings to modify factory (default) settings or customize the current settings for select advanced imaging features.

You can import and export the configuration settings described in this chapter from one ultrasound system to another ultrasound system of the same model.

See also: For information about exporting and importing files with customized configuration settings, refer to Chapter 2 in this manual.

See also: For information about navigation buttons and restoring the factory settings, refer to Chapter 1 in this manual.

Configuring Stress Echo Settings

You can create, edit, and delete stress echo protocols.

Customizing a Stress Echo Protocol

You can customize the image display area, activation method for progression of stages, and review settings for a stress echo protocol.

To customize a protocol:

1. Tap the configuration button.



2. Click **Features**.
3. Click **Stress Echo**.

To	Do This
Copy a protocol	1. Select the required protocol from the **Protocols** list and then click **Copy**. The system appends the name of the copied protocol with a number, for example, **Treadmill 2**. 2. Enter a unique name in the **Protocol Name** text box.
Add a protocol	1. Click **Add**. The system displays a temporary name for the protocol, for example, **User Defined**. 2. Enter a unique name in the **Protocol Name** text box.
Rename a protocol	▪ Select a protocol and then enter a unique name in the **Protocol Name** text box.
Customize the image display area for a protocol	▪ Select a protocol and then select the required **Protocol Settings** options. – **Display ROI** displays the region of interest on the stress echo. – **Allow selection of multiple clips per view** allows for selection of multiple clips for each view. – **Hide the navigation panel on the main screen as default** hides the navigation panel.
Select the progression by stage for a protocol	▪ Select a protocol and then select the required **Progression by Stage** option. – **Automatic** indicates the system activates the next stage in the protocol. – **Manual** indicates you must select the next stage in the protocol.

To	Do This
Select the review settings for a protocol	▪ Select a protocol and then select the required **Default Review Settings** options. – **Display Format** identifies the default layout of the image screen. – **Cropping Mode** identifies the section for clip playback. ▪ **ED Only** displays only the diastolic portion of the heart cycle. ▪ **ES Only** displays only the systolic portion of the heart cycle. ▪ **R-R** displays the full heart rate cycle of systolic and diastolic portions. ▪ **Extended R-R** displays the full heart rate cycle of systolic and diastolic portions with an outward extension of right and left margins of 200 milliseconds (ms). – **Playback Speed** adjusts the rate of playback, in percentages. – **Clip Sorting** identifies the sort order of clips. ▪ **View** displays clips by view. ▪ **Stage** displays clips by stage.
Delete a protocol	1. Select a protocol and then click **Delete**. 2. Click **OK**. 3. To cancel the deletion, click **Cancel**.

Customizing a Protocol Stage

You can customize the stages of a stress echo protocol.

The reference view is configurable for all stages except the first stage.

To customize a protocol stage:

1. Tap the configuration button.



2. Click **Features**.
3. Click **Stress Echo**.
4. Select the required protocol from the **Protocols** list.
5. Select the required stage from the **Stages** list.

To	Do This
Copy a stage	1. Click **Copy**. The system appends the name of the copied stage with a number, for example, **Rest 2**. 2. Enter a unique name in the **Stage Name** text box.
Add a stage	1. Click **Add**. The system displays a temporary name for the stage, for example, **User Defined**. 2. Enter a unique name in the **Stage Name** text box.
Rename a stage	▪ Enter a unique name in the **Stage Name** text box. ▪ Select a name from the drop-down list. The system removes the selected name from the list.
Select the capture settings for the stage	1. To specify the direction for capturing data, select a **Clip Capture** option in the **Stage Capture Settings** section: – **Prospective** saves newly acquired images. – **Retrospective** saves previously acquired images. – **Continuous** saves continuously acquired images. 2. To specify the number of clips stored for a non-continuous stage, select a setting from the **Clips Per Capture** list. 3. To define the type and length of clip: a. Select the **Clip Type**. ▪ **Beats** captures clips for the indicated number of heart cycles ▪ **Time** captures clips for the indicated number of seconds b. Press the **Clip Length** plus button to increase the length of the clip and the minus button to decrease the length of the clip. 4. To apply the capture settings to all stages, click **Apply to All Stages**.

To	Do This
Select the stage timer settings	▪ Select a **Stage Timer** option in the **Additional Selections** section. – **Off** disables the stage timer. – **Start at Beginning of Stage** enables the stage timer at the beginning of the stage. – **Start at First Clip Store** enables the stage timer at the first instance of a clip store.
Select the reference view for the stage	▪ Enable the **Display the reference view** check box and then select an option. – **Baseline Stage** identifies the baseline stage as the reference view. – **Previous Stage** identifies the previous stage as the reference view.
Select the action for entering a stage	▪ Select an **Enter Selection** option. – **Do not enter** indicates you must select the next stage. – **After View Capture** activates the next stage after image acquisition. – **After Stage Capture** activates the next stage after a stage is complete.
Delete a stage	1. Click **Delete**. 2. Click **OK**. 3. To cancel the deletion, click **Cancel**.

Customizing a Protocol View

You can customize the protocol views for a stage of a stress echo protocol.

The reference view is configurable for all stages except the first stage.

To customize a protocol view:

1. Tap the configuration button.



2. Click **Features**.
3. Click **Stress Echo**.
4. Select the required protocol and stage.
5. Select the required view from the **Views** list.
6. To select all views for the stage, click **Select all views**.

To	Do This
Copy a view	1. Click **Copy to**. 2. Select the required option. – **All Stages** copies the view to all stages. – **Single Stage** copies the view to the selected stage. 3. Click **OK**. 4. To cancel copying of the view, click **Cancel**.
Add a view	1. Click **Add**. 2. Select a user-defined view from the **Available Views** list. Or, enter a unique name for the view. 3. To add the view to all stages, click **Add to All Stages**. 4. Click **OK**. 5. To cancel adding the view, click **Cancel**.
Rename a view	1. Enter a unique name in the **View Name** text box. Or, select a name from the drop-down list. The system removes the selected name from the list. 2. To update the view name across all stages, click **Apply to All Stages**.
Assign a transducer and imaging mode to a view	▪ Select the required **Image Settings** options. – **Automatic Transducer Change** specifies the transducer assigned to the view. **None** indicates no change in transducer. – **Automatic Mode Change** specifies the imaging mode assigned to the view. **Note:** Available imaging modes are dependent on the selected transducer.
Delete a view	1. Click **Delete**. 2. Click **OK**. **Note:** The stage must include one view. If all views are selected for deletion, the stage retains the last view. 3. To retain the view, click **Cancel**.

Configuring Wall Motion Scoring

You can select the segment model for wall motion scoring for a stress echo study.

To select the segment model for wall motion scoring:

1. Tap the configuration icon.

2. Click **Features**.
3. Click **Stress Echo**.
4. Click the **Wall Motion Scoring** tab.
5. Select the **Segment Model** option.
   - **16 Segments** indicates a 16-segment model of the left ventricle.
   - **17 Segments** indicates a 17-segment model of the left ventricle.

Exporting and Importing Stress Echo Protocols

See also: For information about exporting and importing customized stress echo protocols, refer to Chapter 2 in this manual.

Configuring 4D Heart AI Settings

You can use the configuration settings to customize the 4D Heart AI feature.

To customize the 4D Heart AI settings:

1. Tap the configuration icon.



2. Click **Features**.
3. Click **4D Heart AI**.
4. Select the default settings for the feature.

To	Do This
Select the initial heart chambers for contour view	▪ Enable the required **Contours** check boxes. – **Left Ventricle** shows the contour of the left ventricle. – **Left Atrium** shows the contour of the left atrium. – **Right Ventricle** shows the contour of the right ventricle. – **Right Atrium** shows the contour of the right atrium.
Show or hide the left ventricle (LV) epicardium	▪ Select a required **LV Epicardium** option. – **Show** shows the LV epicardium. – **Hide** hides the LV epicardium.
Select the heart chamber results to include in the results	▪ Select a required **Chambers** option. – **Left Ventricle (max 6)** displays a maximum of six results for the left ventricle. – **Left Atrium (max 4)** displays a maximum of four results for the left atrium. – **Right Ventricle (max 4)** displays a maximum of four results for the right ventricle. – **Right Atrium (max 4)** displays a maximum of four results for the right atrium. **Note:** Capture sends all available measurements to the report. If the results view is limited, fewer results may display on the image screen.
Select the measured results to include in the results and report	**Note:** Available labels in the **Measurements** list are dependent on the selected heart chambers. ▪ To include a measurement, enable the check box. ▪ To exclude a measurement, clear the check box.
Display measurements as body surface area (BSA) indexed values	▪ Enable the **Display Measurements as BSA Indexed (BSA suffix in above table)** check box. **Note:** Enter the height and weight to obtain BSA indexed values. The height and weight are required on the patient registration form for the system to calculate BSA indexed values.

To	Do This
Select the number of heart beats to analyze	▪ Select the number of beats. **Note:** If the clip includes fewer than the selected number of beats, the system analyzes the available beats.
Analyze results as individual beats or an average of beats	▪ Select a **Results Format** option. – **Individual Beat** displays the results as individual beats, for example, **Beat 1 of 3**. – **Average of Beats** displays the results as an average of the selected number of beats, for example, **Average (3 beats)**. Requires a selection of two or more beats for analysis.
Select the direction of speckle tracking during strain analysis	▪ Select a **Default Direction for Speckle Tracking** option. – **Longitudinal** displays left ventricle (LV) strain results in the longitudinal direction in the bullseye view. – **Circumferential** displays LV strain results in the circumferential direction in the bullseye view.
Select the curve to display after speckle tracking	▪ Select a **Default Curve After Speckle Tracking** option. – **Volume** displays the change in chamber volume from end diastole to end systole as derived from the left ventricle and left atrium. – **Segmental Strain** displays the average strain value in each segment of the cardiac chamber, for example, the left ventricle. – **Global Strain** displays the overall global strain or deformation for the left ventricle and left atrium.
Select the timing or phase to display after speckle tracking for the left ventricle	▪ Select a **Default Timing/Phase After Speckle Tracking** option to change the bullseye view. – **End Systolic Strain** (ESS) displays the strain value at end systole measured at aortic valve closure. – **Peak Systolic Strain** (PSS) displays the peak strain value during systole as measured before aortic valve closure. – **Time to Peak** (TTP) displays the time to reach peak strain. – **Post Systolic Strain Indexed** (PSI) displays the ratio between strain (deformation) after end systole divided by total strain.

Configuring 2D Heart AI Settings

You can use the configuration settings to customize the 2D Heart AI feature.

Note: A maximum of six measurement rsults are avalable for each chamber.

To customize the 2D Heart AI settings:

1. Tap the configuration icon.



2. Click **Features**.
3. Click **2D Heart AI**.
4. Select the default settings for the feature.

To	Do This
Select the heart chambers to contour for the end diastole (ED) and end systole (ES) results	▪ Select the required **Contours (Two frame – ED, ES Results)** options. – **Left Ventricle (A4C,A2C,A3C)** displays the contour of the left ventricle in the apical four, two, and three chamber viewports. – **Left Atrium (A4C,A2C)** displays the contour of the left atrium in the apical four and two chamber viewports. – **Right Ventricle (A4C)** displays the contour of the right ventricle in the apical four chamber viewport. – **Right Atrium (A4C)** displays the contour of the right atrium in the apical four chamber viewport.
Show or hide the left ventricle (LV) epicardium	▪ Select an **LV Epicardium** option. – **Show** shows the LV epicardium. – **Hide** hides the LV epicardium.
Select the heart chamber results to include in the results	▪ Select a required **Chambers** option. – **Left Ventricle** displays results for the left ventricle. – **Left Atrium** displays results for the left atrium. – **Right Ventricle** displays results for the right ventricle. – **Right Atrium** displays results for the right atrium.
Select a maximum of six measurements per heart chamber to include in the results and report	▪ Select the required **Measurements (max 6 per chamber)** options. **Note:** Capture sends all available measurements to the report. **See also:** For information about 2D Heart AI measurement labels, refer to Appendix D in the System Reference.
Display measurements as body surface area (BSA) indexed values	▪ Enable the **Display Measurements as BSA Indexed (BSA suffix in above table)** check box. **Note:** Enter the height and weight to obtain BSA indexed values. The height and weight are required on the patient registration form for the system to calculate BSA indexed values.

To	Do This
Select the number of heart beats to analyze for ED-ES results	▪ Select the **Number of Beats (two frame – ED, ES Results)**, from one to five. **Note:** If the clip excludes the selected number of beats, the system analyzes the available beats.
Analyze ED-ES results as individual beats or an average of beats	▪ Select a **Results Format (Two frame – ED, ES Results)** option. – **Individual Beat** displays the results as individual beats, for example, **Beat 1 of 3**. – **Average of Beats** displays the results as an average of the selected number of beats, for example, **Average (3 beats)**. Tracking analysis requires a selection of two or more beats.
Select the curve to display after speckle tracking for the left ventricle	▪ Select a **Default Curve After Speckle Tracking (LV)** option. – **Segmental Strain** displays the average strain value in each segment of the cardiac chamber, for example, the left ventricle. – **Global Strain** displays the overall global strain or deformation for the left ventricle and left atrium. – **Volume** displays the change in chamber volume from end diastole to end systole as derived from the left ventricle and left atrium. – **Strain Rate** indicates the rate of strain or how fast the deformation occurs for the left ventricle and left atrium.
Select the timing or phase to display after speckle tracking for the left atrium	▪ Select a **Default Timing/Phase After Speckle Tracking (LA)** option. – **Global Strain** displays the overall global strain or deformation for the left ventricle and left atrium. – **Volume** displays the change in chamber volume from end diastole to end systole as derived from the left ventricle and left atrium.
Select the timing or phase to display after speckle tracking for the left ventricle	▪ Select a **Default Timing/Phase After Speckle Tracking (LV)** option. – **End Systolic Strain** (ESS) displays the strain value at end systole measured at aortic valve closure. – **Peak Systolic Strain** (PSS) displays the peak strain value during systole as measured before aortic valve closure. – **Time to Peak** (TTP) displays the time to reach peak strain. – **Post Systolic Strain** (PS) displays the strain value after end systole as measured after aortic valve closure. – **Post Systolic Strain Indexed** (PSI) displays the ratio between strain (deformation) after end systole divided by total strain.

Configuring AI Assist

You can configure the AI Assist feature to activate when you connect a compatible transducer and select a compatible imaging mode.

Configuring AI Assist for Transthoracic Echocardiography (TTE)

You can customize the sequence and list of anatomy areas for a cardiac view.

To configure AI Assist for TTE:

1. Tap the configuration icon.

2. Click **Features**.
3. Click **AI Assist**.
4. To set the default activation for the **AI Assist** feature, select an option:
   - **Enable** activates the feature when you connect a compatible transducer to the ultrasound system and select a compatible imaging mode.
   - **Disable** deactivates the feature.
5. To customize the sequence and list of anatomy areas for a cardiac view:
   a. Select a cardiac view from the **Cardiac Views** list.
   b. Modify the anatomy areas in the **Color Anatomy Areas and Order** list and the **PW and CW Anatomy Areas and Order** list.
      - To add an anatomy area, enable the check box.
      - To remove an anatomy area, clear the check box.
      - To change the sequence of the anatomy area, select the anatomy area and then click an arrow.

      See also: For information about repositioning selections in a list, refer to Chapter 1 in this manual.

Configuring the Z6T Transesophageal Transducer

You can use the configuration settings to configure biplane imaging and assign functions to the smart controls on the transducer.

To customize the transducer settings:

1. Tap the configuration icon.



2. Click **Transducer**.
3. Click **Matrix**.
4. Click the **Z6T** tab, if necessary.
   - **BiPlane+ Settings** provides options to configure biplane imaging.
   - **Assign function to controls** provides options to assign functions to the smart controls on the transducer.

To	Do This
Select the rotation limit of the scan plane	▪ Select a **Rotation** option. – **Rotate 360°** indicates rotation is from 0° to 359°. – **Limit rotation to 180°** indicates rotation is from 0° to 180°.
Select the angle of free tilt for the scan plane	▪ Select a **Free Tilt** option. – **No restrictions** allows the right plane to rotate and tilt at any angle. – **Perpendicular on tilt** maintains the right plane perpendicular to the reference plane during tilt.
Hide the tilt line after 1.5 seconds of inactivity	▪ Enable the **Auto hide after 1.5 seconds** check box in the **Tilt Line Display** section.
Select the rotation angles of the scan plane	▪ Select a **Default BiPlane+ Rotation Angle** option. – **Left 0°, Right 90°** changes rotation of the lateral scan plane to 0° left and the elevation to 90° right. – **Left 0°, Right 270°** changes rotation of the lateral scan plane to 0° left and the elevation to 270° right.

To	Do This
Assign a function to a smart control on the transducer	1. Choose the required smart control: – **Left A** assigns a function to smart control A on the left side of the transducer. – **Left B** assigns a function to smart control B on the left side of the transducer. – **Right A** assigns a function to smart control A on the right side of the transducer. – **Right B** assigns a function to smart control B on the right side of the transducer. 2. Select a function from the drop-down list. **Note:** Press and hold functions require the user to continue to press the smart control when using the transducer. – **Not Assigned** assigns no function to the selected control. – **Capture** assigns the capture function. – **BiPlane+ On/Off** activates or deactivates biplane imaging. – **Increase Depth (press-and-hold function)** increases the depth of the image. – **Decrease Depth (press-and-hold function)** decreases the depth of the image. – **Color On/Off** activates or deactivates color. – **CW On/Off** activates or deactivates continuous wave (CW) Doppler imaging. – **PW On/Off** activates or deactivates pulsed wave (PW) Doppler imaging. – **Freeze** activates or deactivates the freeze function. – **Rotate Forward (press-and-hold function)** rotates the scan plane clockwise (forward). – **Rotate Backward (press-and-hold function)** rotates the scan plane counterclockwise (backward). – **Increase Tilt Angle (press-and-hold function)** increases the tilt angle. – **Decrease Tilt Angle (press-and-hold function)** decreases the tilt angle. – **4D On/Off** activates or deactivates 4D imaging.

Configuring the 5Z1 Transducer

You can use the configuration settings to customize the 5Z1 transducer, for example, the default settings for biplane imaging.

To customize the transducer settings:

1. Tap the configuration icon.



2. Click **Transducer**.
3. Click **Matrix**.
4. Click the **5Z1** tab.
   – **BiPlane+ Settings** provides options to configure biplane imaging.

To	Do This
Select the rotation limit of the scan plane	▪ Select a **Rotation** option. – **Rotate 360°** indicates rotation is from 0° to 359°. – **Limit rotation to 180°** indicates rotation is from 0° to 180°.
Select the angle of free tilt for the scan plane	▪ Select a **Free Tilt** option. – **No restrictions** allows the right plane to rotate and tilt at any angle. – **Perpendicular on tilt** maintains the right plane perpendicular to the reference plane during tilt.
Hide the tilt line after 1.5 seconds of inactivity	▪ Enable the **Auto hide after 1.5 seconds** check box in the **Tilt Line Display** section.
Select the rotation angles of the scan plane	▪ Select a **Default BiPlane+ Rotation Angle** option. – **Left 0°, Right 90°** changes rotation of the lateral scan plane to 0° left and the elevation to 90° right. – **Left 0°, Right 270°** changes rotation of the lateral scan plane to 0° left and the elevation to 270° right.

5 Network Configuration

Overview..... 3
Configuring a Wireless Network Connection 3
Configuring a Virtual Workstation 5

Overview

Prerequisite: A working knowledge of networking principles is beneficial for configuring network connections.

You can connect the ultrasound system (the local host) to a local area network (LAN) through a wired or a wireless connection. When both wired and wireless connections are configured and available, the ultrasound system gives priority to the wired LAN connection.

See also: For information on creating and editing DICOM configuration profiles, refer to Chapter 6 in this manual.

Configuring a Wireless Network Connection

The ultrasound system uses network profiles to store wireless network configurations. The profile names list displays the name of the network profile for the wireless network.

Note: The ultrasound system connects only to wireless networks with saved network profiles.

To configure a connection to a wireless network:

Prerequisite: A USB storage device with a transport layer security (TLS) or secure socket layer (SSL) certificate, if necessary.

1. Tap the configuration button.
   
2. Click **Connectivity & Network**.
3. Click **Wireless Network**.
4. To enable connections to wireless networks, click **Enable WiFi**.
5. If the wireless network is not listed, click **Refresh**.
6. To create a new network profile, click **Add** and then enter the required settings.
   Note: Consult your network administrator for the required settings.

Selection	Description
SSID	Specifies the SSID (Service Set Identification) of the wireless network.
Channel	Specifies the required channel.
Security	Specifies the authentication method.
Encryption	Specifies the encryption method.
Signal Strength	Displays the signal strength of the wireless network.
Profile Saved	▪ **True** indicates the profile has been saved. ▪ **False** indicates the profile has not been saved.
Network Key	The security password, if required.
EAP Type	Specifies the Extensible Authentication Protocol (EAP) authentication method, if required. ▪ **None** indicates that no EAP authentication is required. ▪ **TLS** indicates transport layer security ▪ **PEAP** indicates protected extensible authentication protocol

Selection	Description
Certificate Name	Name of the certificate used for EAP TLS profile, if required.
Browse	Accesses a list of available transport layer security (TLS) certificates on the ultrasound system.
UserName	Specifies the EAP user name, if required.
UserPassword	The EAP password, if required.
Import Certificate	Displays a Windows dialog box for importing a certificate from a USB storage device, for example, an SSL certificate for a remote desktop connection. To import the certificate, you must enter the password for the certificate's private key file. Contact your archival and information system administrator to obtain the password.

7. To connect to a wireless network:
   a. Select a network from the list.
   b. Enter the required settings.
   c. Click **Connect**.
8. To disconnect from a wireless network, select the name of the wireless network and then click **Disconnect**.

To modify a network profile:

1. Tap the configuration button.

2. Click **Connectivity & Network**.
3. Click **Wireless Network**.
4. Select the name of the required wireless network from the profile names list and then enter the required settings.
5. To delete a network profile, select the name of the required wireless network from the profile names list and then click **Remove**.

   Note: Consult your network administrator for the required settings.

Configuring a Virtual Workstation

A virtual workstation on the ultrasound system provides remote access to a facility's archival and information system.

The virtual workstation uses either a web browser or a remote desktop connection. A remote desktop connection requires importing a secure socket layer (SSL) certificate for the wireless network connection.

See also: For information on importing a certificate, refer to page 5-3.

To configure a virtual workstation on the ultrasound system:

Prerequisite: Connect to a wireless network. Upload an SSL certificate for a remote desktop connection.

1. Tap the configuration button.

2. (Available only for the ultrasound system administrator) Enable the NetBIOS port, if necessary.
   a. Click **System Management** and then click **Security**.
   b. Click **Detail** for the **Ports**.
   c. Enable the port assigned to the NetBIOS.
3. Click **Connectivity & Network** and then click **Virtual Workstation**.
4. Select a connection option in the **Access Type** list.
   – **Browser** enables access to your archival and information system from a web browser.
   – **Remote Desktop** enables access to your archival and information system using a remote desktop session.
5. To modify an existing virtual workstation, select a workstation from the list.
6. To add a new virtual workstation, click **Add**.
7. Enter or edit the properties for connecting the virtual workstation to the archival and information system.

Selection	Description
Name	Specifies a unique name for the virtual workstation.
URL	(Available only for the web browser) Specifies the universal resource locator (URL), or web site address, of the archival and information system. Requires hypertext transfer protocol secure (https) format.
Host	(Available only for the remote desktop) Specifies the Internet protocol (IP) address, or domain name, of the archival and information system's server.
Username	(Available only for the remote desktop) Specifies the domain name of the archival and information system's server.
Password	(Available only for the remote desktop) Specifies the domain password for the archival and information system's server.

8. Click **Ping** to confirm the connection.
9. To delete an existing virtual workstation, select a workstation from the list and then click **Delete**.

6 DICOM Configuration

Overview **3**
Prerequisites 3
Configuring and Managing DICOM Profiles 4
Configuring a Local Host 5
Configuring DICOM Storage Locations 6
Configuring DICOM Printers 8
Configuring DICOM Worklist 10
Verifying DICOM Settings 13
Exporting Configuration Settings to Media **14**
Importing or Exporting a Certificate **15**

Overview

The ultrasound system has integrated networked communication capability to support communication with DICOM archive, worklist, and documentation devices.

The networked communication on the ultrasound system is in compliance with the Digital Imaging Communications in Medicine (DICOM) 3.0 standard (also known as ACR/NEMA 3.0).

You can select encrypted DICOM communications by importing a certificate and configuring the ultrasound system for a secure study transfer.

Prerequisites

(Available only for the network administrator)

- Connect the ultrasound system, or local host, to a local area network (LAN) through a wired or a wireless connection.
- A working knowledge of networking principles is necessary and beneficial for completing network configuration. An understanding of DICOM principles is necessary and beneficial for completing DICOM configuration.
- Check the storage server for compatibility with the ultrasound system settings.
- Requires the following DICOM configuration settings for each device.
  - The host name, Application Entity (AE) title, and port number for the ultrasound system.
  - Media type and duplex mode for connection to the host.
  - Alias, AE title, IP address, and port number for each DICOM device.

  Note: If you are using Dynamic Host Control Protocol (DHCP), you are not required to provide the IP address, subnet mask, or default gateway information.

Configuring and Managing DICOM Profiles

(Available only for the network administrator)

You can configure the ultrasound system and connected devices, for example, servers and printers for DICOM by creating and editing profiles (DICOM configurations).

To access a DICOM profile:

1. Tap the configuration button.

2. Click **Connectivity & Network**.
3. Click **DICOM Configuration**.
4. Click the **DICOM Service** tab.
5. Select the required DICOM server type from the **Server Type** drop-down list.
   - **DICOM Storage** specifies settings for a DICOM storage location profile.
   - **DICOM Worklist** specifies settings for a DICOM worklist profile.
   - **DICOM Print** specifies settings for a DICOM printer profile.
6. To delete a profile, select the profile in the **Server Name** list and then click **Delete**.

   Note: The ultrasound system saves configuration settings changes when you navigate away from the page.

Configuring a Local Host

You can configure network settings for the ultrasound system (the local host).

To configure Local Host settings:

1. Access the DICOM configuration settings and then click the required DICOM server type from the **Server Type** drop-down list.
2. Click the **Local Host** tab.
3. Select **Wired** from the **Connection Type** drop-down list.
4. Enter the host name and MAC address, if necessary.
5. Choose a method to enter the **IPv4 Configuration Settings**:
   - If the ultrasound system uses a dynamic IP address assigned by a Dynamic Host Configuration Protocol (DHCP) server, click **Use DHCP**.
   - If the ultrasound system uses a static IP address, enter the required settings for **IP Address**, **Subnet Mask**, and **Gateway**.
6. Configure the advanced local host settings, if necessary.

Selection	Description
Local AE Titles	Specifies local application entity title settings
HIS/RIS [SCU]	Specifies the AE Title used by the HIS/RIS server to schedule procedures for the ultrasound system
Print [SCU]	Specifies the AE Title used to identify the ultrasound system to DICOM print devices
Study Transfer (Secure) [SCP+SCU]	Specifies the AE Title used by DICOM storage SCPs (Storage Class Providers) to identify the ultrasound system for encrypted DICOM storage communication
Study Transfer (Unsecure) [SCP+SCU]	Specifies the AE Title used by DICOM storage SCPs (Storage Class Providers) to identify the ultrasound system for unencrypted DICOM storage communication
DNS	Specifies the DNS (Domain Name Server) settings
Domain	Specifies the DNS name
DNS Service Search Order	Specifies the IP addresses of the DNS servers in the order they are used for domain name resolution
Add	Adds an IP address to the **DNS Service Search Order** drop-down list
Delete	Deletes the selected IP Address in the **DNS Service Search Order** drop-down list

Configuring DICOM Storage Locations

To configure a DICOM storage location:

1. Access the DICOM configuration settings and then click the **DICOM Service** tab, if necessary.
2. Click **DICOM Storage** from the **Server Type** drop-down list.
3. Configure a DICOM storage location.
   - To configure a new DICOM storage location, click **Add**.
   - To configure an existing DICOM storage location, select the name of the required storage device in the **Server Name** list.
4. Enter or modify configuration settings for the device.

   Note: The IP Address and the Port Number settings must be correct for the Ping and Verify tests to work. Confirm this setting with your network administrator.

Selection	Description
Alias	Specifies the name the ultrasound system uses to identify the storage device in the user interface
IP Address	Specifies the IP address of the storage device
AE Title	Specifies the AE Title for the storage device
Port Number	Specifies the network port the storage device uses to communicate with the ultrasound system

5. Configure the advanced options for the DICOM storage location, if necessary.

Selection	Description
Transfer Syntax	Configures how data is sent to the server. You must select at least one of the **Transfer Syntax** options.
Implicit Little Endian	Implicit (without) value representation (string, integer, and date). When enabled, the value representation for each attribute is not sent in the image header and needs to be added at the destination using a data dictionary file. Little Endian means the least significant byte is sent first.
Explicit Little Endian	Explicit (with) value representation (string, integer, and date). When enabled, the value representation for each attribute is sent in the image header. Little Endian means the least significant byte is sent first.
Explicit Big Endian	Explicit (with) value representation (string, integer, and date). When enabled, the value representation for each attribute is sent in the image header. Big Endian means the most significant bit is encoded first.
Transfer	---
Send/Receive Acoustic Data	(Available for volume imaging and for cardiac studies during 2D-mode or 2D-mode with contrast) When enabled, includes acoustic data with images or clips sent to or retrieved from the storage location.
Enable DICOM GSDF	When enabled, selects the DICOM Grayscale Standard Display Function (GSDF). This selection applies an image quality standard to images exported from the ultrasound system to an offline review station.

Selection	Description
Compression	---
JPEG Lossy	When enabled, indicates the PACS accepts compressed images in JPEG Lossy format. Lossy compression is irreversible and can result in the loss of image quality.
JPEG Lossless	When enabled, indicates the PACS accepts compressed images in JPEG Lossless format. The original quality of the images can be restored.
Convert RGB to Monochrome	Specifies image conversion settings. ▪ **No RGB Conversion** does not convert images when transferred. ▪ **Convert RGB Color images** converts all single frame images to monochrome when transferred. ▪ **Convert Ultrasound Non-Color data** converts images without color ultrasound data to monochrome when transferred.
Archive Node	When enabled, studies sent to the DICOM device are marked with a flag for archive in the patient browser. When disabled, studies are not marked for archive.
Secure Connection	Enables or disables the secure mode of DICOM storage communication
Provides Query Model	Specifies the required query model. ▪ **Patient Root** accesses all patient information, including patient registration and patient studies. ▪ **Study Root** accesses all patient studies. ▪ **Patient/Study only** accesses a patient's information and studies.
Storage Commitment	Specifies the device used for storage commitment. ▪ **Use Same Association** retains the currently selected device.
Select SC Server	Specifies available storage servers

6. To delete a storage device from the profile list, select the device and then click **Delete**.
7. To specify a default DICOM storage location, move the preferred location to the top of the DICOM storage locations list.

Configuring DICOM Printers

To configure a DICOM printer:

1. Access the DICOM configuration settings and then click the **DICOM Service** tab, if necessary.
2. Click **DICOM Print** from the **Server Type** drop-down list.
3. Configure a printer.
   – To configure a new DICOM printer, click **Add**.
   – To configure an existing DICOM printer, select the name of the required printer in the list.
4. Enter or modify configuration settings for the device.

Selection	Description
Alias	Specifies the name the ultrasound system uses to identify the printer in the user interface. The alias is not used by DICOM.
IP Address	Identifies the IP address of the printer
AE Title	Identifies the AE Title for the printer
Port Number	Identifies the network port the printer uses to communicate with the ultrasound system
Printer Model	Lists the printers configured in the **Service** menu

5. Select additional configuration options, if necessary.

Selection	Description
Hold Printed Filmjobs	Specifies the number of print jobs (from 0 to 10) to display in the **Film Task Status** dialog box
Medium Type	Specifies the print medium, **BlueFilm**, **ClearFilm**, or **Paper**
Film Destination	Specifies how the film is developed. ▪ **FilmDestMagazine** specifies the exposed film sheet is developed in a darkroom. ▪ **FilmDestProcessor** specifies the exposed film sheet is fed directly into a processor that develops the film.
Transformation	Specifies how the system sends data to the camera if pixel interpolation is necessary. Pixel interpolation may be necessary when sending data to a high-resolution camera. ▪ **Replicate** specifies the interpolated value is identical to the last pixel value. ▪ **Bilinear** specifies the interpolated value is calculated linearly between the last pixel value and the next pixel value. ▪ **Cubic** specifies the interpolated value is calculated on a curve between the last pixel value and the next pixel value. This option is slowest but preserves fine detail better than bilinear interpolation. ▪ **NoMagnification** specifies the image is not magnified.
Background	Sets the background color of the film to black or white
Secure Connection	Enables or disables the secure mode of DICOM storage communication
Min. Density (0.1)	Specifies the minimum density value for the camera (from 0 to 50). **Note:** Consult the printer manufacturer for the appropriate setting. **Note:** The maximum density value is modality-dependent.
Color Appearance	Specifies color settings for the print device, monochrome, color, or 12 bit monochrome. Configure this setting if you want to print color ultrasound images to a camera that supports color.

6. To delete a DICOM printer from the profile list, select the printer and then click **Delete**.
7. To specify a default DICOM printer, move the preferred printer to the top of the DICOM printers list.

Configuring DICOM Worklist

Note: Query/Retrieve is intended for use with ultrasound images only.

To configure a DICOM worklist:

1. Access the DICOM configuration settings and then click the **DICOM Service** tab, if necessary.
2. Click **DICOM Worklist** from the **Server Type** drop-down list.
3. Configure the DICOM worklist.
   - To configure a new DICOM worklist, click **Add**.
   - To configure an existing DICOM worklist, select the required server in the server list.
4. Enter or modify configuration settings for the worklist, if necessary.

Selection	Description
Alias	Specifies the name the ultrasound system uses to identify the HIS/RIS server in the user interface. The alias is not used by DICOM.
IP Address	Specifies the IP address of the HIS/RIS server.
AE Title	Specifies the AE Title for the HIS/RIS server.
Port Number	Specifies the network port the HIS/RIS server uses to communicate with the ultrasound system.
Services	Specifies the type of data to be downloaded from the HIS/RIS server. You must select at least one of the **Services** options.
Basic Worklist	Downloads basic patient data to the patient browser.
Performed Procedure Step	Downloads scheduled procedure information for HIS/RIS systems configured for Modality Performed Procedure Step (MPPS).

