SIEMENS Healthineers

ACUSON Juniper
ACUSON Juniper Select
Diagnostic Ultrasound System
Instructions for Use

US

Complies with
IMDA Standards
DA107142

CE
0123

Siemens Medical Solutions USA, Inc. 11652814-ABS-001-01-01

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Software Version VB11

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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 system safety and care for the ultrasound system.

Chapter 3 **System Setup**

Detailed descriptions for setting up and transporting the system. Includes procedures for updating your system software.

Chapter 4 **Examination Fundamentals**

Procedures for registering a patient; selecting a transducer, exam type and operating mode; and optimizing and capturing images. Includes procedures for creating and editing user-defined exam types.

Chapter 5 **Examination Review**

Procedures for reviewing images and clips in the current or previous examination.

Chapter 6 **Transducer Care and Accessories**

Detailed information on transducer safety, cleaning and disinfecting, and transducer accessories. Attachment procedures for transducer accessories.

Chapter 7 **Specialty Transducers**

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9VE3

Appendix A **Technical Description**

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

Appendix B **Patient Data**

General description of the patient registration form and the patient browser.

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 contain descriptions for the following ultrasound systems:

- ACUSON Juniper diagnostic ultrasound system
- ACUSON Juniper Select diagnostic ultrasound system

Features and options unique to an ultrasound system are identified within the following locations in the user and reference manuals:

- Chapter 1, Instructions for Use
- Chapter 3, Instructions for Use
- Appendix A, Instructions for Use

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 ▪ Technical description of the ultrasound system ▪ Safety and care information for the system and compatible transducers ▪ Descriptions of system controls ▪ Procedures for system setup, examination fundamentals, image acquisition and optimization, and examination review ▪ Information about system security and protection of patient data against security threats ▪ Acoustic output data
Clinical Applications Guide	▪ Explanation of clinical applications and clinical software programs for use on the ultrasound system ▪ Procedures for the physiologic function and the biopsy function ▪ Description of the transesophageal transducer, including cleaning and care of the transducer ▪ General and exam-specific measurements and calculations ▪ Exam-specific annotations
*System Reference**	▪ General and exam-specific measurement and calculation labels ▪ Description of customizable system settings ▪ Information about DICOM connectivity and network capabilities ▪ Clinical references ▪ Information regarding the electromagnetic compatibility (EMC) testing of this system

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

Conventions

Take a moment to familiarize yourself with the following conventions in your user manual.

Convention	Description
Warnings, Cautions, and Notes	⚠ **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 correct operating procedures to prevent the risk of damage to the system. **Note:** Notes contain information concerning the proper use of the system and/or correct execution of a procedure.
Examples of Cross-References	Examples: **See also:** For additional information, refer to Chapter 2 in the System Reference manual. **See also:** Touch screen controls, p. 1-17 **See also:** For a list of transducers compatible with the needle guide accessories, refer to Chapter 5 in this manual.

Typographical Conventions

The following typographical conventions are in descriptions and procedures within your user manual. You can use these conventions to identify the location of a control or selection on the ultrasound system.

Control or Selection on the Control Panel	Description and Convention
Controls on the Control Panel and Keys on the Keyboard	Controls on the control panel are indicated by uppercase, boldface type. The function of the trackball and trackball keys is indicated by on-screen labels displayed on the image screen. Examples: ▪ Push **DEPTH / FOCUS**. ▪ Rotate **2D** to adjust the 2D gain. ▪ Press **CALIPER** to activate the measurement function. ▪ Press and hold the **Alt** key on the keyboard to access the special characters. ▪ Press **UPDATE**. ▪ Position the marker and then press **SET**.
Controls on the Control Panel and Soft Key Selections on the Touch Screen	The touch screen has unlabeled controls located on the control panel. Tap, press, rotate or press and then rotate the control to make a selection or change a setting. The selection assigned to these controls is indicated by boldface type and enclosed in square brackets ([ ]). Examples: ▪ Press **[Tx Power]** downward to decrease transmit power. ▪ Rotate **[Map]**.
Selections on the Image Screen	On-screen selections are indicated by boldface type. Roll the trackball to position the pointer on the on-screen control or object and then press a trackball key. Examples: ▪ Click **Cancel**. ▪ Double-click a thumbnail. ▪ Select the required check box to search for scheduled procedures.
Selections on the Touch Screen	On-screen selections are indicated by boldface type. To access the selection, tap the touch screen. To change the direction of an object displayed on the touch screen, drag the object on the touch screen. Examples: ▪ Tap **Stress Echo**. ▪ Drag the blue dot to indicate the direction of the arrow. ▪ Swipe the page to select the next page.

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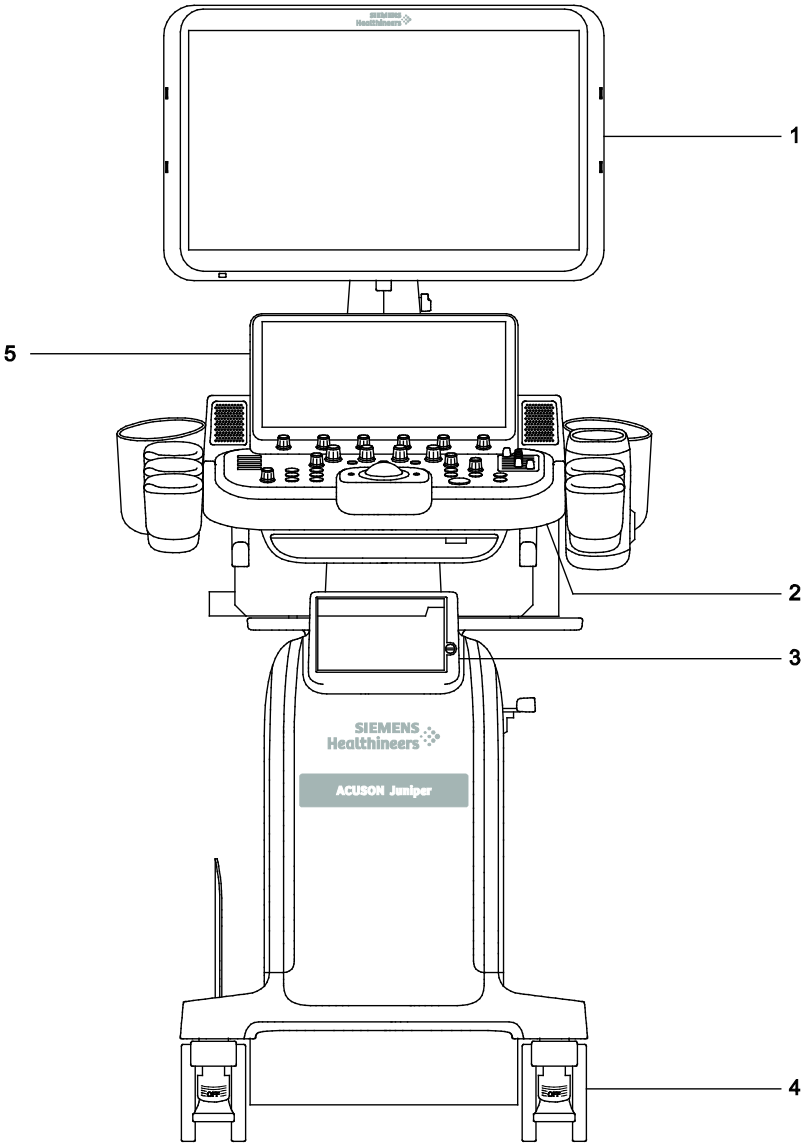
System Overview

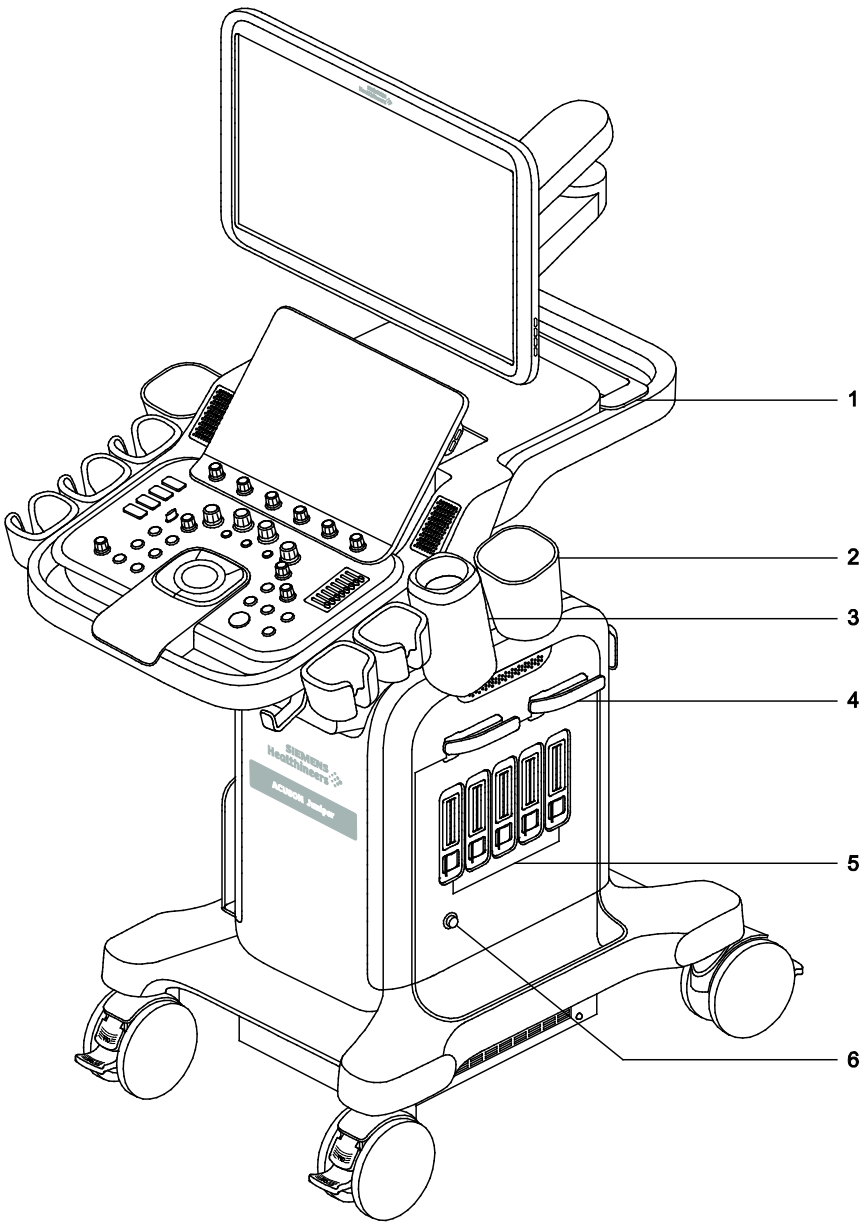
The ACUSON Juniper and ACUSON Juniper Select ultrasound systems are maneuverable, digital diagnostic ultrasound imaging systems. The systems utilize advanced imaging processing and transducer technology. The operating system is based on Windows technology. The system software supports standard applications, exam-specific imaging presets, measurements, body markers, annotations, reports, and system diagnostics.