5. Click the **General Worklist Settings** tab to access additional configuration options, if necessary.

Selection	Description
Worklist	When selected, enables the selected worklist
RIS Query/PPS Communication Modality	Specifies if a query will include only Modality Worklist (MWL) results for the US modality or all modalities
Modality	Specifies the location of the modality ▪ **US** specifies the US modality ▪ **Any** specifies all other modalities
AET	Specifies the AE Title for the HIS/RIS server
From RIS	Specifies the name of the RIS server being queried
MPPS Node	Specifies the DICOM Modality Performed Procedure Step (MPPS) node. **Note:** If more than one worklist server is configured, one server can be used to query the Modality Worklist (MWL) while the other server sends MPPS messages.
Worklist Update	Specifies worklist update configuration options
Update Worklist in Background	When selected, updates the worklist in the background
Ask for Time Range in Manual Update	When selected, displays a dialog box to specify the required time range, and then limits the search to patients scheduled for dates and times within that range. When not selected, limits search of the worklist to patients scheduled for today.
Time Range	Performs a search query on procedures scheduled within a specified time range. ▪ **Today and Previous day(s)** displays the procedures scheduled for today, and a specified time range before today ▪ **Today and Following day(s)** displays the procedures scheduled for today, and a specified time range after today
Patient Attributes (sent/read only from HIS/RIS system)	Specifies the patient information to transfer to and from the HIS/RIS system. This information displays in the patient browser. ▪ **Date of Birth** specifies the patient's date of birth including the month, day, and year ▪ **Gender** specifies the patient's gender ▪ **Accession Number** specifies the identification number indicating the sequence of the current study as related to other studies for this patient
Patient Worklist Query	Sets the worklist query type. ▪ **Predefined Search** provides a list of predefined queries. ▪ **Advanced Search** enables advanced DICOM queries.

6. Click the **Advanced Settings** tab to access additional configuration options, if necessary.

Selection	Description
Query Interval	Specifies the interval between queries (minutes)
Query Waiting Time	Specifies the timeout value for an attempted connection between the host and the HIS/RIS server
Max. Query Match Number	Specifies the limits the number of Worklist entries the HIS/RIS system transfers to the ultrasound system
Secure Connection	Enables or disables the secure mode of DICOM storage communication

7. To delete a DICOM worklist from the profile, select the worklist and then click **Delete**.
8. To specify a default DICOM worklist, move the preferred worklist to the top of the list.

Verifying DICOM Settings

After you have finished creating a DICOM profile, test the profile settings to confirm that they are correct. To test the DICOM configuration, the system must be connected to a local area network (LAN) through a wired or wireless network connection.

To verify DICOM settings for a profile:

1. Access the DICOM configuration settings and then click the **DICOM Service** tab, if necessary.
2. Select the host DICOM Storage profile.
3. To validate an IP address, click **Ping**.

   Results of the test display next to the **Ping** button.
4. To validate the host AE title and port number, click **Verify**.

   Results of the test display next to the **Verify** button.
5. If the verification fails:
   a. Check the **IP Address**, **AE Title**, and **Port Number**.
   b. Verify the **AE Title** of the ultrasound system is registered on the applicable server, if required.
6. Repeat steps 2 through 5 for the **DICOM Print** profile and **DICOM Worklist** profile.

Exporting Configuration Settings to Media

(Available only for the network administrator)

You can export current configuration settings to external media, for example, a USB storage device.

To export network settings to external media:

1. Tap the configuration button.

2. Click **Connectivity & Network**.
3. Click **Export**.
4. Configure the export options, if necessary.

Selection	Description
Report Data Export	---
Enable Transfer	Enables or disables the transfer of XML measurement reports
Network File Share	Displays the network file share
Domain/User Name	Specifies your domain user name
Password	Specifies your domain password
Web API	Specifies information about the Web API, Nuance, and PowerScribe
Server Address	Specifies the server address
User Name	Specifies the user name used to log on to the server
Password	Specifies the password required to access the server
Site	Specifies the web site address

Importing or Exporting a Certificate

You can import a certificate or select a self-signed certificate for use with encrypted DICOM communications.

To import or export a certificate:

1. Tap the configuration button.

2. Click **System Management**.
3. Click **Security**.
4. Click **Configure**.
5. Select the required type of certificate from the drop-down list: **Client Certificates** or **Root Certificates**.
6. Select the required import and export options.

Option	Description
Import/Export intermediate/root certificates (PKI, SSL) with Windows Certificate Wizard	Displays a dialog box to import an intermediate or root certificate using the Windows certificate wizard
Import remote system intermediate/root/self-signed certificate for authentication in DICOM secure connection	Displays a dialog box to import an intermediate or root certificate for authentication in a DICOM secure connection
Import certificate for secure connection to syngo service portal	Displays a dialog box to import a certificate for a secure *syngo* service portal connection
Import certificate and key for binding to DICOM secure connection	Displays a dialog box to import a certificate and the private key files (.PFX) for a secure DICOM connection
Export DICOM certificate/reset to self-signed certificate (DICOM and service portal)	Displays a dialog box to export a DICOM certificate or a self-signed certificate for a secure DICOM connection or service portal
Generate CSR for the certificate	Generates a certificate in Compressed Row Storage (CSR) format

7. Select the required certificate from the list and then enter a password, if necessary.
8. Click **Import**.

7 Security Configuration

Overview **3**
Terminology Used in this Chapter 4
Configuring Security Settings 6

Connect to an Active Directory Domain Controller **8**
Step 1: Renaming the Ultrasound System 8
Step 2: Configuring the Domain Name Server 9
Step 3: Connecting to the Domain Controller 10
Step 4: Establishing Access to the Ultrasound System 11
Step 4.1 Create User Groups on the Domain Controller 11
Step 4.2 Map Domain Controller Groups to the Ultrasound System 11

User Account Management **12**
Managing Groups and Roles 12
Creating a Patient Group 13
Configuring User Groups, Roles, and Patient Groups 14
Factory-assigned Privileges for Roles 17
Adding a User Account 18
Editing a User Account 19
Assigning Patients to a User or a Patient Group 20
Configuring Password Complexity 21

Audit Trail Management **22**
Configuring the Audit Trail 22
Archiving the Audit Trail 24

Overview

The security package provides configuration options for managing user accounts and providing data access permissions and functional privileges.

The ultrasound system administrator can access the configuration settings on the ultrasound system to manage user accounts and establish data access permissions and functional privileges. The ultrasound system administrator can also connect the ultrasound system to an Active Directory domain controller with the assistance of the domain controller administrator.

Prerequisites:

- A working knowledge of networking principles is necessary and beneficial for completing the network configuration.
- A working knowledge of Microsoft Active Directory is necessary for configuring users and groups on the domain controller.

Terminology Used in this Chapter

Term	Definition
User account	A login account assigned to each user to log in to the ultrasound system. User accounts are configured to restrict access to functional privileges and patient information on the ultrasound system.
Ultrasound system administrator	An administrative account with permissions to configure the ultrasound system for use in a networked environment. This person also manages access to functional privileges and patient data on the ultrasound system by configuring user accounts, groups, and roles and manages the audit trail. The ultrasound system administrator can also connect the ultrasound system to the Active Directory domain controller, with the assistance of the domain controller administrator.
Privilege	A restriction of access to functions or tasks on the ultrasound system, for example, sending data. User accounts can be assigned to roles to manage privileges. Privileges are also referred to as **Functional Privileges**. **Note:** The assignment of privileges to roles is not stored or editable on the Active Directory domain controller.
Permission	A restriction of access to patient data on the ultrasound system. User accounts can be assigned to a group to manage permissions. Permissions are also referred to as **Data Access Permissions**. Permissions include the following options: ▪ **No Access** indicates the user account does not have access to patient data in the specified patient group. ▪ **Full Control** indicates the user account has access to patient data in the specified patient group, including the following functions: – Creating a study – Viewing a study – Updating or modifying data; for example, correcting the patient's name – Deleting data – Changing the security level of data, for example, hiding patient identifying information from the screen
User	A single user, identified on the system with a user account.
Group	A classification for a user account, providing access to patient data on the ultrasound system. Groups include user groups and patient groups. The following list includes the default groups: ▪ **Administrator** and **SecurityAdmins** provides access to patient data in all patient groups and access to configure the ultrasound system. This group includes the ultrasound system administrator. ▪ **EmergencyAccess** provides access without a password for emergency login. The accounts have limited access. ▪ **Standard** provides access to all patient groups except service. The standard group and role cannot be deleted.

Term	Definition
User group	A group of user accounts requiring similar access; for example, users from the same team or department. One or more user groups can be assigned to a patient group.
Patient group	A group of user accounts requiring the same access to patient data.
Role	A classification for a user account, providing access to functions or tasks on the ultrasound system. The following list includes the default groups and roles: ▪ **Administrator/SecurityAdmins** provides access to patient data in all patient groups and access to configure the ultrasound system. This group and role includes the ultrasound system administrator. ▪ **EmergencyAccess** provides access without a password for emergency login. The accounts have limited access. ▪ **Standard** provides access to all patient groups except service. The standard group and role cannot be deleted. ▪ **DICOM_Group** provides access for processing DICOM services. This role is a virtual account for transferring network data. ▪ **syngoServiceUsers** provides access for remote service from your service representative.
Audit trail	A collection of security log files. The security log file tracks user actions, including powering on the ultrasound system, logging in, accessing files, modifying patient data and images, and powering off the ultrasound system. Only authorized users can view the security log files. Security log files are saved to the system hard disk, a storage device, or a network location. Saving the security log file is also referred to as archiving the audit trail.
Domain	A group of computers in a network with a common file database. Groups and roles can be managed within domains on a network, for example, a Hospital Information System/Radiology Information System server.
Federal Information Processing Standard (FIPS)	The Federal Information Processing Standard is a United States government computer security standard used to accredit cryptographic modules.
Active Directory domain controller	Microsoft Active Directory is a domain server for controlling access to Windows resources, for example, enabling user account management, authenticating user logon requests, and providing access to network resources, for example, data and printers on the local area network. Active Directory domain controller is also referred to as **domain controller**.
Domain controller administrator	The person designated in your organization to configure user accounts and groups on the domain controller. This administrator also creates a user account for the domain controller on the ultrasound system.
Service representative	A Siemens Healthineers representative who configures the ultrasound system during initial installation, supports troubleshooting activities, and repairs the system.

Configuring Security Settings

You can manage access to functional privileges and patient data on the ultrasound system by configuring user accounts.

To configure security settings:

1. Access the configuration settings.
   a. Tap the configuration button.
   
   b. Click **System Management** and then click **Security**.
   c. Click the **Configure** selection for **syngo Security**.
   d. Click **Security Configuration**.
2. Select a domain from the list, for example, the ultrasound system or a domain controller.
3. Click the menu option for the required settings.

Selection	Description
User Management	---
Users	Lists the individual user accounts. Use this selection to add and configure additional user accounts.
DICOM Nodes	Lists the virtual accounts for transferring network data. The following icon identifies virtual accounts: 
Internal Users	Lists factory-defined user accounts with access to all patient data and access to configure the ultrasound system. The following icon identifies internal users: 
Groups	Lists the current group accounts. Use this selection to add and configure additional groups.
Roles	Lists the current roles. Use this selection to add and configure additional roles.
Security Management	---
Data Access Permissions	**Prerequisite:** Your service representative must enable the **Data access check** in the security settings. Lists access to patient data on the ultrasound system.
Functional Privileges	Lists access to functions and tasks on the ultrasound system.

4. Enter the required settings.

5. Save the changes.

   Note: If the selections for saving the changes are not visible, resize the dialog box. Position your cursor on the edge of the dialog box and then click and drag the edges to resize the dialog box.

   – To save the settings, click **Apply**.
   – To save the settings and close the dialog box, click **OK**.
   – To discard the changes and exit the configuration settings, click **Cancel**.

To enable the Federal Information Processing Standard:

1. Tap the configuration button.

2. Click **System Management** and then click **Security**.
3. Click the **Enable** selection for the **FIPS (Federal Information Processing Standard)**.

Connect to an Active Directory Domain Controller

You must complete all steps of this multiple-step procedure to connect the ultrasound system to an Active Directory domain controller. In the final step, the service representative must be present to map an administrator group and a user group from the domain controller to the security settings on the ultrasound system and reinstall the system management controls.

Step 1: Renaming the Ultrasound System

(Available only for the ultrasound system administrator)

Each ultrasound system connected to the domain controller must have a unique host name.

To create a unique host name:

1. Access the configuration settings.
   a. Tap the configuration button.
   
   b. Click **System Management** and then click **Service**.
2. Click **Local Service** and then click **OK**.
3. Click **Configuration**.
   Note: If this is the first time configuring the **TCP/IP LAN** setting, you may be required to click **Next** repeatedly to access the setting.
4. Click **TCP/IP LAN**.
5. Enter a unique host name for the ultrasound system in the **Computer Name** text box.
   Note: The default host name for the ultrasound system is US2015.
6. Click **Save**.
7. Click **OK** to confirm the changes can result in a loss of communication.
   Note: Precisely follow the steps in this procedure, including clicking the home button, to prevent loss of communication.
8. Click **OK** to acknowledge your agreement to validate the host name.
   The ultrasound system displays status messages in the lower left and lower center of the screen, for example, please wait, ready, and reboot system pending.

9. Click **OK** to confirm the system saved the host name.
10. Click **Home** to validate the host name.

    Note: Do not restart the system or interrupt this process.

    The ultrasound system displays status messages in the lower left and lower center of the screen, for example, starting report creation and reboot system pending.
11. Click **OK** to restart the ultrasound system and apply the changes.

    The system restarts and displays the new host name in the domain list of the login screen.

Step 2: Configuring the Domain Name Server

(Available only for the ultrasound system administrator)

To configure the network settings for the domain:

1. Access the configuration settings.
   a. Tap the configuration button.

   b. Click **Connectivity & Network** and then click **DICOM Configuration**.
2. Select the **Use DHCP** check box to specify the domain name server (DNS) settings for the Active Directory domain controller.

   Note: If the DNS settings are incorrect, enter the domain name server for the domain controller in the **DNS Service Search Order** text boxes and then click **Add**.
3. Click **Apply**.
4. Click **OK** to restart the ultrasound system.

Step 3: Connecting to the Domain Controller

(Available only for the ultrasound system administrator and the domain controller administrator)

The domain controller administrator must create a user account for the domain controller on the ultrasound system.

To connect the ultrasound system to the domain controller:

1. Log in to the ultrasound system as an ultrasound system administrator.
2. Access the configuration settings.
   a. Tap the configuration button.
   
   b. Click **System Management** and then click **Security**.
   c. Click the **Configure** selection for **Active Directory**.
3. Click **Domain** and then enter the name of the domain controller.
4. Click **Apply**.
5. Log in to the domain controller from the ultrasound system as a domain controller administrator.
   a. Enter the identification and password for the domain controller and then click **OK**.
   Note: The system displays a restart window when login is successful. If login is unsuccessful, confirm and then re-enter the identification and password for the domain controller.
   b. Click **OK**.
   c. Click **Restart Now**.
6. Log in to the ultrasound system.
   a. Select the domain controller from the **Domain** list.
   b. Log in as a domain controller administrator.
7. Access the configuration settings.
   a. Tap the configuration button.
   
   b. Click **System Management** and then click **Security**.
   c. Click the **Configure** selection for **syngo Security**.
   d. Click **Security Configuration**.
8. Add a user account for the Active Directory domain controller in the configuration settings on the ultrasound system.
   a. Select the ultrasound system domain from the list.
   b. Select **User Management**.
   c. Right-click **Users** and then select **New**.
   d. Click **User**.
   e. Create a new user for the domain controller, for example, AD Domain.

See also: For additional information on adding a user account, refer to page 7-18.

Step 4: Establishing Access to the Ultrasound System

(Available only for the domain controller administrator and your service representative)

Create an administrative user group on the domain controller for managing access to the ultrasound system and a non-administrative user group for performing imaging functions on the ultrasound system.

Step 4.1 Create User Groups on the Domain Controller

- Create an administrative and a non-administrative user group on the Active Directory domain controller and then add members to the groups, for example:
  - SH Administrators as the administrative group
  - SH Sonographers as the non-administrative group

Step 4.2 Map Domain Controller Groups to the Ultrasound System

Prerequisite: Your service representative must perform this step.

- Add the groups created in the preceding step to the security settings on the ultrasound system, for example:
  - Your service representative adds the SH Administrator group to the Administrator and SecurityAdmins groups on the ultrasound system.
  - Your service representative adds the SH Sonographers group to the Standard group on the ultrasound system.

  Note: SH Administrator and SH Sonographer are examples only.
- If the host name was changed, reinstall the system management controls, if necessary.

User Account Management

You can manage the following user account configuration:

- Creating, editing, and deleting user accounts, including user names and passwords
- Configuring access to patient data and ultrasound tasks
- Configuring password complexity
- Configuring, viewing, and archiving the security log file

Managing Groups and Roles

You can create groups and roles to use in addition to the default groups and roles. Each name of the group or role must be unique and cannot include special characters. If a user group name and role name are identical, the system displays a message indicating all changes are applicable for both the user group and the role. After you create a group or a role, you cannot change the name.

To create or delete a user group or role:

1. Access the configuration settings.
   a. Tap the configuration button.
   
   b. Click **System Management** and then click **Security**.
   c. Click the **Configure** selection for **syngo Security**.
   d. Click **Security Configuration**.
2. Select **User Management**.
3. Select a domain from the list, for example, the ultrasound system or a domain controller.
4. To create a user group:
   a. Right-click **Groups**, select **New**, and then click **Group**.
   b. Enter a name and description.
   c. Select the **Members** tab.
   d. To add users, select the users from the **Available Users** list and then click **Add**.
   e. To delete users, select the users from the **Assigned Users** list and then click **Remove**.
   f. Save the changes.
5. To create a role:
   a. Right-click **Roles**, select **New**, and then click **Role**.
   b. Enter a name and description.
   c. Select the **Owners** tab.
   d. To add users, select the users from the **Available Users** list and then click **Add**.
   e. To delete users, select the users from the **Assigned Users** list and then click **Remove**.
   f. Save the changes.

6. To edit an existing user group or role:
   a. Double-click the name of the group or role.
   b. Select the tab with the information for editing and then enter the required updates.
   c. Save the changes.
7. To delete a user group or role:
   a. Right-click the group or role.
   b. Select **Delete** and then select **Yes**.
   c. Restart the ultrasound system.

Creating a Patient Group

(Available only for the ultrasound system administrator)

You can create a group for patients, assign the patient group to user accounts, and then use the patient browser to assign patients to the patient group.

To create or delete a patient group:

Prerequisite: Your service representative must enable the **Data access check** in the security settings.

1. Access the configuration settings.
   a. Tap the configuration button.
   
   b. Click **System Management** and then click **Security**.
   c. Click the **Configure** selection for **syngo Security**.
   d. Click **Security Configuration**.
2. Select **Security Management** and then select **Data Access Permissions**.
3. Right-click **Patient Groups** and then select **New**.
4. Click **Patient Group**.
5. Enter a name and description.
6. To provide read-only access for service representatives, select the required check box.
7. To delete a patient group:
   a. Right-click the patient group.
   b. Select **Delete** and then select **Yes**.
8. Save the changes.

Configuring User Groups, Roles, and Patient Groups

You can assign access to a user account by configuring user accounts, groups, and roles. The system displays an asterisk (*) next to any field with unsaved changes.

You can limit the list of groups and roles by selecting a filter at the top of the screen. The system displays a drop-down list of groups or roles based on the filter.

Note: To avoid unpredictable results, never modify the syngo text in the user group description on the domain controller.

To configure user groups, roles, and patient groups:

1. Access the configuration settings.
   a. Tap the configuration button.
   
   b. Click **System Management** and then click **Security**.
   c. Click the **Configure** selection for **syngo Security**.
   d. Click **Security Configuration**.
2. To configure a patient group:
   a. Select **Security Management** and then select **Data Access Permissions**.
   b. To display the access by patient groups, select **By Patient Groups**.
   c. To display the access by user groups, select **By User / Groups**.
   d. Select the group and then enter or modify the configuration settings.
      - To assign permissions, select the permission option from the **Permission** drop-down list.

        Access provided to a group is included in the effective permissions for all user accounts in the group.
      - To assign the default permissions, select the **Default** check box. This option is only available for groups with access to the patient group.

Selection	Description
List only objects with permissions assigned	When the check box is selected, lists only patient groups with **Full Control** access to patient data on the ultrasound system
User/Group	List the individual user accounts and the groups
Patient Groups	List the patient groups
Permission	Selects the group's access to patient data, for example, **Full Access**
Eff. Default Patient Group	When the check box is selected, access provided to a patient group is included in the effective permissions for all user accounts in the patient group.
Description	Describes the access assigned to a group

3. To assign access to a patient group:
   a. Select **Patient Group**, select the name of the required group, and then select the **Default** check box.
   b. To provide limited access during maintenance of the ultrasound system, select the **Grant Read Access for syngoServiceUser in service sessions** check box.
4. To assign access to functional privileges:
   a. Select a domain from the list, for example, the ultrasound system or a domain controller.
   b. Select **Security Management** and then select **Functional Privileges**.
   c. Select **By User / Role**.
   d. Select a classification.
      - **Everyone** includes all users and all groups
      - **Roles** includes a list of roles
      - **Users** includes a list of individual user accounts
   e. Select a name from the **Privileges of** list, for example, if the selected classification is **Groups**, select a group name from the list.
   f. Select the required category and then select the **Grant** check box to assign the privilege.

      Note: You cannot remove effective privileges from factory-assigned roles.

      See also: For information on effective privileges, refer to page 7-17.

Category	Privilege
ArchNet	**Archive** indicates access to archive patient data in DICOM format, for example, to a recording device or network location.
	Export indicates access to export patient data in DICOM format from the patient browser. This setting does not affect the ability to export patient data to a USB-compatible storage device in PC format.
	Send indicates access to send patient data to a DICOM print store, for example, PACS or HIS/RIS
AuditTrail	**Archive** indicates access to save the security log file
	ConfigureReadWrite indicates access to configure, read, and edit the security log file
	SetFilter indicates access to configure the filter settings of the security log file
	View indicates access to view the security log file

Category	Privilege
Common	**CopyToClipboard** indicates access to copy patient data
	NetworkConfiguration indicates access to configure the network, including DICOM configuration
	EmergencyServiceAccess indicates emergency access to service pages
	RemoteAssistance indicates access to virtual communication with a Siemens Healthineers service representative
	SaveLog indicates access to save logs on the ultrasound system
	ServiceAccess indicates access to the local service page, including access to the backup and restore feature
CorrectRearrange	**Correct** indicates access to edit the patient registration information
Filming	**Expose** indicates access to print patient data
PatientBrowser	**Delete** indicates access to delete patient data
PatientRegistration	**InvokeRegistration** indicates access to register a patient.
SecuritySystem	**BypassBlockedSystem** indicates access to bypass an ultrasound system blocked as a result of the security log file filling the system hard disk
	ConfigurationRead indicates access to view the security configuration settings
	ConfigurationReadWrite indicates access to view and edit the security configuration settings
	EnableServiceAccount indicates the password for a user account of Siemens Healthineers service personnel
	InterractiveLogin indicates access to log in when the ultrasound system is locked. When managing users in a domain, this privilege defines which users have access to the ultrasound system.
	OverrideLoginErrors indicates a user can access the ultrasound system when the ultrasound system displays login errors, for example, when an exam is in progress
	SetMode indicates a user can access and edit the security settings for the ultrasound system

5. Save the changes.

Factory-assigned Privileges for Roles

The following table identifies factory-assigned privileges (effective privileges) for roles on the ultrasound system with a checkmark (✓).

Categories and Privileges	Everyone	Standard	EmergencyAccess	DICOM_Group	SecurityAdmins	syngoServiceUsers
ArchNet						
Archive		✓	✓	✓	✓	✓
Export		✓	✓	✓	✓	✓
Send		✓	✓	✓	✓	✓
AuditTrail						
Archive					✓	
SetFilter					✓	
ConfigurationReadWrite					✓	
View		✓		✓	✓	✓
Common						
ServiceAccess					✓	✓
NetworkConfiguration				✓	✓	✓
RemoteAssistance		✓	✓	✓	✓	✓
EmergencyServiceAccess		✓	✓		✓	✓
SaveLog		✓	✓	✓	✓	✓
CopyToClipBoard		✓		✓	✓	✓
CorrectRearrange						
Correct		✓	✓	✓	✓	✓
History		✓	✓	✓	✓	✓
Rearrange		✓	✓	✓	✓	✓
Filming						
Expose		✓	✓	✓	✓	✓
PatientBrowser						
Delete		✓	✓	✓	✓	✓
ModifyPatientGroups		✓		✓	✓	✓
SetStateCompleted		✓	✓	✓	✓	✓
SetStateRead		✓	✓	✓	✓	✓
SetStateVerified		✓	✓	✓	✓	✓
PatientRegistration						
InvokeRegistration		✓	✓	✓	✓	✓
SecuritySystem						
BypassBlockedSystem			✓		✓	
OverrideLoginErrors			✓		✓	
ConfigurationRead		✓		✓	✓	✓
ConfigurationReadWrite					✓	
EnableServiceAccount					✓	✓
InteractiveLogin		✓	✓	✓	✓	✓
SetMode					✓	

Adding a User Account

You can add and configure user accounts for the ultrasound system.

Note: User accounts on a domain server must be added and managed using the domain server, not the ultrasound system.

To add a user account:

1. Access the configuration settings.
   a. Tap the configuration button.
   
   b. Click **System Management** and then click **Security**.
   c. Click the **Configure** selection for **syngo Security**.
   d. Click **Security Configuration**.
2. Select the ultrasound system domain from the list.
3. Create a user account.
   a. Select **User Management**.
   b. Right-click **Users** and then select **New**.
   c. Click **User**.
   d. Enter the information in the **User** tab.

Selection	Description
Name	Login name for the user account. The name is not editable after you save the user account.
Full name	Full name including first name and last name of the user
Description	Description of the user
New password	Password for the user
Confirm password	Password for the user
Account is disabled	When the check box is selected, the user account is not active, and the user cannot log in using a user name and password.
Password never expires	When the check box is selected, the password for the user account does not expire.
User cannot change password	When the check box is selected, the user cannot modify the password for the user account.
Account is locked out	When the check box is selected, the user account is locked, and the user cannot log in to the ultrasound system.

   e. Save the changes.

4. To assign group permissions to a user:
   a. Select the **Member of** tab.
   b. Select a group from the **Available Groups** list and then click **Add**.
   c. To remove the user from a group, select the group from the **Assigned Groups** list and then click **Remove**.
   d. Save the changes.
5. To assign role privileges to a user:
   a. Select the **Owner of** tab.
   b. Select a role from the **Available Roles** list and then click **Add**.
   c. To remove the user from a role, select the role from the **Assigned Roles** list and then click **Remove**.
   d. Save the changes.
6. To delete a user account:
   a. Right-click the user account.
   b. Select **Delete** and then select **Yes**.
   c. Restart the ultrasound system.

Editing a User Account

To edit a user account:

1. Access the configuration settings.
   a. Tap the configuration button.
   
   b. Click **System Management** and then click **Security**.
   c. Click the **Configure** selection for **syngo Security**.
   d. Click **Security Configuration**.
2. Select **User Management** and then select **Users**.
3. To filter the list of users, use the drop-down menus.
   a. Select a user, group, or role filter.
   b. Enter the search criteria and then press enter on the keyboard.
4. To change a user password:
   a. Double-click the user name.
   b. Enter and then confirm the new password.
   c. Save the changes.
5. To edit user information, for example, group permissions or role privileges:
   a. Double-click the user name.
   b. Select a tab and then update the required information.
   c. Save the changes.

Assigning Patients to a User or a Patient Group

You can assign patients or patient studies to a patient group. Patient groups or individual patients can also be assigned to individual users or user groups.

To assign patients to a patient group:

Prerequisite: Create a patient group.

1. Access the patient browser.
2. Select a patient study.
3. Select **Edit** and then click **Modify Patient Groups**.
4. Select the patient group to assign to the selected patient.
5. Click **OK**.

To assign patients to a user:

1. Access the patient browser.
2. Select a patient study.
3. Select **Edit** and then click **Modify Patient Groups**.
4. Click **Users**.
5. Select the user name and then click **Add**.
6. Select a domain from the **Domain** list, for example, the ultrasound system or a domain controller.
7. To search for a user, enter the search criteria in the **Filter** text box and then click **Find**.
8. Select the user name from the list and then click **OK**.
9. Click **OK** in each subsequent window.

Configuring Password Complexity

You can configure the password requirement for user accounts on the ultrasound system. You can also reset internal account passwords.

To configure password complexity or reset internal passwords:

1. Access the configuration settings.
   a. Tap the configuration button.
   
   b. Click **System Management** and then click **Security**.
   c. Click the **Configure** selection for **syngo Security**.
2. Click **Password Configuration**.
3. Select the required tab and then enter or modify the configuration settings.

Selection	Description
Reset Password	---
Users List	Lists internal accounts essential for the underlying operating system of the ultrasound system. You can reset passwords for internal users. ▪ **AET DICOM_USER** performs processes using DICOM services ▪ **BRAdmin** backs up and restores files on the computer ▪ **LocalServiceUser** provides local service access ▪ **RemoteServiceUser** provides remote service access ▪ **ReplACCUser** is reserved for future use
Select All	Selects all internal accounts in the list
Default Settings	Selects the default setting for the password of the selected internal accounts
Reset Password	Resets the password for the selected internal accounts. The system displays a dialog box requesting confirmation to reset the password for the selected accounts and restart the ultrasound system.
Password Complexity	Displays the password configuration requirements, for example, a minimum number of uppercase characters
Account Policy	Displays account configuration requirements, for example, the duration to lock an account

4. To save the settings and close the dialog box, click **OK**.
5. To restart the ultrasound system, click **OK**.

Audit Trail Management

Configuring the Audit Trail

You can configure the audit trail by selecting the events recorded in the security log file and specifying the archive location. The archive location is called an auditing mode.

To configure the audit trail:

1. Tap the configuration button.

2. Click **System Management** and then click **Security**.
3. Click the **Detail** selection for **Audit Trail**.
4. Click **Audit Trail Settings**.
5. Click **Setup**, if necessary.
6. Select the required archive location for the security log file and then enter or modify the configuration settings.
7. To view the next configuration screen, click **Next**.
8. To view the previous configuration screen, click **Back**.

Selection	Description
Local file system	Select the ultrasound system as the destination for the security log file.
Audit Trail directory	Select the location for the archive of the security log file.
Max size (kBytes)	Enter the maximum size of the security log file.
Zipped	Select the check box to compress the security log file.
Disc quota checks	**Note:** The system displays the total disk space of the audit trail drive, including the total disk space used by the audit trail.
Warning level [%]	Select the check box to specify the storage capacity level of the security log file as a percentage of the maximum size.
Quota limit [%]	Select the check box to specify the quota limit of the security log file as a percentage of the maximum size.
Optical Drives	**Prerequisite:** Attach and configure the optional Blu-ray/DVD/CD combination drive. Enter the location of the device and select additional options.
Network Share	Enter the user name, domain, password, and network location.
Test	Validate the connection to the network location.
USB	Select the drive letter for the USB-compatible storage device. **Note:** USB ports E and F are located on the touch screen.

Selection	Description
Central syslog server	Select a network location as the destination for the security log file.
Host	Enter the host name of the network location.
Port	Enter the port number of the network location.
Protocol	Enter the protocol name of the network location.
Encoding	Enter the encoding option of the network location.
Test	Validate the connection to the network location.

9. Click **Finish**.

To view the audit trail:

1. Tap the configuration button.



2. Click **System Management** and then click **Security**.
3. Click the **Detail** selection for **Audit Trail**.
4. Click **Audit Trail View**.
   - **Audit Filter** lists the filters available for security log files.
   - **Audit Viewer** lists the viewing selections for security log files.
5. To exit, close the dialog box.

Archiving the Audit Trail

You can archive the audit trail by saving the security log file to the location specified in the configuration settings.

To archive the audit trail:

Prerequisite: Configure an archive location for the audit trail, for example, a network location.

1. Tap the configuration button.
   
2. Click **System Management** and then click **Security**.
3. Click the **Detail** selection for **Audit Trail**.
4. Click **Audit Trail Archive**.
   The system displays an icon next to the name of the security log file to indicate the archive status of the log file.

Icon	Function
	The security log file is not stored.
	The security log file is stored.
	The security log file is not stored and includes edits to patient data.
	The security log file is stored and includes edits to patient data. The security log files must be saved according to national and local regulations.

5. Select the file and then click **Archive**.
   The ultrasound system displays the disk space available on the system and total quota limit in megabytes.
6. To initiate the archive process after an incomplete archive, click **Restart**.
7. To remove the security log file from the ultrasound system, click **Delete**.

Appendix A EMC Publication

Electromagnetic Compatibility 3
Avoiding Electromagnetic Interference 3
Electrosurgical Units 4

Restrictions for Use 4
Immunity Level Test Results 4

Transducers, Accessories, and Cables 5
User-Accessible Cables 5

Electromagnetic Compatibility

The electromagnetic compatibility (EMC) testing of this system was performed according to the international standard for EMC of medical devices (IEC 60601-1-2). This International Electrotechnical Commission (IEC) standard has been adopted in Europe as the European Norm (EN) standard (EN 60601-1-2). The ultrasound system from Siemens Healthineers meets the requirements of the standard and is suitable for a professional healthcare environment. Compliance with test limits does not guarantee that a particular installation will be free from electromagnetic interference.

The following is the definition for the essential performance of the ultrasound equipment:

- The image display is free of noise or distortion of the image or numerical value errors which may cause misdiagnosis.
- The image display is free from incorrect safety-related indications, for example, MI or TI.
- The device is free from unintended or excessive ultrasound output, transducer surface temperature, or uncontrolled motion of transducer assemblies intended for intra-corporeal (endocavity) use.

Avoiding Electromagnetic Interference

⚠ **WARNING:** Operating the ultrasound system in close proximity to other equipment can cause reciprocal interference. You should observe and ensure normal operation of the ultrasound system and other equipment.

Medical devices either generate (emit) or receive electromagnetic interference. The EMC standards describe tests for both emitted and received interference. Emission tests address interference generated by the device being tested. The ultrasound system from Siemens Healthineers meets the standard for radiated emissions.

Radio frequency (RF) is a form of electromagnetic energy tested by the EMC standards. Ultrasound systems and ultrasound transducers operate in the range of RF frequencies and are therefore susceptible to interference generated by other RF energy sources. Sources of RF interference include medical devices, information technology products, and radio/television transmission towers. To reduce interference from an RF energy source:

- Increase the separation (distance) between the ultrasound equipment and the interfering device (RF energy source).
- Connect the ultrasound equipment and the interfering device (RF energy source) to separate outlets on separate circuits, if possible.