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



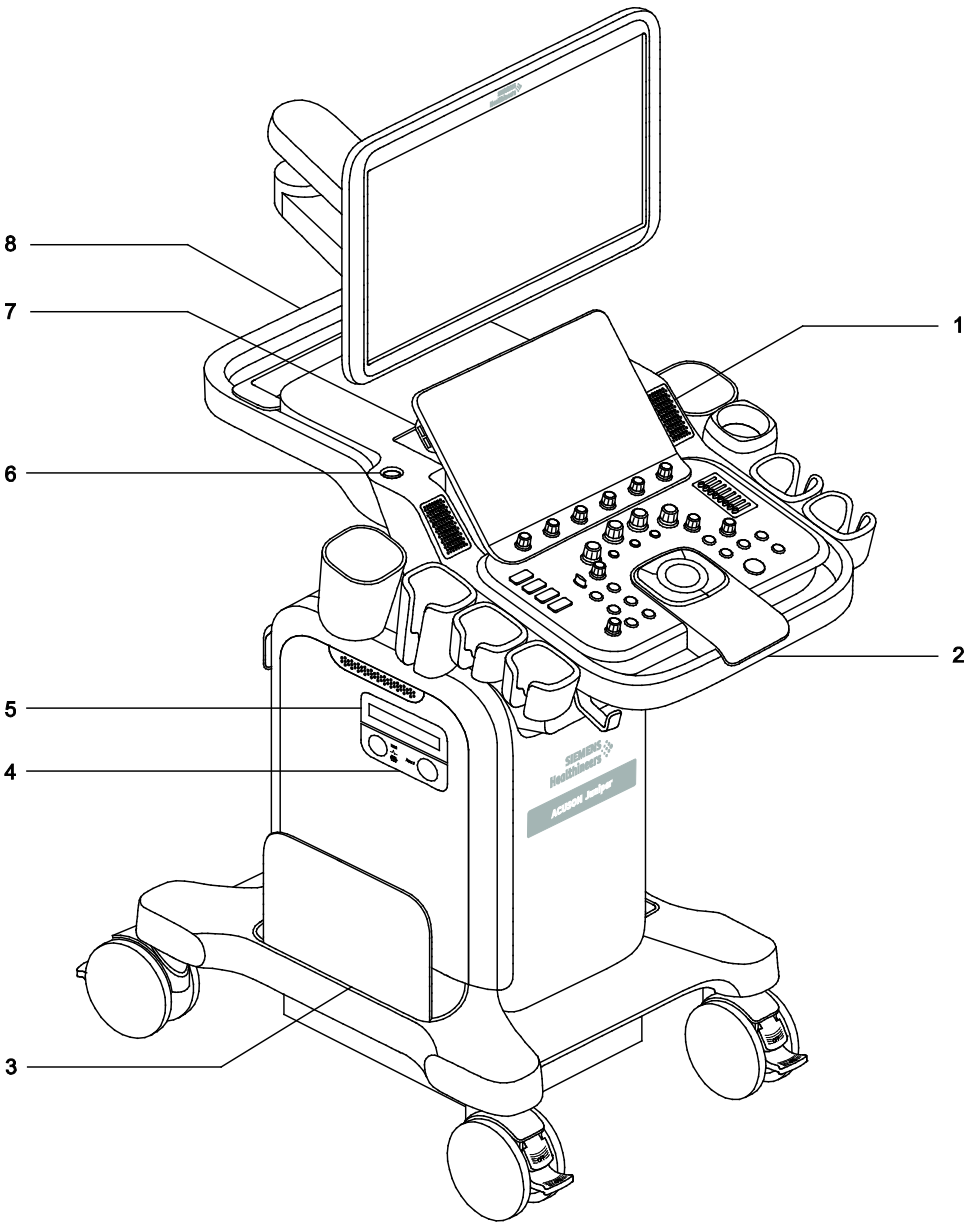
Example of the ultrasound system, front view.

1 User-adjustable monitor
2 Control panel
3 Black and white printer
4 Wheel
5 Touch screen



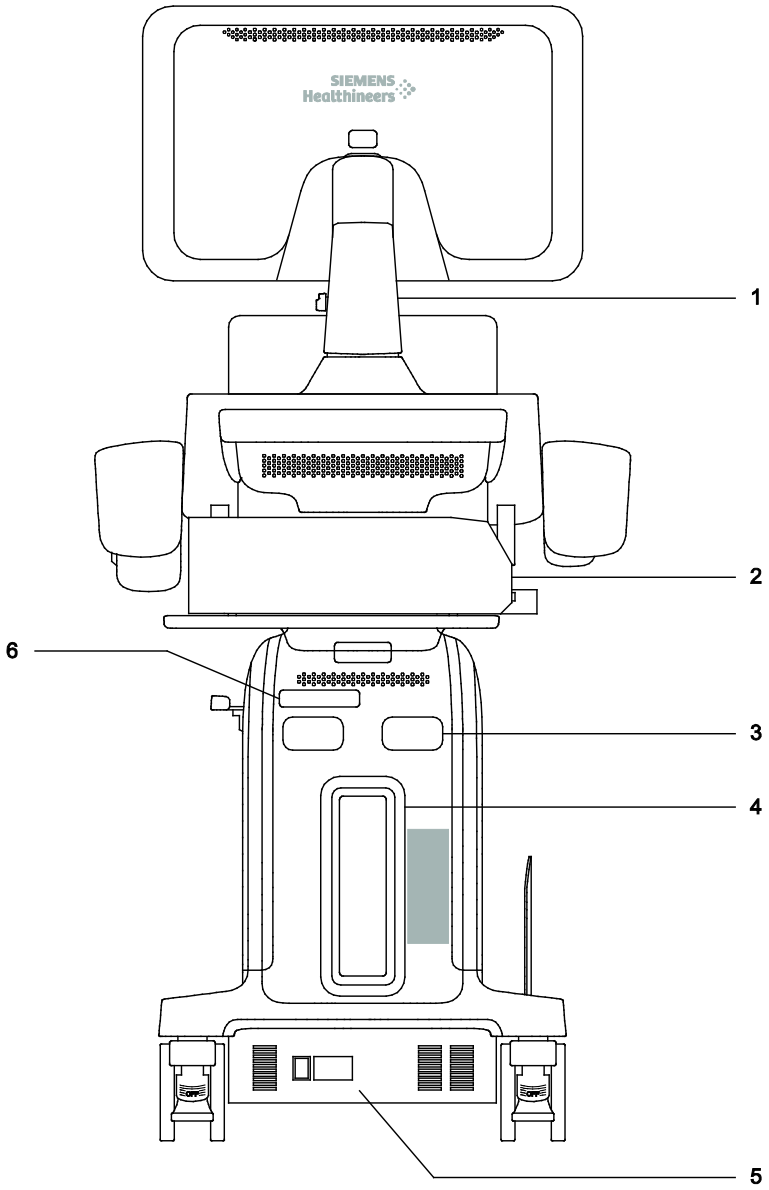
Example of the ultrasound system, right front view.

1 Rear basket
2 Holder for large bottle of gel
3 Gel warmer
4 Transducer cable hanger
5 Transducer ports
6 Transducer port for continuous wave (pencil) transducers



Example of the ultrasound system, left front view.

1 Speaker
2 Front handle
3 Side storage bin
4 Electrocardiogram (ECG) module
5 CD/DVD read/write drive
6 Power on/off
7 Touch screen with USB ports
8 Rear handle



Example of the ultrasound system, back view.

1 Adjustable arm
2 Printer or DVR
3 Power cable hanger
4 Input/output panel
5 Power supply unit
6 Air filter

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 Juniper Ultrasound System	The ACUSON Juniper 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, Obstetrics, Gynecology, Small Parts, Pediatric, Neonatal, Vascular, Urology, Echocardiography, Musculoskeletal, and Intraoperative applications using different ultrasound transducers for different applications. The system also provides the ability to measure anatomical structures and provides analysis packages that provide information used by a physician for clinical diagnostic purposes.
ACUSON Juniper Select Ultrasound System	The ACUSON Juniper Select 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, Obstetrics, Gynecology, Small Parts, Pediatric, Vascular, Urology, Echocardiography and Musculoskeletal applications using different ultrasound transducers for different applications. The system also provides the ability to measure anatomical structures and provides analysis packages that provide information used by a physician for clinical diagnostic purposes.
syngo Arterial Health Package (AHP)	The Arterial Health Package (AHP) software provides the physician with the capability to measure Intima Media Thickness and the option to reference normative tables that have been validated and published in peer-reviewed studies. The information is intended to provide the physician with an easily understood tool for communicating with patients regarding state of their cardiovascular system. **Note:** This feature can be utilized according to the "ASE Consensus Statement; Use of Carotid Ultrasound to Identify Subclinical Vascular Disease and Evaluate Cardiovascular Disease Risk: A Consensus Statement from the American Society of Echocardiography Carotid Intima-Media Thickness Task Force. Endorsed by the Society for Vascular Medicine."

Operating Modes

- 2D-mode
  - 2D-mode with Harmonic imaging
- Color flow Doppler
  - Color (velocity)
  - Power (energy)
- Pulsed Wave Doppler
  - Pulsed Wave Doppler Tissue Imaging
  - High Pulsed Repetition Frequency Pulsed Wave Doppler
- Continuous Wave Doppler
  - Steerable Continuous Wave Doppler for phased array transducers
  - Auxiliary Continuous Wave Doppler for pencil transducers
- M-mode
  - M-mode with Harmonic 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
- 2D-mode with Elastography
- 2D-mode with Contrast Agent Imaging
- 2D/Anatomical M-mode

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
Radiologist	▪ Performs ultrasound exams ▪ Performs image-guided access and biopsy procedures ▪ 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 radiology; 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). ▪ A customer service engineer is an individual representing the manufacturer of the ultrasound system who configures the ultrasound system during initial installation, supports troubleshooting activities, and repairs 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.

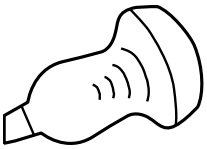
Curved and Linear Array Transducers

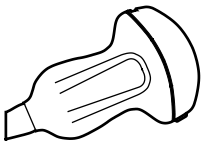
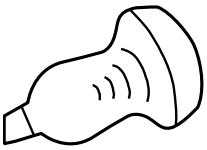
The following transducers are available on the ACUSON Juniper ultrasound system:

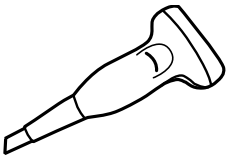
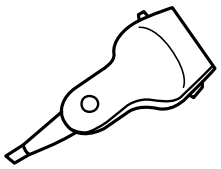
- 5C1, 6C1, 7C2, 12L3, 11L4, 13L4, 14L4, 16L4, 18H5, 11M3

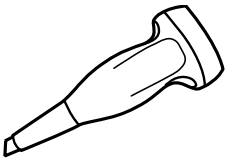
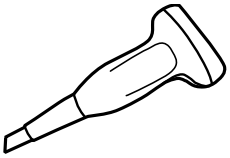
The following transducers are available on the ACUSON Juniper Select ultrasound system:

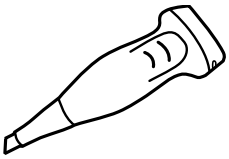
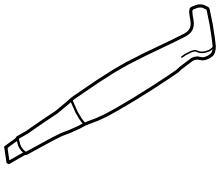
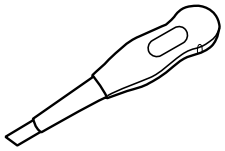
- 5C1, 12L3, 11L4

Transducer Name	Modes of Operation[1]	Intended Applications	Exam Types on the System
5C1 	2D, C, D, M	▪ Abdominal ▪ Renal ▪ Bowel ▪ Focused Assessment with Sonography for Trauma ▪ Lung ▪ Obstetrics ▪ Early Obstetrics ▪ Advanced Obstetrics ▪ Fetal Echocardiography ▪ Gynecology ▪ Peripheral Venous ▪ Peripheral Arterials ▪ Pelvis ▪ Spine	▪ **Abd** ▪ **Renal** ▪ **Bowel** ▪ **FAST** ▪ **Lung** ▪ **OB** ▪ **Early OB** ▪ **OB(Adv)** ▪ **Fetal Echo** ▪ **GYN** ▪ **Venous** ▪ **Arterial** ▪ **Pelvis** ▪ **Spine**

Transducer Name	Modes of Operation[1]	Intended Applications	Exam Types on the System
6C1 	2D, C, D, M	▪ Abdominal ▪ Abdominal Difficult ▪ Renal ▪ Bowel ▪ Focused Assessment with Sonography for Trauma ▪ Lung ▪ Obstetrics ▪ Early Obstetrics ▪ Advanced Obstetrics ▪ Fetal Echocardiography ▪ Gynecology ▪ Peripheral Venous ▪ Peripheral Arterials ▪ Pelvis ▪ Spine	▪ **Abd** ▪ **Abd-Difficult** ▪ **Renal** ▪ **Bowel** ▪ **FAST** ▪ **Lung** ▪ **OB** ▪ **Early OB** ▪ **OB(Adv)** ▪ **Fetal Echo** ▪ **GYN** ▪ **Venous** ▪ **Arterial** ▪ **Pelvis** ▪ **Spine**
7C2 	2D, C, D, M	▪ Abdominal ▪ Renal ▪ Bowel ▪ Focused Assessment with Sonography for Trauma ▪ Lung ▪ Obstetrics ▪ Early Obstetrics ▪ Advanced Obstetrics ▪ Fetal Echocardiography ▪ Gynecology ▪ Spine ▪ Pediatric Abdomen ▪ Pelvis	▪ **Abd** ▪ **Renal** ▪ **Bowel** ▪ **FAST** ▪ **Lung** ▪ **OB** ▪ **Early OB** ▪ **OB(Adv)** ▪ **Fetal Echo** ▪ **GYN** ▪ **Spine** ▪ **Ped Abd** ▪ **Pelvis**

Transducer Name	Modes of Operation[1]	Intended Applications	Exam Types on the System
12L3 	2D, C, D, M	▪ Bowel ▪ Focused Assessment with Sonography for Trauma ▪ Lung ▪ Obstetrics ▪ Breast ▪ Testis ▪ Penile ▪ Thyroid ▪ Pediatric Hip Joint ▪ Carotid ▪ Peripheral Venous ▪ Peripheral Arterials ▪ Spine ▪ Musculoskeletal ▪ Digital ▪ Nerve	▪ **Bowel** ▪ **FAST** ▪ **Lung** ▪ **OB** ▪ **Breast** ▪ **Testis** ▪ **Penile** ▪ **Thyroid** ▪ **Ped Hip** ▪ **Carotid** ▪ **Venous** ▪ **Arterial** ▪ **Spine** ▪ **MSK** ▪ **Digital** ▪ **Nerve**
11L4 	2D, C, D, M	▪ Bowel ▪ Focused Assessment with Sonography for Trauma ▪ Lung ▪ Obstetrics ▪ Breast ▪ Testis ▪ Penile ▪ Thyroid ▪ Pediatric Hip Joint ▪ Carotid ▪ Peripheral Venous ▪ Peripheral Arterials ▪ Spine ▪ Musculoskeletal ▪ Digital ▪ Nerve	▪ **Bowel** ▪ **FAST** ▪ **Lung** ▪ **OB** ▪ **Breast** ▪ **Testis** ▪ **Penile** ▪ **Thyroid** ▪ **Ped Hip** ▪ **Carotid** ▪ **Venous** ▪ **Arterial** ▪ **Spine** ▪ **MSK** ▪ **Digital** ▪ **Nerve**

Transducer Name	Modes of Operation[1]	Intended Applications	Exam Types on the System
13L4 	2D, C, D, M	▪ Bowel ▪ Focused Assessment with Sonography for Trauma ▪ Lung ▪ Obstetrics ▪ Breast ▪ Testis ▪ Penile ▪ Thyroid ▪ Pediatric Hip Joint ▪ Carotid ▪ Peripheral Venous ▪ Peripheral Arterials ▪ Spine ▪ Musculoskeletal ▪ Digital ▪ Nerve	▪ **Bowel** ▪ **FAST** ▪ **Lung** ▪ **OB** ▪ **Breast** ▪ **Testis** ▪ **Penile** ▪ **Thyroid** ▪ **Ped Hip** ▪ **Carotid** ▪ **Venous** ▪ **Arterial** ▪ **Spine** ▪ **MSK** ▪ **Digital** ▪ **Nerve**
14L4 	2D, C, D, M	▪ Bowel ▪ Focused Assessment with Sonography for Trauma ▪ Lung ▪ Obstetrics ▪ Breast ▪ Testis ▪ Penile ▪ Thyroid ▪ Pediatric Hip Joint ▪ Carotid ▪ Peripheral Venous ▪ Peripheral Arterials ▪ Spine ▪ Musculoskeletal ▪ Digital ▪ Nerve	▪ **Bowel** ▪ **FAST** ▪ **Lung** ▪ **OB** ▪ **Breast** ▪ **Testis** ▪ **Penile** ▪ **Thyroid** ▪ **Ped Hip** ▪ **Carotid** ▪ **Venous** ▪ **Arterial** ▪ **Spine** ▪ **MSK** ▪ **Digital** ▪ **Nerve**

Transducer Name	Modes of Operation[1]	Intended Applications	Exam Types on the System
16L4 	2D, C, D, M	▪ Bowel ▪ Focused Assessment with Sonography for Trauma ▪ Lung ▪ Breast ▪ Testis ▪ Penile ▪ Thyroid ▪ Pediatric Hip Joint ▪ Carotid ▪ Musculoskeletal ▪ Digital ▪ Nerve	▪ **Bowel** ▪ **FAST** ▪ **Lung** ▪ **Breast** ▪ **Testis** ▪ **Penile** ▪ **Thyroid** ▪ **Ped Hip** ▪ **Carotid** ▪ **MSK** ▪ **Digital** ▪ **Nerve**
18H5 	2D, C, D, M	▪ Testis ▪ Penile ▪ Thyroid ▪ Musculoskeletal ▪ Digital ▪ Nerve ▪ Intraoperative Abdomen ▪ Carotid	▪ **Testis** ▪ **Penile** ▪ **Thyroid** ▪ **MSK** ▪ **Digital** ▪ **Nerve** ▪ **IO Abd** ▪ **Carotid**
11M3 	2D, C, D, M	▪ Pediatric Abdomen ▪ Neonatal Echocardiography ▪ Neonatal Head ▪ Carotid ▪ Pediatric Echocardiography	▪ **Ped Abd** ▪ **Neo Echo** ▪ **Neo Head** ▪ **Carotid** ▪ **Ped Echo**

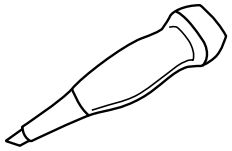
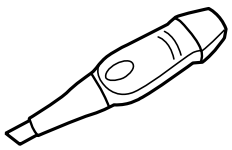
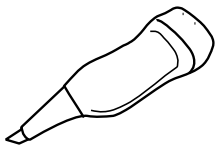
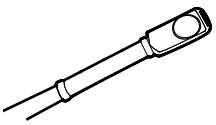
Phased Array Transducers

The following transducers are available on the ACUSON Juniper ultrasound system:

- 5P1, 8V4, 10V4, 5VT

The following transducers are available on the ACUSON Juniper Select ultrasound system:

- 5P1

Transducer Name	Modes of Operation[1]	Intended Applications	Exam Types on the System
5P1 	2D, C, D, M, CW	▪ Abdominal ▪ Renal ▪ Focused Assessment with Sonography for Trauma ▪ Lung ▪ Transcranial Doppler ▪ Adult Echocardiography ▪ Pediatric Echocardiography	▪ **Abd** ▪ **Renal** ▪ **FAST** ▪ **Lung** ▪ **TCD** ▪ **Adult Echo** ▪ **Ped Echo**
8V4 	2D, C, D, M, CW	▪ Pediatric Abdomen ▪ Neonatal Echocardiography ▪ Neonatal Head ▪ Pediatric Echocardiography	▪ **Ped Abd** ▪ **Neo Echo** ▪ **Neo Head** ▪ **Ped Echo**
10V4 	2D, C, D, M, CW	▪ Pediatric Abdomen ▪ Neonatal Echocardiography ▪ Neonatal Head ▪ Pediatric Echo	▪ **Ped Abd** ▪ **Neo Echo** ▪ **Neo Head** ▪ **Ped Echo**
5VT 	2D, C, D, M, CW	▪ Transesophageal Echocardiography	▪ **TEE**

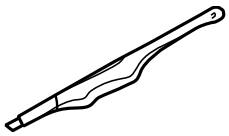
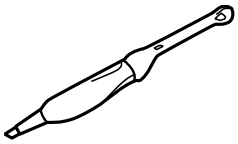
Endocavity Transducers

The following transducers are available on the ACUSON Juniper ultrasound system:

- 9MC3, 10MC3

The following transducers are available on the ACUSON Juniper Select ultrasound system:

- 10MC3

Transducer Name	Modes of Operation[1]	Intended Applications	Exam Types on the System
9MC3 	2D, C, D, M	▪ Obstetrics ▪ Early Obstetrics ▪ Advanced Obstetrics ▪ Gynecology ▪ Prostate	▪ **OB** ▪ **Early OB** ▪ **OB(Adv)** ▪ **GYN** ▪ **Prostate**
10MC3 	2D, C, D, M	▪ Obstetrics ▪ Early Obstetrics ▪ Advanced Obstetrics ▪ Gynecology ▪ Prostate	▪ **OB** ▪ **Early OB** ▪ **OB(Adv)** ▪ **GYN** ▪ **Prostate**

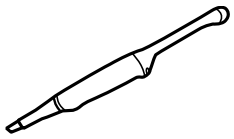
*four*Sight 4D Transducers

The following transducers are available on the ACUSON Juniper ultrasound system:

- 8VC3, 9VE3

The following transducers are available on the ACUSON Juniper Select ultrasound system:

- 8VC3

Transducer Name	Modes of Operation[1]	Intended Applications	Exam Types on the System
8VC3	2D, C, D, M, Volume Imaging	▪ Abdominal ▪ Obstetrics ▪ Early Obstetrics ▪ Advanced Obstetrics ▪ Gynecology ▪ Fetal Echocardiography ▪ Pelvic Floor	▪ **Abd** ▪ **OB** ▪ **Early OB** ▪ **OB(Adv)** ▪ **GYN** ▪ **Fetal Echo** ▪ **Pelvic Floor**
9VE3 	2D, C, D, M, Volume Imaging	▪ Obstetrics ▪ Early Obstetrics ▪ Advanced Obstetrics ▪ Gynecology ▪ Pelvic Floor	▪ **OB** ▪ **Early OB** ▪ **OB(Adv)** ▪ **GYN** ▪ **Pelvic Floor**

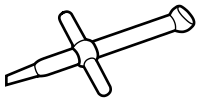
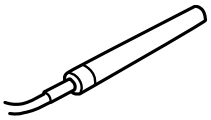
CW Transducers

The following transducers are available on the ACUSON Juniper ultrasound system:

- CW2, CW5, CW8

The following transducers are available on the ACUSON Juniper Select ultrasound system:

- CW2, CW5

Transducer Name	Modes of Operation[1]	Intended Applications	Exam Types on the System
CW2 	CW	▪ Adult Echocardiography ▪ Pediatric Echocardiography	▪ **Adult Echo** ▪ **Ped Echo**
CW5	CW	▪ Carotid ▪ Transcranial Doppler ▪ Pediatric Echocardiography	▪ **Carotid** ▪ **TCD** ▪ **Ped Echo**
CW8 	CW	▪ Carotid ▪ Peripheral Arterials	▪ **Carotid** ▪ **Arterial**

Legend

[1] Modes of Operation	Includes one or more of the following system operating modes:
2D (brightness mode)	2D-mode, 2D-mode with Tissue Harmonic Imaging (THI)
C (color flow Doppler)	Color Doppler Velocity (CDV), Color Doppler Energy (CDE), Doppler Tissue Imaging (DTI), Doppler Tissue Energy (DTE)
D (Doppler)	Pulsed Wave Doppler, 2D/Doppler, 2D/Doppler with CDV, 2D/Doppler with CDE
M (motion mode)	M-mode, 2D/M-mode
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.

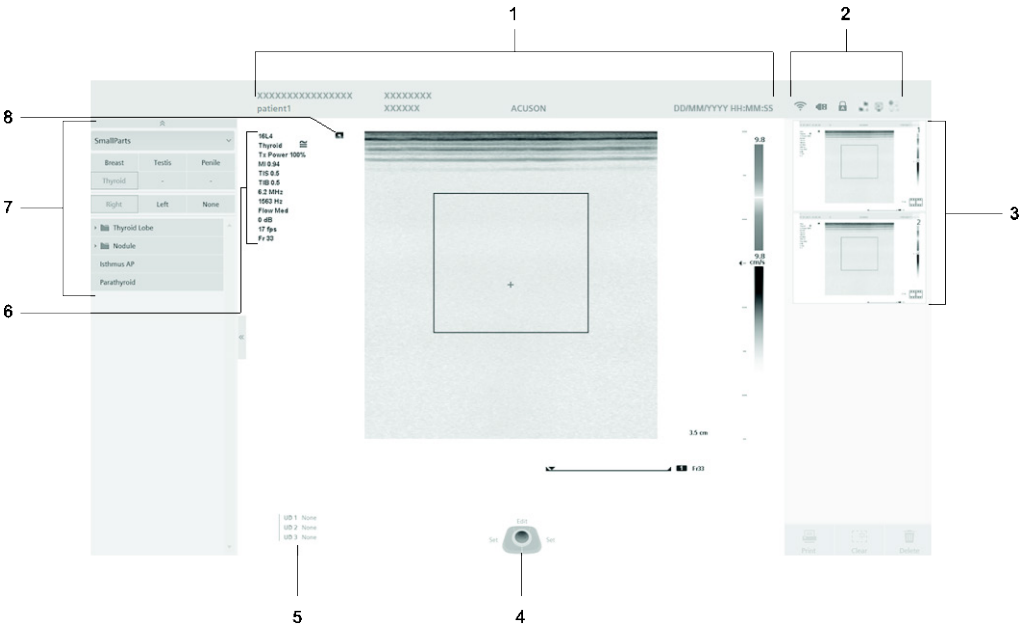
Image Screen Layout

The monitor on the ultrasound system displays clinical images together with important operating parameters and patient data.

Screen Saver

The screen saver feature freezes the system and replaces the active display with a screen-saver display after the system has been inactive for a specified number of minutes. Exit the active screen saver display by pressing any key, adjusting any control, or rolling the trackball.

Note: The screen saver feature is not available when the system is in external video playback or during the Biopsy function.



Example of a typical image screen.

1 Patient banner
Displays patient information, operator, institution, the system date and time.

2 System status indicators
Displays information about the ultrasound system, for example, the signal strength of a wireless network and the status of printing, video recording, and transferring data.

3 Thumbnail panel
Displays reference images of stored clips, images, and volumes.

4 Trackball legend
Identifies the functions currently assigned to the trackball and surrounding controls on the control panel. In this manual, the trackball keys are named **SET**.

5 User-defined key legend
Identifies the function currently assigned to user-defined keys.
6 Imaging parameters
Displays a list of imaging settings for the active operating mode.
7 Left panel
Provides functions for workflow protocols, reports, and for specialty features, for example, Virtual Touch quantification.
During the measurement function, displays measurement labels and modifiers.
8 Transducer orientation indicator
Indicates the direction of the scan.

System Status Indicators

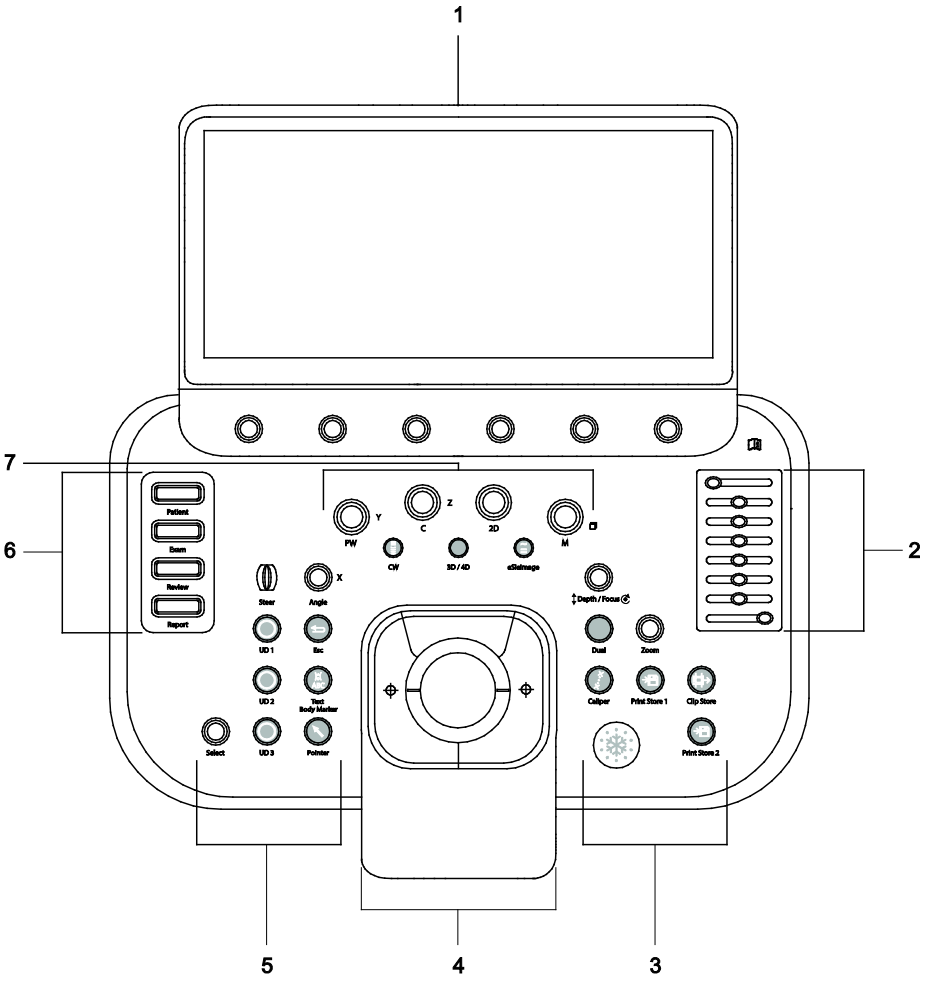
The system status is always displayed to provide information about the system.