In some environments, it is difficult to identify the source of radiated interference. To identify the source of the interference, determine the answers to these questions and then contact your service representative with the information you have collected.

- Is the interference intermittent or constant?
- Is the interference present with only one transducer or with several transducers?
- Do two different transducers operating at the same frequency have the same problem?
- Is the interference present if the ultrasound system is moved to a different location in the facility?
- Is the interference mode-dependent? That is, does the interference occur only in one mode, such as during Doppler?
- Can the EMC coupling path be attenuated? For example, does placing a transducer close to an ECG cable increase electromagnetic interference? Does moving the cable or other medical equipment away from the transducer result in reduced electromagnetic interference?

Electrosurgical Units

Electrosurgical units (ESUs) and other devices intentionally introduce radio frequency electromagnetic fields or currents into patients. Because ultrasound imaging frequencies are coincidentally in this radio frequency range, ultrasound transducer circuits are susceptible to radio frequency interference. When an ESU is in use, expect the ultrasound image to experience severe interference that may make the image unusable. This interference stops as soon as the ESU is powered off.

Restrictions for Use

If RF interference is detected, then the physician must determine if an artifact caused by the interference will negatively impact image quality and the subsequent diagnosis.

Immunity Level Test Results

Immunity is defined in the standard as the ability of a system to perform without degradation in the presence of electromagnetic disturbance. The EMC standards require manufacturers of patient-coupled equipment to specify immunity levels for their systems. The standards recognize that ultrasound equipment is designed to receive and amplify low-level signals in the same bandwidth as the interference. Therefore, it is reasonable to expect image noise during electromagnetic disturbance.

Electromagnetic Compatibility (EMC) Note: Operating the ultrasound imaging system in close proximity to sources of strong electromagnetic fields, such as radio transmitter stations or similar installations, as well as portable and mobile RF (radiated frequency) may lead to temporary degradation or interference visible on the monitor screen. A lightening of image background may be noticed while visualizing hypoechoic structures, or color spectral interference, or jitter, or horizontal lines in the image screen may occur. However, the device has been designed and tested to withstand such interference and will not be permanently damaged. Wait until the interference disappears or restart the ultrasound system.

When comparing immunity levels of different ultrasound systems, recognize that although the EMC standard does define the test methodology, it does not specify the criteria to assess degradation. Degradation assessment may vary by manufacturer.

A qualitative assessment of degradation in image quality is subjective. Noting when the first sign of an artifact is seen in the image minimizes the issue of subjectivity and also provides for stringent test results.

The results of emissions testing and immunity testing are provided in the accompanying tables. The standards used in testing are also provided in the tables. Testing was performed on a typical ultrasound system configuration. The values in the compliance level column of the tables specific to transducers is the level at which the RF interference is no longer discernable from the ambient background noise.

Transducers, Accessories, and Cables

⚠ **WARNING:** Accessory equipment connected to the analog and digital interfaces must be certified according to the respective EN or IEC standards (for example, EN 60950 or IEC 60950 for data processing equipment and EN 60601-1 or IEC 60601-1 for medical equipment). Anyone who connects additional equipment to any of the signal input or signal output ports configures a medical system and is therefore responsible that the system complies with the requirements of the system standards EN 60601-1 or IEC 60601-1. Siemens Healthineers can only guarantee the performance and safety of the devices listed in the *Instructions for Use*. If in doubt, consult the Siemens Healthineers service department or your local Siemens Healthineers representative.

⚠ **WARNING:** You must only use the transducers, accessories, cables, and replacement parts for internal components specified by Siemens Healthineers to reduce the risk of increased RF (radio frequency) emissions or decreased immunity of the ultrasound system.

User-Accessible Cables

See also: For information about cables, refer to Appendix A in the Instructions for Use.

Table 1. Guidance and manufacturer's declaration — electromagnetic emissions for the ultrasound system

The ultrasound system is intended for use in the electromagnetic environment specified below. The customer or the user of the ultrasound system should assure that it is used in such an environment.		
Emissions Test	**Compliance**	**Electromagnetic Environment - Guidance**
RF emissions CISPR 11	Group 1	The ultrasound system uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class A	The ultrasound system is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations/flicker emissions IEC 61000-3-3	Complies	

Table 2. Guidance and manufacturer's declaration — electromagnetic immunity for the ultrasound system independent of transducer type

The ultrasound system is intended for use in the electromagnetic environment specified below. The customer or the user of the ultrasound system should assure that it is used in such an environment.			
Immunity Test	**IEC 60601-1-2 Test Level**	**Compliance Level**	**Electromagnetic Environment - Guidance**
Electrostatic discharge (ESD) IEC 61000-4-2	±8 kV contact ±15 kV air	±8 kV contact ±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	±1 kV line to line ±2 kV line to ground	±1 kV differential mode ±2 kV common mode	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 (100% dip in U_T) for 0.5 cycle	System may shut down and the mains circuit breaker could be switched to the off position (O = OFF).	Ensure the mains circuit breaker is in the on position (I = ON) and then use the power on sequence to reboot the system. Mains power quality should be that of a typical commercial or hospital environment. If the user of the ultrasound system requires continued operation during power mains interruptions, it is recommended that the ultrasound system be powered from an uninterruptible power supply or a battery.
	0% U_T (100% dip in U_T) for 1 cycle	0% U_T (100% dip in U_T) for 1 cycle	Mains power quality should be that of a typical commercial or hospital environment. If the user of the ultrasound system requires continued operation during power mains interruptions, it is recommended that the ultrasound system be powered from an uninterruptible power supply or a battery.
	70% U_T (30% dip in U_T) for 25 cycles	70% U_T (30% dip in U_T) for 25 cycles	
	0% U_T (100% dip in U_T) for 250 cycles	System goes to normal power down condition.	For extended mains power outages without the use of an uninterruptible power supply or a battery, the system will shut down normally. Use the power on sequence to reboot the system.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	30 A/m	30 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
Note: U_T is the a.c. mains voltage prior to application of the test level.			

Table 3. Guidance and manufacturer's declaration — electromagnetic immunity for the ultrasound system

The ultrasound system is intended for use in the electromagnetic environment specified below. The customer or the user of the ultrasound system should assure that the system is used in such an environment.

Immunity Test	IEC 60601-1-2 Test Level	Compliance Level	Electromagnetic Environment – Guidance
			Portable and mobile RF communications equipment should be used no closer to any part of the ultrasound system, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. **Recommended separation distance (*d*)**
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz outside ISM bands	3 Vrms	$d = 1.2 \sqrt{P}$
	6 Vrms 150 kHz to 80 MHz within ISM bands	6 Vrms	
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2.7 GHz	3 V/m	$d = 2.0 \sqrt{P}$ 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.

Note 3: The ISM (Industrial, Scientific, and Medical) bands between 150 kHz and 80 MHz are 6.765 MHz to 6.795 MHz; 13.553 MHz to 13.567 MHz; 26.957 MHz to 27.283 MHz; and 40.66 MHz to 40.70 MHz.

[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 ultrasound system is used exceeds the applicable RF compliance level above, the ultrasound system should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as changing transducers or transducer operating frequency, or re-orienting or relocating the ultrasound system.

[b] Over the frequency range 150 kHz to 80 MHz, field strengths should be less than the compliance level 3 V/m.

Table 4. Recommended separation distances between portable and mobile RF communications equipment and the ultrasound system

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

Rated maximum output power of transmitter **W (watts)**	**Separation distance according to frequency of transmitter m (meters)**	
	150 kHz to 80 MHz	**80 MHz to 2.7 GHz**
	$d = 1.2 \sqrt{P}$	$d = 2.0 \sqrt{P}$
0.01	0.12	0.20
0.1	0.38	0.63
1	1.2	2.0
10	3.8	6.3
100	12	20

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

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.

Table 5. Guidance and manufacturer's declaration - electromagnetic immunity

The ultrasound system is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. Portable RF communications equipment should be used no closer than 30 cm (12 inches) to any part of the ultrasound system. Otherwise, degradation of the performance of this equipment could result.					
Immunity Test	**Band[a]**	**Service[a]**	**Modulation**	**IEC 60601 test level**	**Compliance level**
Proximity fields from RF wireless communications equipment IEC 61000-4-3	380 - 390 MHz	TETRA 400	Pulse modulation 18 Hz	27 V/m	27 V/m
	430 - 470 MHz	GMRS 460 FRS 460	FM ± 5 kHz deviation 1 kHz sine	28 V/m	28 V/m
	704 - 787 MHz	LTE Band 13, 17	Pulse modulation 217 Hz	9 V/m	9 V/m
	800 - 960 MHz	GSM 800/900 TETRA 800 iDEN 820 CDMA 850 LTE Band 5	Pulse modulation 18 Hz	28 V/m	28 V/m
	1700 - 1990 MHz	GSM 1800 CDMA 1900 GSM 1900 DECT LTE Band 1, 3, 4, 25 UMTS	Pulse modulation 217 Hz	28 V/m	28 V/m
	2400 - 2570 MHz	Bluetooth WLAN 802.11 b/g/n RFID 2450 LTE Band 7	Pulse modulation 217 Hz	28 V/m	28 V/m
	5100 - 5800 MHz	WLAN 802.11 a/n	Pulse modulation 217 Hz	9 V/m	9 V/m
Note: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.					
[a] For some services, only the uplink frequencies are included.					

Appendix B Patient Data Access

Overview **3**
Location of Patient Data 3
Accessing Studies from Source Media 4
Patient Browser Selections 5
Searching for Patient Studies **6**
Deleting a Patient Study **6**
Adjusting the Study List **7**
Study List Selections and Icons 8
Managing Images and Clips **10**
Entering Query/Retrieve Selection Criteria **11**
Reviewing Job Status **13**
Job Status Selections 14

Overview

You can access patient data from patient registration and from the patient browser.

Patient registration includes selections for scheduling a new patient or searching for a study saved to a worklist server or the ultrasound system. Use patient registration to update patient information or select the study.

The patient browser displays a list of patient studies saved to a worklist server, the ultrasound system, or an external storage device. Use the patient browser to manage patient data, including correcting patient information or transferring a patient study.

See also: For information about patient registration and beginning a study, refer to Chapter 5 in the Instructions for Use.

Location of Patient Data

You can access patient data from the patient browser screen or the patient registration screen. The location of patient data is dependent on the screen.

Note: The patient registration screen includes a patient browser in a condensed layout.

Patient Browser

Selection	Description
Source Media	---
Local Database	Displays a list of patient data stored in the local database of the ultrasound system. Also displays the space available in the database.
USB	Displays a list of patient data stored on a connected USB-compatible storage device.
CD/DVD	Displays a list of patient data stored on a disc in a connected compatible optical drive, for example, a compact disc (CD) or digital video disc (DVD).

Patient Registration

Selection	Description
Local Database	Displays a list of patient data stored in the local database of the ultrasound system.
Worklist	(Available only for systems connected to a HIS/RIS server configured for MPPS) Displays a list of patient data for scheduled patient procedures.
Paused Studies	Displays a list of paused patient studies in the local database.

Accessing Studies from Source Media

You can change the source media from the local database to a server connected to the ultrasound system.

To view a patient study saved on an external storage device, you must import the study to the local database on the ultrasound system.

See also: For information about importing patient data, refer to Chapter B2 in the Advanced Imaging Manual.

To select source media and a time period:

1. Select a new location from the **Source Media** list.
   The study list populates with patient data from the selected location.
2. To select a custom period for the studies:
   a. Select the **Custom Range** check box.
   b. Select a **Start Date** and **End Date**.
      Note: You can click the icon to access a calendar to select a date.
3. To select a defined period for the studies:
   a. Deselect the **Custom Range** check box.
   b. Select an option from the list.
      - **Show All** shows all studies.
      - **Last 24 hours** shows studies within the last 24 hours.
      - **Last 48 hours** shows studies within the last 48 hours.
      - **Last 7 days** shows studies within the last seven days.
      - **Last 1 month** shows studies within the last month.

Patient Browser Selections

The following selections are available on the patient browser screen.

Patient browser selections display on the touch screen on a contextual workflow basis.

Selection	Description
Source Media	Indicates the current storage location of patient data in the study list, for example, the local database or a connected server.
Query/Retrieve	Queries and retrieves patient data from a connected DICOM archive, worklist, or picture archiving and communication system (PACS).
Print Preview	Displays an image preview from a connected DICOM print server. **See also:** For information about printing patient data, refer to Chapter 13 in the Instructions for Use.
Job Status	Displays the status of patient data transferring to a connected DICOM server.
Search	Displays criteria for searching for patient data stored in the source media, for example, patient name, accession number, operator, patient identification, date of birth, and gender.
Study List	Displays a list of patient studies stored in the current storage location.
Delete	Deletes the selected patient data from the current storage location.
Print	Prints the selected studies. **See also:** For information about printing images, refer to Chapter 13 in the Instructions for Use.
Send	Sends the selected studies to a connected server.
Export	Exports the selected studies to storage media on a connected external device. **See also:** For information about exporting patient data, refer to Chapter B2 in the Advanced Imaging Manual.
Load to Review	Loads the selected patient study and activates review. **See also:** For information about reviewing a patient study, refer to Chapter B1 in the Advanced Imaging Manual.
New Study	Populates the patient registration form with patient data from the selected study. **See also:** For information about selecting an existing patient and beginning a new study, refer to Chapter 5 in the Instructions for Use.
Append Study	Available for 24 hours after a study ends. Loads the selected study as the active study.

Searching for Patient Studies

Patient registration and patient browser screens include a keyword search text box. Patient registration also includes a search panel for locating specific study information.

Icon	Description
+	Expands the search panel.
–	Hides the search panel.

To find a patient study using the search panel:

Prerequisite: Access the patient browser.

1. Enter the required search criteria, for example, patient name, accession number, operator, patient identification, date of birth, and gender.
2. Click **Search**.
3. To clear the selected criteria, click **Clear**.

Deleting a Patient Study

Deleting a study removes all content in the study from the local database on the ultrasound system, for example, all images saved with the study.

You cannot delete active, locked, or paused studies.

To delete a study:

1. Tap **Patient**.
2. Tap **Patient Browser**.
3. Select the check box next to each required study.
4. Click **Delete**.
5. To confirm the deletion, click **OK**.
6. To cancel the deletion, click **Cancel**.

Adjusting the Study List

The study list displays the list of patient data for the current location, for example, the local database or a connected server.

You can adjust the study list by sorting the contents of the list, adding and removing columns, and changing the column widths.

To adjust the study list:

Prerequisite: Access the patient browser.

To	Do This
Sort the study list	▪ Click a column heading.
Add or remove a column	1. Click the column display selection icon.  2. To display a column in the study list, enable the check box for the selection. **Note:** You can choose up to six selections. 3. Click **OK**.
Change the width of a column	1. Access the pointer and then roll the trackball to position the pointer over the required column heading until the resize icon displays in the column.  2. Press a trackball key and then drag the icon to resize the column.

Study List Selections and Icons

Selection	Description	Icon
---	Selects or deselects all patient studies in the list.	
(study status)	---	---
Active	Indicates the study is in progress. (green icon)	
Paused	Indicates the study is paused and has not ended. Paused studies, including measurement data and images, are saved to the local database on the ultrasound system. You cannot transfer, export, print, or delete paused studies. (yellow icon)	
Discontinued	Indicates the study is abandoned. Data and images cannot be transferred. You cannot review, resume, or append a discontinued study. You can export a discontinued study. (gray icon)	
Complete	Indicates the study has ended. (gray icon)	
(collapsed)	Indicates the hierarchy of all series objects is hidden for the selected patient.	
(expanded)	Indicates a hierarchy of all series objects is shown for the selected patient. A series object may contain multiple images from other modalities. ▪ **CT** indicates computed tomography ▪ **MR** indicates magnetic resonance ▪ **MM** indicates mammography ▪ **US** indicates ultrasound	
Patient Name	Indicates the patient name.	---
Patient ID	Indicates the identification code for the patient.	---
Date of Birth	Indicates the birth date of the patient.	---
Gender	Indicates the gender of the patient.	---
Accession No	Indicates the accession number for the study.	---
Exam	Indicates the name of the exam or image preset included in the study.	---
Date & Time	Indicates the date and time of the study.	---

Selection	Description	Icon
Operator	Indicates the name of the person operating the ultrasound system for the study.	---
Performing Physician	Indicates the name of the physician for the study.	---
Referring Physician	Indicates the referring physician for the study.	---
(thumbnail images)	---	---
Images	Displays the number of images in the study.	
Clips	Displays the number of clips in the study.	
Volumes	Displays the number of volumes in the study.	
SR	Displays the number of DICOM structured reports (SR) in the study.	SR
Archived	Indicates patient data is stored on the DICOM server.	
(protection status)	(Available only for patient data in the local database) Selecting the lock or unlock icon assigns or removes a data protection status.	---
Locked	Indicates the study is locked. Prevents deletion, correction, or rearrangement of the data.	
Unlocked	(Available only for patient data in the local database) Indicates the study is unlocked. Allows for deletion, correction, or rearrangement of the data.	
Size (MB)	Arranges studies by the file size.	---

Managing Images and Clips

The patient browser includes a thumbnail panel for managing images and clips, including volumes and structured reports (SR).

See also: For information about using the thumbnail panel to view, select, and delete images, refer to Chapter 5 in the Instructions for Use.

You can click the collapse/expand icon to show or hide the thumbnail panel.

Example of the collapse/expand icon.

To manage an image or clip from the study list:

Prerequisite: Access the patient browser.

1. Select the required study.
2. Select the thumbnails of the required images and clips.
3. To delete the selected images and clips:
   a. Click **Delete**.

   b. To confirm the deletion, click **OK**.
   c. To cancel the deletion, click **Cancel**.
4. To send the selected images and clips to the connected DICOM server, click **Send**.

   See also: For information about sending data to the server, refer to Chapter B2 in the Advanced Imaging Manual.
5. To export the selected images or clips to a connected external storage device, click **Export**.

   See also: For information about exporting patient data, refer to Chapter B2 in the Advanced Imaging Manual.

Entering Query/Retrieve Selection Criteria

You can query and retrieve patient data from a connected DICOM archive, worklist, or picture archiving and communication system (PACS) using DICOM attributes.

See also: For information about querying and retrieving patient data, refer to Chapter B2 in the Advanced Imaging Manual.

Basic Search

Selection	Description of DICOM Attribute
Patient Name	Patient name
Patient ID	Patient identification
Date of Birth	Date of birth for the patient
Sex	Gender of the patient: any, male, female, other
Study Date	From and to date of the study
Study Time	From and to time of the study
Accession Number	Accession number of the study
Modality	Modality of the study: all modalities, computed tomography, magnetic resonance imaging, mammography, ultrasound
Node	DICOM node, for example, an archive node or MPPS node

Advanced Search

Selection	Description of DICOM Attribute
Study Description	Study description
Study ID	Study identification
Referring Physician	Referring physician
Study Instance UID	Study instance unique identifier
Series Instance UID	Series instance unique identifier
Series Number	Series number
Series Description	Description of the series
PPS Start Date	Start date of the performed procedure step
Body Part Exam	Examined body part
Performing Physician	Performing physician
Request Procedure ID	Request procedure identification
Scheduled Procedure ID	Scheduled procedure identification
Approval Status	Approval status: approved, unapproved, rejected

Reporting Search

Selection	Description of DICOM Attribute
Concept Code Meaning	Concept code meaning
Concept Code Value	Concept code value
Concept Code Designator	Concept code designator
Content Date	Content date: today, yesterday
Content Time	Content time
Report Status	Report status: none, completed + unverified, completed + verified, partially completed + unverified, partially completed + verified
Verification Date	Verification date
Verification Time	Verification time
Verifying Observer Name	Name of the verifying observer

Reviewing Job Status

You can check the status of a print or transfer job. You can also pause and retry jobs.

See also: For information about importing and exporting patient data, refer to Chapter B2 in the Advanced Imaging Manual.

To display the job status:

Prerequisite: Access the patient browser.

- Tap **Job Status**. Or, click **Job Status**.

To	Do This
Select a job	▪ Select the check box next to the job.
Limit the number of jobs displayed in the list	▪ Click the filter icon. 
Refresh the job status list	▪ Click **Refresh**.
Delete a data transfer	1. Select the required job. 2. Click **Delete**.
Pause a data transfer	1. Select the required job. 2. Click **Pause**.
Resend the data transfer, export, or print job	1. Select the required job. 2. Click **Retry**.
Resend all pending data transfers or print jobs	▪ Click **Retry All**.
Close the job status dialog box	▪ Click **Close**.

Job Status Selections

Selection	Description
Type	Indicates the type of operation, for example, storage.
Import	Indicates an import operation.
Print	Indicates a print operation.
DICOM Print	Indicates a DICOM print operation.
DICOM Store	Indicates a DICOM store operation.
Export	Indicates an export operation.
Nuance Data	Indicates a Nuance data transfer operation.
Patient Name	Indicates the patient name. **Note:** For Nuance data, the system displays the accession number.
Object	Indicates the type of data, for example, image or study, and the object count.
Size (MB)	Indicates the file size of the job.
Posted	Indicates the date and time the job was initiated.
Destination	Indicates the study destination; for example, DICOM storage.
Nuance Server	Indicates the destination is the Nuance server.
Status	---
Imported	Indicates the data import is completed.
Succeeded	Indicates the data transfer is completed.
Failed	Indicates the data transfer failed.
Error	Indicates a data transfer error.
Pause	Indicates the data transfer is paused. When a DICOM printer is paused, the system displays a message indicating the printer is paused and prompts you to press **Retry** to resume printing.
In progress…	Indicates the data transfer is in progress.
(progress bar)	Displays the progress of the data transfer.
Description	Provides an error description if the job fails.

Appendix C Measurement and Calculation Labels

Overview **3**
Modifiers for Measurement Labels 3

Abdomen and Pediatric Abdomen **3**
2D-mode General Abdominal Measurement Labels 4
Doppler General Abdominal Measurement Labels 4
2D-mode Abdominal Vascular Measurement Labels 5
Doppler Abdominal Vascular Measurement Labels 6
2D-mode Renal Vascular Measurement Labels 7
Doppler Renal Vascular Measurement Labels 7
Abdomen and Pediatric Abdomen Calculation Labels 8

Breast **9**
2D-mode Breast Measurement Labels 9
2D-mode and Doppler Breast Measurement Labels 9
Breast Calculation Labels 9

Carotid **10**
2D-mode and Doppler Carotid Measurement Labels 10
Carotid Calculation Labels 10

Gynecology **11**
2D-mode Gynecology Measurement Labels 11
Doppler Gynecology Measurement Labels 11
Gynecology Calculation Labels 12

Pediatric Hip **13**
2D-mode Pediatric Hip Measurement Labels 13

Pelvis **14**
2D-mode Pelvis Measurement Labels 14
Pelvis Calculation Labels 14

Penile **15**
2D-mode Penile Measurement Labels 15
2D-mode and Doppler Penile Measurement Labels 15

Peripheral Vascular Arterial, Lower Extremity (LEA) **16**
2D-mode and Doppler LEA Measurement Labels 16

Peripheral Vascular Arterial, Upper Extremity (UEA) **16**
2D-mode and Doppler UEA Measurement Labels 16

Peripheral Vascular Venous, Lower Extremity (LEV) **17**
2D-mode and Doppler LEV Measurement Labels 17

Peripheral Vascular Venous, Upper Extremity (UEV) **17**
2D-mode and Doppler UEV Measurement Labels 17

Prostate **18**
2D-mode Prostate Measurement Labels 18
Doppler Prostate Measurement Labels 18
Prostate Calculation Labels 19

Renal **20**
2D-mode Renal Measurement Labels 20
Doppler Renal Measurement Labels 20
Renal Calculation Labels 20

Testis **21**
2D-mode Testis Measurement Labels 21
Doppler Testis Measurement Labels 21
Testis Calculation Labels 21

Thyroid **22**
2D-mode Thyroid Measurement Labels 22
Doppler Thyroid Measurement Labels 22
Thyroid Calculation Labels 22

Transcranial Imaging (TCI) **23**
Doppler TCI Measurement Labels 23
Transcranial Imaging (TCI) Calculation Labels 23

Overview

The ultrasound system calculates the value when the required labeled measurements have been made.

The measurement label for the required measurements can include the location, view, or dimension of the anatomy.

Note: Installed features determine the availability of measurement and calculation label packages.

Use the configuration settings to select measurement labels to display on the touch screen.

Modifiers for Measurement Labels

(Not available for the cardiac exam)

You can configure the display of measurement labels.

Measurement labels are organized on the touch screen as specified in the configuration settings. Measurement labels can include the location, view, or dimension of the anatomy, for example, proximal or distal.

Abdomen and Pediatric Abdomen

The ultrasound system organizes the measurement labels into the following categories and sub-categories:

- **General** includes general measurements.
  - **Abdomen** lists abdominal measurement labels.
  - **Miscellaneous** lists general measurement labels.
- **Abdominal Vascular** includes vascular measurements.
  - **Aorta-iliac** lists labels for measuring the iliac aorta.
  - **Hepatoportal/TIPS** lists labels for measuring the liver.
  - **Liver Transplant** lists measurement labels for measuring a liver transplant.
  - **Mesenteric** lists labels for measuring abdomen vessels (Doppler).
- **Renal Vascular** includes renal vascular measurements.

2D-mode General Abdominal Measurement Labels

Measurement Label	Definition
Aorta	Aorta
Liver	Liver length, anterior to posterior diameter, and width
Spleen	Spleen length, anterior to posterior diameter, and width
Kidney	Kidney length, anterior to posterior diameter, and width
Pre-Void Bladder	Pre-void bladder length, anterior to posterior diameter, and width
IVC	Inferior vena cava
Pancreatic Duct	Pancreatic duct
GB Wall Thickness	Gall bladder wall thickness
Cortical Thickness	Cortical thickness
Post-Void Bladder	Post-void bladder, length, and width
CBD	Common bile duct
CHD	Common hepatic duct
GB	Gall bladder length, anterior to posterior diameter, and width
Pancreas	Pancreas head, body, and tail

Doppler General Abdominal Measurement Labels

Measurement Label	Definition
Aorta	Aorta
Celiac Axis	Celiac axis
RHV	Right hepatic vein
Portal V	Portal vein
IVC	Inferior vena cava
CHA	Common hepatic artery
SMA	Superior mesenteric artery
MHV	Middle hepatic vein
SMV	Superior mesenteric vein
Splenic A	Splenic artery
IMA	Inferior mesenteric artery
LHV	Left hepatic vein
Splenic V	Splenic vein

2D-mode Abdominal Vascular Measurement Labels

Abdominal vascular measurement labels include portal end, mid, and hepatic end measurements.

Measurement Label	Definition
Liver	Liver
Stent	Stent
Spleen	Spleen
Portal V	Portal vein
Splenic V	Splenic vein
CHA	Common hepatic artery
IVC	Inferior vena cava
AAA	Abdominal aortic aneurysm
CIA	Common iliac artery
AAA (Post Repair)	Abdominal aortic aneurysm, post repair
Ao Stent Graft	Aortic stent graft
AAA Sac Length	Abdominal aortic aneurysm sac length
EIA	External iliac artery
IIA	Internal iliac artery
Portal V Pre-anast	Portal vein pre-anastomosis
Portal V Anast	Portal vein anastomosis
Aorta	Aorta
CBD	Common bile duct
CHD	Common hepatic duct
Celiac A Origin	Celiac artery origin
SMA	Superior mesenteric artery
IMA Origin	Inferior mesenteric artery origin
Celiac A Origin, Postprandial	Celiac artery origin, postprandial
Splenic A	Splenic artery
IMA	Inferior mesenteric artery
SMA Origin, Postprandial	Superior mesenteric artery origin, postprandial
SMA Origin	Superior mesenteric artery origin

Doppler Abdominal Vascular Measurement Labels

Measurement Label	Definition
IVC	Inferior vena cava
Stent-Portal End Vmax	Stent-portal end, maximum velocity
Splenic V	Splenic vein
RHV	Right hepatic vein
Portal V	Portal vein
Stent-Mid Vmax	Stent-mid, maximum velocity
SMV	Superior mesenteric vein
MHV	Middle hepatic vein
CHA	Common hepatic artery
Stent-Hepatic End Vmax	Stent-hepatic end, maximum velocity
LHV	Left hepatic vein
AAA	Abdominal aortic aneurysm
CIA	Common iliac artery
AAA (Post Repair)	Abdominal aortic aneurysm, post repair
Ao Stent Graft	Aortic stent graft
AAA Sac Length	Abdominal aortic aneurysm sac length
EIA	External iliac artery
IIA	Internal iliac artery
Portal V Pre-anast	Portal vein pre-anastomosis
Portal V Anast	Portal vein anastomosis
CHA	Common hepatic artery
RHA	Right hepatic artery
LHA	Left hepatic artery
Aorta	Aorta
Celiac A Origin	Celiac artery origin
SMA	Superior mesenteric artery
IMA Origin	Inferior mesenteric artery origin
Celiac A Origin, Postprandial	Celiac artery origin, postprandial
Splenic A	Splenic artery
IMA	Inferior mesenteric artery
SMA Origin, Postprandial	Superior mesenteric artery origin, postprandial
SMA Origin	Superior mesenteric artery origin

2D-mode Renal Vascular Measurement Labels

Measurement Label	Definition
Kidney	Kidney
IVC	Inferior vena cava
Main RA	Main renal artery
Suprarenal Ao	Suprarenal aorta
ARA	Accessory renal artery
Aorta	Aorta
Cortical Thickness	Cortical thickness

Doppler Renal Vascular Measurement Labels

Measurement Label	Definition
Segmental A	Segmental artery
Arcuate A	Arcuate artery
Main RA	Main renal artery
Suprarenal Ao	Suprarenal aorta
ARA	Accessory renal artery
Aorta	Aorta

Abdomen and Pediatric Abdomen Calculation Labels

Calculation Label	Definition	Required Measurements
Main RA/Suprarenal Ao	Ratio of the main renal artery to the suprarenal aorta	Renal artery Suprarenal aorta
ARA/Suprarenal Ao	Ratio of the accessory renal artery to the suprarenal aorta	Renal artery Suprarenal aorta
GB	Gall bladder volume	Length Anterior to posterior diameter Width
Kidney	Kidney volume	Length Anterior to posterior diameter Width
Transplant Kidney	Kidney volume	Length Anterior to posterior diameter Width
Liver	Liver volume	Length Anterior to posterior diameter Width
Spleen	Spleen volume	Length Anterior to posterior diameter Width
Portal V Anast/Pre-Anast Vel Ratio	Velocity ratio of the portal vein anastomosis to the portal vein pre-anastomosis	Portal vein anastomosis Portal vein pre-anastomosis

Breast

The ultrasound system organizes the measurement labels into the following categories:

- **Default** lists general measurement labels.

2D-mode Breast Measurement Labels

Measurement Label	Definition
Mass 1	Mass, numbered 1 through 5
Cyst 1	Breast cyst, numbered 1 through 5
Axillary LN 1	Axillary lymph node, numbered 1 through 5
Int Mammary A	Internal mammary artery
Site 1	Breast site, numbered 1 through 5

2D-mode and Doppler Breast Measurement Labels

Measurement Label	Definition
Int Mammary A	Internal mammary artery

Breast Calculation Labels

Calculation Label	Definition	Required Measurements
Mass 1	Mass volume, numbered 1 through 5	Distance
Cyst 1	Cyst volume, numbered 1 through 5	Distance
Axillary Ln	Axillary lymph node volume, numbered 1 through 5	Distance
Int Mammary A	Internal mammary artery volume	Diameter

Carotid

The ultrasound system organizes the measurement labels into the following categories:

- **Default** lists general measurement labels.

2D-mode and Doppler Carotid Measurement Labels

Measurement Label	Definition
CCA	Common carotid artery
ECA	External carotid artery
ICA	Internal carotid artery
Vert A	Vertebral artery
Subclav A	Subclavian artery
Bulb	Carotid bulb
IMT	Intima-media thickness

Carotid Calculation Labels

The ultrasound system calculates the ratio of the internal carotid artery and common carotid artery with the required measurements from the RI-S/D Doppler trace tool. You can also perform the required measurements using the Doppler Trace and Heart Cycle tools.

Use the patient report to specify proximal, mid, or distal peak systolic values for the numerator and denominator.

Calculation Label	Definition	Required Measurements
ICA PS/CCA PS	Ratio of the internal carotid artery peak systolic velocity to the common carotid artery peak systolic velocity	Common carotid artery Internal carotid artery

Gynecology

The ultrasound system organizes the measurement labels into the following categories:

- **EV** lists endovaginal measurement labels.
- **Default** lists general Doppler measurement labels.
- **Follicle** lists measurement labels for measuring follicles.
- **TA** transabdominal lists pelvic measurement labels.
- **Pelvic Floor** lists pelvic measurement labels.
- **Renal/Bladder** lists renal and bladder measurement labels.

2D-mode Gynecology Measurement Labels

Measurement Label	Definition
Uterus (TA)	Uterus, transabdominal
Endo Thick (TA)	Endometrium thickness, transabdominal
Cyst 1	Cyst, numbered 1 through 5
Fibroid 1	Fibroid, numbered 1 through 5
Mass 1	Mass, numbered 1 through 5
Ovary (TA)	Ovary, transabdominal
Cervix (TA)	Cervix length, transabdominal
Uterus (EV)	Uterus, endovaginal
Endo Thick (EV)	Endometrium thickness, endovaginal
Ovary (EV)	Ovary, endovaginal
Cervix (EV)	Cervix length, endovaginal
Follicle 1	Follicle, numbered 1 through 4
Pre-Void Bladder	Pre-void bladder
Post-Void Bladder	Post-void bladder
Kidney	Kidney
Bladder neck-Symphysis	Bladder neck-symphysis distance
Rectovesical Angle at Rest	Rectovesical angle at rest
Rectovesical Angle at Valsalvas	Rectovesical angle at valsalvas
Rectal Ampulla descent	Rectal ampulla descent
Levator Hiatus	Levator hiatus

Doppler Gynecology Measurement Labels

Measurement Label	Definition
Uterine A	Uterine artery
Ovarian A	Ovarian artery
Ovarian V	Ovarian vein

Gynecology Calculation Labels

Calculation Label	Definition	Required Measurements
Mass 1	Mass, numbered 1 through 5	Length Anterior to posterior diameter Width
Axillary LN	Axillary lymph node, numbered 1 through 5	Length Anterior to posterior diameter Width
Cyst 1	Cyst, numbered 1 through 5	Length Anterior to posterior diameter Width
Ovary (EV)	Ovarian volume, endovaginal	Length Anterior to posterior diameter Width
Ovary (TA)	Ovarian volume, transabdominal	Length Anterior to posterior diameter Width
Uterus (EV)	Uterine volume, endovaginal	Length Anterior to posterior diameter Width
Uterus (TA)	Uterine volume, transabdominal	Length Anterior to posterior diameter Width
Kidney	Kidney volume	Length Anterior to posterior diameter Width

Calculation Label	Definition	Required Measurements
Fibroid 1	Fibroid, numbered 1 through 5	Length Anterior to posterior diameter Width
Int Mammary A	Internal mammary artery	Length Anterior to posterior diameter Width
PreVoid Bladder	Prevoid bladder volume	Length Anterior to posterior diameter Width
PostVoid Bladder	Postvoid bladder volume	Length Anterior to posterior diameter Width
Micturated Vol	Micturated volume	Prevoid bladder Postvoid bladder
Levator Hiatus	Levator hiatus	Anterior to posterior diameter Lateral distance Hiatal area

Pediatric Hip

The ultrasound system organizes the measurement labels in the following category:

- **Default** lists general measurement labels.

2D-mode Pediatric Hip Measurement Labels

Measurement Label	Definition
Hip Angle	Hip angle
Stressed %FHC	Stressed percentage of femoral head coverage
Flexed %FHC	Flexed percentage of femoral head coverage

Pelvis

The ultrasound system organizes the measurement labels into the following categories and sub-categories:

- **Default** lists general measurement labels.

2D-mode Pelvis Measurement Labels

Measurement Label	Definition
Prostate	Prostate
Pre-Void Bladder	Pre-void bladder
Post-Void Bladder	Post-void bladder
Seminal Ves	Seminal vesicle
Urethra	Urethra
Ureter	Ureter
Kidney	Kidney
Cortical Thickness	Cortical thickness

Pelvis Calculation Labels

Calculation Label	Definition	Required Measurements
Micturated Vol	Micturated volume	Prevoid bladder Postvoid bladder
Prostate	Prostate weight	Length Anterior to posterior diameter Width Weight
PreVoid Bladder	Prevoid bladder volume	Length Anterior to posterior diameter Width
PostVoid Bladder	Postvoid bladder volume	Length Anterior to posterior diameter Width

Penile

The ultrasound system organizes the measurement labels into the following categories:

- **Default** lists general measurement labels.

2D-mode Penile Measurement Labels

Measurement Label	Definition
Penile V	Penile vein

2D-mode and Doppler Penile Measurement Labels

Measurement Label	Definition
Penile V	Penile vein
Pre-inj Cavernosal A	Pre-injection cavernosal artery
Post-inj Cavernosal A	Post-injection cavernosal artery
Pre-inj Dorsal A	Pre-injection dorsal artery
Post-inj Dorsal A	Post-injection dorsal artery

Peripheral Vascular Arterial, Lower Extremity (LEA)

The ultrasound system organizes the measurement labels into the following categories:

- **Bypass** lists bypass measurement labels.
- **Native** lists general measurement labels.

System-defined calculation labels are not available for this exam package.

2D-mode and Doppler LEA Measurement Labels

Measurement Label	Definition
CFA	Common femoral artery
SFA	Superficial femoral artery
Pop A	Popliteal artery
PTA	Posterior tibial artery
Peroneal A	Peroneal artery
ATA	Anterior tibial artery
EIA	External iliac artery
DFA	Deep femoral artery
CFA Pseudoaneurysm	Common femoral artery pseudoaneurysm distance
Anast 1	Anastomosis, numbered 1 through 2
Graft 1	Graft, numbered 1 through 2

Peripheral Vascular Arterial, Upper Extremity (UEA)

The ultrasound system organizes the measurement labels into the following categories:

- **Bypass** lists bypass measurement labels.
- **Native** lists general measurement labels.
- **AVF** lists arteriovenous fistula labels for arterial blood vessels.

System-defined calculation labels are not available for this exam package.

2D-mode and Doppler UEA Measurement Labels

Measurement Label	Definition
Subclav A	Subclavian artery
Axillary A	Axillary artery
Brach A	Brachial artery
Radial A	Radial artery
Ulnar A	Ulnar artery

Peripheral Vascular Venous, Lower Extremity (LEV)

The ultrasound system organizes the measurement labels into the following categories:

- **Deep Venous** lists general measurement labels.
- **Superficial Venous** lists superficial venous measurement labels.

System-defined calculation labels are not available for this exam package.

2D-mode and Doppler LEV Measurement Labels

Measurement Label	Definition
CFV	Common femoral vein
Fem V	Femoral vein
Pop V	Popliteal vein
PTV 1	Posterior tibial vein, numbered 1 through 2
Peroneal V1	Peroneal vein, numbered 1 through 2
Gastroc V1	Gastrocnemius vein, numbered 1 through 2
SFJ	Saphenofemoral junction
Soleus V	Soleus vein
GSV: Thigh	Great saphenous vein, thigh
GSV: Knee	Great saphenous vein, knee
GSV: Calf	Great saphenous vein, calf
GSV: Ankle	Great saphenous vein, ankle
SSV: Calf	Small saphenous vein, calf
SSV: Ankle	Small saphenous vein, ankle
Cockett's Perf 1	Cockett's perforator, numbered 1 through 3
Dodd Perf	Dodd perforator

Peripheral Vascular Venous, Upper Extremity (UEV)

The ultrasound system organizes the measurement labels into the following categories:

- **Deep Venous** lists general measurement labels.
- **Superficial Venous** lists superficial venous measurement labels.

System-defined calculation labels are not available for this exam package.

2D-mode and Doppler UEV Measurement Labels

Measurement Label	Definition
IJV	Internal jugular vein
Subclav V	Subclavian vein
Axillary V	Axillary vein
Brachial V1	Brachial vein, numbered 1 through 2
Radial V1	Radial vein, numbered 1 through 2
Ulnar V1	Ulnar vein, numbered 1 through 2

Prostate

The ultrasound system organizes the measurement labels into the following categories:

- **Transabdominal** lists transabdominal measurement labels.
- **Endorectal (2D)** lists endorectal measurement labels.

2D-mode Prostate Measurement Labels

Measurement Label	Definition
Prostate	Prostate
Seminal Ves	Seminal vessel
Prostatic Urethra	Prostatic urethra
Mass 1	Mass, numbered 1 through 5
Prostate Mass 1	Prostate mass, numbered 1 through 5
Ejaculatory Duct	Ejaculatory duct
Vas Deferens	Vas deferens
Kidney	Kidney
PreVoid Bladder	Pre-void bladder
PostVoid Bladder	Post-void bladder

Doppler Prostate Measurement Labels

Measurement Label	Definition
IIA	Internal iliac artery
IIV	Internal iliac vein

Prostate Calculation Labels

Calculation Label	Definition	Required Measurements
Prostate	Prostate volume	Length Anterior to posterior diameter Width
Prostate	Prostate weight	Length Anterior to posterior diameter Width
Prostate Mass 1	Prostate mass, numbered 1 through 5	Length Anterior to posterior diameter Width
Kidney	Kidney volume	Length Anterior to posterior diameter Width
Micturated Vol	Micturated volume	Prevoid bladder Postvoid bladder
PreVoid Bladder	Prevoid bladder volume	Length Anterior to posterior diameter Width
PostVoid Bladder	Postvoid bladder volume	Length Anterior to posterior diameter Width

Renal

The ultrasound system organizes the measurement labels into the following categories:

- **Renal/Bladder** lists bladder measurement labels.
- **Renal Vascular** lists vascular measurement labels.
- **Renal Transplant** lists Doppler transplant measurement labels.

2D-mode Renal Measurement Labels

Measurement Label	Definition
Kidney	Kidney
Ureter	Ureter
Prostate	Prostate
PreVoid Bladder	Pre-void bladder
PostVoid Bladder	Post-void bladder
Cortical Thickness	Cortical thickness
Urethra	Urethra
Aorta	Aorta
Renal V	Renal vein

Doppler Renal Measurement Labels

Measurement Label	Definition
Aorta	Aorta
Suprarenal Ao	Suprarenal aorta
Main RA	Main renal artery
ARA	Accessory renal artery
Segmental A	Segmental artery
Arcuate A	Arcuate artery

Renal Calculation Labels

Calculation Label	Definition	Required Measurements
RA/Suprarenal Ao	Ratio of the main renal artery to the suprarenal aorta	Renal artery Suprarenal aorta
ARA/Suprarenal Ao	Ratio of the accessory renal artery to the suprarenal aorta	Renal artery Suprarenal aorta
PreVoid Bladder	Prevoid bladder volume	Length Anterior to posterior diameter Width
PostVoid Bladder	Postvoid bladder volume	Length Anterior to posterior diameter Width

Testis

The ultrasound system organizes the measurement labels into the following categories:

- **Default** lists general measurement labels.

2D-mode Testis Measurement Labels

Measurement Label	Definition
Testicle	Testicle
Testis Mass 1	Mass, numbered 1 though 3
Epididymal A	Epididymal artery
Testicular A	Testicular artery
Epididymis	Epididymis
Scrotal Wall	Scrotal wall

Doppler Testis Measurement Labels

Measurement Label	Definition
Epididymal A	Epididymal artery
Testicular A	Testicular artery
Testicular V	Testicular vein

Testis Calculation Labels

Calculation Label	Definition	Required Measurements
Testicle	Testicle volume	Length Anterior to posterior diameter Width
Epididymis	Epididymis volume	Length Anterior to posterior diameter Width
Testis Mass 1	Testis mass volume, numbered 1 through 3	Length Anterior to posterior diameter Width

Thyroid

The ultrasound system organizes the measurement labels into the following categories:

- **Default** lists general measurement labels.

2D-mode Thyroid Measurement Labels

Measurement Label	Definition
Thyroid	Thyroid lobe
Isthmus	Isthmus
Isthmus Mass 1	Isthmus mass, numbered 1 through 5
Parathyroid	Parathyroid
Mass 1	Mass, numbered 1 through 5
Neck Mass 1	Mass, numbered 1 through 5
Thyroid Mass 1	Thyroid mass, numbered 1 through 5
Site 1	Site, numbered 1 through 5

Doppler Thyroid Measurement Labels

Measurement Label	Definition
Thyroid A	Thyroid artery

Thyroid Calculation Labels

Calculation Label	Definition	Required Measurements
Thyroid	Thyroid volume	Length Anterior to posterior diameter Width
Thyroid Mass 1	Thyroid mass volume, numbered 1 through 5	Length Anterior to posterior diameter Width
Isthmus Mass 1	Isthmus mass volume, numbered 1 through 5	Length Anterior to posterior diameter Width
Neck Mass 1	Neck mass volume, numbered 1 through 5	Length Anterior to posterior diameter Width

Transcranial Imaging (TCI)

The ultrasound system organizes the measurement labels into the following category:

- **Default** lists general measurement labels.

Doppler TCI Measurement Labels

Measurement Label	Definition
ACoA	Anterior communicating artery
Basilar A	Basilar artery
ACA A1	Anterior cerebral artery, A1 segment
ACA A2	Anterior cerebral artery, A2 segment
Vert Atlas Loop	Loop vertebral artery
ICA-skull entrance	Skull internal carotid artery
MCA M1	Middle cerebral artery, M1 segment
MCA M2	Middle cerebral artery, M2 segment
Ophthalmic A	Ophthalmic artery
Vert A	Vertebral artery
ICA Siphon	Internal carotid artery siphon
PCA P1	Posterior cerebral artery, P1 segment
PCA P2	Posterior cerebral artery, P2 segment
PCoA	Posterior communicating artery
Terminal ICA	Terminal internal carotid artery
Terminal Vert A	Terminal vertebral artery

Transcranial Imaging (TCI) Calculation Labels

Calculation Label	Definition	Required Measurements
MCA/ICA	Ratio of the middle cerebral artery to the internal carotid artery	Middle cerebral artery Internal carotid artery
MCA M2 PS/MCA M1 PS	Ratio of the middle cerebral artery M2 peak systolic velocity to the middle cerebral artery M1 peak systolic velocity	Middle cerebral artery M2 Middle cerebral artery M1

Appendix D Cardiac Measurement and Calculation Labels

Overview 3

Arteries 4

Aortic Valve (AoV) 5

Shunts 10

Coronary Arteries 11

Left Atrium (LA) 12

Left Ventricle (LV) 14

Mitral Valve (MV) 25

Pulmonary Artery (PA) 29

Pericardial Effusion 31

Pulmonary Valve (PV) 34

Pulmonary Veins 38

Right Atrium (RA) 40

Right Ventricle (RV) 41

Systemic Veins 44

Tricuspid Valve Measurements 46

M-mode Measurements 51

AI Measure Measurements 55

Stress Echo Results 57

2D Heart AI Result Labels 66

4D Heart AI Results 71

AI Assist for TTE Labels 73

Overview

The system provides categories of groups of measurements, such as valves and vessels. The patient report provides a separate table for each group.

Note: Installed features determine the availability of measurement and calculation label packages.

Cardiac measurements are organized into the following categories of selections:

Selection	Description
Dimensions	Dimensions, for example, diastole series and diameter
LV Mass A-L	Left ventricular mass measurements
PISA	Proximal isovelocity surface area method measurements
Qp/Qs	Stroke volume measurements
RV/RA	Right ventricle and right atrium measurements
Simpson (Volume)	Volume measurements using Simpson's method of discs
Valves	Valve measurements
Vessels	Vessel measurements

Arteries

Arteries 2D-mode Measurement Labels

Measurement Label	Definition
Aorta	Aorta
Ao Abd	Abdominal aorta
Ao Arch d	Aortic arch diastole
Ao Arch	Aortic arch
Ao Asc d	Ascending aorta diameter, diastole
Ao Coarct Diam	Aortic coarctation diameter
Ao Desc	Descending aorta
Ao Isthmus	Aortic isthmus
Ao Root d	Aortic root diameter, diastole
Ao Sinus d	Aortic sinus diameter, diastole
Ao STJ d	Aortic sinotubular junction diameter, diastole
Ao Thoracic	Thoracic aorta

Arteries Doppler Measurement Labels

Measurement Label	Definition
Aorta	Aorta
Ao Asc Vmax	Ascending aorta maximum velocity
Ao Asc VTI	Ascending aorta velocity time integral
Ao Coarct Vmax	Aortic coarctation maximum velocity
Ao Desc Vmax	Descending aorta maximum velocity

Arteries Calculation Labels

Calculation Label	Definition	Units
Ao Root d/BSA	Aortic root diameter, diastole indexed by body surface area	cm/m²
Ao Sinus d/BSA	Aortic sinus diameter, diastole indexed by body surface area	cm/m²
Ao STJ d/BSA	Aortic sinotubular junction diameter, diastole indexed by body surface area	cm/m²
Ao Asc d/BSA	Ascending aorta diameter, diastole indexed by body surface area	cm/m²
Ao Arch d/BSA	Aortic arch diameter, diastole indexed by body surface area	cm/m²
Ao Asc Peak Grad	Ascending aorta peak pressure gradient	mmHg
Ao Desc Peak Grad	Descending aorta peak pressure gradient	mmHg

Aortic Valve (AoV)

Aortic Valve 2D-mode Measurement Labels

Measurement Label	Definition
AoV	Aortic valve
AoV Area (Vmax)	Aortic valve area, maximum velocity, folder of labels
LVOT Diam s	Left ventricular outflow tract diameter, systole
AoV Area (VTI)	Aortic valve area, velocity time integral, folder of labels
LVOT Diam s	Left ventricular outflow tract diameter, systole
AoV CO	Aortic valve cardiac output, folder of labels
AoV Annulus s	Aortic valve annulus, systole
AR EROA (PISA)	Aortic regurgitation effective regurgitant orifice area, proximal isovelocity surface area method, folder of labels
AR PISA Radius	Aortic regurgitation, proximal isovelocity surface area method, radius
AR RF (Doppler)	Aortic regurgitation, regurgitant fraction, Doppler, folder of labels
LVOT Diam s	Left ventricular outflow tract diameter, systole
AoV Site 2 Diam	Aortic valve site two diameter
AR RF (PISA)	Aortic regurgitation, regurgitant fraction, proximal isovelocity surface area method, folder of labels
AR PISA Radius	Aortic regurgitation, proximal isovelocity surface area method, radius
LVOT Diam s	Left ventricular outflow tract diameter, systole
AoV Annulus s	Aortic valve annulus, systole
AoV Planimetry	Aortic valve, planimetry method
AR Jet Area	Aortic regurgitation jet area
AR Jet Ht	Aortic regurgitation jet height
AR VC Width	Aortic regurgitation, vena contracta width
LVOT Area d	Left ventricular outflow tract area, diastole
LVOT Ht PLAX	Left ventricular outflow tract height, parasternal long axis view

Measurement Label	Definition
AVR	Aortic valve repair/replacement
AoV Area (Vmax)	Aortic valve area, maximum velocity, folder of labels
AoV Area (VTI)	Aortic valve area, velocity time integral, folder of labels
LVOT Diam s	Left ventricular outflow tract diameter, systole
AoV CO	Aortic valve cardiac output, folder of labels
AoV Annulus s	Aortic valve annulus, systole
AR EROA (PISA)	Aortic regurgitation effective regurgitant orifice area, proximal isovelocity surface area method, folder of labels
AR PISA Radius	Aortic regurgitation, proximal isovelocity surface area method, radius
AR RF (Doppler)	Aortic regurgitation, regurgitant fraction, Doppler, folder of labels
LVOT Diam s	Left ventricular outflow tract diameter, systole
Site 2 Diam	Site two diameter
AR RF (PISA)	Aortic regurgitation, regurgitant fraction, proximal isovelocity surface area method, folder of labels
AR PISA Radius	Aortic regurgitation, proximal isovelocity surface area method, radius
LVOT Diam s	Left ventricular outflow tract diameter, systole
AoV Annulus s	Aortic valve annulus, systole
AoV Planimetry	Aortic valve, planimetry method
AR Jet Area	Aortic regurgitation jet area
AR Jet Ht	Aortic regurgitation jet height
AR VC Width	Aortic regurgitation, vena contracta width
LVOT Area d	Left ventricular outflow tract area, diastole
LVOT Ht	Left ventricular outflow tract height

Aortic Valve Doppler Measurement Labels

Measurement Label	Definition
AoV	Aortic valve
AoV Area (Vmax)	Aortic valve area maximum velocity, folder of labels
LVOT Vmax	Left ventricular outflow tract maximum velocity
AoV Vmax	Aortic valve maximum velocity
AoV Area (VTI)	Aortic valve area, velocity time integral, folder of labels
LVOT VTI	Left ventricular outflow tract, velocity time integral
AoV VTI	Aortic valve, velocity time integral
AoV CO	Aortic valve cardiac output, folder of labels
AoV VTI	Aortic valve, velocity time integral
HR	Heart rate
AR EROA (PISA)	Aortic regurgitation effective regurgitant orifice area, proximal isovelocity surface area, folder of labels
AR Vmax	Aortic regurgitation maximum velocity
AR RF (Doppler)	Aortic regurgitation, regurgitant fraction, Doppler, folder of labels
LVOT VTI	Left ventricular outflow tract, velocity time integral
AoV Site 2 VTI	Aortic valve site two velocity time integral
AR RF (PISA)	Aortic regurgitation, regurgitant fraction, proximal isovelocity surface area, folder of labels
AR Vmax	Aortic regurgitation maximum velocity
AR VTI	Aortic regurgitation velocity time integral
LVOT VTI	Left ventricular outflow tract, velocity time integral
AoV AT	Aortic valve acceleration time
AoV ET	Aortic valve ejection time
AoV Vmax	Aortic valve maximum velocity
AoV VTI	Aortic valve, velocity time integral

Measurement Label	Definition
AR ED Velocity	Aortic regurgitation end diastolic velocity
AR Slope	Aortic regurgitation slope
AR VTI	Aortic regurgitation, velocity time integral
AVR	Aortic valve repair/replacement
AoV Area (Vmax)	Aortic valve area maximum velocity, folder of labels
LVOT Vmax	Left ventricular outflow tract, maximum velocity
AoV Vmax	Aortic valve maximum velocity
AoV Area (VTI)	Aortic valve area, velocity time integral, folder of labels
LVOT VTI	Left ventricular outflow tract, velocity time integral
AoV VTI	Aortic valve, velocity time integral
AoV CO	Aortic valve cardiac output, folder of labels
AoV VTI	Aortic valve, velocity time integral
HR	Heart rate
AR EROA (PISA)	Aortic regurgitation effective regurgitant orifice area, proximal isovelocity surface area, folder of labels
AR Vmax	Aortic regurgitation maximum velocity
AR RF (Doppler)	Aortic regurgitation, regurgitant fraction, Doppler, folder of labels
LVOT VTI	Left ventricular outflow tract, velocity time integral
AoV Site 2 VTI	Aortic valve site two velocity time integral
AR RF (PISA)	Aortic regurgitation, regurgitant fraction, proximal isovelocity surface area, folder of labels
AR Vmax	Aortic regurgitation maximum velocity
AR VTI	Aortic regurgitation, velocity time integral
LVOT VTI	Left ventricular outflow tract, velocity time integral
AoV AT	Aortic valve acceleration time
AoV ET	Aortic valve ejection time
AoV Vmax	Aortic valve maximum velocity
AoV VTI	Aortic valve, velocity time integral
AR ED Velocity	Aortic regurgitation end diastolic velocity
AR Slope	Aortic regurgitation slope
AR VTI	Aortic regurgitation, velocity time integral

Aortic Valve Calculation Labels

Calculation Label	Definition	Units
AoV Ann s/BSA	Aortic valve annulus, systole indexed by body surface area	cm/m²
AoV AT/ET	Aortic valve acceleration time/ejection time ratio	---
LVOT Area s	Left ventricular outflow tract area, systole	cm²
LVOT SV	Left ventricular outflow tract stroke volume	ml
AoV Peak Grad	Aortic valve peak pressure gradient	mmHg
LVOT/AoV Vmax	Left ventricular outflow tract/aortic valve maximum velocity	---
LVOT/AoV VTI	Left ventricular outflow tract/aortic valve velocity time integral	---
AVA (Vmax)	Aortic valve area continuity equation maximum velocity	cm²
AVA (Vmean)	Aortic valve area continuity equation mean velocity	cm²
AVA (VTI)	Aortic valve area continuity equation velocity time integral	cm²
AVA/BSA (Vmax)	Aortic valve area continuity equation indexed by body surface area maximum velocity	cm²/m²
AVA/BSA (Vmean)	Aortic valve area continuity equation indexed by body surface area mean velocity	cm²/m²
AVA/BSA (VTI)	Aortic valve area continuity equation indexed by body surface area velocity time integral	cm²/m²
LV Pressure s	Left ventricular pressure, systole	mmHg
AR PHT	Aortic regurgitation pressure half-time	msec
AR ED Grad	Aortic regurgitation end diastolic pressure gradient	mmHg
LV Pressure ED	Left ventricular pressure, end diastole	mmHg
AR Jet/LVOT Area d	Aortic regurgitant jet area/left ventricular outflow tract diastolic area	---
AR Jet/LVOT Ht d	Aortic regurgitant jet height/left ventricular outflow tract diastolic height	---
Site 2 Area	Site two area	cm²
Site 2 SV	Site two stroke volume	ml
AR Volume (Doppler)	Aortic regurgitant volume Doppler	ml
AR RF (Doppler)	Aortic regurgitation, regurgitant fraction, Doppler	%
AR PISA	Aortic regurgitation, proximal isovelocity surface area	cm²
AR EROA	Aortic regurgitant, effective regurgitant orifice area	cm²
AR Volume (PISA)	Aortic regurgitant volume proximal isovelocity surface area	ml
AR RF (PISA)	Aortic regurgitation, regurgitant fraction proximal isovelocity surface area	%
AoV Ann Area	Aortic valve annulus area	cm²
AoV SV	Aortic valve stroke volume	ml
AoV SI	Aortic valve stroke index	ml/m²
AoV CO	Aortic valve cardiac output	l/min
AoV CI	Aortic valve cardiac index	l/min/m²

Shunts

Shunts 2D-mode Measurement Labels

Measurement Label	Definition
Qp	Pulmonary venous stroke volume, folder of labels
Pulm Side Diam	Pulmonary side diameter
Qs	Systemic stroke volume, folder of labels
Sys Side Diam	Systemic side diameter
Ao Coarct Diam	Aortic coarctation diameter
ASD Diam	Atrial septal defect diameter
ASD Major	Atrial septal defect major axis
ASD Minor	Atrial septal defect minor axis
ASD Sup-Inf	Atrial septal defect superior-inferior axis
PDA Diam	Patent ductus arteriosus diameter
VSD Diam	Ventricular septal defect diameter
VSD Major	Ventricular septal defect major axis
VSD Minor	Ventricular septal defect minor axis

Shunts Doppler Measurement Labels

Measurement Label	Definition
Qp	Pulmonary venous stroke volume, folder of labels
Pulm Side VTI	Pulmonary side velocity time integral
Qp HR	Pulmonary venous stroke volume heart rate
Qs	Systemic stroke volume, folder of labels
Qs HR	Systemic stroke volume heart rate
Sys Side VTI	Systemic side velocity time integral
Ao Coarct Vmax	Aortic coarctation maximum velocity
ASD Vmax	Atrial septal defect maximum velocity
PDA Vmax	Patent ductus arteriosus maximum velocity
VSD Vmax	Ventricular septal defect maximum velocity

Shunts Calculation Labels

Calculation Label	Definition	Units
Ao Coarct Peak Grad	Aortic coarctation peak pressure gradient	mmHg
ASD Peak Grad	Atrial septal defect peak pressure gradient	mmHg
PDA Peak Grad	Patent ductus arteriosus peak pressure gradient	mmHg
VSD Peak Grad	Ventricular septal defect peak pressure gradient	mmHg
RVSP (VSD)	Right ventricular systolic pressure, ventricular septal defect	mmHg
Pulm Side Area	Pulmonary side area	cm²
Pulm Side SV	Pulmonary side stroke volume	ml
Pulm Side SI	Pulmonary side stroke index	ml/m²
Pulm Side CO	Pulmonary side cardiac output	l/m²
Pulm Side CI	Pulmonary side cardiac index	l/min/m²
Sys Side Area	Systemic side area	cm²
Sys Side SV	Systemic side stroke volume	ml
Sys Side SI	Systemic side stroke index	ml/m²
Sys Side CO	Systemic side cardiac output	l/min
Sys Side CI	Systemic side cardiac index	l/min/m²
Qp/Qs	Ratio of the pulmonary venous stroke volume to the systemic stroke volume	---
Qp-Qs	Difference between pulmonary venous stroke volume and systemic stroke volume	l/min

Coronary Arteries

Coronary Arteries 2D-mode Measurement Labels

Measurement Label	Definition
Coronaries	Coronary arteries
Circumflex Diam	Circumflex diameter
LAD Diam	Left anterior descending coronary artery diameter
Left Main Diam	Left main coronary artery diameter
RCA Diam	Right coronary artery diameter

Left Atrium (LA)

LA 2D-mode Measurement Labels

Measurement Label	Definition
LA A-P Diam s	Left atrium diameter systole anterior to posterior
LA Vol d A4C	Left atrium volume diastole apical four chamber view
LA Vol s A4C	Left atrium volume systole apical four chamber view
LA Major d A4C	Left atrium major axis diastole apical four chamber view
LA Major s A4C	Left atrium major axis systole apical four chamber view
LA Minor d A4C	Left atrium minor axis diastole apical four chamber view
LA Minor s A4C	Left atrium minor axis systole apical four chamber view
LA Vol d A2C	Left atrium volume diastole apical two chamber view
LA Vol s A2C	Left atrium volume systole apical two chamber view
LA Major d A2C	Left atrium major axis diastole apical two chamber view
LA Major s A2C	Left atrium major axis systole apical two chamber view

LA Calculation Labels

Calculation Label	Definition	Units
Ao d/LA s	Ratio of aortic diameter, diastole to left atrial diameter, systole	---
LA s/Ao d	Ratio of left atrial diameter, systole to aortic diameter, diastole	---
LA s/BSA	Left atrium systolic diameter indexed by body surface area	cm/m²
LA %FAC A4C	Left atrium fractional area change apical four chamber view	%
LA %FAC A2C	Left atrium fractional area change apical two chamber view	%
LA EF A4C A-L	Left atrium ejection fraction apical four chamber view area and length	%
LA Vol d A4C A-L	Left atrium volume diastole apical four chamber view area and length	ml
LA Vol s A4C A-L	Left atrium volume systole apical four chamber view area and length	ml
LA Vol d A4C A-L/BSA	Left atrium volume diastole apical four chamber view area and length indexed by body surface area	ml/m²
LA Vol s A4C A-L/BSA	Left atrium volume systole apical four chamber view area and length indexed by body surface area	ml/m²
LA EF A2C A-L	Left atrium ejection fraction apical two chamber view area and length	%
LA Vol d A2C A-L	Left atrium volume diastole apical two chamber view area and length	ml
LA Vol s A2C A-L	Left atrium volume systole apical two chamber view area and length	ml

Calculation Label	Definition	Units
LA Vol d A2C A-L/BSA	Left atrium volume diastole apical two chamber view area and length indexed by body surface area	ml/m²
LA Vol s A2C A-L/BSA	Left atrium volume systole apical two chamber view area and length indexed by body surface area	ml/m²
LA EF Biplane A-L	Left atrium ejection fraction biplane area and length	%
LA Vol d Biplane A-L	Left atrium volume diastole biplane area and length	ml
LA Vol s Biplane A-L	Left atrium volume systole biplane area and length	ml
LA Vol d Biplane A-L/BSA	Left atrium volume diastole biplane area and length indexed by body surface area	ml/m²
LA Vol s Biplane A-L/BSA	Left atrium volume systole biplane area and length indexed by body surface area	ml/m²
A4C	Apical four chamber view calculations, folder of labels	---
LA EF A4C MOD	Left atrial ejection fraction, apical four chamber view, method of disks	%
LA Vol d A4C MOD/BSA	Left atrial volume, diastole, apical four chamber view, method of disk indexed by body surface area	ml/m²
LA Vol s A4C MOD/BSA	Left atrial volume, systole, apical four chamber view, method of disk indexed by body surface area	ml/m²
A2C	Apical two chamber view calculations, folder of labels	---
LA EF A2C MOD	Left atrial ejection fraction, apical two chamber view, method of disks	%
LA Vol d A2C MOD/BSA	Left atrial volume, diastole, apical two chamber view, method of disk indexed by body surface area	ml/m²
LA Vol s A2C MOD/BSA	Left atrial volume, systole, apical two chamber view, method of disk indexed by body surface area	ml/m²
Biplane	Biplane calculations, folder of labels	---
LA EF Biplane MOD	Left atrial ejection fraction, biplane, method of disks	%
LA Vol d Biplane MOD	Left atrial volume, diastole, biplane, method of disks	ml
LA Vol s Biplane MOD	Left atrial volume, systole, biplane, method of disks	ml
LA Vol d Bi-Plane MOD/BSA	Left atrial volume, diastole, biplane, method of disks indexed by body surface area	ml/m²
LA Vol s Bi-Plane MOD/BSA	Left atrial volume, systole, biplane, method of disks indexed by body surface area	ml/m²

Left Ventricle (LV)

LV 2D-mode Measurement Labels

Measurement Label	Definition
LV Mass	Left ventricular mass, folder of labels
LV MASS T-E	Left ventricular mass (truncated ellipse)
LV Area d A4C	Left ventricular area, diastole, apical four chamber view
LV Area d PSAX pap	Left ventricular area, diastole, parasternal short axis, papillary muscle level
LV Epi Area d PSAX pap	Left ventricular epicardial area, diastole, parasternal short axis, papillary muscle level
LV MASS A-L	Left ventricular mass (area and length)
LV Area d PSAX pap	Left ventricular area, diastole, parasternal short axis, papillary muscle level
LV Epi Area d PSAX pap	Left ventricular epicardial area, diastole, parasternal short axis, papillary muscle level
LV Major d A2C	Left ventricular major axis, diastole, apical two chamber view
LV Major d A4C	Left ventricular major axis, diastole, apical four chamber view
LV MASS ASE	Left ventricular mass, American society of echocardiography calculation method
IVS d PLAX	Interventricular septum thickness, diastole, parasternal long axis view
LVID d PLAX	Left ventricular internal dimension, diastole, parasternal long axis view
LVPW d PLAX	Left ventricular posterior wall dimension, diastole, parasternal long axis view
A2C	Apical two chamber view
Qs	Systemic stroke volume, folder of labels
Sys Side Diam	Systemic side diameter
LV Area	Left ventricular area
LV Major	Left ventricular major axis
LV Minor	Left ventricular minor axis
A4C	Apical four chamber view
LVOT CO	Left ventricular outflow tract cardiac output, folder of labels
LVOT Diam s	Left ventricular outflow tract diameter, systole
Qs	Systemic stroke volume, folder of labels
Sys Side Diam	Systemic side diameter
LV Area	Left ventricular area
LV Major	Left ventricular major axis
LV Minor	Left ventricular minor axis

Measurement Label	Definition
PLAX	Parasternal long axis view
LV d Series	Left ventricular diastole series, folder of labels
IVS	Interventricular septal dimension
LV d Series	Left ventricular diastole series
LVID	Left ventricular internal dimension
LVPW	Left ventricular posterior wall dimension
IVS Bulge d	Interventricular septum thickness bulge, diastole
IVS Bulge s	Interventricular septum thickness bulge, systole
LVOT Diam s	Left ventricular outflow tract diameter, systole
LVOT Ht	Left ventricular outflow tract height
IVS d	Interventricular septum thickness, diastole
IVS s	Interventricular septum thickness, systole
LVID d A-P pap	Left ventricular internal diameter, diastole, anterior to posterior, papillary muscle level
LVID d chord	Left ventricular internal diameter, diastole, chordal level
LVID d M-L pap	Left ventricular internal diameter, diastole, medial to lateral, papillary muscle level
LVID s A-P pap	Left ventricular internal diameter, systole, anterior to posterior, papillary muscle level
LVID s chord	Left ventricular internal diameter, systole, chordal level
LVID s M-L pap	Left ventricular internal diameter, systole, medial to lateral, papillary muscle level
LVPW d chord	Left ventricular posterior wall thickness, diastole, chordal level
LVPW d pap	Left ventricular posterior wall thickness, diastole, papillary muscle level
LVPW s chord	Left ventricular posterior wall thickness, systole, chordal level
LVPW s pap	Left ventricular posterior wall thickness, systole, papillary muscle level
Subcostal	Subcostal
LV Major s	Left ventricular major axis, systole