Icon	Description
	Indicates a software download to the ultrasound system is in progress.
	Indicates remote service is in progress.
	Indicates the system is connected to a wireless network and indicates the signal strength.
	Indicates a wireless network is not found.
	Indicates a wireless network error.
	Indicates the system is connected to a wired network.
	Indicates the system is trying to connect to a wired network.
	Indicates an error occurred while connecting to a wired network.

Icon	Description
	Indicates printing is in progress.
	Indicates an error occurred during printing.
	Indicates a data transfer is in progress.
	Indicates a data transfer error.
	Indicates the status of video recording.
	Indicates the status of video paused.
	Indicates a USB device is connected to the system.
	Indicates the **CAPS LOCK** key is activated.
	Indicates the system is connected to the HDMI.

About the Control Panel

The control panel provides access to system features and workflow tasks. The keys and controls are logically arranged to require a minimum of hand and eye movements. The control panel also includes customizable keys.



Example of control panel on the ultrasound system.

1 Touch screen with touch screen controls

Use the six controls to change imaging parameter settings, select a measurement method, or perform review functions. The screen displays the functions assigned to each key.

2 Depth Gain Compensation controls

Slide the controls left or right to manually adjust the depth-gain compensation.

3 Image acquisition and documentation controls

Use these controls to freeze the image, adjust the depth or zoom factor, perform measurements, and save or print an image or clip.

4 Trackball controls: the trackball, **SET** keys and **UPDATE**

Use the trackball to position or resize objects on the image screen, for example, the 2D FOV (field of view), the color ROI (region of interest), a Doppler cursor, and measurement markers.

The function of all trackball controls depends on the active task. Use the **SET** keys to anchor the measurement markers, and use the **UPDATE** key to activate or deactivate an operating mode, acquire imaging volume or clips, or to refresh a 2D-mode image.

5 Doppler optimization, annotation controls, and user-defined controls

Use the Doppler optimization controls to adjust the color or correct the Doppler flow angle.

Press the annotation controls to activate the annotation function including text, body markers, and pointer.

Press the user-defined controls to activate the function specified in the configuration settings.

6 Workflow controls

Use these controls to activate workflow tasks, for example, registering a patient, displaying a report.

7 Operating mode controls

Press the control to activate the required operating mode. Rotate the control to adjust the gain for the active mode.

Control Panel Lighting

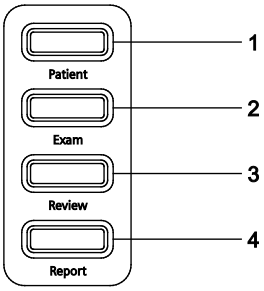
When the ultrasound system is in use, controls and keys on the control panel are supported by backlighting. The brightness of the backlighting increases when a control is active.

Power Control

Press this control to power on or power off the ultrasound system.

Workflow Controls

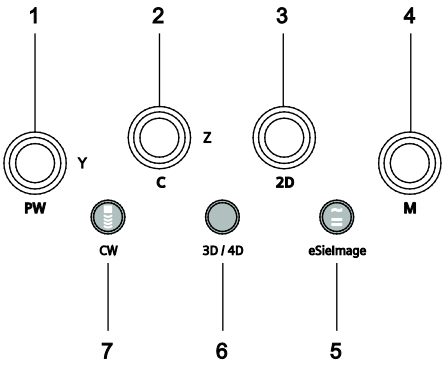
Note: Press the workflow control to activate or exit the function.



Example of workflow controls next to the alphanumeric keyboard.

1 **PATIENT** displays the patient registration form. You can enter patient data and select an exam type and transducer.
2 **EXAM** displays a list on the touch screen of transducers connected to the ultrasound system and the supported exam types for the selected transducer.
3 **REVIEW** displays the review screen for the current exam. You can view, print, export, or delete saved images and clips.
4 **REPORT** displays the report for the current exam. You can review and edit results, add images to the report, preview and print the report, and export the report in PDF format.

Operating Mode Controls



Example of operating mode controls.

1 **PW**

Press this control to activate pulsed wave (PW) Doppler and display the Doppler spectrum and 2D image as specified in the configuration settings.

Rotate this control to adjust the Doppler gain. Use the touch screen selections to activate Doppler Tissue Imaging (DTI).

2 **C**

Press this control to activate color Doppler.

Rotate this control to adjust the color gain. Use the touch screen selections to activate Color Doppler Velocity (CDV), Color Doppler Energy (CDE), Doppler Tissue Imaging (DTI), or Doppler Tissue Energy (DTE).

3 **2D**

Press this control to activate 2D-mode or to exit another operating mode.

Rotate this control to adjust the 2D gain.

4 **M**

Press this control to activate M-mode and display the M-mode sweep and 2D image as specified in the configuration settings.

Rotate this control to adjust the M-mode gain.

5 **ESIEIMAGE**

Press this control to activate the eSieImage feature.

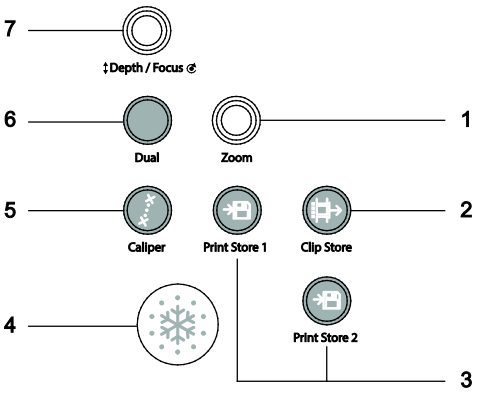
6 **3D / 4D**

Press this control to activate volume imaging.

7 **CW**

Press this control to activate continuous wave (CW) Doppler or steerable continuous wave (SCW) Doppler function for phased array transducers.

Image Acquisition and Documentation Controls



Example of image acquisition and documentation controls.

1 **ZOOM**

Rotate this control to change the image magnification.

Press the control to activate a high-density zoom image on the screen.

2 **CLIP STORE**

Press this control to acquire and save a clip or static image to the system's hard disk as specified in the configuration settings. The thumbnail panel displays the saved data.

During Stress Echo, this control saves a clip as specified in the configuration setting for a continuous protocol or alternates beginning and ending acquisition for a non-continuous protocol.

3 **PRINT STORE 1, PRINT STORE 2**

Press this control to acquire a static image. The system saves the image to the system's hard disk, sends the image to a printer, or both, as specified in the configuration settings.

4 **FREEZE**

Press this control to freeze an image, sweep, or spectrum or restore real-time imaging.

During system freeze, you can review or save an image or clip, perform measurements, or add annotations or body markers.

5 **CALIPER**

Press this control to activate or deactivate the measurement function.

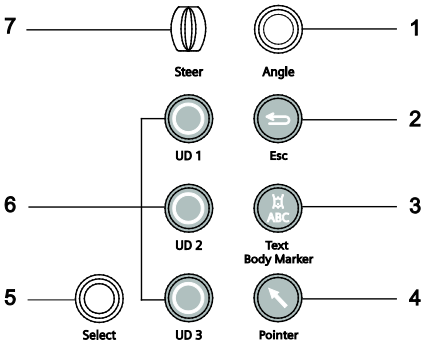
6 **DUAL**

Press this control to activate dual imaging.

7 **DEPTH / FOCUS**

Rotate or push this control to adjust the imaging depth as specified in the configuration settings. Press the control to add multiple transmit focal zones. Rotate or push the control to reposition the transmit focal zones in the image as specified in the configuration settings.

Optimization Controls



Example of optimization controls.

1 **ANGLE**

During Doppler, press this control to adjust the flow angle in 60° increments (60°, 0°, and -60°). Rotate the control to adjust the flow angle in 1° increments.

During SieScape, rotate this control to rotate a composite image.

2 **ESC**

Exits the currently displayed mode, function, or page and reactivates the previous mode, function, or page.

3 **TEXT BODY MARKER**

Activates the text, body marker, and arrows on the image.

4 **POINTER**

Press the pointer control to access the controls or thumbnails on the image screen.

5 **SELECT**

Press or rotate this control to make selections from the screen.

6 **UD 1 / UD 2 / UD 3**

Activates the function assigned to this control specified in the configuration settings.

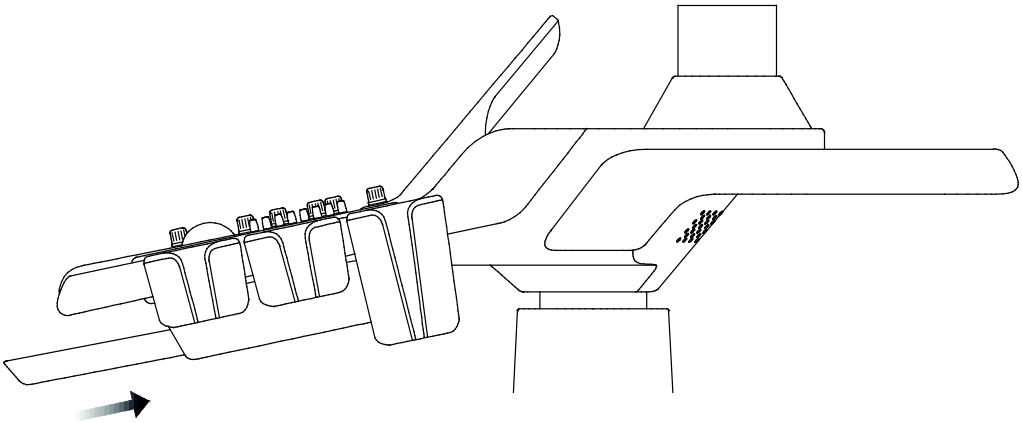
7 **STEER**

Positions the M-mode or Doppler cursor or the color region of interest.