LV Doppler Measurement Labels

Measurement Label	Definition
LV Diastolic Function	Left ventricular diastolic function
MV Inflow (Annulus)	Mitral valve inflow annulus
MV A Vmax	Mitral valve A wave, maximum velocity
MV A VTI	Mitral valve A wave, velocity time integral
MV E DT	Mitral valve E wave, deceleration time
MV E Vmax	Mitral valve E wave, maximum velocity
MV E VTI	Mitral valve E wave, velocity time integral
MV VTI	Mitral valve, velocity time integral
MV Inflow	Mitral valve inflow
LV IVRT	Left ventricular isovolumic relaxation time
MV A Vmax	Mitral valve A wave maximum velocity
MV A Vmax (valsalva)	Mitral valve A wave maximum velocity, valsalva
MV AT	Mitral valve acceleration time
MV E DT	Mitral valve E wave deceleration time
MV E Duration	Mitral valve E wave duration
MV E Vmax	Mitral valve E wave maximum velocity
MV E Vmax (valsalva)	Mitral valve E wave maximum velocity, valsalva
LV IVRT	Left ventricular isovolumic relaxation time
MV PW DTI	Myocardial velocity pulsed-wave Doppler tissue imaging
MV A' Vmax (L)	Late diastolic myocardial velocity, maximum velocity, lateral
MV A' Vmax (M)	Late diastolic myocardial velocity, maximum velocity, medial
MV E' AT (L)	Early diastolic myocardial velocity, acceleration time, lateral
MV E' AT (M)	Early diastolic myocardial velocity, acceleration time, medial
MV E' DT (L)	Early diastolic myocardial velocity, deceleration time, lateral
MV E' DT (M)	Early diastolic myocardial velocity, deceleration time, medial
MV E' Vmax (L)	Early diastolic myocardial velocity, maximum velocity, lateral
MV E' Vmax (M)	Early diastolic myocardial velocity, maximum velocity, medial
MV S' Vmax (L)	Systolic myocardial velocity, maximum velocity, lateral
MV S' Vmax (M)	Systolic myocardial velocity, maximum velocity, medial

Measurement Label	Definition
P Vein	Pulmonary vein
P Vein A Duration	Pulmonary vein A wave duration
P Vein A Vmax	Pulmonary vein A wave maximum velocity
P Vein D Vmax	Pulmonary vein D wave maximum velocity
P Vein D VTI	Pulmonary vein D wave velocity time integral
P Vein S Vmax	Pulmonary vein S wave maximum velocity
P Vein S VTI	Pulmonary vein S wave velocity time integral
LV MPI	Left ventricular myocardial performance index, folder of labels
LVOT ET	Left ventricular outflow tract ejection time
MV C-O Duration	Mitral valve close-open duration
LVOT CO	Left ventricular outflow tract cardiac output
HR	Heart rate
LVOT VTI	Left ventricular outflow tract, velocity time integral
Qs	Systemic stroke volume
Qs HR	Systemic stroke volume heart rate
Sys Side VTI	Systemic side velocity time integral

LV Diastolic Function Calculation Labels

Calculation Label	Definition	Units
MV E/A	Mitral valve ratio of peak E wave velocity (E) to peak A wave velocity (A)	---
MV E/A (Valsalva)	Mitral valve ratio of peak E wave velocity (E) to peak A wave velocity (A), valsalva	---
MV A/E	Mitral valve ratio of peak A wave velocity (A) to peak E wave velocity (E)	---
MV E/A (Annulus)	Mitral valve ratio of peak E wave velocity (E) to peak A wave velocity (A), annulus	---
MV A/E (Annulus)	Mitral valve ratio of peak A wave velocity (A) to peak E wave velocity (E), annulus	---
MV E/MV VTI (Annulus)	Mitral valve ratio of peak E wave velocity (E) to mitral valve velocity time integration, annulus	---
MV A/MV VTI (Annulus)	Mitral valve ratio of peak A wave velocity (A) to mitral valve velocity time integration, annulus	---
MV E'/A' (M)	Mitral valve ratio of early diastolic velocity (E') to late diastolic velocity (A'), medial	---
MV E/E' (M)	Mitral valve ratio of peak E wave velocity (E) to early diastolic velocity (E'), medial	---
MV E'/A' (L)	Mitral valve ratio of early diastolic velocity (E') to late diastolic velocity (A'), lateral	---
MV E/E' (L)	Mitral valve ratio of peak E wave velocity (E) to early diastolic velocity (E'), lateral	---
MV E/E' Vmax (Average)	Mitral valve ratio of peak E wave velocity (E) to early diastolic velocity (E'), average maximum velocity	---
P Vein S/D Vmax	Pulmonary vein ratio of systolic / diastolic maximum velocity	---
P Vein A/MV A Dur	Pulmonary vein ratio of peak A wave velocity (A) to mitral valve A wave duration	---

LV Dimension Calculation Labels

Calculation Label	Definition	Units
IVS/LVPW	Interventricular septum thickness / Left ventricular posterior wall thickness	---
IVS %Thick	Interventricular septum percent thickening	%
LVPW %Thick	Left ventricular posterior wall percent thickening	%
LVID d/BSA	Left ventricular internal diameter, diastole indexed by body surface area	cm/m²
LVID s/BSA	Left ventricular internal diameter, systole indexed by body surface area	cm/m²
LV Relative Wall Thickness (LV RWT)	Left ventricular relative wall thickness	%
LV Eccentricity Index d (LVEI d)	Left ventricular eccentricity index, diastole	---
LV Eccentricity Index s (LVEI s)	Left ventricular eccentricity index, systole	---

LV Doppler Calculation Labels

Calculation Label	Definition	Units
LV MPI	Left ventricular myocardial performance index	---
LV PEP/LV ET	Ratio of the left ventricular pre-ejection period to the ejection time	---
dPEP	Difference in pre-ejection period	ms
LV AT/LV ET	Ratio of the left ventricular acceleration time to ejection time	---
LV Pressure s	Left ventricular pressure, systole	mmHg

LV Outflow Tract Calculation Labels

Calculation Label	Definition	Units
LVOT Peak Grad	Left ventricular outflow tract peak pressure gradient	mmHg
LVOT Area s	Left ventricular outflow tract area, systole	cm²
LVOT SV	Left ventricular outflow tract stroke volume	ml
LVOT SI	Left ventricular outflow tract stroke index	ml/m²
LVOT CO	Left ventricular outflow tract cardiac output	l/min
LVOT CI	Left ventricular outflow tract cardiac index	l/min/m²

LV: Cubed Method Calculation Labels

Calculation Label	Definition	Units
LV %FS Cubed	Left ventricular fractional shortening, cubed	%
LV Vol d Cubed	Left ventricular volume diastole, cubed	ml
LV Vol s Cubed	Left ventricular volume systole, cubed	ml
LV EF PSAX Cubed	Left ventricular ejection fraction, parasternal short axis view, cubed	%
LV EF Cubed	Left ventricular ejection fraction, cubed	%
LV SV Cubed	Left ventricular stroke volume, cubed	ml
LV SI Cubed	Left ventricular stroke index, cubed	ml/m²
LV CO Cubed	Left ventricular cardiac output, cubed	l/min
LV CI Cubed	Left ventricular cardiac index, cubed	l/min/m²

LV: Teichholz Method Calculation Labels

Calculation Label	Definition	Units
LV %FS (Teichholz)	Left ventricular fractional shortening, Teichholz	%
LV EF (Teichholz)	Left ventricular ejection fraction, Teichholz	%
LV EF PSAX (Teichholz)	Left ventricular ejection fraction, parasternal short axis view, Teichholz	%
LV Vol d (Teichholz)	Left ventricular volume, diastole, Teichholz	ml
LV Vol s (Teichholz)	Left ventricular volume, systole, Teichholz	ml
LV Vol d (Teichholz)/BSA	Left ventricular volume, diastole, Teichholz indexed by body surface area	ml/m²
LV Vol s (Teichholz)/BSA	Left ventricular volume, systole, Teichholz indexed by body surface area	ml/m²
LV Vol d (Teichholz)/HT	Left ventricular volume, diastole, Teichholz indexed by height	ml/cm
LV Vol s (Teichholz)/HT	Left ventricular volume, systole, Teichholz indexed by height	ml/cm
LV SV (Teichholz)	Left ventricular stroke volume, Teichholz	ml
LV SI (Teichholz)	Left ventricular stroke index, Teichholz	ml/m²
LV CO (Teichholz)	Left ventricular cardiac output, Teichholz	l/min
LV CI (Teichholz)	Left ventricular cardiac index, Teichholz	l/min/m²

LV: A-L Method Calculation Labels

Calculation Label	Definition	Units
A4C	Apical four chamber view calculations	---
LV %FAC A4C	Left ventricular fractional area change, apical four chamber view	%
LV EF A4C A-L	Left ventricular ejection fraction, apical four chamber view, area and length	%
LV Vol d A4C A-L	Left ventricular volume, diastole, apical four chamber view, area and length	ml
LV Vol s A4C A-L	Left ventricular volume, systole, apical four chamber view, area and length	ml
LV Vol d A4C A-L/BSA	Left ventricular volume, diastole, apical four chamber view, area and length indexed by body surface area	ml/m²
LV Vol s A4C A-L/BSA	Left ventricular volume, systole, apical four chamber view, area and length indexed by body surface area	ml/m²
LV Vol d A4C A-L/HT	Left ventricular volume, diastole, apical four chamber view, area and length indexed by height	ml/cm
LV Vol s A4C A-L/HT	Left ventricular volume, systole, apical four chamber view, area and length indexed by height	ml/cm
A2C	Apical two chamber view calculations	---
LV %FAC A2C	Left ventricular fractional area change, apical two chamber view	%
LV EF A2C A-L	Left ventricular ejection fraction, apical two chamber view, area and length	%
LV Vol d A2C A-L	Left ventricular volume, diastole, apical two chamber view, area and length	ml
LV Vol s A2C A-L	Left ventricular volume, systole, apical two chamber view, area and length	ml
LV Vol d A2C A-L/BSA	Left ventricular volume, diastole, apical two chamber view, area and length indexed by body surface area	ml/m²
LV Vol s A2C A-L/BSA	Left ventricular volume, systole, apical two chamber view, area and length indexed by body surface area	ml/m²
LV Vol d A2C A-L/HT	Left ventricular volume, diastole, apical two chamber view, area and length indexed by height	ml/cm
LV Vol s A2C A-L/HT	Left ventricular volume, systole, apical two chamber view, area and length indexed by height	ml/cm

Calculation Label	Definition	Units
Biplane	Biplane calculations	---
LV EF Biplane A-L	Left ventricular ejection fraction, biplane, area and length	%
LV Vol d Biplane A-L	Left ventricular volume, diastole, biplane, area and length	ml
LV Vol s Biplane A-L	Left ventricular volume, systole, biplane, area and length	ml
LV Vol d Biplane A-L/BSA	Left ventricular volume, diastole, biplane, area and length indexed by body surface area	ml/m²
LV Vol s Biplane A-L/BSA	Left ventricular volume, systole, biplane, area and length indexed by body surface area	ml/m²
LV Vol d Biplane A-L/HT	Left ventricular volume, diastole, biplane, area and length indexed by height	ml/cm
LV Vol s Biplane A-L/HT	Left ventricular volume, systole, biplane, area and length indexed by height	ml/cm

LV: MOD Calculation Labels

Calculation Label	Definition	Units
A4C	Apical four chamber view calculations	---
LV EF A4C MOD	Left ventricular ejection fraction, apical four chamber view, method of disks	%
LV Vol d A4C MOD/BSA	Left ventricular volume, diastole, apical four chamber view, method of disks indexed by body surface area	ml/m²
LV Vol s A4C MOD/BSA	Left ventricular volume, systole, apical four chamber view, method of disks indexed by body surface area	ml/m²
LV Vol d A4C MOD/HT	Left ventricular volume, diastole, apical four chamber view, method of disks indexed by height	ml/cm
LV Vol s A4C MOD/HT	Left ventricular volume, systole, apical four chamber view, method of disks indexed by height	ml/cm
LV SV A4C MOD	Left ventricular stroke volume, apical four chamber view, method of disks	ml
LV SI A4C MOD	Left ventricular stroke index, apical four chamber view, method of disks	ml/m²
LV CO A4C MOD	Left ventricular cardiac output, apical four chamber view, method of disks	l/min
LV CI A4C MOD	Left ventricular cardiac index, apical four chamber view, method of disks	l/min/m²

Calculation Label	Definition	Units
A2C	Apical two chamber view calculations	---
LV EF A2C MOD	Left ventricular ejection fraction, apical two chamber view, method of disks	%
LV Vol d A2C MOD/BSA	Left ventricular volume, diastole, apical two chamber view, method of disks indexed by body surface area	ml/m²
LV Vol s A2C MOD/BSA	Left ventricular volume, systole, apical two chamber view, method of disks indexed by body surface area	ml/m²
LV Vol d A2C MOD/HT	Left ventricular volume, diastole, apical two chamber view, method of disks indexed by height	ml/cm
LV Vol s A2C MOD/HT	Left ventricular volume, systole, apical two chamber view, method of disks indexed by height	ml/cm
LV SV A2C MOD	Left ventricular stroke volume, apical two chamber view, method of disk	ml
LV SI A2C MOD	Left ventricular stroke index, apical two chamber view, method of disk	ml/m²
LV CO A2C MOD	Left ventricular cardiac output, apical two chamber view, method of disk	l/min
LV CI A2C MOD	Left ventricular cardiac index, apical two chamber view, method of disk	l/min/m²
Biplane	Bichamber calculations	---
LV Major s max	Left ventricular major systole maximum	cm
LV EF Biplane MOD	Left ventricular ejection fraction biplane, method of disks	%
LV Vol d Biplane MOD	Left ventricular volume, diastole, biplane, method of disks	ml
LV Vol s Biplane MOD	Left ventricular volume, systole, biplane, method of disks	ml
LV Vol d Biplane MOD/BSA	Left ventricular volume, diastole, biplane, method of disks indexed by body surface area	ml/m²
LV Vol s Biplane MOD/BSA	Left ventricular volume, systole, biplane, method of disks indexed by body surface area	ml/m²
LV Vol d Biplane MOD/HT	Left ventricular volume, diastole, biplane, method of disks indexed by height	ml/cm
LV Vol s Biplane MOD/HT	Left ventricular volume, systole, biplane, method of disks indexed by height	ml/cm
LV SV Biplane MOD	Left ventricular stroke volume, biplane, method of disks	ml
LV SI Biplane MOD	Left ventricular stroke index, biplane, method of disks	ml/m²
LV CO Biplane MOD	Left ventricular volume, cardiac output, method of disks	l/min
LV CI Biplane MOD	Left ventricular volume, cardiac index, method of disks	l/min/m²

LV Mass: ASE Calculation Labels

Calculation Label	Definition	Units
LV Mass ASE	Left ventricular mass, American Society of Echocardiography	g
LV Mass ASE/BSA	Left ventricular mass, American Society of Echocardiography indexed by body surface area	g/m²
LV Mass ASE/Ht	Left ventricular mass, American Society of Echocardiography indexed by height	g/cm

LV Mass A-L Calculation Labels

Calculation Label	Definition	Units
LV Mass A-L	Left ventricular mass area and length	g
LV Mean Wall Thickness d	Left ventricular mean wall thickness, diastole	cm
LV Mass/BSA (A-L)	Left ventricular mass indexed by body surface area, area and length	g/m²
LV Mass/Ht (A-L)	Left ventricular mass indexed by height, area and length	g/cm

LV Mass T-E Calculation Labels

Calculation Label	Definition	Units
LV Mass T-E	Left ventricular mass, truncated ellipse	g
LV Minor Rad d PSAX pap	Left ventricular minor radial diastole, parasternal short axis view, papillary muscle	cm
LV Mean Wall Thickness d	Left ventricular mean wall thickness diastole	cm
LV Mass/BSA (T-E)	Left ventricular mass indexed by body surface area, truncated ellipse	g/m²
LV Mass/Ht (T-E)	Left ventricular mass indexed by height, truncated ellipse	g/cm

Mitral Valve (MV)

MV 2D-mode Measurement Labels

Measurement Label	Definition
Mitral Valve	Mitral valve function
MR EROA (PISA)	Mitral regurgitation effective regurgitant orifice area, proximal isovelocity surface area method, folder of labels
MR PISA Radius	Mitral regurgitation, proximal isovelocity surface area method, radius
MR RF (Doppler)	Mitral regurgitation, regurgitant fraction, Doppler, folder of labels
MV Annulus d	Mitral valve annulus diastole
MV Site 2 Diam	Mitral valve site two diameter
MR RF (PISA)	Mitral regurgitation, regurgitant fraction, proximal isovelocity surface area method, folder of labels
MR PISA Radius	Mitral regurgitation, proximal isovelocity surface area method, radius
MV Annulus d	Mitral valve annulus diastole
MV Area (PISA)	Mitral valve area, proximal isovelocity surface area method, folder of labels
MV Funnel Angle	Mitral valve funnel angle
MV PISA Radius	Mitral valve, proximal isovelocity surface area method, radius
LVOT Diam s	Left ventricular outflow tract diameter, systole
MV CO	Mitral valve cardiac output, folder of labels
MV Annulus d	Mitral valve annulus diastole
MR VC Width	Mitral regurgitation vena contracta width
MV Annulus d A-P	Mitral valve annulus, diastole, anterior to posterior
MV Annulus d M-L	Mitral valve annulus, diastole, medial to lateral
MV Annulus s	Mitral valve annulus systole
MV Annulus s A-P	Mitral valve annulus, systole, anterior to posterior
MV Annulus s M-L	Mitral valve annulus, systole, medial to lateral
MV Planimetry	Mitral valve planimetry method

MV Doppler Measurement Labels

Measurement Label	Definition
MV	Mitral valve function
MR EROA (PISA)	Mitral regurgitation effective regurgitant orifice area, proximal isovelocity surface area, folder of labels
MR Vmax	Mitral regurgitation, maximum velocity
MR RF (Doppler)	Mitral regurgitation regurgitant fraction, Doppler, folder of labels
MV VTI	Mitral regurgitation velocity time integral
MV Site 2 VTI	Mitral valve site two velocity time integral
MR RF (PISA)	Mitral regurgitation regurgitant fraction, proximal isovelocity surface area, folder of labels
MR Vmax	Mitral regurgitation maximum velocity
MR VTI	Mitral regurgitation velocity time integral
MV VTI, Annulus	Mitral valve velocity time integral, annulus
MV Area (PISA)	Mitral valve area, proximal isovelocity surface area, folder of labels
MV Vmax	Mitral valve maximum velocity
MV Area (VTI)	Mitral valve area, velocity time integral, folder of labels
LVOT VTI	Left ventricular outflow tract, velocity time integral
MV VTI	Mitral valve velocity time integral
MV CO	Mitral valve cardiac output, folder of labels
HR	Heart rate
MV VTI	Mitral valve velocity time integral
LV dP/dt	Left ventricular rate of pressure rise during isovolumic contraction
LV IVRT	Left ventricular isovolumic relaxation time
MR Vmax	Mitral regurgitation maximum velocity
MR VTI	Mitral regurgitation velocity time integral
MV A Vmax	Mitral valve A wave maximum velocity
MV AT	Mitral valve acceleration time
MV E DT	Mitral valve E wave deceleration time
MV E Duration	Mitral valve E wave duration
MV E Vmax	Mitral valve E wave maximum velocity
MV PHT	Mitral valve pressure half time
MV VTI	Mitral regurgitation velocity time integral

Measurement Label	Definition
MVR	Mitral valve repair/replacement
MR EROA (PISA)	Mitral regurgitation effective regurgitant orifice area, proximal isovelocity surface area, folder of labels
MR PISA Radius	Mitral regurgitation, proximal isovelocity surface area, radius
MR RF (Doppler)	Mitral regurgitation, regurgitant fraction, Doppler, folder of labels
MV Annulus d	Mitral valve annulus diastole
MV Site 2 Diam	Mitral valve site two diameter
MR RF (PISA)	Mitral regurgitation, regurgitant fraction, proximal isovelocity surface area, folder of labels
MR PISA Radius	Mitral regurgitation, proximal isovelocity surface area, radius
MV Annulus d	Mitral valve annulus diastole
MV Area (PISA)	Mitral valve area, proximal isovelocity surface area, folder of labels
MV Funnel Angle	Mitral valve funnel angle
MV PISA Radius	Mitral valve proximal isovelocity surface area, radius
MV Area (VTI)	Mitral valve area, velocity time integral, folder of labels
LVOT Diam s	Left ventricular outflow tract diameter, systole
MV CO	Mitral valve cardiac output, folder of labels
MV Annulus d	Mitral valve annulus diastole
MR VC Width	Mitral regurgitation vena contracta width
MV Annulus d	Mitral valve annulus diastole
MV Annulus d A-P	Mitral valve annulus diastole anterior to posterior
MV Annulus d M-L	Mitral valve annulus diastole medial to lateral
MV Annulus s	Mitral valve annulus systole
MV Annulus s A-P	Mitral valve annulus systole anterior to posterior
MV Annulus s M-L	Mitral valve annulus systole medial to lateral
MV Planimetry	Mitral valve planimetry method

MV Calculation Labels

Calculation Label	Definition	Units
MV E/A	Ratio of peak E wave velocity (E) to peak A wave velocity (A) of mitral inflow	---
MV E/A (Valsalva)	Ratio of peak E wave velocity (E) to peak A wave velocity (A) of mitral inflow, valsalva	---
MV A/E	Ratio of peak A wave velocity (A) to peak E wave velocity (E) of mitral inflow	---
MV PHT	Mitral valve pressure half-time	msec
MV Area (PHT)	Mitral valve area pressure half-time	cm^2
MV Peak Grad	Mitral valve peak pressure gradient	mmHg
MV Area (VTI)	Mitral valve area velocity time integral	cm^2
MV Area/BSA (VTI)	Mitral valve area indexed by body surface area velocity time integral	cm^2/m^2
MV PISA	Mitral valve proximal isovelocity surface area	cm^2
MV Inst Flow Rate	Mitral valve instantaneous flow rate	l/min
MV Area (PISA)	Mitral valve area proximal isovelocity surface area	cm^2
MV Area/BSA (PISA)	Mitral valve area indexed by body surface area proximal isovelocity surface area	cm^2/m^2
Site 2 Area	Site two area	cm^2
Site 2 SV	Site two stroke volume	ml
MR Volume (Doppler)	Mitral regurgitation volume Doppler	ml
MR RF (Doppler)	Mitral regurgitation, regurgitant fraction Doppler	%
MR PISA	Mitral regurgitation proximal isovelocity surface area	cm^2
MR Inst Flow Rate	Mitral regurgitation instantaneous flow rate	ml/s
MR EROA	Mitral regurgitation effective regurgitant orifice area	cm^2
MR Volume (PISA)	Mitral regurgitation volume proximal isovelocity surface area	ml
MR RF (PISA)	Mitral regurgitation regurgitant fraction proximal isovelocity surface area	%
MV Annulus Area	Mitral valve annulus area	cm^2
MV SV	Mitral valve stroke volume	ml
MV SI	Mitral valve stroke index	ml/m^2
MV CO	Mitral valve cardiac output	l/min
MV CI	Mitral valve cardiac index	$l/min/m^2$

Calculation Label	Definition	Units
MV E/A (Annulus)	Ratio of peak E wave velocity (E) to peak A wave velocity (A) of mitral inflow annulus	---
MV A/E (Annulus)	Ratio of peak A wave velocity (A) to peak E wave velocity (E) of mitral inflow annulus	---
MV E/MV VTI (Annulus)	Mitral valve E wave/mitral valve velocity time integral annulus	---
MV A/MV VTI (Annulus)	Mitral valve A wave/mitral valve velocity time integral annulus	---
MV E'/A' (M)	Mitral valve early diastolic/late diastolic medial	---
MV E/E' (M)	Mitral valve E wave/early diastolic medial	---
MV E'/A' (L)	Mitral valve early diastolic/late diastolic lateral	---
MV E/E' (L)	Mitral valve E wave/early diastolic lateral	---
MV E/E' Vmax (Average)	Mitral valve E wave/early diastolic maximum velocity average	---

Pulmonary Artery (PA)

PA 2D-mode Measurement Labels

Measurement Label	Definition
PA	Pulmonary artery
LPA Diam	Left pulmonary artery diameter
MPA Diam	Main pulmonary artery diameter
RPA Diam	Right pulmonary artery diameter

PA Doppler Measurement Labels

Measurement Label	Definition
PA	Pulmonary artery
Pulmonary Vasc Resistance	Pulmonary vascular resistance, folder of labels
RVOT VTI	Right ventricular outflow tract, velocity time integral
TR Vmax	Tricuspid regurgitation maximum velocity
LPA Vmax	Left pulmonary artery maximum velocity
MPA Vmax	Main pulmonary artery maximum velocity
MPA VTI	Main pulmonary artery velocity time integral
RPA Vmax	Right pulmonary artery maximum velocity

PA Calculation Labels

Calculation Label	Definition	Units
MPA Peak Grad	Main pulmonary artery peak pressure gradient	mmHg
RV PEP/RV ET	Ratio of the right ventricular pre-ejection period to the right ventricular ejection time	---
RV AT/RV ET	Ratio of the right ventricular acceleration time to the right ventricular ejection time	---
PASP	Pulmonary artery systolic pressure	mmHg
PASP/SBP	Ratio of the pulmonary artery systolic pressure to the systolic blood pressure	---
PAEDP	Pulmonary artery end diastolic pressure	mmHg
Mean PAP	Mean pulmonary artery pressure	mmHg
LPA Peak Grad	Left pulmonary artery peak pressure gradient	mmHg
RPA Peak Grad	Right pulmonary artery peak pressure gradient	mmHg
PVR	Pulmonary valve repair/replacement	---

Pericardial Effusion

Pericardial Effusion 2D-mode Measurement Labels

Measurement Label	Definition
Pericardial Effusion	Pericardial effusion
IVC Diam, exp	Inferior vena cava diameter, expiration
IVC Diam, insp	Inferior vena cava diameter, inspiration
LA d Diam, exp	Left atrial diastole diameter, expiration
LA d Diam, insp	Left atrial diastole diameter, inspiration
LVID d, exp	Left ventricular internal diameter diastole, expiration
LVID d, insp	Left ventricular internal diameter diastole, inspiration
PE d, Ant PLAX	Pericardial effusion diastole, anterior parasternal long axis view
PE d, Ant SCLAX	Pericardial effusion diastole, anterior subcostal long axis view
PE d, Apical A4C	Pericardial effusion diastole, apical four chamber view
PE d, Lt Lat A4C	Pericardial effusion diastole, left lateral apical four chamber view
PE d, Post PLAX	Pericardial effusion diastole, post parasternal long axis view
PE d, Post SCLAX	Pericardial effusion diastole, post subcostal long axis view
PE d, Rt Lat A4C	Pericardial effusion diastole, right lateral apical four chamber view
RA d Diam, exp	Right atrial diastole diameter, expiration
RA d Diam, insp	Right atrial diastole diameter, inspiration
RVID d, exp	Right ventricular internal diameter diastole, expiration
RVID d, insp	Right ventricular internal diameter diastole, inspiration

Pericardial Effusion Doppler Measurement Labels

Measurement Label	Definition
Pericardial Effusion	Pericardial effusion
HV	Hepatic vein
A Vmax, exp	A wave maximum velocity, expiration
A Vmax, insp	A wave maximum velocity, inspiration
D Vmax, exp	D wave maximum velocity, expiration
D Vmax, insp	D wave maximum velocity, inspiration
S Vmax, exp	S wave maximum velocity, expiration
S Vmax, insp	S wave maximum velocity, inspiration
MV	Mitral valve
A Vmax, exp	A wave maximum velocity, expiration
A Vmax, insp	A wave maximum velocity, inspiration
E DT, exp	E wave deceleration time, expiration
E DT, insp	E wave deceleration time, inspiration
E Vmax, exp	E wave maximum velocity, expiration
E Vmax, insp	E wave maximum velocity, inspiration
LV IVRT, exp	Left ventricular isovolumic relaxation time, expiration
LV IVRT, insp	Left ventricular isovolumic relaxation time, inspiration
P Vein	Pulmonary vein
A Vmax, exp	A wave maximum velocity, expiration
A Vmax, insp	A wave maximum velocity, inspiration
D Vmax, exp	D wave maximum velocity, expiration
D Vmax, insp	D wave maximum velocity, inspiration
S Vmax, exp	S wave maximum velocity, expiration
S Vmax, insp	S wave maximum velocity, inspiration
TV	Tricuspid valve
A Vmax, exp	A wave maximum velocity, expiration
A Vmax, insp	A wave maximum velocity, inspiration
E DT, exp	E wave deceleration time, expiration
E DT, insp	E wave deceleration time, inspiration
E Vmax, exp	E wave maximum velocity, expiration
E Vmax, insp	E wave maximum velocity, inspiration

Pericardial Effusion Calculation Labels

Calculation Label	Definition	Units
RA d Diam % change	Right atrial diastole diameter percent change	%
RVID d % change	Right ventricular internal diameter diastole percent change	%
LA d Diam % change	Left atrial diastole diameter percent change	%
LVID d % change	Right ventricular internal diameter diastole percent change	%
MV E Vmax % change	Mitral valve E wave maximum velocity percent change	%
MV A Vmax % change	Mitral valve A wave maximum velocity percent change	%
MV DT % change	Mitral valve deceleration time percent change	%
LV IVRT % change	Left ventricular isovolumic relaxation time percent change	%
P Vein S Vmax % change	Pulmonary vein S wave maximum velocity percent change	%
P Vein D Vmax % change	Pulmonary vein D wave maximum velocity percent change	%
P Vein A Vmax % change	Pulmonary vein A wave maximum velocity percent change	%
TV E Vmax % change	Tricuspid valve E wave maximum velocity percent change	%
TV A Vmax % change	Tricuspid valve A wave maximum velocity percent change	%
TV DT % change	Tricuspid valve deceleration time percent change	%
IVC Diam % change	Inferior vena cava diameter percent change	%
HV S Vmax % change	Hepatic vein S wave maximum velocity percent change	%
HV D Vmax % change	Hepatic vein D wave maximum velocity percent change	%
HV A Vmax % change	Hepatic vein A wave maximum velocity percent change	%

Pulmonary Valve (PV)

PV 2D-mode Measurement Labels

Measurement Label	Definition
PV	Pulmonary valve
PR EROA (PISA)	Pulmonary regurgitation effective regurgitant orifice area, proximal isovelocity surface area method, folder of labels
PR PISA Radius	Pulmonary regurgitation proximal isovelocity surface area method, radius
PR RF (Doppler)	Pulmonary regurgitation, regurgitant fraction, Doppler, folder of labels
RVOT Diam s PSAX	Right ventricular outflow tract diameter, systole, parasternal short axis view
PV Site 2 Diam	Pulmonary valve site two diameter
PR RF (PISA)	Pulmonary regurgitation, regurgitant fraction, proximal isovelocity surface area method, folder of labels
PR PISA Radius	Pulmonary regurgitation proximal isovelocity surface area method, radius
RVOT Diam s PSAX	Right ventricular outflow tract diameter systole, parasternal short axis view
PV Area (Vmax)	Pulmonary valve area, maximum velocity, folder of labels
RVOT Diam s PSAX	Right ventricular outflow tract diameter systole, parasternal short axis view
PV Area (VTI)	Pulmonary valve area, velocity time integral, folder of labels
RVOT Diam s PSAX	Right ventricular outflow tract diameter systole, parasternal short axis view
PV CO	Pulmonary valve cardiac output, folder of labels
PV Annulus s	Pulmonary valve annulus, systole
PR VC Width	Pulmonary regurgitation vena contracta width
PV Annulus s	Pulmonary valve annulus, systole
PVR	Pulmonary valve repair/replacement
PR EROA (PISA)	Pulmonary regurgitation, effective regurgitant orifice area, proximal isovelocity surface area, folder of labels
PR PISA Radius	Pulmonary regurgitation, proximal isovelocity surface area, radius
PR RF (Doppler)	Pulmonary regurgitation, regurgitant fraction, Doppler, folder of labels
RVOT Diam s	Right ventricular outflow tract diameter, systole
PV Site 2 Diam	Pulmonary valve site two diameter
PR RF (PISA)	Pulmonary regurgitation, regurgitant fraction, proximal isovelocity surface area, folder of labels
PR PISA Radius	Pulmonary regurgitation, proximal isovelocity surface area, radius
RVOT Diam s	Right ventricular outflow tract diameter, systole
PV Area (Vmax)	Pulmonary valve area, maximum velocity, folder of labels
RVOT Diam s	Right ventricular outflow tract diameter, systole
PV Area (VTI)	Pulmonary valve area, velocity time integral, folder of labels
RVOT Diam s	Right ventricular outflow tract diameter, systole
PV CO	Pulmonary valve cardiac output, folder of labels
PV Annulus s	Pulmonary valve annulus, systole
PR VC Width	Pulmonary regurgitation vena contracta width
PV Annulus s	Pulmonary valve annulus, systole

PV Doppler Measurement Labels

Measurement Label	Definition
PV	Pulmonary valve
PR EROA (PISA)	Pulmonary regurgitation, effective regurgitant orifice area, proximal isovelocity surface area, folder of labels
PR Vmax	Pulmonary regurgitation maximum velocity
PR RF (Doppler)	Pulmonary regurgitation, regurgitant fraction, Doppler, folder of labels
RVOT VTI	Right ventricular outflow tract, velocity time integral
PV Site 2 VTI	Pulmonary valve site two velocity time integral
PR RF (PISA)	Pulmonary regurgitation, regurgitant fraction, proximal isovelocity surface area, folder of labels
PR Vmax	Pulmonary regurgitation maximum velocity
PR VTI	Pulmonary regurgitation, velocity time integral
RVOT VTI	Right ventricular outflow tract, velocity time integral
PV Area (Vmax)	Pulmonary valve area, maximum velocity, folder of labels
PV Vmax	Pulmonary valve maximum velocity
RVOT Vmax	Right ventricular outflow tract, maximum velocity
PV Area (VTI)	Pulmonary valve area, velocity time integral, folder of labels
PV VTI	Pulmonary valve, velocity time integral
RVOT VTI	Right ventricular outflow tract, velocity time integral
PV CO	Pulmonary valve cardiac output, folder of labels
HR	Heart rate
PV VTI	Pulmonary valve, velocity time integral
PR ED Velocity	Pulmonary regurgitation end diastolic velocity
PR Slope	Pulmonary regurgitation slope
PR Vmax	Pulmonary regurgitation maximum velocity
PR VTI	Pulmonary regurgitation velocity time integral
PV AT	Pulmonary valve acceleration time
PV ET	Pulmonary valve ejection time
PV Vmax	Pulmonary valve maximum velocity
PV VTI	Pulmonary valve velocity time integral

Measurement Label	Definition
PVR	Pulmonary valve repair/replacement
PR EROA (PISA)	Pulmonary regurgitation, effective regurgitant orifice area, proximal isovelocity surface area, folder of labels
PR Vmax	Pulmonary regurgitation, maximum velocity
PR RF (Doppler)	Pulmonary regurgitation, regurgitant fraction, Doppler, folder of labels
RVOT VTI	Right ventricular outflow tract, velocity time integral
PV Site 2 VTI	Pulmonary valve site two velocity time integral
PR RF (PISA)	Pulmonary regurgitation, regurgitant fraction, proximal isovelocity surface area, folder of labels
PR Vmax	Pulmonary regurgitation, maximum velocity
PR VTI	Pulmonary regurgitation, velocity time integral
RVOT VTI	Right ventricular outflow tract, velocity time integral
PV Area (Vmax)	Pulmonary valve area maximum velocity, folder of labels
PV Vmax	Pulmonary valve maximum velocity
RVOT Vmax	Right ventricular outflow tract, maximum velocity
PV Area (VTI)	Pulmonary valve area, velocity time integral, folder of labels
PV VTI	Pulmonary valve, velocity time integral
RVOT VTI	Right ventricular outflow tract, velocity time integral
PV CO	Pulmonary valve cardiac output, folder of labels
HR	Heart rate
PV VTI	Pulmonary valve, velocity time integral
PR ED Velocity	Pulmonary regurgitation end diastolic velocity
PR Slope	Pulmonary regurgitation slope
PR Vmax	Pulmonary regurgitation maximum velocity
PR VTI	Pulmonary regurgitation velocity time integral
PV AT	Pulmonary valve acceleration time
PV ET	Pulmonary valve ejection time
PV Vmax	Pulmonary valve maximum velocity
PV VTI	Pulmonary valve velocity time integral

PV Calculation Labels

Calculation Label	Definition	Units
PV AT/ET	Pulmonary valve acceleration time to ejection time ratio	---
RVOT Area	Right ventricular outflow tract area	cm²
RVOT SV	Right ventricular outflow tract stroke volume	ml
PV Peak Grad	Pulmonary valve peak gradient	mmHg
PV Area (Vmax)	Pulmonary valve area maximum velocity	cm²
PV Area/BSA (Vmax)	Pulmonary valve area body surface area index, maximum velocity	cm²/m²
PV Area (VTI)	Pulmonary valve area velocity-time integral	cm²
PV Area/BSA (VTI)	Pulmonary valve area body surface area index, velocity-time integral	cm²/m²
PR ED Grad	Pulmonary regurgitation end diastolic pressure gradient	mmHg
PR (Doppler-Doppler)	Pulmonary regurgitation Doppler calculation labels	---
Site 2 Area	Site two area	cm²
Site 2 SV	Site two stroke volume	ml
PR Volume (Doppler)	Pulmonary regurgitation volume, Doppler	ml
PR RF (Doppler)	Pulmonary regurgitation, regurgitant fraction, Doppler	%
PR PISA	Pulmonary regurgitation, proximal isovelocity surface area method calculations	---
PR PISA	Pulmonary regurgitation, proximal isovelocity surface area method	cm²
PR Inst Flow Rate	Pulmonary regurgitation instantaneous regurgitant flow rate	ml/s
PR EROA	Pulmonary regurgitation effective regurgitant orifice area	cm²
PV Ann s Area	Pulmonary valve annulus systole area	cm²
PV SV	Pulmonary valve stroke volume	ml
PV SI	Pulmonary valve stroke index	ml/m²
PV CO	Pulmonary valve cardiac output	l/min
PV CI	Pulmonary valve cardiac index	l/min/m²

Pulmonary Veins

Pulmonary Veins 2D-mode Measurement Labels

Measurement Label	Definition
Pulm Veins	Pulmonary veins
LLPV Diam	Left lower pulmonary vein diameter
LUPV Diam	Left upper pulmonary vein diameter
RLPV Diam	Right lower pulmonary vein diameter
RUPV Diam	Right upper pulmonary vein diameter

Pulmonary Veins Doppler Measurement Labels

Measurement Label	Definition
Pulm Veins	Pulmonary veins
LLPV	Left lower pulmonary vein
S VTI	S wave velocity time integral
A Duration	A wave duration
A Vmax	A wave maximum velocity
A VTI	A wave velocity time integral
D Vmax	D wave maximum velocity
D VTI	D wave velocity time integral
S Vmax	S wave maximum velocity
RLPV	Right lower pulmonary vein
S VTI	S wave velocity time integral
A Duration	A wave duration
A Vmax	A wave maximum velocity
A VTI	A wave velocity time integral
D Vmax	D wave maximum velocity
D VTI	D wave velocity time integral
S Vmax	S wave maximum velocity

Pulmonary Veins Calculation Labels

Calculation Label	Definition	Units
LUPV A Dur - MV A Dur	Difference between A wave duration and mitral valve A wave duration, left upper pulmonary vein	msec
LUPV S Vmax / D Vmax	Ratio of the S wave maximum velocity to the D wave maximum velocity, left upper pulmonary vein	---
LUPV Systolic Filling Fraction	Left upper pulmonary vein systolic filling fraction	%
LLPV A Dur - MV A Dur	Difference between A wave duration and mitral valve A wave duration, left lower pulmonary vein	msec
LLPV S Vmax / D Vmax	Ratio of the S wave maximum velocity to the D wave maximum velocity, left lower pulmonary vein	---
LLPV Systolic Filling Fraction	Left lower pulmonary vein systolic filling fraction	%
RUPV A Dur - MV A Dur	Difference between A wave duration and mitral valve A wave duration, right upper pulmonary vein	msec
RUPV S Vmax / D Vmax	Ratio of the S wave maximum velocity to the D wave maximum velocity, right upper pulmonary vein	---
RUPV Systolic Filling Fraction	Right upper pulmonary vein systolic filling fraction	%
RLPV A Dur - MV A Dur	Difference between A wave duration and mitral valve A wave duration, right lower pulmonary vein	msec
RLPV S Vmax / D Vmax	Ratio of the S wave maximum velocity to the D wave maximum velocity, right lower pulmonary vein	---
RLPV Systolic Filling Fraction	Right lower pulmonary vein systolic filling fraction	%

Right Atrium (RA)

RA 2D-mode Measurement Labels

Measurement Label	Definition
RA Vol d A4C	Right atrium volume diastole apical four chamber view
RA Vol s A4C	Right atrium volume systole apical four chamber view
RA Major d A4C	Right atrium major axis diastole apical four chamber view
RA Major s A4C	Right atrium major axis systole apical four chamber view
RA Minor d A4C	Right atrium minor axis diastole apical four chamber view
RA Minor s A4C	Right atrium minor axis systole apical four chamber view

RA Calculation Labels

RA: A-L Method Calculation Labels

Calculation Label	Definition	Units
RA Vol d A4C A-L	Right atrial volume, diastole, apical four chamber view, area and length	ml
RA Vol s A4C A-L	Right atrial volume, systole, apical four chamber view, area and length	ml
RA Vol d A4C A-L/BSA	Right atrial volume, diastole, apical four chamber view, area and length indexed by body surface area	ml/m²
RA Vol s A4C A-L/BSA	Right atrial volume, systole, apical four chamber view, area and length indexed by body surface area	ml/m²

RA: MOD Method Calculation Labels

Calculation Label	Definition	Units
A4C	Apical four chamber view calculations	---
RA Vol d A4C MOD/BSA	Right atrial volume, diastole, apical four chamber view, method of disk indexed by body surface area	ml/m²
RA Vol s A4C MOD/BSA	Right atrial volume, systole, apical four chamber view, method of disk indexed by body surface area	ml/m²

Right Ventricle (RV)

RV 2D-mode Measurement Labels

Measurement Label	Definition
RV Systolic Function	Right ventricular systolic function
A4C	Apical four chamber view
RV Area d	Right ventricular area, diastole
RV Area s	Right ventricular area, systole
RV Major d	Right ventricular major axis, diastole
RV Major s	Right ventricular major axis, systole
RV Minor d Base	Right ventricular minor axis, diastole, base
RV Minor d Mid	Right ventricular minor axis, diastole, middle
RV Minor s Base	Right ventricular minor axis, systole, base
RV Minor s Mid	Right ventricular minor axis, systole, middle
PLAX	Parasternal long axis view
RVAW d	Right ventricular anterior wall thickness, diastole
RVAW s	Right ventricular anterior wall thickness, systole
RVID d	Right ventricular internal diameter, diastole
RVID s	Right ventricular internal diameter, systole
RVOT Diam s	Right ventricular outflow tract, diameter, systole
PSAX	Parasternal short axis view
Qp	Pulmonary venous stroke volume, folder of labels
Pulm Side Diam	Pulmonary side diameter
RVOT CO	Right ventricular outflow tract cardiac output, folder of labels
RVOT Diam s	Right ventricular outflow tract, diameter, systole
RVOT 1 Diam s	Right ventricular outflow tract 1 diameter, systole
RVOT 2 Diam s	Right ventricular outflow tract 2 diameter, systole
Subcostal	Subcostal
RVOT Diam s	Right ventricular outflow tract, diameter, systole

RV Doppler Measurement Labels

Measurement Label	Definition
RV Diastolic Function	Right ventricular diastolic function
IVC	Inferior vena cava
IVC A Duration	Inferior vena cava A wave duration
IVC A Vmax	Inferior vena cava A wave maximum velocity
IVC D VTI	Inferior vena cava D wave velocity time integral
IVC S VTI	Inferior vena cava S wave velocity time integral
TV Inflow (Annulus)	Tricuspid valve inflow annulus
RV IVRT	Right ventricular isovolumetric relaxation time
TV A Duration	Tricuspid valve A wave duration
TV A Vmax	Tricuspid valve A wave maximum velocity
TV DT	Tricuspid valve deceleration time
TV E Vmax	Tricuspid valve E wave maximum velocity
TV Inflow	Tricuspid valve inflow
TV A Vmax	Tricuspid valve A wave maximum velocity
TV E Vmax	Tricuspid valve E wave maximum velocity
TV PW DTI	Tricuspid valve, pulsed-wave, Doppler tissue imaging
TV A' Vmax (L)	Tricuspid valve A prime maximum velocity, lateral
TV E' Vmax (L)	Tricuspid valve E prime maximum velocity, lateral
TV S' Vmax (L)	Tricuspid valve S prime maximum velocity, lateral
RV Systolic Function	Right ventricular systolic function
Qp	Pulmonary venous stroke volume, folder of labels
Pulm Side VTI	Pulmonary side velocity time integral
Qp HR	Pulmonary venous stroke volume heart rate
RV MPI	Right ventricular myocardial performance index, folder of labels
RVOT ET	Right ventricular outflow tract ejection time
TV C-O Duration	Tricuspid valve close open duration
RVOT CO	Right ventricular outflow tract cardiac output, folder of labels
HR	Heart rate
RVOT VTI	Right ventricular outflow tract, velocity time integral
RV dP/dt	Right ventricular rate of pressure rise during isovolumic contraction
RV IVCT	Right ventricular isovolumic contraction time
RV PEP	Right ventricular pre ejection period
RVOT AT	Right ventricular outflow tract, acceleration time
RVOT ET	Right ventricular outflow tract, ejection time
RVOT Vmax	Right ventricular outflow tract, maximum velocity
RVOT VTI	Right ventricular outflow tract, velocity time integral
TV C-O Duration	Tricuspid valve close open duration

RV Diastolic Function Calculation Labels

Calculation Label	Definition	Units
TV E/A	Ratio of peak E wave velocity (E) to peak A wave velocity (A) of tricuspid valve flow	---
TV E/E' (L)	Ratio of tricuspid valve E wave maximum velocity (E) to early diastolic velocity (E'), lateral	---
TV E'/A' (L)	Ratio of tricuspid valve end diastolic velocity to late diastolic velocity, lateral	---
HV S/D Vmax	Hepatic vein systolic/diastolic velocity ratio maximum velocity	---

RV Systolic Function Calculation Labels

Calculation Label	Definition	Units
RVID d/BSA	Right ventricular internal diameter, diastole indexed by body surface area	cm/m²
RVID d/LVID d	Right ventricular internal diameter diastole/left ventricular internal diameter, diastole	---
RV %FAC A4C	Right ventricle fraction area change, apical four chamber view	%
RV MPI	Right ventricular myocardial performance index	---
RVSP (TR)	Right ventricular systolic pressure, tricuspid regurgitation	mmHg
RVSP (VSD)	Right ventricular systolic pressure, ventricular septal defect	mmHg
RVOT/LVOT VTI	Right ventricular outflow tract / Left ventricular outflow tract velocity time integral	---
RVOT Peak Grad	Right ventricular outflow tract peak gradient	mmHg
RVOT Area	Right ventricular outflow tract area	cm²
RVOT SV	Right ventricular outflow tract stroke volume	ml
RVOT SI	Right ventricular outflow tract stroke index	ml/m²
RVOT CO	Right ventricular outflow tract cardiac output	l/min
RVOT CI	Right ventricular outflow tract cardiac index	l/min/m²
RV EF A4C A-L	Right ventricular ejection fraction, apical four chamber view, area and length	%
RV Area d A4C/BSA	Right ventricular area diastole, apical four chamber view indexed by body surface area	cm²/m²
RV Area s A4C/BSA	Right ventricular area systole, apical four chamber view indexed by body surface area	cm²/m²
RV Vol d A4C A-L	Right ventricular volume, diastole, apical four chamber view, area-length	ml
RV Vol s A4C A-L	Right ventricular volume, systole, apical four chamber view, area and length	ml
RV Vol d A4C A-L/BSA	Right ventricular volume, diastole, apical four chamber view, area and length indexed by body surface area	ml/m²
RV Vol s A4C A-L/BSA	Right ventricular volume, systole, apical four chamber view, area and length indexed by body surface area	ml/m²

Calculation Label	Definition	Units
RV EF A4C MOD	Right ventricular ejection fraction, apical four chamber view, method of disks	%
RV Area d A4C/BSA	Right ventricular area, diastole, apical four chamber view indexed by body surface area	cm^2/m^2
RV Area s A4C/BSA	Right ventricular area, systole, apical four chamber view indexed by body surface area	cm^2/m^2
RV Vol d A4C MOD/BSA	Right ventricular volume, diastole, apical four chamber view, method of disks indexed by body surface area	ml/m^2
RV Vol s A4C MOD/BSA	Right ventricular volume, systole, apical four chamber view, method of disks indexed by body surface area	ml/m^2

Systemic Veins

Systemic Veins 2D-mode Measurement Labels

Measurement Label	Definition
Systemic Veins	Systemic veins
HV Diam	Hepatic vein diameter
IVC Diam	Inferior vena cava diameter
IVC Diam Collapsed	Inferior vena cava diameter collapsed

Systemic Veins Doppler Measurement Labels

Measurement Label	Definition
Systemic Veins	Systemic veins
HV A Vmax	Hepatic vein A wave maximum velocity
HV D Vmax	Hepatic vein D wave maximum velocity
HV D VTI	Hepatic vein D wave velocity time integral
HV S Vmax	Hepatic vein S wave maximum velocity
HV S VTI	Hepatic vein S wave velocity time integral
IVC A Duration	Inferior vena cava A wave duration
IVC A Vmax	Inferior vena cava A wave maximum velocity
IVC D VTI	Inferior vena cava D wave velocity time integral
IVC S VTI	Inferior vena cava S wave velocity time integral
SVC A Duration	Superior vena cava A wave duration
SVC A Vmax	Superior vena cava A wave maximum velocity
SVC D VTI	Superior vena cava D wave velocity time integral
SVC S VTI	Superior vena cava S wave velocity time integral

Hepatic Vein Calculation Labels

Calculation Label	Definition	Units
HV S/D Vmax	Hepatic vein, ratio of systolic / diastolic velocity, maximum velocity	---
HV Systolic Filling Fraction	Hepatic vein systolic filling fraction	%

Inferior Vena Cava Calculation Labels

Calculation Label	Definition	Units
IVC Diam % change	Inferior vena cava diameter percent change	%
IVC Diam change (cm)	Inferior vena cava diameter change in centimeters	cm
IVC S/D Vmax	Inferior vena cava, ratio of systolic / diastolic velocity, maximum velocity	---

Tricuspid Valve Measurements

Tricuspid Valve 2D-mode Measurement Labels

Measurement Label	Definition
TV	Tricuspid valve
TR EROA (PISA)	Tricuspid regurgitation effective regurgitant orifice area, proximal isovelocity surface area, folder of labels
TR PISA Radius	Tricuspid regurgitation, proximal isovelocity surface area, radius
TR RF (Doppler)	Tricuspid regurgitation, regurgitant fraction, Doppler, folder of labels
TV Site 2 Diam	Tricuspid valve site two diameter
TV Annulus d	Tricuspid valve annulus diastole
TR RF (PISA)	Tricuspid regurgitation, regurgitant fraction, proximal isovelocity surface area, folder of labels
TR PISA Radius	Tricuspid regurgitation, proximal isovelocity surface area, radius
TV Annulus d	Tricuspid valve annulus diastole
TV Area (PISA)	Tricuspid valve area, proximal isovelocity surface area, folder of labels
TV Funnel Angle	Tricuspid valve funnel angle
TV PISA Radius	Tricuspid valve, proximal isovelocity surface area, radius
TV Area (VTI)	Tricuspid valve area, velocity time integral, folder of labels
RVOT Diam s	Right ventricular outflow tract diameter, systole
TV CO	Tricuspid valve cardiac output, folder of labels
TV Annulus d A4C	Tricuspid valve annulus diastole, apical four chamber view
TR VC Width	Tricuspid regurgitation vena contracta width
TV Annulus d	Tricuspid valve annulus diastole
TV Annulus d A-P	Tricuspid valve annulus diastole anterior to posterior
TV Annulus d M-L	Tricuspid valve annulus diastole medial to lateral
TV Planimetry	Tricuspid valve planimetry method
TVR	Tricuspid valve repair/replacement
TR EROA (PISA)	Tricuspid regurgitation effective regurgitant orifice area, proximal isovelocity surface area, folder of labels
TR PISA Radius	Tricuspid regurgitation, proximal isovelocity surface area, radius
TR RF (Doppler)	Tricuspid regurgitation, regurgitant fraction, Doppler, folder of labels
TV Site 2 Diameter	Tricuspid valve site two diameter
TV Annulus d	Tricuspid valve annulus diastole

Measurement Label	Definition
TR RF (PISA)	Tricuspid regurgitation, regurgitant fraction, proximal isovelocity surface area, folder of labels
TR PISA Radius	Tricuspid regurgitation, proximal isovelocity surface area, radius
TV Annulus d	Tricuspid valve annulus diastole
TV Area (PISA)	Tricuspid valve area, proximal isovelocity surface area, folder of labels
TV Funnel Angle	Tricuspid valve funnel angle
TV PISA Radius	Tricuspid valve, proximal isovelocity surface area, radius
TV Area (VTI)	Tricuspid valve area, velocity time integral, folder of labels
RVOT Diam s	Right ventricular outflow tract diameter, systole
TV CO	Tricuspid valve cardiac output, folder of labels
TV Annulus d A4C	Tricuspid valve annulus diastole, apical four chamber view
TR VC Width	Tricuspid regurgitation vena contracta width
TV Annulus d	Tricuspid valve annulus diastole
TV Annulus d A-P	Tricuspid valve annulus diastole anterior to posterior
TV Annulus d M-L	Tricuspid valve annulus diastole medial to lateral
TV Planimetry	Tricuspid valve planimetry method

Tricuspid Valve Doppler Measurement Labels

Measurement Label	Definition
TV	Tricuspid valve
TR EROA (PISA)	Tricuspid regurgitation effective regurgitant orifice area, proximal isovelocity surface area, folder of labels
TR Vmax	Tricuspid regurgitation maximum velocity
TR RF (Doppler)	Tricuspid regurgitation, regurgitant fraction, Doppler, folder of labels
TV VTI	Tricuspid valve velocity time integral
TV Site 2 VTI	Tricuspid valve site two velocity time integral
TR RF (PISA)	Tricuspid regurgitation, regurgitant fraction, proximal isovelocity surface area, folder of labels
TR Vmax	Tricuspid regurgitation maximum velocity
TR VTI	Tricuspid regurgitation velocity time integral
TV VTI, Annulus	Tricuspid valve velocity time integral, annulus
TV Area (PISA)	Tricuspid valve area, proximal isovelocity surface area, folder of labels
TV Vmax	Tricuspid valve maximum velocity
TV Area (VTI)	Tricuspid valve area, velocity time integral, folder of labels
TV VTI	Tricuspid valve velocity time integral
RVOT VTI	Right ventricular outflow tract, velocity time integral
TV CO	Tricuspid valve cardiac output, folder of labels
HR	Heart rate
TV VTI	Tricuspid valve velocity time integral
RV dP/dt	Right ventricular rate of pressure rise during isovolumic contraction
TR Vmax	Tricuspid regurgitation maximum velocity
TR VTI	Tricuspid regurgitation velocity time integral
TV A Vmax	Tricuspid valve A wave, maximum velocity
TV E Vmax	Tricuspid valve E wave, maximum velocity
TV PHT	Tricuspid valve pressure half time
TV VTI	Tricuspid valve velocity time integral
TVR	Tricuspid valve repair/replacement
TR EROA (PISA)	Tricuspid regurgitation effective regurgitant orifice area, proximal isovelocity surface area, folder of labels
TR Vmax	Tricuspid regurgitation maximum velocity
TR RF (Doppler)	Tricuspid regurgitation, regurgitant fraction, Doppler, folder of labels
TV VTI	Tricuspid valve velocity time integral
TV Site 2 VTI	Tricuspid valve site two velocity time integral

Measurement Label	Definition
TR RF (PISA)	Tricuspid regurgitation, regurgitant fraction, proximal isovelocity surface area, folder of labels
TR Vmax	Tricuspid regurgitation maximum velocity
TR VTI	Tricuspid regurgitation velocity time integral
TV VTI, Annulus	Tricuspid valve velocity time integral, annulus
TV Area (PISA)	Tricuspid valve area, proximal isovelocity surface area, folder of labels
TV Vmax	Tricuspid valve maximum velocity
TV Area (VTI)	Tricuspid valve area, velocity time integral, folder of labels
TV VTI	Tricuspid valve velocity time integral
RVOT VTI	Right ventricular outflow tract, velocity time integral
TV CO	Tricuspid valve cardiac output, folder of labels
HR	Heart rate
TV VTI	Tricuspid valve velocity time integral
RV dP/dt	Right ventricular rate of pressure rise during isovolumic contraction
TR Vmax	Tricuspid regurgitation maximum velocity
TR VTI	Tricuspid regurgitation velocity time integral
TV A Vmax	Tricuspid valve A wave maximum velocity
TV E Vmax	Tricuspid valve E wave maximum velocity
TV PHT	Tricuspid valve pressure half time
TV VTI	Tricuspid valve velocity time integral

Tricuspid Valve Calculation Labels

Calculation Label	Definition	Units
TV E/A	Ratio of peak E wave velocity (E) to peak A wave velocity (A) of tricuspid valve flow	---
TV A/E	Ratio of peak A wave velocity (A) to peak E wave velocity (E) of tricuspid valve flow	---
TV PHT	Tricuspid valve pressure half time	msec
TV Area (PHT)	Tricuspid valve area, pressure half time	cm^2
TV Area (VTI)	Tricuspid valve area velocity time integral	cm^2
TV Area/BSA (VTI)	Tricuspid valve area indexed by body surface area, velocity time integral	cm^2/m^2
Tricuspid Valve PISA	Tricuspid valve proximal isovelocity surface area calculations	---
TV PISA	Tricuspid valve proximal isovelocity surface area	cm^2
TV Inst Flow Rate	Tricuspid valve instantaneous flow rate	l/min
TV Area (PISA)	Tricuspid valve area, proximal isovelocity surface area	cm^2
TV Area/BSA (PISA)	Tricuspid valve area indexed by body surface area, proximal isovelocity surface area	cm^2/m^2

Calculation Label	Definition	Units
TR Peak Grad	Tricuspid regurgitation peak pressure gradient	mmHg
TR (Doppler)	Tricuspid regurgitation Doppler calculations	---
Site 2 Area	Site two area	cm²
Site 2 SV	Site two stroke volume	ml
TR Volume (Doppler)	Tricuspid regurgitation volume, Doppler	ml
TR RF (Doppler)	Tricuspid regurgitation, regurgitant fraction, Doppler	%
TR PISA	Tricuspid regurgitation, proximal isovelocity surface area calculations	---
TR PISA	Tricuspid regurgitation, proximal isovelocity surface area method	cm²
TR Inst Flow Rate	Tricuspid regurgitation instantaneous flow rate	ml/s
TR EROA	Tricuspid regurgitation, effective regurgitant orifice area	cm²
TR Volume (PISA)	Tricuspid regurgitation volume, proximal isovelocity surface area method	ml
TR RF (PISA)	Tricuspid regurgitation, regurgitant fraction, proximal isovelocity surface area method	%
TV Ann Area	Tricuspid valve annulus area	cm²
TV SV	Tricuspid valve stroke volume	ml
TV SI	Tricuspid valve stroke index	ml/m²
TV CO	Tricuspid valve cardiac output	l/min
TV CI	Tricuspid valve cardiac index	l/min/m²
TV E/A (Annulus)	Tricuspid valve, ratio of peak E wave velocity (E) to peak A wave velocity (A), annulus	---
TV A/E (Annulus)	Tricuspid valve, ratio of peak A wave velocity (A) to peak E wave velocity (E), annulus	---
TV E/E' (L)	Tricuspid valve, ratio of E wave maximum velocity to early diastolic velocity, lateral	---
TV E'/A' (L)	Tricuspid valve, ratio of early diastolic velocity to late diastolic velocity, lateral	---

M-mode Measurements

M-mode Measurement Labels

Measurement Label	Definition
M-mode	M-mode
Ao/LA	Aorta/left atrium measurements
Ao Diam d	Aortic diameter at end-diastole
AoV Cusp Sep	Aortic valve cusp separation
LA Diam s	Left atrial diameter systole
IVC	Inferior vena cava
IVC Collapsed Diam	Inferior vena cava collapsed diameter
IVC Diam	Inferior vena cava diameter
MV	Mitral valve function
CE Amp	Amplitude of the E wave
CA Amp	Amplitude of the A wave
DE Excursion	DE excursion
DE Slope	Anterior excursion of the mitral leaflet at early diastole
EPSS	E point to septal separation The distance between the anterior leaflet and the ventricular septum at early diastole.
EF Slope	Deceleration slope of the mitral leaflet's closure at early diastole
MAPSE	Mitral valve annular plane systemic excursion
Systolic BP	Systolic blood pressure
TV	Tricuspid valve
DE Excursion	DE excursion
DE Slope	Anterior excursion of the mitral leaflet at early diastole
EF Slope	Deceleration slope of the mitral leaflet's closure at early diastole
TAPSE	Tricuspid annular plane systolic excursion
RV	Right ventricle dimensions
RV ET	Right ventricular ejection time
RV Inflow Vp	Right ventricular inflow propagation velocity
RV PEP	Right ventricular pre-ejection period
RVAW d	Right ventricular anterior wall at end-diastole
RVAW s	Right ventricular anterior wall at end-systole
RVID d	Right ventricular internal diameter at end-diastole
RVID s	Right ventricular internal diameter at end-systole

Measurement Label	Definition
LV	Left ventricle
LV d Series	Left ventricular diastole series, folder of labels
IVS d	Interventricular septal dimension at end-diastole
LV d Series	Left ventricular diastole series
LVID d	Left ventricular internal dimension at end-diastole
LVPW d	Left ventricular posterior wall dimension at end-diastole
LV s Series	Left ventricular systole series, folder of labels
IVS s	Interventricular septal dimension at end-systole
LV s Series	Left ventricular systole series
LVID s	Left ventricular internal dimension at end-systole
LVPW s	Left ventricular posterior wall dimension at end-systole
LV Mass ASE	Left ventricular mass American Society of Echocardiography, folder of labels
IVS d	Interventricular septal dimension at end-diastole
LVID d	Left ventricular internal dimension at end-diastole
LVPW d	Left ventricular posterior wall dimension at end-diastole
Mean VCFc	Left ventricular mean velocity of circumferential fiber shortening, folder of labels
LV ET	Left ventricular ejection time
HR	Heart rate
LVID d	Left ventricular internal dimension at end-diastole
LVID s	Left ventricular internal dimension at end-systole
Wall Stress Circum	Wall stress circumference, folder of labels
LV Major s	Left ventricular major systole
LVID s	Left ventricular internal dimension at end-systole
LVPW s	Left ventricular posterior wall dimension at end-systole
Systolic BP	Systolic blood pressure
Wall Stress Meridian	Wall stress meridian, folder of labels
LVID s	Left ventricular internal dimension at end-systole
LVPW s	Left ventricular posterior wall dimension at end-systole
Systolic BP	Systolic blood pressure
LV ET	Left ventricular ejection time
LV Inflow Vp	Left ventricular inflow propagation velocity
LV PEP	Left ventricular pre-ejection period
LVOT Diam s	Left ventricular outflow tract diameter at end-systole

M-mode Calculation Labels

Calculation Label	Definition	Units
Ao d/LA s	Ratio of aortic diameter, diastole to left atrial diameter, systole	---
LA s/Ao d	Ratio of left atrial diameter, systole to aortic diameter, diastole	---
EPSS/LVID d	Ratio of the E point septal separation to the left ventricular internal diameter, diastole	---
IVS/LVPW	Ratio of interventricular septum thickness to the left ventricular posterior wall thickness	---
IVS %Thick	Interventricular septum percent thickening	%
LVPW %Thick	Left ventricular posterior wall percent thickening	%
LV %FS	Left ventricular percent fractional shortening	%
LV EF	Left ventricular ejection fraction	%
LV Vol d	Left ventricular volume, diastole	ml
LV Vol s	Left ventricular volume, systole	ml
LV SV	Left ventricular stroke volume	ml
LV SI	Left ventricular stroke index	ml/m²
LV CO	Left ventricular cardiac output	l/min
LV CI	Left ventricular cardiac index	l/min/m²
LV Mass ASE	Left ventricle mass American Society of Echocardiography calculation method	g
LV Mass ASE/BSA	Left ventricle mass American Society of Echocardiography calculation method indexed by body surface area	g/m²
LV Mass ASE/Ht	Left ventricle mass American Society of Echocardiography calculation method indexed by height	g/cm
Mean VCFc	Left ventricular mean velocity of circumferential fiber shortening	circs/s
Wall Stress Circum	Left ventricular wall stress, circumferential	g/cm²
Wall Stress Merid	Left ventricular wall stress, meridional	g/cm²

Calculation Label	Definition	Units
LV ETc	Left ventricle	msec
LV PEP corrected	Left ventricular pre-ejection period corrected	msec
LV PEP/ET	Ratio of the left ventricular pre-ejection period to the ejection time	---
CA/CE	Mitral valve ratio of the CA amplitude to the CE amplitude	---
CE/CA	Mitral valve ratio of the CE amplitude to the CA amplitude	---
RV ET corrected	Right ventricular ejection time corrected	msec
RV PEP corrected	Right ventricular pre-ejection period corrected	msec
RV PEP/ET	Ratio of the right ventricular pre-ejection period to the ejection time	---
IVC Diam % change	Inferior vena cava diameter percent change	%
IVC Diam change (cm)	Inferior vena cava diameter change	cm

AI Measure Measurements

Measurement labels available with AI Measure are indicated on the touch screen with **AI** in orange superscript text.

AI Measure 2D-mode Measurement Labels

Note: The feature excludes measurements for the right ventricle.

Measurement Label	Definition
LV	Left ventricular
LV d	Left ventricular diastole
IVS d	Interventricular septum thickness, diastole
LVID d	Left ventricular internal diameter, diastole
LVPW d	Left ventricular posterior wall dimension at end-diastole
LV s	Left ventricular systole
LVID s	Left ventricular internal diameter, systole

AI Measure M-mode Measurement Labels

Note: The feature excludes measurements for the right ventricle and aortic cusp separation.