For linear array transducers, steers the 2D image. The amount of steering is dependent on the type of transducer.

Retractable Keyboard

The retractable alphanumeric keyboard attaches below the control panel.



To extend the keyboard, gently push the keyboard toward the ultrasound system until you hear an audible click.

- To retract the keyboard, gently lift up and then push the keyboard toward the ultrasound system until you hear an audible click.
- The retractable keyboard is an ultrasound system option, not a standard feature.

Special Keys

Key Name	Description
Text A, **Text B**	Inserts text on the image screen at the cursor location.
Arrow	Inserts an arrow on the image screen at the cursor location.
END	Closes the study as specified in the configuration settings.

Special Characters

To access special characters on the retractable keyboard:

1. Press and hold the **Alt** key on the keyboard.
2. 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
i	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

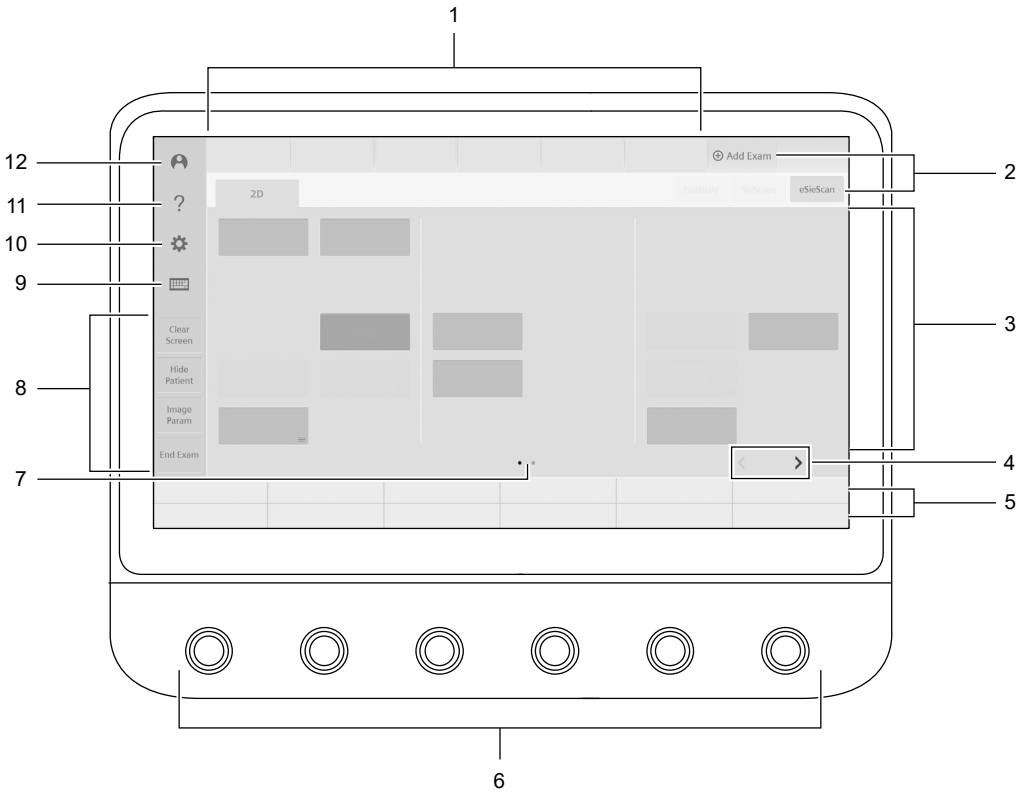
Touch Screen Controls

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

The following colors indicate the availability of a selection for use.

- Blue indicates the selection is active.
- Gray indicates the selection is available, but not active.
- A dimmed selection is not available for use.

Use the configuration settings to change and rearrange selections on the touch screen.



Example of the touch screen layout.

1 Selections for the exam type and for transducers connected to the ultrasound system
2 Tabs or selections for operating modes, features, or functions
3 Selections for the active mode, feature, or function
Tap a selection on the touch screen to activate a feature or function, or to change a setting.
4 Additional pages of selections
5 Selections for the controls directly below the selections
6 Controls corresponding to the touch screen selections directly above the controls
Press, rotate, or press and then rotate a control to make a selection or change a setting
7 Number of pages of selections and the active page. The active page is indicated in white.
8 Shortcut selections for accessing, hiding, or showing the patient information or image parameters, removing all annotations and pictograms from the screen, and ending the current study
9 Selections for accessing the virtual keyboard
10 Selections for configuring the ultrasound system
11 Information about how to use the ultrasound system
12 Options for logging in to the ultrasound system to restrict access to the ultrasound system

Touch Screen Symbols

Symbol	Description
	Indicates a port is available for connecting an array transducer to the ultrasound system.
	Indicates a port is available for connecting a continuous wave (pencil) transducer to the system.
	Accesses additional pages of selections or selections for additional features.
	Accesses additional selections.
	Indicates a selection assigned to a control requiring a rotate action.
	Indicates a selection assigned to a control requiring a press action.
	Indicates a package of measurement labels.
	Indicates a group of measurement labels requiring completion before the ultrasound system can calculate a result.
	Indicates a measured or entered value is assigned to the measurement label. During eSieScan or stress echo, indicates a view is complete.
	Indicates additional options available for the selection.
	▪ Increases a value. ▪ During stress echo, indicates a protocol or view is temporarily paused. ▪ Enlarges the size of the 2D image.
	▪ Decreases a value. ▪ Reduces the size of the 2D image.
	Temporarily hides the virtual keyboard.
	Rotates the image clockwise for the transesophageal transducer in 90 degree.
	Rotates the image counterclockwise for the transesophageal transducer in 90 degree.

Touch Screen Keyboard

The touch screen includes an alphanumeric keyboard for entering and editing information in the patient registration form, a report, or on the image.

The on-screen keyboard displays only alphanumeric keys and special function keys related to the active feature. For example, during text annotation, keys specific to text annotation are on the keyboard.

Special Keys and Special Characters

Use the touch screen keyboard to enter text. The keyboard also includes special function keys.

Key Name	Description
English	Accesses special characters specific to a language. Press and hold the key and then select **Special**.
INS	Inserts text when the text cursor is active.

System Configuration

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

You can customize the system to accommodate your workflow and preferences, for example:

- Language, date and time format, measurement units for height and weight, and audio feedback
- Format of the patient registration form (short or long form)
- Functions assigned to keys on the control panel
- Screen saver, patient banner, and Doppler and M-mode cursor display
- Freeze response, display formats, and other settings by exam type
- Customizable functions assigned to touch screen selections and left panel controls
- Customizable measurement and report settings by exam type
- Annotations and body markers available with each exam type
- Wireless and wired network configuration
- Clip capture type (prospective or retrospective), compression, clip playback, and slide show settings
- Archival settings
- Printer and barcode configuration
- Contrast configuration
- eSieScan configuration
- Stress echo configuration
- Security configuration

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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 2-11.

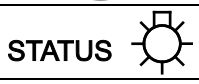
Serious Incident Reporting

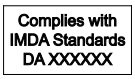
If you become aware of any (potential) malfunction of our device which has resulted or could result in serious health consequences for the user, patient or any other person please inform us immediately and if legally required, inform the Competent Authority of your country.

System Symbols

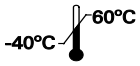
Refer to this table to identify important symbols located on the ultrasound imaging system and transducers.

Symbol	Explanation
	AC (alternating current) voltage source
	Caution: Risk of electric shock (black and yellow illustration)
	Defibrillation-proof type CF 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)
	Caution (black illustration)
	General warning (black and yellow illustration)
	Attention (black illustration)
	Protective earth ground
	Signal earth ground
	USB connection
	Ethernet connection
	Continuous wave (pencil) transducer port

Symbol	Explanation
	Unlocked position
	Locked position
	Swivel for locking or unlocking the monitor arm
	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 Located on the Power Supply Unit (PSU) of the ultrasound system.
	Signal output
	DVI output
	S-Video output
	DVR
	Status indicator light for service diagnostics
	Input/output service status
	ECG signal input connection
Aux 1	Auxiliary in/out port
ECG	Electrocardiogram (EKG)
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

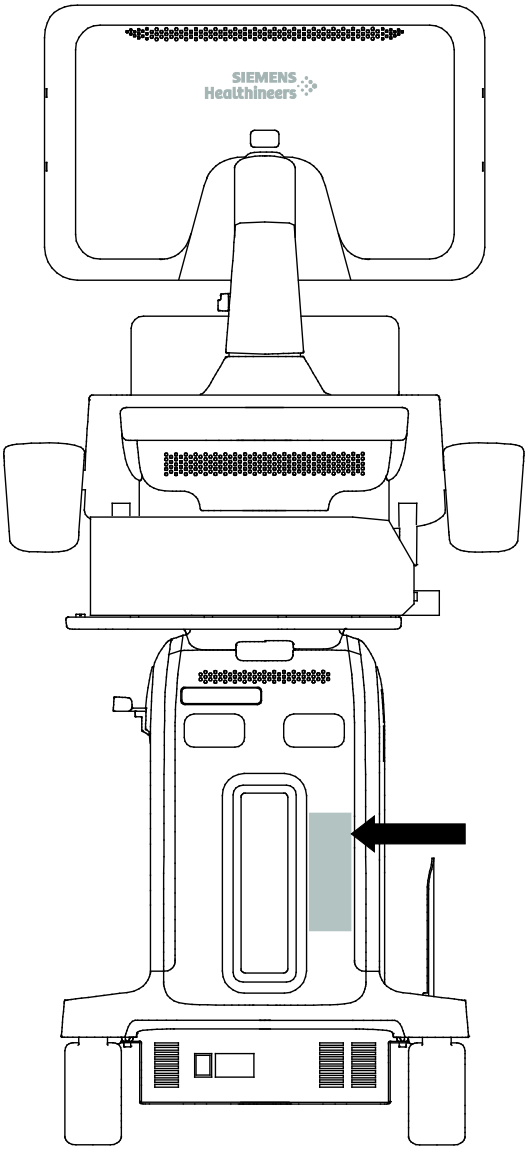
Symbol	Explanation
	Identifies the importer of the medical device
	Authorized representative in Switzerland
	European Conformity mark Indicates the manufacturer declares the product complies with the applicable requirements in Regulation (EU) 2017/745 and other applicable European Union harmonization 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
	UL classified symbol for Canada and United States of America
	Authorized representative in the European community
	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
	Equipment complies with the standard and specifications published by IMDA (Info-communications Media Development Authority of Singapore) "XXXXXX" represents the dealer's license number
	Agência Nacional de Telecomunicações (ANATEL) certification label in Brazil Includes the certification number
	National Communications Commission (NCC) certification of type approval label in Taiwan Includes the approval number
	Technical Conformity Mark for specified radio equipment in Japan
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