Measurement Label	Definition
LV	Left ventricular
LV d	Left ventricular diastole
IVS d	Interventricular septum thickness, diastole
LVID d	Left ventricular internal diameter, diastole
LVPW d	Left ventricular posterior wall dimension at end-diastole
LV s	Left ventricular systole
LVID s	Left ventricular internal diameter, systole
AO/LA	Aorta/left atrium
Ao Diam d	Aortic diameter at end-diastole
LA Diam s	Left atrial diameter systole

AI Measure Doppler Measurement Labels

Measurement Label	Definition
AoV VTI	Aortic valve, velocity time integral
AoV Vmax	Aortic valve maximum velocity
AoV Mean Grad	Aortic valve mean gradient
AR PHT	Aortic regurgitation pressure half-time
AR Slope	Aortic regurgitation slope
AR DT	Aortic regurgitation deceleration time
DTI RV	Doppler tissue imaging, right ventricle
TV E' Vmax (L)	Tricuspid valve E prime maximum velocity, lateral
TV A' Vmax (L)	Tricuspid valve A prime maximum velocity, lateral
TV S' Vmax (L)	Tricuspid valve S prime maximum velocity, lateral
DTI Lat	Doppler tissue imaging, lateral
MV E' Vmax (L)	Early diastolic myocardial velocity, maximum velocity, lateral
MV A' Vmax (L)	Late diastolic myocardial velocity, maximum velocity, lateral
MV S' Vmax (L)	Systolic myocardial velocity, maximum velocity, lateral
DTI Med	Doppler tissue imaging, medial
MV E' Vmax (M)	Early diastolic myocardial velocity, maximum velocity, medial
MV A' Vmax (M)	Late diastolic myocardial velocity, maximum velocity, medial
MV S' Vmax (M)	Systolic myocardial velocity, maximum velocity, medial
LVOT VTI	Left ventricular outflow tract, velocity time integral
LVOT Vmax	Left ventricular outflow tract maximum velocity
LVOT Mean Grad	Left ventricular outflow tract mean gradient
MR VTI	Mitral regurgitation velocity time integral
MR Vmax	Mitral regurgitation maximum velocity
MR Mean Grad	Mitral regurgitation mean gradient
MV Inflow	Mitral valve inflow
MV DT	Mitral valve deceleration time
MV E Vmax	Mitral valve E wave, maximum velocity
MV A Vmax	Mitral valve A wave, maximum velocity
PV VTI	Pulmonary valve, velocity time integral
PV Vmax	Pulmonary valve maximum velocity
PV Mean Grad	Pulmonary valve mean gradient
RVOT VTI	Right ventricular outflow tract, velocity time integral
RVOT Vmax	Right ventricular outflow tract
RVOT Mean Grad	Right ventricular outflow tract mean gradient
TR	Tricuspid regurgitation
TR Vmax	Tricuspid regurgitation maximum velocity
TR Peak Grad	Tricuspid regurgitation peak gradient

Stress Echo Results

Stress Echo Aortic Valve (AoV) Calculation Labels

Calculation Label	Definition	Units
AoV Stenosis	Aortic valve stenosis calculations	---
AoV Peak Grad	Aortic valve peak pressure gradient	mmHg
LVOT/AoV Vmax	Left ventricular outflow tract/aortic valve maximum velocity	m/s
LVOT/AoV VTI	Left ventricular outflow tract/aortic valve velocity time integral	cm
AVA (Vmax)	Aortic valve area continuity equation maximum velocity	cm^2
AVA (Vmean)	Aortic valve area continuity equation mean velocity	cm^2
AVA (VTI)	Aortic valve area continuity equation velocity time integral	cm^2
AVA/BSA (Vmax)	Aortic valve area continuity equation indexed by body surface area maximum velocity	cm^2/m^2
AVA/BSA (Vmean)	Aortic valve area continuity equation indexed by body surface area mean velocity	cm^2/m^2
AVA/BSA (VTI)	Aortic valve area continuity equation indexed by body surface area velocity time integral	cm^2/m^2
AR Doppler	Aortic regurgitation Doppler calculations	---
AR Peak Grad	Aortic regurgitation peak pressure gradient	mmHg
AoV Site 2 SV	Aortic valve site two stroke volume	ml
AR Volume (Doppler)	Aortic regurgitant volume Doppler	ml
AR RF (Doppler)	Aortic regurgitation, regurgitant fraction, Doppler	%
AoV Stroke Volume	Aortic valve stroke volume calculations	---
AoV SV	Aortic valve stroke volume	ml

Stress Echo Left Ventricle (LV) Calculation Labels

Calculation Label	Definition	Units
LVOT	Left ventricular outflow tract calculations	---
LVOT Peak Grad	Left ventricular outflow tract peak pressure gradient	mmHg
LVOT SV	Left ventricular outflow tract stroke volume	ml
LVOT SI	Left ventricular outflow tract stroke index	ml/m²
LVOT CO	Left ventricular outflow tract cardiac output	l/min
LVOT CI	Left ventricular outflow tract cardiac index	l/min/m²
Volume, Method of Disks	Volume, method of disks calculations	---
A4C	Apical four chamber view calculations	---
LV EF A4C MOD	Left ventricular ejection fraction, apical four chamber view, method of disks	%
LV Vol d A4C MOD/BSA	Left ventricular volume, diastole, apical four chamber view, method of disks indexed by body surface area	ml/m²
LV Vol s A4C MOD/BSA	Left ventricular volume, systole, apical four chamber view, method of disks indexed by body surface area	ml/m²
LV SV A4C MOD	Left ventricular stroke volume, apical four chamber view, method of disks	ml
LV SI A4C MOD	Left ventricular stroke index, apical four chamber view, method of disks	ml/m²
LV CO A4C MOD	Left ventricular cardiac output, apical four chamber view, method of disks	l/min
LV CI A4C MOD	Left ventricular cardiac index, apical four chamber view, method of disks	l/min/m²
A2C	Apical two chamber view calculations	---
LV EF A2C MOD	Left ventricular ejection fraction, apical two chamber view, method of disks	%
LV Vol d A2C MOD/BSA	Left ventricular volume, diastole, apical two chamber view, method of disks indexed by body surface area	ml/m²
LV Vol s A2C MOD/BSA	Left ventricular volume, systole, apical two chamber view, method of disks indexed by body surface area	ml/m²
LV SV A2C MOD	Left ventricular stroke volume, apical two chamber view, method of disk	ml
LV SI A2C MOD	Left ventricular stroke index, apical two chamber view, method of disk	ml/m²
LV CO A2C MOD	Left ventricular cardiac output, apical two chamber view, method of disk	l/min
LV CI A2C MOD	Left ventricular cardiac index, apical two chamber view, method of disk	l/min/m²

Calculation Label	Definition	Units
Biplane	Biplane calculations	---
LV EF Biplane MOD	Left ventricular ejection fraction, biplane, method of disks	%
LV Vol d Biplane MOD	Left ventricular volume, diastole, biplane, method of disks	ml
LV Vol s Biplane MOD	Left ventricular volume, systole, biplane, method of disks	ml
LV Vol d Biplane MOD/BSA	Left ventricular volume, diastole, biplane, method of disks indexed by body surface area	ml/m²
LV Vol s Biplane MOD/BSA	Left ventricular volume, systole, biplane, method of disks indexed by body surface area	ml/m²
LV SV Biplane MOD	Left ventricular stroke volume, biplane, method of disks	ml
LV SI Biplane MOD	Left ventricular stroke index, biplane, method of disks	ml/m²
LV CO Biplane MOD	Left ventricular volume, cardiac output, method of disks	l/min
LV CI Biplane MOD	Left ventricular volume, cardiac index, method of disks	l/min/m²

Stress Echo Mitral Valve (MV) Calculation Labels

Calculation Label	Definition	Units
MV Stenosis	Mitral valve stenosis calculations	---
MV Area (VTI)	Mitral valve area velocity time integral	cm²
MV Area/BSA (VTI)	Mitral valve area indexed by body surface area velocity time integral	cm²/m²
MV Peak Grad	Mitral valve peak pressure gradient	mmHg
MR	Mitral valve regurgitation calculations	---
MR Peak Grad	Mitral regurgitation peak pressure gradient	mmHg
MR Doppler	Mitral valve regurgitation Doppler calculations	---
MV Site 2 SV	Mitral valve site two stroke volume	ml
MR Volume (Doppler)	Mitral regurgitation volume Doppler	ml
MR RF (Doppler)	Mitral regurgitation, regurgitant fraction Doppler	%
MV Stroke Volume	Mitral valve stroke volume calculation	---
MV SV	Mitral valve stroke volume	ml

Stress Echo Pulmonary Valve (PV) Calculation Labels

Calculation Label	Definition	Units
PV Stenosis	Pulmonary valve stenosis calculations	---
RVOT SV	Right ventricular outflow tract stroke volume	ml
PV Peak Grad	Pulmonary valve peak gradient	mmHg
PV Area (Vmax)	Pulmonary valve area maximum velocity	cm²
PV Area/BSA (Vmax)	Pulmonary valve area body surface area index, maximum velocity	cm²/m²
PV Area (VTI)	Pulmonary valve area velocity-time integral	cm²
PV Area/BSA (VTI)	Pulmonary valve area body surface area index, velocity-time integral	cm²/m²
PR Doppler	Pulmonary regurgitation Doppler calculations	---
PV Site 2 SV	Pulmonary valve site two stroke volume	ml
PR Volume (Doppler)	Pulmonary regurgitation volume, Doppler	ml
PR RF (Doppler)	Pulmonary regurgitation, regurgitant fraction, Doppler	%
PV Stroke Volume	Pulmonary valve stroke volume calculation	---
PV SV	Pulmonary valve stroke volume	ml

Stress Echo Tricuspid Valve (TV) Calculation Labels

Calculation Label	Definition	Units
TV PW DTI	Tricuspid valve, pulsed-wave, Doppler tissue imaging calculations	---
RVSP (TR)	Right ventricular systolic pressure, tricuspid regurgitation	mmHg
TV Stenosis	Tricuspid valve stenosis calculations	---
TV Area (VTI)	Tricuspid valve area velocity time integral	cm²
TV Area/BSA (VTI)	Tricuspid valve area indexed by body surface area, velocity time integral	cm²/m²
TV Peak Grad	Tricuspid valve peak pressure gradient	mmHg
TR	Tricuspid regurgitation calculation	---
TR Peak Grad	Tricuspid regurgitation peak pressure gradient	mmHg
TR Doppler	Tricuspid regurgitation Doppler calculations	---
TV Site 2 SV	Tricuspid valve site two stroke volume	ml
TR Volume (Doppler)	Tricuspid regurgitation volume, Doppler	ml
TR RF (Doppler)	Tricuspid regurgitation, regurgitant fraction, Doppler	%
TV Stroke Volume	Tricuspid valve stroke volume calculation	---
TV SV	Tricuspid valve stroke volume	ml

Stress Echo Right Ventricle (RV) Calculation Labels

Calculation Label	Definition	Units
RVOT	Right ventricular outflow tract calculations	---
RVOT Peak Grad	Right ventricular outflow tract peak gradient	mmHg

Stress Echo View and View Plane Labels

Views	Description
PLAX	Parasternal long axis view measurements
PSAX	Parasternal short axis
A2C	Apical two chamber view
A3C	Apical three chamber view
A4C	Apical four chamber view
ALAX	Apical long axis
A5C	Apical five chamber view
EF A2C	Ejection fraction apical two chamber view
EF A4C	Ejection fraction apical four chamber view
Valve Color	Valve color
PISA	Proximal isovelocity surface area
Regurg VTI	Regurgitation velocity time integral
LVOT VTI	Left ventricular outflow tract velocity time integral
AV VTI	Aortic valve velocity time integral
MV Ann InFlow	Mitral valve annulus in flow
MV VTI	Mitral valve velocity time integral

Stress Echo Stage Labels

Stage Label	Description
AoV VTI	Aortic valve, velocity time integral
AoV Vmax	Aortic valve maximum velocity
AoV Peak Grad	Aortic valve peak pressure gradient
AoV VMean	Aortic valve mean velocity
AoV Mean Grad	Aortic valve mean pressure gradient
AoV Site 2 VTI	Aortic valve site two velocity time integral
AoV Site 2 SV	Aortic valve site two stroke volume
AR VTI	Aortic regurgitation, velocity time integral
AR Vmax	Aortic regurgitation maximum velocity
AR Peak Grad	Aortic regurgitation peak pressure gradient
AR Vmean	Aortic regurgitation mean velocity
AR Mean Grad	Aortic regurgitation mean pressure gradient
AR PHT	Aortic regurgitation pressure half-time
AR DT	Aortic regurgitation deceleration time
AR Slope	Aortic regurgitation slope
AR Volume (Doppler)	Aortic regurgitant volume Doppler
AR RF (Doppler)	Aortic regurgitation, regurgitant fraction, Doppler
AoV SV	Aortic valve stroke volume

Stage Label	Description
LVOT VTI	Left ventricular outflow tract velocity time integral
LVOT Vmax	Left ventricular outflow tract, maximum velocity
LVOT Peak Grad	Left ventricular outflow tract peak pressure gradient
LVOT Vmean	Left ventricular outflow tract mean velocity
LVOT Mean Grad	Left ventricular outflow tract mean pressure gradient
LVOT SV	Left ventricular outflow tract stroke volume
LVOT SI	Left ventricular outflow tract stroke index
LVOT CO	Left ventricular outflow tract cardiac output
LVOT CI	Left ventricular outflow tract cardiac index
LVOT/AoV Vmax	Left ventricular outflow tract/aortic valve maximum velocity
LVOT/AoV VTI	Left ventricular outflow tract/aortic valve velocity time integral
AVA (Vmax)	Aortic valve area continuity equation maximum velocity
AVA (Vmean)	Aortic valve area continuity equation mean velocity
AVA (VTI)	Aortic valve area continuity equation velocity time integral
AVA/BSA (Vmax)	Aortic valve area continuity equation indexed by body surface area maximum velocity
AVA/BSA (Vmean)	Aortic valve area continuity equation indexed by body surface area mean velocity
AVA/BSA (VTI)	Aortic valve area continuity equation indexed by body surface area velocity time integral
LV EF A4C MOD	Left ventricular ejection fraction, apical four chamber view, method of disks
LV Vol d A4C MOD	Left ventricular volume, diastole, apical four chamber view, method of disks
LV Vol s A4C MOD	Left ventricular volume, systole, apical four chamber view, method of disks
LV Vol d A4C MOD/BSA	Left ventricular volume, diastole, apical four chamber view, method of disks indexed by body surface area
LV Vol s A4C MOD/BSA	Left ventricular volume, systole, apical four chamber view, method of disks indexed by body surface area
LV SV A4C MOD	Left ventricular stroke volume, apical four chamber view, method of disks
LV SI A4C MOD	Left ventricular stroke index, apical four chamber view, method of disks
LV CO A4C MOD	Left ventricular cardiac output, apical four chamber view, method of disks
LV CI A4C MOD	Left ventricular cardiac index, apical four chamber view, method of disks
LV Area d A4C	Left ventricular area, diastole, apical four chamber view
LV Area s A4C	Left ventricular area, systole, apical four chamber view
LV Major d A4C	Left ventricular major axis, diastole, apical four chamber view
LV Major s A4C	Left ventricular major axis, systole, apical four chamber view

Stage Label	Description
LV EF A2C MOD	Left ventricular ejection fraction, apical two chamber view, method of disks
LV Vol d A2C MOD	Left ventricular volume, diastole, apical two chamber view, method of disks
LV Vol s A2C MOD	Left ventricular volume, systole, apical two chamber view, method of disks
LV Vol d A2C MOD/BSA	Left ventricular volume, diastole, apical two chamber view, method of disks indexed by body surface area
LV Vol s A2C MOD/BSA	Left ventricular volume, systole, apical two chamber view, method of disks indexed by body surface area
LV SV A2C MOD	Left ventricular stroke volume, apical two chamber view, method of disks
LV SI A2C MOD	Left ventricular stroke index, apical two chamber view, method of disks
LV CO A2C MOD	Left ventricular cardiac output, apical two chamber view, method of disks
LV CI A2C MOD	Left ventricular cardiac index, apical two chamber view, method of disks
LV Area d A2C	Left ventricular area, diastole, apical two chamber view
LV Area s A2C	Left ventricular area, systole, apical two chamber view
LV Major d A2C	Left ventricular major axis, diastole, apical two chamber view
LV Major s A2C	Left ventricular major axis, systole, apical two chamber view
LV EF Biplane MOD	Left ventricular ejection fraction biplane, method of disks
LV Vol d Biplane MOD	Left ventricular volume, diastole, biplane, method of disks
LV Vol s Biplane MOD	Left ventricular volume, systole, biplane, method of disks
LV Vol d Biplane MOD/BSA	Left ventricular volume, diastole, biplane, method of disks indexed by body surface area
LV Vol s Biplane MOD/BSA	Left ventricular volume, systole, biplane, method of disks indexed by body surface area
LV SV Biplane MOD	Left ventricular stroke volume, biplane, method of disks
LV SI Biplane MOD	Left ventricular stroke index, biplane, method of disks
LV CO Biplane MOD	Left ventricular volume, cardiac output, method of disks
LV CI Biplane MOD	Left ventricular volume, cardiac index, method of disks
MV VTI	Mitral valve velocity time integral
MV Vmax	Mitral valve maximum velocity
MV Peak Grad	Mitral valve peak pressure gradient
MV Vmean	Mitral valve mean velocity
MV Mean Grad	Mitral valve mean pressure gradient
MV DT	Mitral valve deceleration time
MV Site 2 VTI	Mitral valve site two velocity time integral
MV Site 2 SV	Mitral valve site two stroke volume

Stage Label	Description
MR VTI	Mitral regurgitation velocity time integral
MR Vmax	Mitral regurgitation maximum velocity
MR Peak Grad	Mitral regurgitation peak pressure gradient
MR Vmean	Mitral regurgitation mean velocity
MR Mean Grad	Mitral regurgitation mean pressure gradient
MV VTI, Annulus	Mitral valve velocity time integral, annulus
MV Vmax, Annulus	Mitral valve maximum velocity, annulus
MV Vmean, Annulus	Mitral valve mean velocity, annulus
MV Area (VTI)	Mitral valve area velocity time integral
MV Area/BSA (VTI)	Mitral valve area indexed by body surface area velocity time integral
MV SV	Mitral valve stroke volume
MR Volume (Doppler)	Mitral regurgitation volume Doppler
MR RF (Doppler)	Mitral regurgitation, regurgitant fraction Doppler
TV VTI	Tricuspid valve velocity time integral
TV Vmax	Tricuspid valve maximum velocity
TV Peak Grad	Tricuspid valve peak pressure gradient
TV Vmean	Tricuspid valve mean velocity
TV Mean Grad	Tricuspid valve mean pressure gradient
TV PHT	Tricuspid valve regurgitation pressure half-time
TV DT	Tricuspid valve regurgitation deceleration time
TV Decel Slope	Tricuspid valve deceleration slope
TR VTI	Tricuspid regurgitation velocity time integral
TR Vmax	Tricuspid regurgitation maximum velocity
TR Peak Grad	Tricuspid regurgitation peak pressure gradient
RVSP (TR)	Right ventricular systolic pressure, tricuspid regurgitation
TV Site 2 VTI	Tricuspid valve site two velocity time integral
TV Site 2 SV	Tricuspid valve site two stroke volume
TV VTI, Annulus	Tricuspid valve velocity time integral, annulus
TV Vmax, Annulus	Tricuspid valve maximum velocity, annulus
TV Peak Grad, Annulus	Tricuspid valve peak pressure gradient, annulus
TV Vmean, Annulus	Tricuspid valve mean velocity, annulus
TV Mean Grad, Annulus	Tricuspid valve mean pressure gradient, annulus
TV A/E	Tricuspid valve, ratio of peak A wave velocity (A) to peak E wave velocity (E)
TV Area (PHT)	Tricuspid valve area, pressure half time
TV Area (VTI)	Tricuspid valve area velocity time integral
TV Area/BSA (VTI)	Tricuspid valve area indexed by body surface area, velocity time integral
TV SV	Tricuspid valve stroke volume
TR Volume (Doppler)	Tricuspid regurgitation volume, Doppler
TR RF (Doppler)	Tricuspid regurgitation, regurgitant fraction, Doppler

Stage Label	Description
PV VTI	Pulmonary valve velocity time integral
PV Vmax	Pulmonary valve maximum velocity
PV Peak Grad	Pulmonary valve peak gradient
PV Vmean	Pulmonary valve mean velocity
PV Mean Grad	Pulmonary valve mean pressure gradient
PV Site 2 VTI	Pulmonary valve site two velocity time integral
PV Site 2 SV	Pulmonary valve site two stroke volume
PV Area (Vmax)	Pulmonary valve area maximum velocity
PV Area/BSA (Vmax)	Pulmonary valve area body surface area index, maximum velocity
PV Area (VTI)	Pulmonary valve area velocity-time integral
PV Area/BSA (VTI)	Pulmonary valve area body surface area index, velocity-time integral
PV SV	Pulmonary valve stroke volume
PR Volume (Doppler)	Pulmonary regurgitation volume, Doppler
PR RF (Doppler)	Pulmonary regurgitation, regurgitant fraction, Doppler
PR Slope	Pulmonary regurgitation slope
PR PHT	Pulmonary regurgitation, pressure half time
PR DT	Pulmonary regurgitation deceleration time
PR ED Velocity	Pulmonary regurgitation end diastolic velocity
PR ED Grad	Pulmonary regurgitation end diastolic pressure gradient
RVOT VTI	Right ventricular outflow tract, velocity time integral
RVOT Vmax	Right ventricular outflow tract, maximum velocity
RVOT Peak Grad	Right ventricular outflow tract peak gradient
RVOT Vmean	Right ventricular outflow mean velocity
RVOT Mean Grad	Right ventricular outflow mean pressure gradient
RVOT SV	Right ventricular outflow tract stroke volume

2D Heart AI Result Labels

See also: For information about the 2D Heart AI feature, refer to Chapter D3 in the Advanced Imaging Manual.

2D Heart AI General Labels

Result Label	Description	Units
HR	Heart rate	bpm

2D Heart AI Left Ventricle Pre-tracking Measurement Labels

Result Label	Description	Units
A4C Pre-tracking	Apical four chamber pre-tracking	---
EF	Ejection fraction	%
GLS	Global longitudinal strain	%
Mass	Mass	g
Mass/BSA	Mass, body surface area	g/m²
CO	Cardiac output	l/min
EDV	End diastolic volume	ml
EDV/BSA	End diastolic volume, body surface area	ml/m²
ESV	End systolic volume	ml
ESV/BSA	End systolic volume, body surface area	ml/m²
SV	Stroke volume	ml
SV/BSA	Stroke volume, body surface area	ml/m²
ED Axis	End diastolic major axis	cm
ES Axis	End systolic major axis	cm
A2C Pre-tracking	Apical two chamber pre-tracking	---
EF	Ejection fraction	%
GLS	Global longitudinal strain	%
Mass	Mass	g
Mass/BSA	Mass, body surface area	g/m²
CO	Cardiac output	l/min
EDV	End diastolic volume	ml
EDV/BSA	End diastolic volume, body surface area	ml/m²
ESV	End systolic volume	ml
ESV/BSA	End systolic volume, body surface area	ml/m²
SV	Stroke volume	ml
SV/BSA	Stroke volume, body surface area	ml/m²
ED Axis	End diastolic major axis	cm
ES Axis	End systolic major axis	cm

Result Label	Description	Units
A3C Pre-tracking	Apical three chamber pre-tracking	---
EF	Ejection fraction	%
GLS	Global longitudinal strain	%
CO	Cardiac output	l/min
EDV	End diastolic volume	ml
EDV/BSA	End diastolic volume, body surface area	ml/m²
ESV	End systolic volume	ml
ESV/BSA	End systolic volume, body surface area	ml/m²
SV	Stroke volume	ml
SV/BSA	Stroke volume, body surface area	ml/m²
ED Axis	End diastolic major axis	cm
ES Axis	End systolic major axis	cm

2D Heart AI Left Atrium Pre-tracking Measurement Labels

Result Label	Description	Units
A4C Pre-tracking	Apical four chamber pre-tracking	---
EF	Ejection fraction	%
GLS	Global longitudinal strain	%
CO	Cardiac output	l/min
EDV	End diastolic volume	ml
EDV/BSA	End diastolic volume, body surface area	ml/m²
ESV	End systolic volume	ml
ESV/BSA	End systolic volume, body surface area	ml/m²
SV	Stroke volume	ml
SV/BSA	Stroke volume, body surface area	ml/m²
ED Axis	End diastolic major axis	cm
ES Axis	End systolic major axis	cm
A2C Pre-tracking	Apical two chamber pre-tracking	---
EF	Ejection fraction	%
GLS	Global longitudinal strain	%
CO	Cardiac output	l/min
EDV	End diastolic volume	ml
EDV/BSA	End diastolic volume, body surface area	ml/m²
ESV	End systolic volume	ml
ESV/BSA	End systolic volume, body surface area	ml/m²
SV	Stroke volume	ml
SV/BSA	Stroke volume, body surface area	ml/m²
ED Axis	End diastolic major axis	cm
ES Axis	End systolic major axis	cm

2D Heart AI Left Atrium Pre-tracking Measurement Labels

Result Label	Description	Units
Right Ventricle A4C Pre-tracking	Right ventricle apical four chamber pre-tracking	---
EF	Ejection fraction	%
GLS	Global longitudinal strain	%
CO	Cardiac output	l/min
EDV	End diastolic volume	ml
EDV/BSA	End diastolic volume, body surface area	ml/m²
ESV	End systolic volume	ml
ESV/BSA	End systolic volume, body surface area	ml/m²
SV	Stroke volume	ml
SV/BSA	Stroke volume, body surface area	ml/m²
ED Axis	End diastolic major axis	cm
ES Axis	End systolic major axis	cm

2D Heart AI Biplane Measurement Labels

Result Label	Description	Units
Left Ventricle Biplane	Left ventricle biplane	---
EF	Ejection fraction	%
GLS	Global longitudinal strain	%
Mass	Mass	g
Mass/BSA	Mass, body surface area	g/m²
CO	Cardiac output	l/min
EDV	End diastolic volume	ml
EDV/BSA	End diastolic volume, body surface area	ml/m²
ESV	End systolic volume	ml
ESV/BSA	End systolic volume, body surface area	ml/m²
SV	Stroke volume	ml
SV/BSA	Stroke volume, body surface area	ml/m²
ED Axis	End diastolic major axis	cm
ES Axis	End systolic major axis	cm

Result Label	Description	Units
Left Atrium Biplane	Left atrium biplane	---
EF	Ejection fraction	%
GLS	Global longitudinal strain	%
CO	Cardiac output	l/min
EDV	End diastolic volume	ml
EDV/BSA	End diastolic volume, body surface area	ml/m²
ESV	End systolic volume	ml
ESV/BSA	End systolic volume, body surface area	ml/m²
SV	Stroke volume	ml
SV/BSA	Stroke volume, body surface area	ml/m²
ED Axis	End diastolic major axis	cm
ES Axis	End systolic major axis	cm
Overall Global Longitudinal Strain	Overall global longitudinal strain	---
Overall GLS	Overall global longitudinal strain	%

2D Heart AI Tracking Results Summary

Result Label	Description	Units
Left Ventricle Summary	Left ventricle summary	---
AVG EF	Averaged ejection fraction	%
PSD	Peak strain dispersion (systolic)	ms
AVC	Aortic valve closure	ms
Left Atrium Summary	Left atrium summary	---
AVG GLS Cond	Averaged global longitudinal strain, conduit	%
AVG GLS Cont	Averaged global longitudinal strain, contraction	%
AVG GLS Res	Averaged global longitudinal strain, reservoir	%
AVG ESV	Averaged end systolic volume	ml
AVG ESV/BSA	Averaged end systolic volume, body surface area	ml/m²
Pre-A	Pre-atrial contraction time measured at the onset of the P-wave	ms

2D Heart AI Single View Tracking Results Labels

Result Label	Description	Units
Left Atrium A4C Tracking	Left atrium apical four chamber tracking	---
GLS Cond	Global longitudinal strain, conduit	%
GLS Cont	Global longitudinal strain, contraction	%
GLS Res	Global longitudinal strain, reservoir	%
Left Atrium A2C Tracking	Left atrium apical two chamber tracking	---
GLS Cond	Global longitudinal strain, conduit	%
GLS Cont	Global longitudinal strain, contraction	%
GLS Res	Global longitudinal strain, reservoir	%

2D Heart AI Bullseye Result Labels

Result Label	Description	Units
ESS	Left ventricle end systolic strain	%
PS	Left ventricle post systolic strain	%
PSI	Left ventricle post systolic indexed	---
PSS	Left ventricle peak systolic strain	%
TTP	Left ventricle time to peak	ms

4D Heart AI Results

Individual and averaged results are available for each heart chamber.

See also: For information about the 4D Heart AI feature, refer to Chapter D4 in the Advanced Imaging Manual.

4D Heart AI General Labels

Result Label	Description	Units
AVC	Aortic valve closure time	ms
preA	Pre-atrial contraction time measured at the onset of the P-wave	ms
HR	Heart rate	bpm

4D Heart AI Left Ventricle (LV) Labels

Result Label	Description	Units
CO	Cardiac output	l/min
EDV	End diastolic volume	ml
EDV/BSA	End diastolic volume, body surface area	ml/m²
EF	Ejection fraction	%
ESV	End systolic volume	ml
ESV/BSA	End systolic volume, body surface area	ml/m²
GLS	Global longitudinal strain	%
Mass	Mass	g
Mass/BSA	Mass, body surface area	g/m²
SV	Stroke volume	ml
SV/BSA	Stroke volume, body surface area	ml/m²

4D Heart AI Left Atrium (LA) Labels

Result Label	Description	Units
EDV	End diastolic volume	ml
EDV/BSA	End diastolic volume, body surface area	ml/m²
EF	Ejection fraction	%
ESV	End systolic volume	ml
ESV/BSA	End systolic volume, body surface area	ml/m²
GLS	Global longitudinal strain	%
GLS Cond	Global longitudinal strain, conduit	%
GLS Cont	Global longitudinal strain, contraction	%
GLS Res	Global longitudinal strain, reservoir	%

4D Heart AI Right Ventricle (RV) Labels

Result Label	Description	Units
EDV	End diastolic volume	ml
EDV/BSA	End diastolic volume, body surface area	ml/m²
EF	Ejection fraction	%
ESV	End systolic volume	ml
ESV/BSA	End systolic volume, body surface area	ml/m²
SV	Stroke volume	ml
SV/BSA	Stroke volume, body surface area	ml/m²

4D Heart AI Right Atrium (RA) Labels

Result Label	Description	Units
EDV	End diastolic volume	ml
EDV/BSA	End diastolic volume, body surface area	ml/m²
EF	Ejection fraction	%
ESV	End systolic volume	ml
ESV/BSA	End systolic volume, body surface area	ml/m²

4D Heart AI Bullseye Result Labels

Result Label	Description	Units
ESS	Left ventricle end systolic strain	%
PSI	Left ventricle post systolic indexed	--
PSS	Left ventricle peak systolic strain	%
TTP	Left ventricle time to peak	ms

AI Assist for TTE Labels

The labels are used in AI Assist for a transthoracic echocardiogram (TTE):

AI Assist for TTE Cardiac View Labels

Label	Definition
PLAX	Parasternal long axis view measurements
PLAX-RVIT	Parasternal long axis view measurements, right ventricular inflow tract
PLAX-RVOT	Parasternal long axis view measurements, right ventricular outflow tract
A2C	Apical two chamber view
A3C	Apical three chamber view
A4C	Apical four chamber view
A5C	Apical five chamber view
PSAX	Parasternal short axis
AV	Aortic valve
Suprasternal	Suprasternal
Subcostal-4C	Subcostal, four chamber
Subcostal-IVC	Subcostal, inferior vena cava

AI Assist for TTE Anatomy Area Labels

Label	Definition
MV	Mitral valve
TV	Tricuspid valve
AV/LVOT	Aortic valve / left ventricular outflow tract
PV/RVOT	Pulmonary valve / right ventricular outflow tract
PulmV	Pulmonary valve
IVC	Inferior vena cava
IAS	Inter-atrial septal
LV	Left ventricle
Desc Ao	Descending aorta

Appendix E OB and Fetal Echo Measurement and Calculation Labels

Obstetric Measurement Labels 3
- Early Obstetric 2D-mode Measurement Labels 3
  - 2D-mode Labels for Estimating Gestational Age 3
  - 2D-mode Labels for Obstetrical Structures 4
- Early Obstetric Doppler Measurement Labels 5
- Early Obstetric M-mode Measurement Labels 5
- Obstetric 2D-mode Measurement Labels 6
  - 2D-mode Labels for Estimating Gestational Age 6
  - 2D-mode Labels for Obstetrical Structures 7
- Obstetric Doppler Measurement Labels 8
- Obstetric M-mode Measurement Labels 8

Obstetric Calculation Labels 9
- Obstetric, 2D-mode 9
- Obstetric, Doppler 9

Fetal Echo 10
- 2D-mode General Fetal Echo Measurement Labels 11
- Doppler General Fetal Echo Measurement Labels 12
- 2D-mode Pulmonic Side Fetal Echo Measurement Labels 13
- Doppler Pulmonic Side Fetal Echo Measurement Labels 14
- 2D-mode Systemic Side Fetal Echo Measurement Labels 16
- Doppler Systemic Side Fetal Echo Measurement Labels 17
- 2D-mode Truncus Arteriosus Fetal Echo Measurement Labels 19
- Doppler Truncus Arteriosus Fetal Echo Measurement Labels 19
- 2D-mode Veins Fetal Echo Measurement Labels 19
- Doppler Veins Fetal Echo Measurement Labels 20
- 2D-mode Obstetric Fetal Echo Measurement Labels 21
- Doppler Obstetric Fetal Echo Measurement Labels 21
- M-mode Fetal Echo Measurement Labels 21

Fetal Echo Calculation Labels 22
- Fetal Echo, 2D-mode 22
- Fetal Echo, Doppler 24
- Fetal Echo, Doppler Tissue Imaging 28
- Fetal Echo, M-mode 28

Obstetric Measurement Labels

You can configure the display of measurement labels.

Measurement labels are organized on the touch screen as specified in the configuration settings. Measurement labels can include the location, view, or dimension of the anatomy, for example, proximal or distal.

Note: Installed features determine the availability of measurement and calculation label packages.

Early Obstetric 2D-mode Measurement Labels

The ultrasound system organizes the measurement labels into the following categories:

- **Fetal** lists selections for the fetus.
- **Maternal (TA)** lists maternal transabdominal measurement labels.
- **Maternal (EV)** lists maternal endovaginal measurement labels.
- **Renal / Bladder** lists renal and bladder measurement labels.
- **Fetus A** lists measurement labels for the fetus.
- **Add Fetus** displays the patient registration form to add a fetus when multiple fetuses are present.

2D-mode Labels for Estimating Gestational Age

Measurement Label	Definition
BPD	Biparietal diameter
HC	Head circumference
FL	Femur length
CRL	Crown rump length
MSD	Mean sac diameter

2D-mode Labels for Obstetrical Structures

Measurement Label	Definition	Fetal or Maternal
Yolk Sac	Yolk sac	Fetal
Nuchal Translucency	Nuchal translucency	Fetal
Cervix (EV)	Cervix length, endovaginal	Maternal
Cervix (TA)	Cervix length, transabdominal	Maternal
Kidney	Kidney	Maternal
Ovarian A	Ovarian artery	Maternal
Ovarian V	Ovarian vein	Maternal
Uterine A	Uterine artery	Maternal
Nasal Bone	Nasal bone	Fetal
Ovary (EV)	Ovary, endovaginal	Maternal
Ovary (TA)	Ovary, transabdominal	Maternal
Uterus (EV)	Uterus, endovaginal	Maternal
Uterus (TA)	Uterus, transabdominal	Maternal
Endo Thick (EV)	Endometrium thickness, endovaginal	Maternal
Endo Thick (TA)	Endometrium thickness, transabdominal	Maternal
Pre-Void Bladder	Bladder	Maternal
Post-Void Bladder	Bladder	Maternal
Cyst 1	Cyst, numbered 1 through 5	Maternal
Mass 1	Mass, numbered 1 through 5	Maternal
Fibroid 1	Fibroid, numbered 1 through 5	Maternal

Early Obstetric Doppler Measurement Labels

You can perform Doppler measurements using the velocity or frequency scale. The system displays results in the appropriate measurement units.

Measurement Label	Definition	Fetal or Maternal
Ovarian A	Ovarian artery	Maternal
Uterine A	Uterine artery	Maternal
Fetal HR	Fetal heart rate	Fetal
Ductus V A Vmax	Ductus venosus atrial systole maximum velocity	Fetal
Ductus V D Vmax	Ductus venosus diastole maximum velocity	Fetal
Ductus V S Vmax	Ductus venosus systole maximum velocity	Fetal
Ovarian V Vmax	Ovarian vein maximum velocity	Maternal
Ovarian V Vmin	Ovarian vein minimum velocity	Maternal

Early Obstetric M-mode Measurement Labels

Measurement Label	Definition	Fetal or Maternal
Fetal HR	Fetal heart rate	Fetal

Obstetric 2D-mode Measurement Labels

The ultrasound system organizes the measurement labels into the following categories:

- **Fetal** lists fetal measurement labels.
- **Maternal** lists maternal measurement labels.
- **Fetus A** lists measurement labels for the fetus.
- **Add Fetus** displays the patient registration form to add a fetus when multiple fetuses are present.