Symbol	Explanation
	TÜV Rheinland INMETRO Certification Mark (Brazil)
	TÜV SÜD INMETRO Certification Mark (Brazil)
	Ukrainian conformity mark
	The monitor is compliant with the limits for a Class B digital device, pursuant to Part 15 of the Federal Communication Commission (FCC) rules in the United States of America.
	Product complies with applicable Australian or New Zealand standards for EMC and radio-communications.
	C-Tick Mark Product complies with applicable Australian or New Zealand standards for EMC and radio-communications
	National certification for Korea
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
	Barcode with product identification information according to the following barcode specification: GS1 DataMatrix
	Environmentally friendly use period
	Manufacturer
	Date of manufacture Includes the year and month adjacent to the symbol
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

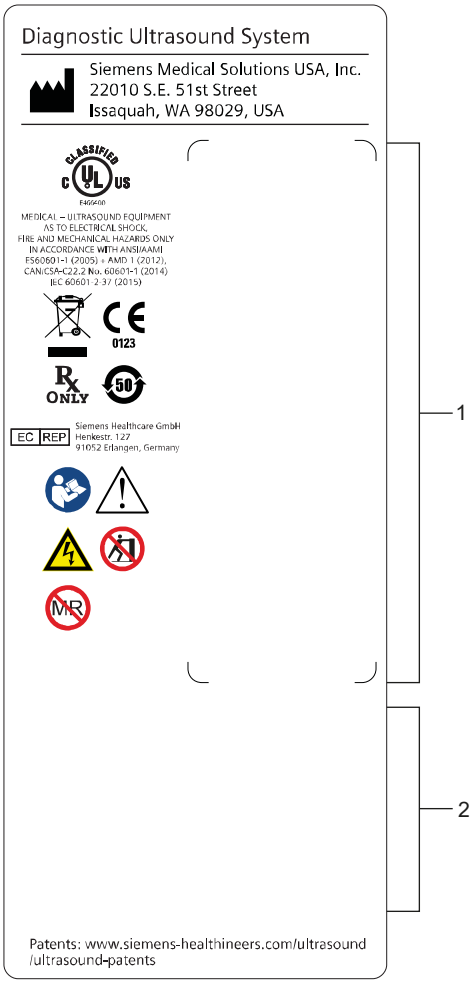
Symbol	Explanation
GTIN	Global Trade Item Number
Rev REV	Model revision
Serial SERIAL	Serial number
Count COUNT	Quantity of product
Model MODEL	Siemens Healthineers model number
REF	Device part number
Origin KR ORIGIN KR	Manufacturer country of origin: Republic of Korea
Origin US ORIGIN US	Manufacturer country of origin: United States of America
Origin JP ORIGIN JP	Manufacturer country of origin: Japan
Origin CN ORIGIN CN	Manufacturer country of origin: China
MADE IN USA	Location of device manufacturing: United States of America
MADE IN KOREA	Location of device manufacturing: Republic of Korea
	Do not install wet
	The wood packaging material for shipping the ultrasound system complies with the International Standards for Phytosanitary Measures No. 15. (example)
	Storage temperature range (example)
	Do not expose to direct sunlight
	Storage atmospheric pressure range (example)
	Storage humidity range (example)
	Indicates this side up
	Do not stack

Symbol	Explanation
	Shipping weight (example)
	Do not allow to get wet
	Fragile. Handle with care.
	Refer to the operator's manual for information about compatible needle guides.
	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.
	Control panel height adjustment
	Control panel rotation adjustment
	Do not lean against the cart (black and red illustration)
	Do not exert excessive force when moving or positioning the ultrasound system. (black and red illustration)
	Rear basket weight restriction
	Pinch hazard (black and yellow illustration)
	Recycle
	Do not re-use Indicates the medical device is for single use only and must not be used more than one time
	Location of air filter
OFF	Lock released for the wheels
ON	Lock engaged for the wheels
STOP	Lock and swivel lock engaged for the wheels
	Swivel lock engaged for the wheels
	Adjusts the imaging depth or focus
	Adjusts the imaging depth or focus

Labels

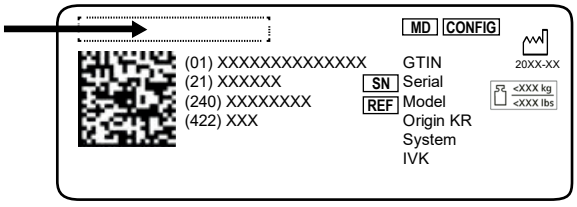


Example of the location of the system label.

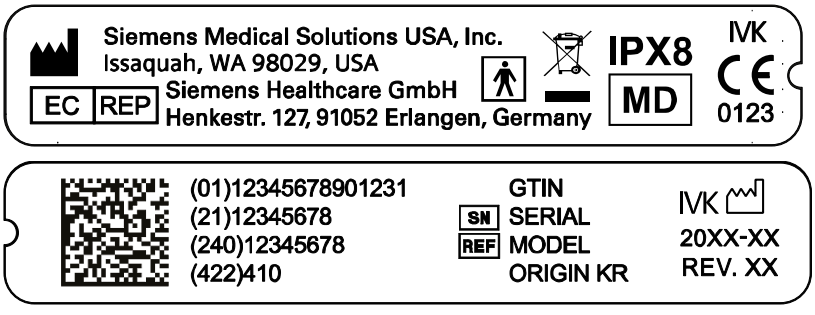


Example of ultrasound system labels with certification labels.

1 Identification label
2 Country-specific labels



Example of identification label.



Example of transducer labels.

Biohazard Considerations

⚠ **WARNING:** This equipment is not suitable for intracardiac use or direct cardiac contact.

⚠ **WARNING:** For neonatal head imaging, Siemens Healthineers recommends that you exercise special care during neonatal cephalic scanning to avoid possible damage to the posterior region of the eye. The ultrasound energy emitted by the transducer easily penetrates the fontanels of the infant.

⚠ **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.

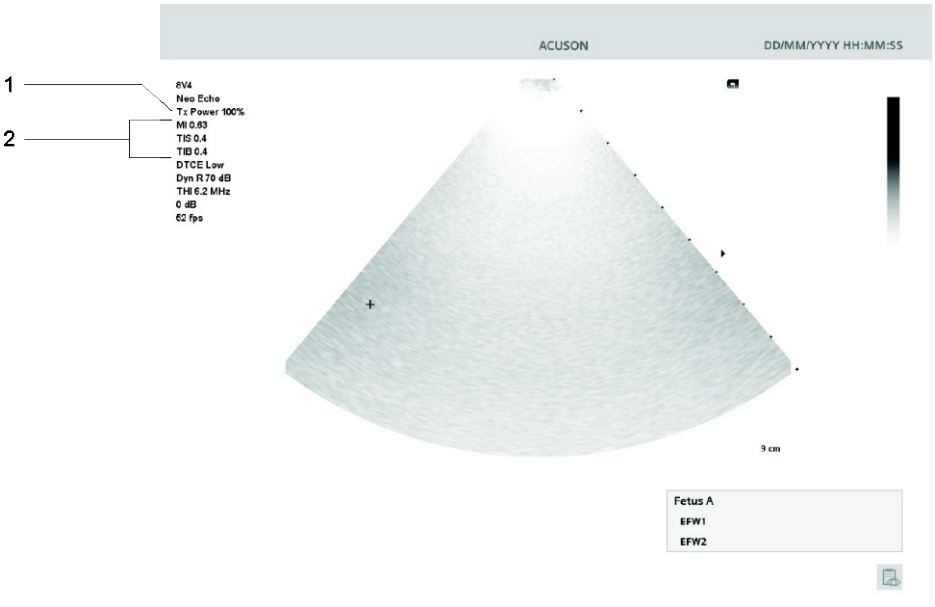
The American Institute of Ultrasound in Medicine (AIUM) has also advocated the responsible use of diagnostic ultrasound for all fetal imaging (August 2005).

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.



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

1 Transmit power
2 Mechanical and thermal indices

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 diagnostic exam type has preset values for mechanical and thermal indices.

See also: Imaging Functions that Change Acoustic Output, p. 2-16

Note: Maximum transmit acoustic intensity and the mechanical index for each exam type 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. Although some exam types may default to a condition of maximum allowable transmit power, there are other system controls or functions that could raise acoustic output levels.

To increase the transmit power during real-time imaging:

- Rotate **[Tx Power]** clockwise to increase transmit power.

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

To decrease the transmit power during real-time imaging:

- Rotate **[Tx 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 0.20% to 100%. Selecting 100%, in combination with other system controls or functions, generates the maximum acoustic intensity and mechanical index for each transducer, where:

$I_{SPTA.3} : \leq 720$ mW/cm^2 **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, when the mechanical index or the thermal indices are equal to or exceed a value of 0.1.

Use the configuration settings to select the thermal indices for display during neonatal head exams.

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:

- Automatic Time-out
- M-mode cursor
- Color and Power ROI Position and Size; Steering Angle for linear array transducers
- Doppler Gate Position and Size; Steering Angle for linear array transducers
- Doppler PRF
- Color PRF
- Exam Type
- Field of View (Scan Angle); 2D Steering Angle for linear array transducers
- Focus
- Zoom
- Frame Rate
- Freeze
- Image Depth
- Imaging Mode
- Multi-Frequency
- Power On/Off
- Image presets
- THI
- Resolution/Speed
- Simultaneous/Update
- Transducer

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 are in accordance with IEC 60601-2-37.