2D-mode Labels for Estimating Gestational Age

Measurement Label	Definition
BPD	Biparietal diameter
HC	Head circumference
AC	Abdominal circumference
CRL	Crown rump length
Binoc D	Binocular distance (outer orbital diameter)
GSD	Gestational sac diameter
HL	Humerus length
Radius	Radius
Ulna	Ulna length
FL	Femur length
Tibia	Tibia length
Fibula	Fibula
Clavicle	Clavicle length
Foot	Foot length
OFD	Occipital frontal diameter
FTA	Fetal trunk area
Facial Angle	Facial angle

2D-mode Labels for Obstetrical Structures

Measurement Label	Definition	Fetal or Maternal
AFI - Q1	Amniotic Fluid Index, numbered 1 through 3; quadrant numbered 1 through 4	Fetal
APAD	Anterior-posterior abdominal diameter	Fetal
APTD	Anterior-posterior trunk diameter	Fetal
TAD	Transverse abdominal diameter	Fetal
TC	Thoracic circumference	Feta
Cerebellum	Trans cerebellar diameter	Fetal
HW	Hemispheric width	Fetal
Radius	Radius length	Fetal
Yolk Sac	Yolk sac length	Fetal
Cist Magna	Cisterna magna length	Fetal
Nuchal Thickness	Nuchal fold thickness	Fetal
Cervix (TA)	Cervix, transabdominal	Maternal
Kidney	Kidney	Maternal
Ovarian A	Ovarian artery	Maternal
Uterine A	Uterine artery	Maternal
Fetal Kidney	Fetal kidney	Fetal
TA	Thoracic area	Fetal
IOD	Interocular distance (inner orbital diameter)	Fetal
Nasal Bone	Nasal bone length	Fetal
CSP	Cavum septum pellucidum	Fetal
Fibula	Fibula length	Fetal
TTD	Transverse thoracic diameter	Fetal
Ovarian V	Ovarian vein	Maternal
Ovary (TA)	Ovary, transabdominal	Maternal
Cyst 1	Cyst, numbered 1 through 5	Maternal
Mass 1	Mass, numbered 1 through 5	Maternal
Fibroid 1	Fibroid, numbered 1 through 5	Maternal
LV-A	Anterior horn lateral ventricular width	Fetal
Lat Vent	Lateral ventricle width	Fetal
LV-P	Posterior horn lateral ventricular width	Fetal

Obstetric Doppler Measurement Labels

You can perform Doppler measurements using the velocity or frequency scale. The system displays results in the appropriate measurement units.

Measurement Label	Definition	Fetal or Maternal
Fetal HR	Fetal heart rate	Fetal
Aorta	Fetal aorta	Fetal
MCA	Middle cerebral artery	Fetal
Umb A	Umbilical artery	Fetal
Ovarian A	Ovarian artery	Maternal
Uterine A	Uterine artery	Maternal
Ductus V A Vmax	Ductus venosus atrial systole maximum velocity	Fetal
Ductus V D Vmax	Ductus venosus diastole maximum velocity	Fetal
Ductus V S Vmax	Ductus venosus systole maximum velocity	Fetal
Ovarian V Vmax	Ovarian vein maximum velocity	Maternal
Ovarian V Vmin	Ovarian vein minimum velocity	Maternal

Obstetric M-mode Measurement Labels

Measurement Label	Definition	Fetal or Maternal
Fetal HR	Fetal heart rate	Fetal

Obstetric Calculation Labels

Obstetric, 2D-mode

Calculation Label	Definition	Required Measurements
CTR Area	Cardiothoracic area ratio of the fetal heart area to the fetal thoracic	Heart area Thoracic area
CI	Cephalic index CI=(BPD/OFD)*100	Biparietal diameter Occipital-frontal diameter
AFI	Amniotic fluid index, numbered 1 through 4	Amniotic fluid index, quadrants 1 through 4
BPDa	Area-corrected biparietal diameter	Biparietal diameter
APTDxTTD	Fetal thoracic cross-sectional area	Anterior-posterior trunk diameter Transverse thoracic diameter
APADxTAD	Abdominal cross-sectional area	Anterior-posterior trunk diameter Thoracic area diameter
Fetal Kidney	Ellipsoid volume	Length Anterior to posterior diameter

Obstetric, Doppler

Calculation Label	Definition	Required Measurements
Rt CP Ratio **Lt CP Ratio**	Ratio of the middle cerebral artery pulsatility index to the umbilical artery pulsatility index	Middle cerebral artery Umbilical artery

Fetal Echo

The ultrasound system organizes the measurement labels into the following categories and sub-categories:

- **General** lists general measurement labels.
  - **General** lists general measurement labels.
  - **Z-Score** lists measurement labels calculating a Z-score.
- **Systemic Side** lists systemic side measurement labels.
  - **LV** lists left ventricle measurement labels.
  - **LA** lists left atrium measurement labels.
  - **MV** lists mitral valve measurement labels.
  - **Aorta** lists aorta measurement labels.
  - **Shunts** lists shunts measurements labels.
- **Pulmonic Side** lists pulmonic side measurement labels.
  - **RV** lists right ventricle measurement labels.
  - **RA** lists right atrium measurement labels.
  - **TV** lists tricuspid valve measurement labels.
  - **PA** lists pulmonary artery measurement labels.
  - **Shunts** lists shunts measurement labels.
- **Veins** lists labels for measuring pulmonary veins and inferior-superior vena cava.
- **Truncus Arteriosus** lists truncus arteriosus measurement labels.
- **OB** lists obstetric measurement labels.

Measurement labels are organized on the touch screen as specified in the configuration settings. Measurement labels can include the location, view, or dimension of the anatomy, for example, systole or diastole.

2D-mode General Fetal Echo Measurement Labels

Measurement Label	Definition
Ao Asc	Ascending aorta
Ao Desc	Descending aorta
Ao Root	Aortic root
Ductus A 3VV	Ductus arteriosus, three vessel view
LA	Left atrium
LPA	Left pulmonary artery
LV	Left ventricle
MPA	Main pulmonary artery
RV	Right ventricle
RA	Right atrium
RPA	Right pulmonary artery
LVOT CO	Left ventricular outflow tract, cardiac output
RVOT CO	Right ventricular outflow tract, cardiac output
Ao Isthmus 3VV	Aortic isthmus, three vessel view
Ao Isthmus Sagittal	Aortic isthmus sagittal
AoV Annulus	Aortic valve annulus
MV Annulus	Mitral valve annulus
PV Annulus	Pulmonary valve annulus
TV Annulus	Tricuspid valve annulus
Qp	Pulmonic stroke volume
Qs	Systemic stroke volume

Doppler General Fetal Echo Measurement Labels

Measurement Label	Definition
Ao Desc Vmax	Descending aorta, maximum velocity
AoV Vmax	Aortic valve, maximum velocity
Ductus Art	Ductus arteriosus resistive index
LPA Vmax	Left pulmonary artery, maximum velocity
LVOT Vmax	Left ventricular outflow tract, maximum velocity
MR Vmax	Mitral valve regurgitation, maximum velocity
MV A Vmax	Mitral valve A wave, maximum velocity
MV E Vmax	Mitral valve E wave, maximum velocity
PR Interval	Time interval P-R
PV Vmax	Pulmonary valve, maximum velocity
RPA Vmax	Right pulmonary artery, maximum velocity
RVOT Vmax	Right ventricular outflow tract, maximum velocity
TR Vmax	Tricuspid valve regurgitation, maximum velocity
TV Vmax	Tricuspid valve, maximum velocity
LVOT CO	Left ventricular outflow tract, cardiac output
RVOT CO	Right ventricular outflow tract, cardiac output
Qp	Pulmonic stroke volume
Qs	Systemic stroke volume

2D-mode Pulmonic Side Fetal Echo Measurement Labels

Measurement Label	Definition
RV	Right ventricle
RVFW	Right ventricular free wall
RVID	Right ventricular internal diameter
RVOT	Right ventricular outflow tract
RVOT CO	Right ventricular outflow tract, cardiac output calculation
Cor Sinus	Coronary sinus
IVC	Inferior vena cava
RA	Right atrium
SVC	Superior vena cava
TV Annulus	Tricuspid valve annulus
LPA	Left pulmonary artery
MPA	Main pulmonary artery
PV Area (VTI)	Pulmonary valve area, velocity time integral calculation
PV Annulus	Pulmonary valve annulus
RPA	Right pulmonary artery
A Septum	Atrial septum
ASD	Atrial septal defect
AVSD	Atrioventricular septal defect
Ductus A 3VV	Ductus arteriosus, three vessel view
PFO	Patent foramen ovale
VSD	Ventricular septal defect
Qp	Pulmonic stroke volume
Qs	Systemic stroke volume

Doppler Pulmonic Side Fetal Echo Measurement Labels

Measurement Label	Definition
RV ET	Right ventricular ejection time
RV IVCT	Right ventricular isovolumic contraction time
RV IVRT	Right ventricular isovolumic relaxation time
RV PEP	Right ventricular pre-ejection period
RVFW A' Vmax	Right ventricular free wall A prime, maximum velocity
RVFW E' Vmax	Right ventricular free wall E prime, maximum velocity
RVFW S' Vmax	Right ventricular free wall S prime, maximum velocity
RVOT Vmax	Right ventricular outflow tract, maximum velocity
RVOT VTI	Right ventricular outflow tract, velocity time integral
RV MPI	Right ventricle, myocardial performance index calculation
RVOT CO	Right ventricular outflow tract, cardiac output calculation
TR Vmax	Tricuspid valve regurgitation, maximum velocity
TR VTI	Tricuspid valve regurgitation, velocity time integral
TV A Vmax	Tricuspid valve A wave, maximum velocity
TV C-O	Tricuspid valve close-open duration
TV Decel Slope	Tricuspid valve deceleration slope
TV E Vmax	Tricuspid valve E wave, maximum velocity
TV Vmax	Tricuspid valve, maximum velocity
TV VTI	Tricuspid valve, velocity time integral
PR Decel Slope	Pulmonary regurgitation deceleration slope
PR ED	Pulmonary regurgitation, end diastolic maximum velocity
PR Interval	Time interval P-R
PR Vmax	Pulmonary regurgitation, maximum velocity
PR VTI	Pulmonary regurgitation, velocity time integral
PV AT	Pulmonary valve, acceleration time
PV ET	Pulmonary valve, ejection time
PV Vmax	Pulmonary valve, maximum velocity
PV VTI	Pulmonary valve, velocity time integral
PV Area (VTI)	Pulmonary valve area, velocity time integral calculation

Measurement Label	Definition
LPA AT	Left pulmonary artery, acceleration time
LPA ET	Left pulmonary artery, ejection time
LPA Vmax	Left pulmonary artery, maximum velocity
LPA VTI	Left pulmonary artery, velocity time integral
MPA Vmax	Main pulmonary artery, maximum velocity
RPA AT	Right pulmonary artery, acceleration time
RPA ET	Right pulmonary artery, ejection time
RPA Vmax	Right pulmonary artery, maximum velocity
RPA VTI	Right pulmonary artery, velocity time integral
ASD Vmax	Atrial septal defect, maximum velocity
AVSD Vmax	Atrioventricular septal defect, maximum velocity
Ductus Art	Ductus arteriosus
Ductus V A Vmax	Ductus venous A wave, maximum velocity
Ductus V D Vmax	Ductus venous D wave, maximum velocity
Ductus V S Vmax	Ductus venous S wave, maximum velocity
Ductus V VTI	Ductus venous, velocity time integral
PFO Vmax	Patent foramen ovale, maximum velocity
VSD Vmax	Ventricular septal defect, maximum velocity
Qp	Pulmonic stroke volume
Qs	Systemic stroke volume

2D-mode Systemic Side Fetal Echo Measurement Labels

Measurement Label	Definition
LV	Left ventricle
LVID	Left ventricular internal diameter
LVOT	Left ventricular outflow tract
PE	Pericardial effusion
LV d Series	Left ventricle diastolic measurement series
LV s Series	Left ventricle systolic measurement series
LVOT CO	Left ventricular outflow tract, cardiac output calculation
LA	Left atrium
MR VC	Mitral valve regurgitation vena contracta
MV Annulus	Mitral valve annulus
MV Planimetry	Mitral valve planimetry
MV Area (VTI)	Mitral valve area, velocity time integral calculation
Ao Abd	Abdominal aorta
Ao Arch	Aortic arch
Ao Asc	Ascending aorta
Ao Coarct	Aortic coarctation
Ao Desc	Descending aorta
Ao Isthmus 3VV	Aortic isthmus, three vessel view
Ao Isthmus Sagittal	Aortic isthmus sagittal
Ao Root	Aortic root
AoV Annulus	Aortic root valve annulus
AoV Area (VTI)	Aortic valve area, velocity time integral calculation
A Septum	Atrial septum
ASD	Atrial septal defect
AVSD	Atrioventricular septal defect
Ductus A 3VV	Ductus arteriosus, three vessel view
PFO	Patent foramen ovale
VSD	Ventricular septal defect
Qp	Pulmonic stroke volume
Qs	Systemic stroke volume

Doppler Systemic Side Fetal Echo Measurement Labels

Measurement Label	Definition
LV ET	Left ventricular ejection time
LV IVCT	Left ventricular isovolumic contraction time
LV IVRT	Left ventricular isovolumic relaxation time
LV PEP	Left ventricular pre-ejection period
LVOT Vmax	Left ventricular outflow tract, maximum velocity
LVOT VTI	Left ventricular outflow tract, velocity time integral
PR Interval	Time interval P-R
LV MPI	Left ventricle, myocardial performance index calculation
LVOT CO	Left ventricular outflow tract, cardiac output calculation
MR Vmax	Mitral valve regurgitation, maximum velocity
MR VTI	Mitral valve regurgitation, velocity time integral
MV A	Mitral valve A wave duration
MV A Vmax	Mitral valve A wave, maximum velocity
MV C-O Duration	Mitral valve close-open duration
MV Decel Slope	Mitral valve deceleration slope
MV E Vmax	Mitral valve E wave, maximum velocity
MV Vmax	Mitral valve, maximum velocity
MV VTI	Mitral valve, velocity time integral
MV Area (VTI)	Mitral valve area, velocity time integral calculation
AoV Accel Slope	Aortic valve acceleration slope
AoV ET	Aortic valve ejection time
AoV Vmax	Aortic valve, maximum velocity
AoV VTI	Aortic valve velocity time integral
AR Decel Slope	Aortic regurgitation deceleration slope
AR ED	Aortic regurgitation end diastole
AR VTI	Aortic regurgitation velocity time integral

Measurement Label	Definition
AoV Area (VTI)	Aortic valve area, velocity time integral calculation
Ao Arch Vmax	Aortic arch, maximum velocity
Ao Asc Vmax	Ascending aorta, maximum velocity
Ao Coarct AT	Aortic coarctation acceleration time
Ao Coarct ET	Aortic coarctation ejection time
Ao Coarct Vmax	Aortic coarctation, maximum velocity
Ao Coarct VTI	Aortic coarctation velocity time integral
Ao Desc AT	Descending aorta acceleration time
Ao Desc ET	Descending aorta ejection time
Ao Desc Vmax	Descending aorta, maximum velocity
Ao Desc VTI	Descending aorta, velocity time integral
LAD D Vmax	Left anterior descending coronary artery D wave, maximum velocity
LAD S Vmax	Left anterior descending coronary artery S wave, maximum velocity
Left Main D Vmax	Left main coronary artery D wave, maximum velocity
Left Main S Vmax	Left main coronary artery S wave, maximum velocity
RCA D Vmax	Right coronary artery D wave, maximum velocity
RCA S Vmax	Right coronary artery S wave, maximum velocity
ASD Vmax	Atrial septal defect, maximum velocity
AVSD Vmax	Atrioventricular septal defect, maximum velocity
Ductus Art	Ductus arteriosus
Ductus V A Vmax	Ductus venous A wave, maximum velocity
Ductus V D Vmax	Ductus venous D wave, maximum velocity
Ductus V S Vmax	Ductus venous S wave, maximum velocity
Ductus V VTI	Ductus venous, velocity time integral
PFO Vmax	Patent foramen ovale, maximum velocity
VSD Vmax	Ventricular septal defect, maximum velocity
Qp	Pulmonic stroke volume
Qs	Systemic stroke volume

2D-mode Truncus Arteriosus Fetal Echo Measurement Labels

Measurement Label	Definition
TruncArt V Annulus	Truncal valve annulus
Truncus Art	Truncus arteriosus

Doppler Truncus Arteriosus Fetal Echo Measurement Labels

Measurement Label	Definition
TruncArt V AT	Truncal valve, acceleration time
TruncArt V ET	Truncal valve, ejection time
TruncArt V Regurg Decel Slope	Truncal valve regurgitation, deceleration slope
TruncArt V Regurg ED Velocity	Truncal valve regurgitation, end diastolic maximum velocity
TruncArt V Regurg VTI	Truncal valve regurgitation, velocity time integral
TruncArt V Vmax	Truncal valve, maximum velocity
TruncArt V VTI	Truncal valve, velocity time integral

2D-mode Veins Fetal Echo Measurement Labels

Measurement Label	Definition
IVC	Inferior vena cava
LLPV	Left lower pulmonary vein
LUPV	Left upper pulmonary vein
RLPV	Right lower pulmonary vein
RUPV	Right upper pulmonary vein
SVC	Superior vena cava

Doppler Veins Fetal Echo Measurement Labels

Measurement Label	Definition
LLPV A Duration	Left lower pulmonary vein A wave duration
LLPV A Vmax	Left lower pulmonary vein A wave, maximum velocity
LLPV D Vmax	Left lower pulmonary vein D wave, maximum velocity
LLPV D VTI	Left lower pulmonary vein D wave, velocity time integral
LLPV S Vmax	Left lower pulmonary vein S wave, maximum velocity
LLPV S VTI	Left lower pulmonary vein S wave, velocity time integral
LUPV A Duration	Left upper pulmonary vein A wave duration
LUPV A Vmax	Left upper pulmonary vein A wave, maximum velocity
LUPV D Vmax	Left upper pulmonary vein D wave, maximum velocity
LUPV D VTI	Left upper pulmonary vein D wave, velocity time integral
LUPV S Vmax	Left upper pulmonary vein S wave, maximum velocity
LUPV S VTI	Left upper pulmonary vein S wave, velocity time integral
RLPV A Duration	Right lower pulmonary vein A wave duration
RLPV A Vmax	Right lower pulmonary vein A wave, maximum velocity
RLPV D Vmax	Right lower pulmonary vein D wave, maximum velocity
RLPV D VTI	Right lower pulmonary vein D wave, velocity time integral
RLPV S Vmax	Right lower pulmonary vein S wave, maximum velocity
RLPV S VTI	Right lower pulmonary vein S wave, velocity time integral
RUPV A Duration	Right upper pulmonary vein A wave duration
RUPV A Vmax	Right upper pulmonary vein A wave, maximum velocity
RUPV D Vmax	Right upper pulmonary vein D wave, maximum velocity
RUPV D VTI	Right upper pulmonary vein D wave, velocity time integral
RUPV S Vmax	Right upper pulmonary vein S wave, maximum velocity
RUPV S VTI	Right upper pulmonary vein S wave, velocity time integral
Ductus V A Vmax	Ductus venous A wave, maximum velocity
Ductus V D Vmax	Ductus venous D wave, maximum velocity
Ductus V S Vmax	Ductus venous S wave, maximum velocity
Ductus V VTI	Ductus venous, velocity time integral
IVC Vmax	Inferior vena cava, maximum velocity
LHV Vmax	Left hepatic vein, maximum velocity
MHV Vmax	Middle hepatic vein, maximum velocity
RHV Vmax	Right hepatic vein, maximum velocity
SVC Vmax	Superior vena cava, maximum velocity

2D-mode Obstetric Fetal Echo Measurement Labels

Measurement Label	Definition
AC	Abdominal circumference
AFI - Q1	Amniotic fluid index for the quadrant, numbered 1 through 4
APTD	Anterior posterior trunk diameter
BPD	Biparietal diameter
Cardiac Axis	Cardiac axis
Cerebellum	Cerebellum
FL	Femur length
HA	Heart area
HC	Head circumference
Heart Circum	Heart circumference
HL	Humerus length
HW	Hemispheric width
Lat Vent	Lateral ventricle
OFD	Occipital frontal diameter
TA	Thoracic area
TC	Thoracic circumference
TTD	Transverse thoracic diameter

Doppler Obstetric Fetal Echo Measurement Labels

Measurement Label	Definition
MCA	Middle cerebral artery
Umbilical A	Umbilical artery
Umbilical V A Vmax	Umbilical vein A wave, maximum velocity
Umbilical V D Vmax	Umbilical vein D wave, maximum velocity
Umbilical V S Vmax	Umbilical vein S wave, maximum velocity
Umbilical V VTI	Umbilical vein, velocity time integral
Uterine A	Uterine artery

M-mode Fetal Echo Measurement Labels

Measurement Label	Definition
LVID	Left ventricular internal diameter
MAPSE	Mitral annular plane systolic excursion
PR Interval	Time interval P-R
RVFW	Right valve free wall
RVID	Right ventricular internal diameter
TAPSE	Tricuspid annular plane systolic excursion
LV d Series	Left ventricle diastolic measurement series
LV s Series	Left ventricle systolic measurement series

Fetal Echo Calculation Labels

Calculations may require measurements in the same unit.

Fetal Echo, 2D-mode

Calculation Label	Definition	Required Measurements
LV%FS	Left ventricular percentage of fractional shortening	Left ventricular internal diameter at diastole Left ventricular internal diameter at systole
CTR Circum	Cardiothoracic circumference ratio	Heart circumference Thoracic circumference
CTR Area	Cardiothoracic area ratio	Fetal heart area Thoracic area
Ao Root/MPA Diam	Ratio of the aortic root diameter to the main pulmonary artery diameter	Aortic root diameter Main pulmonary artery diameter
AoV/PV Annulus s	Ratio of the aortic valve annulus systole to the pulmonary valve annulus systole	Aortic valve annulus diameter systole Pulmonary valve annulus diameter systole
AoV Annulus Area s	Aortic valve annulus area systole derived	Aortic valve annulus diameter systole
AoV SV	Aortic valve stroke volume	Aortic valve annulus area systole Aortic valve velocity time integral
Cor Sinus Length/Diam	Coronary sinus length-to-diameter ratio	Coronary sinus length Coronary sinus diameter
LA A-P Diam s/Ao Root	Ratio of the left atrium anterior to posterior diameter systole to the aortic root diameter	Left atrium anterior to posterior diameter systole Aortic root diameter
LA/RA Major d	Ratio of the left atrium major diastole to the right atrium major diastole	Left atrium major diastole Right atrium major diastole
LA %FAC	Left atrium percentage of fractional area change	Left atrium fractional area change diastole Left atrium fractional area change systole
IVS/LVPW	Ratio of the interventricular septum to the left ventricular posterior wall thickness	Interventricular septum diastole Left ventricle posterior wall thickness diastole
IVS %Thick	Interventricular septal percentage of thickness	Interventricular septum diastole Interventricular septum systole

Calculation Label	Definition	Required Measurements
LVPW %Thick	Left ventricle posterior wall percentage of thickness	Left ventricle posterior wall thickness diastole Left ventricle posterior wall thickness systole
LV/RV Major d	Ratio of the left ventricle major diastole to the right ventricle major diastole	Left ventricle major diastole Right ventricle major diastole
LVOT Area s	Left ventricular outflow tract area systole derived	Left ventricle outflow tract diameter systole
MV Annulus Area d	Mitral valve annulus area diastole derived	Mitral valve annulus diameter diastole
MV/TV Annulus d	Ratio of the mitral valve annulus diameter diastole to the tricuspid valve annulus diameter	Mitral valve annulus diameter diastole Tricuspid valve annulus diastole
MV SV	Mitral valve stroke volume	Mitral valve annulus diameter diastole Mitral valve annulus velocity time integral
PV Annulus Area s	Pulmonary valve annulus area systole derived	Pulmonary valve annulus systole
PV SV	Pulmonary valve stroke volume	Pulmonary valve annulus systole Pulmonary valve velocity time integral
RVOT Area s	Right ventricular outflow tract area systole derived	Right ventricle outflow tract diameter systole
PFO/A Septum Length	Ratio of the patent foramen ovale to the atrial septum length	Patent foramen ovale diameter Atrial septum length
Pulm Side Area	Pulmonic side valve area derived	Pulmonic side diameter velocity time integral
Sys Side Area	Systemic side valve area derived	Systemic side diameter velocity time integral
TV Annulus Area d	Tricuspid valve annulus area diastole derived	Tricuspid valve annulus diastole
TV SV	Tricuspid valve stroke volume	Tricuspid valve annulus diastole Tricuspid valve velocity time integral
TruncArt V Annulus Area s	Truncus arteriosus valve annulus area systole derived	Truncal valve annulus diameter systole

Fetal Echo, Doppler

Calculation Label	Definition	Required Measurements
AoV AT/ET	Ratio of the aortic valve acceleration time to the ejection time	Aortic valve acceleration time Aortic valve ejection time
AoV Area (VTI)	Aortic valve area velocity time integral	Left ventricle outflow tract area systole Left ventricle outflow tract velocity time integral Aortic valve velocity time integral
AoV Area (Vmax)	Aortic valve area maximum velocity	Left ventricle outflow tract area systole Left ventricle outflow tract maximum velocity Aortic valve maximum velocity
AR PHT	Aortic regurgitation pressure half time	Aortic regurgitation deceleration time
MV E/A	Ratio of the mitral valve E wave to the A wave	Mitral valve E wave maximum velocity Mitral valve A wave maximum velocity
MV A/E	Ratio of the mitral valve A wave to the E wave	Mitral valve A wave maximum velocity Mitral valve E wave maximum velocity
LV MPI	Left ventricle myocardial performance index	Mitral valve close-open duration Left ventricle ejection time
LVOT SV	Left ventricular stroke volume	Left ventricular outflow tract diameter systole Left ventricular outflow tract velocity time integral
LV CO	Left ventricular outflow tract cardiac output	Left ventricular outflow tract stroke volume Left ventricular outflow tract fetal heart rate
MV PHT	Mitral valve pressure half time	Mitral valve deceleration time
MV Area (PHT)	Mitral valve area, pressure half time	Mitral valve pressure half time
MV Area (VTI)	Mitral valve area, velocity time integral	Left ventricle outflow tract area systole Left ventricle outflow tract velocity time integral Mitral valve velocity time integral

Calculation Label	Definition	Required Measurements
MR RF	Mitral valve regurgitant fraction	Mitral regurgitation volume Mitral valve stroke volume
MR Vol	Mitral valve regurgitant volume	Mitral valve stroke volume Left ventricle outflow tract stroke volume
PV AT/ET	Ratio of the pulmonary valve AT wave to the ET wave	Pulmonary valve acceleration time Pulmonary valve ejection time
PV Area (Vmax)	Pulmonary valve area, maximum velocity	Right ventricle outflow tract area systole Right ventricle outflow tract maximum velocity Pulmonary valve maximum velocity
PV Area (VTI)	Pulmonary valve area, velocity time integral	Right ventricle outflow tract area systole Right ventricle outflow tract velocity time integral Pulmonary valve velocity time integral
RUPV A Dur - MV A Dur	Right upper pulmonary vein A wave duration minus the mitral valve A wave duration	Right upper pulmonary vein A wave duration Mitral valve A wave duration
RUPV S/D Vmax	Ratio of the right upper pulmonary vein S wave maximum velocity to the D wave maximum velocity	Right upper pulmonary vein S wave maximum velocity Right upper pulmonary vein D wave maximum velocity
RUPV Sys Filling Fraction	Right upper pulmonary vein systolic filling fraction	Right upper pulmonary vein systole velocity time integral Right upper pulmonary vein diastole velocity time integral
RLPV A Dur - MV A Dur	Right lower pulmonary vein A wave duration minus the mitral valve A wave duration	Right lower pulmonary vein A wave duration Mitral valve A wave duration
RLPV S/D Vmax	Ratio of the right lower pulmonary vein S wave maximum velocity to the D wave maximum velocity	Right lower pulmonary vein S wave maximum velocity Right lower pulmonary vein D wave maximum velocity
RLPV Sys Filling Fraction	Right lower pulmonary vein systolic filling fraction	Right lower pulmonary vein systole velocity time integral Right lower pulmonary vein diastole velocity time integral

Calculation Label	Definition	Required Measurements
LUPV A Dur - MV A Dur	Left upper pulmonary vein A wave duration minus the mitral valve A wave duration	Left upper pulmonary vein A wave duration Mitral valve A wave duration
LUPV S/D Vmax	Ratio of the left upper pulmonary vein S wave maximum velocity to the D wave maximum velocity	Left upper pulmonary vein S wave maximum velocity Left upper pulmonary vein D wave maximum velocity
LUPV Sys Filling Fraction	Left upper pulmonary vein systolic filling fraction	Left upper pulmonary vein S wave velocity time integral Left upper pulmonary vein D wave velocity time integral
LLPV A Dur - MV A Dur	Left lower pulmonary vein A wave duration minus the mitral valve A wave duration	Left lower pulmonary vein A wave duration Mitral valve A wave duration
LLPV S/D Vmax	Ratio of the left lower pulmonary vein S wave maximum velocity to the D wave maximum velocity	Left lower pulmonary vein A wave maximum velocity Left lower pulmonary vein D wave maximum velocity
LLPV Sys Filling Fraction	Left lower pulmonary vein systolic filling fraction	Left lower pulmonary vein S wave velocity time integral Left lower pulmonary vein D wave velocity time integral
RVOT SV	Right ventricular outflow tract stroke volume	Right ventricle outflow tract diameter Right ventricle outflow tract velocity time integral
RVOT CO	Right ventricular outflow tract cardiac output	Right ventricle outflow tract stroke volume Right ventricle outflow tract fetal heart rate
RV MPI	Right ventricle myocardial performance index	Tricuspid valve close-open duration Right ventricle ejection time
RVSP (TR)	Right ventricle systolic pressure, tricuspid regurgitation	Right atrial pressure, user-entered value Tricuspid regurgitation peak gradient

Calculation Label	Definition	Required Measurements
Pulm Side SV	Pulmonary side valve stroke volume	Pulmonary side valve area Pulmonary side velocity time integral
Pulm Side CO	Pulmonary side valve cardiac output	Pulmonary side valve stroke volume Pulmonary side fetal heart rate
Sys Side SV	Systemic side valve stroke volume	Systemic side valve area Systemic side velocity time integral
Sys Side CO	Systemic side valve cardiac output	Systemic side valve stroke volume Systemic side fetal heart rate
Qp/Qs (SV)	Ratio of the Qp to the Qs using stroke volume	Pulmonary side stroke volume Systemic side stroke volume
Qp/Qs (CO)	Ratio of the Qp to the Qs using cardiac output	Pulmonary side cardiac output Systemic side cardiac output
TV E/A	Ratio of the tricuspid valve E wave to the A wave	Tricuspid valve E wave maximum velocity Tricuspid valve A wave maximum velocity
TV PHT	Tricuspid valve pressure half time	Tricuspid valve deceleration time
TruncArt V Regurg PHT	Truncus arteriosus valve regurgitation pressure half time	Truncal valve regurgitation deceleration time
Ductus V S/D Vmax	Ratio of the ductus venosus systole velocity maximum to the diastole velocity maximum	Ductus venosus systole maximum velocity Ductus venosus diastole maximum velocity
CCO	Combined cardiac output	Left ventricle outflow tract cardiac output Right ventricle outflow tract cardiac output

Fetal Echo, Doppler Tissue Imaging

Calculation Label	Definition	Required Measurements
MV E/E' (L)	Ratio of the mitral valve E wave maximum velocity to the E' wave of lateral left ventricular wall	Mitral valve E maximum velocity Mitral valve E' maximum velocity lateral
MV E'/A' (L)	Ratio of the mitral valve lateral E' wave maximum velocity to the lateral A' wave maximum velocity	Mitral valve E' maximum velocity lateral Mitral valve A' maximum velocity lateral
MV E/E' (M)	Ratio of the mitral valve E wave to the E' wave of medial left ventricular wall	Mitral valve E maximum velocity Mitral valve E' maximum velocity medial
MV E'/A' (M)	Ratio of the mitral valve E' wave to the A' wave of medial left ventricular wall	Mitral valve E' maximum velocity medial Mitral valve A' maximum velocity medial
RVFW E/E'	Ratio of the tricuspid valve E wave to the E' wave of right ventricular free wall	Tricuspid valve E maximum velocity Right ventricular free wall E' maximum velocity

Fetal Echo, M-mode

Calculation Label	Definition	Required Measurements
LV Mass	Left ventricle mass	Left ventricular internal diameter diastole Left ventricular posterior wall diastole Interventricular septum diastole
LV EF	Left ventricle ejection fraction, Teichholz	Left ventricle volume diastole Left ventricle volume systole
LV Vol d	Left ventricle volume diastole, Teichholz	Left ventricular internal diameter diastole
LV Vol s	Left ventricle volume systole, Teichholz	Left ventricular internal diameter systole
LV SV	Left ventricle stroke volume, Teichholz	Left ventricle volume diastole Left ventricle volume systole
LV CO	Left ventricle cardiac output, Teichholz	Left ventricle stroke volume Fetal heart rate

Appendix F Bibliography

Cardiac Clinical References **3**
Adult Cardiac 3
Pediatric Cardiac 7
2D Heart AI and 4D Heart AI 8

Fetal Echo Clinical References **9**
Fractional Shortening 9
Cardiothoracic Ratio 9
Mean Pressure Gradient 9
Mitral Valve Peak E Wave Velocity to Peak A Wave Velocity Ratio 9
Peak Pressure Gradient 9
Tei Index (Myocardial Performance Index) 9
Z-Score Calculations 9

Obstetric Clinical References **10**
Simple Gestational Age Calculations 10
Composite Gestational Age Calculations 15
Estimated Fetal Weight Calculations 16
Ratio Calculations 18
Growth Analysis Calculations 19
Additional Obstetric References 27

Pediatric Hip Clinical References **28**

Transcranial Imaging Clinical References **28**

Ultrasound-Derived Fat Fraction Clinical References **28**

Stress Echo Clinical References **29**

Pulsatility Index Calculation References **29**

Vascular Clinical References **29**

Volume Clinical References **29**
Thyroid 30

Cardiac Clinical References

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