	Maximum Temperature	
Transducer	**TMM**	**Still Air**
5C1*	42.6°C	37.4°C
6C1*	41.3°C	39.2°C
7C2	42.5°C	40.9°C
12L3	38.9°C	42.1°C
11L4	39.7°C	38.7°C
13L4	41.7°C	36.7°C
14L4*	42.7°C	41.4°C
16L4	40.0°C	39.4°C
18H5	39.8°C	41.4°C
11M3	41.1°C	40.5°C
5P1	42.0°C	44.7°C
8V4	41.3°C	39.5°C
10V4	41.7°C	40.0°C
5VT	41.5°C	31.5°C
9MC3	42.3°C	40.3°C
10MC3	42.5°C	39.7°C
8VC3	40.1°C	43.5°C
9VE3*	42.5°C	37.2°C
CW2	35.3°C	40.1°C
CW5	34.8°C	31.9°C
CW8	38.3°C	31.2°C

TMM = Tissue Mimicking Material
An asterisk (*) indicates the maximum surface temperature of a transducer is from a testing laboratory approved by Underwriters Laboratories (UL).

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 that the circuit breaker on the ultrasound system (mains switch) will disconnect the power supply in the event of a short circuit.

⚠ **WARNING:** For systems used in the U.S.A.: To ensure grounding reliability, only plug the system into 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:** To avoid electrical shock and damage to the control panel resulting from ingress of liquid, place the gel and gel warmer on the side of the system closest to the patient.

⚠ **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."

The Type BF icon is 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.

The Type CF defibrillation proof icon is located on the ECG module.

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 supports three on-board documentation devices. 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.

Barcode Reader

⚠ **WARNING:** To avoid electrical shock, do not connect the barcode reader to the system when more than two on-board documentation devices are connected to the system.

⚠ **WARNING:** Do not stare into the beam of the barcode reader. This action can create a risk for injury to the user.

You can connect a Siemens Healthineers-approved barcode reader directly to a USB port on the ultrasound system. The barcode reader provides direct entry of patient information in the registration form, for example, patient name, patient identifier, or physician identifier.

Important Information for Maintaining Data Integrity

⚠ **WARNING:** To prevent the loss of data that results from unplugging the system from the supply mains (power source) 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 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 an external media, for example, a USB storage device.
- 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, hard disk failure, CPU failure, system lockup, and other similar causes.
- Should an abnormal system shutdown occur, retrieval of data not saved to the hard disk or not archived to an external recording 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 hard disk to detect and segregate any truncated or corrupted files.

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 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, p. 2-32

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 additional information about a list of disinfectants for transducer, refer to Chapter 6 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.

  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 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.

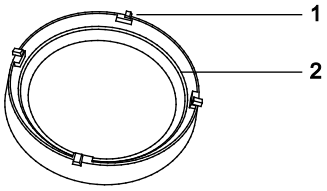
System Surfaces

See also: For instructions on removing and installing transducer holders and the gel warmer, refer to Chapter 3 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 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 surface 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 verify the transducer identification and indicated frequency are correct for the active transducer.
Clean and disinfect the holders for transducers and gel	1. Remove the holder from the ultrasound system. 2. Clean the holder under running water, using a mild detergent and dry with a lint-free cloth. 3. Use an approved disinfectant wipe to disinfect the holder. 4. Reattach the holder to the ultrasound system.

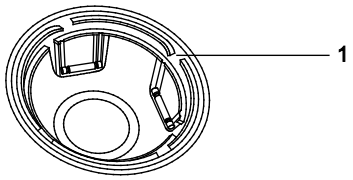
To	Do This
Clean and disinfect the rear basket or storage bin	**See also:** For information about removing and attaching the rear basket or storage bin, refer to Chapter 3 in this manual 1. Remove the rear basket or storage bin from the ultrasound system. 2. Use a clean gauze pad or lint-free cloth, lightly moistened with a mild detergent, to wipe the basket and the point of attachment on the ultrasound system. 3. After cleaning, use a clean, lint-free cloth to dry the basket or storage bin and the point of attachment on the ultrasound system. 4. As required, use an approved disinfectant wipe to disinfect the basket and the point of attachment on the ultrasound system. 5. Reattach the rear basket or storage bin to the ultrasound system.
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.

To	Do This
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 Tab for inserting into the trackball assembly
2 Raised markings on either side of the ring



Example trackball assembly.

1 Point of attachment for the trackball ring

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 ridges 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 components, except for the monitor screen, touch screen, and 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	All other ultrasound system surfaces*
Acrylan	✓	✓	✓	✓	✓
ANIOS OXI'ZYME	✓	✓	✓	✓	✓
ANIOXY-TWIN	✓	✓	✓	✓	✓
ANIOXYDE 1000	✓	✓	✓	✓	✓
ANIOXYDE 1000 LD	✓	✓	✓	✓	✓
antifect N liquid	✓	✓	✓	✓	✓
AZO 70% IPA Wipes & Spray	✓	✓	✓	✓	✓
AzoMax wipes & spray	✓	✓	✓	✓	✓
Azo Universal Cleaning and Disinfectant Wipes	✓	✓	✓	✓	✓
Bacillol 30 Tissues & Foam	✓	✓	✓	✓	✓
Bacillol AF	✓	✓	✓	✓	✓
Bacillol Tissues	✓	✓	✓	✓	✓
Bacillol Wipes	✓	✓	✓	✓	✓
CaviCide	✓	✓	✓	✓	✓
CaviCide1	✓	✓	✓	✓	✓
CaviWipes	✓	✓	✓	✓	✓
CaviWipes 1	✓	✓	✓	✓	✓
CaviWipes 2.0	✓	✓	✓	✓	✓
CLEANISEPT WIPES	✓	✓	✓	✓	✓
CLEANISEPT WIPES forte	✓	✓	✓	✓	✓
Clinell Clorox Wipes	✓	✓	✓	✓	✓
Clinell Universal Wipes & Spray	✓	✓	✓	✓	✓
Clorox Healthcare Bleach Germicidal Cleaner	✓	✓	✓	✓	✓
Clorox Healthcare Bleach Germicidal Wipes	✓	✓	✓	✓	✓
Clorox Healthcare Fuzion Cleaner Disinfectant	✓	✓	✓	✓	✓
Clorox Healthcare Hydrogen Peroxide Cleaner Disinfectant	✓	✓	✓	✓	✓
Clorox Healthcare VersaSure Cleaner Disinfectant Wipes	NA	✓	✓	NA	✓

	Monitor Screen	Touch Screen	Trackball Assembly	Gel Warmer	All other ultrasound system surfaces*
Dispatch	✓	✓	✓	✓	✓
Easy Screen Cleaning Wipe	✓	✓	✓	✓	✓
Ecolab Quaternary Disinfectant Wipes	✓	✓	✓	✓	✓
ESCULASE	✓	✓	✓	✓	✓
gigasept PAA concentrate	✓	✓	✓	✓	✓
gigasept pearls	✓	✓	✓	✓	✓
HospiCare 3525S Disinfectant Wipes	✓	✓	✓	✓	✓
HospiCare 60R Multi-surface Wipes	✓	✓	✓	✓	✓
Incidin OxyFoam S	✓	✓	✓	✓	✓
Incidin OxyWipe	✓	✓	✓	✓	✓
Incidin OxyWipe S	✓	✓	✓	✓	✓
INTERCEPT Detergent	✓	✓	✓	✓	✓
Meliseptol Wipes sensitive	✓	✓	✓	✓	✓
Micro-Kill Bleach Germicidal Bleach Wipes	✓	✓	✓	✓	✓
Mikrobac Tissues	✓	✓	✓	✓	✓
mikrozid AF wipes & liquid	✓	✓	✓	✓	✓
mikrozid PAA wipes	✓	✓	✓	✓	✓
mikrozid sensitive wipes & liquid	✓	✓	✓	✓	✓
mikrozid universal wipes & liquid	✓	✓	✓	✓	✓
Oxivir Tb	✓	✓	✓	✓	✓
PHAGO'SPORE & PHAGO'WIPES SPORE	✓	✓	✓	✓	✓
Protex Disinfectant Spray and Wipes	✓	✓	✓	✓	✓
Protex ULTRA Disinfectant Wipes	✓	✓	✓	✓	✓
RAPICIDE PA	✓	✓	✓	✓	✓
Rely+On PeraSafe	✓	✓	✓	✓	✓
Reynard IPA Surface Disinfection Wipes	✓	✓	✓	✓	✓
Reynard Premier Detergent & Disinfectant Wipes	✓	✓	✓	✓	✓

	Monitor Screen	Touch Screen	Trackball Assembly	Gel Warmer	All other ultrasound system surfaces*
Sani-Cloth 70% Wipes	✓	✓	✓	✓	✓
Sani-Cloth Active Wipes	✓	✓	✓	✓	✓
Sani-Cloth AF Universal Wipes	✓	✓	✓	✓	✓
Sani-Cloth AF3 Germicidal Disposable Wipes	✓	✓	✓	✓	✓
Sani-Cloth Bleach Germicidal Disposable Wipe	✓	✓	✓	✓	✓
Sani-Cloth Chlor Wipes	✓	✓	✓	✓	✓
Sani-Cloth HB Germicidal Disposable Wipe	✓	✓	✓	✓	✓
Sani-Cloth Plus Germicidal Disposable Cloth	✓	✓	✓	✓	✓
Sani-Cloth Prime Germicidal Disposable Wipes	✓	✓	✓	✓	✓
Septiwipes	✓	✓	✓	✓	✓
SideKick Disinfecting Wipes	✓	✓	✓	✓	✓
SONO Ultrasound Wipes	✓	✓	✓	✓	✓
Super Sani-Cloth Germicidal Disposable Wipe	✓	✓	✓	✓	✓
SURFA'SAFE Premium	✓	✓	✓	✓	✓
Transeptic	✓	✓	✓	✓	✓
Tristel Duo ULT	✓	✓	✓	✓	✓
Tristel Solo for Ultrasound	✓	✓	✓	✓	✓
trophon Companion Cleaning Wipes	✓	✓	✓	✓	✓
Tuffie 5 Universal Sanitising Wipes	NA	✓	NA	NA	NA
Virex II 256	✓	✓	✓	✓	✓
Wet Wipe Ethanol Disinfection with detergent	✓	✓	✓	✓	✓
WIP'ANIOS Excel	✓	✓	✓	✓	✓
WipeClean Ethanol Disinfection 80%	✓	✓	✓	✓	✓

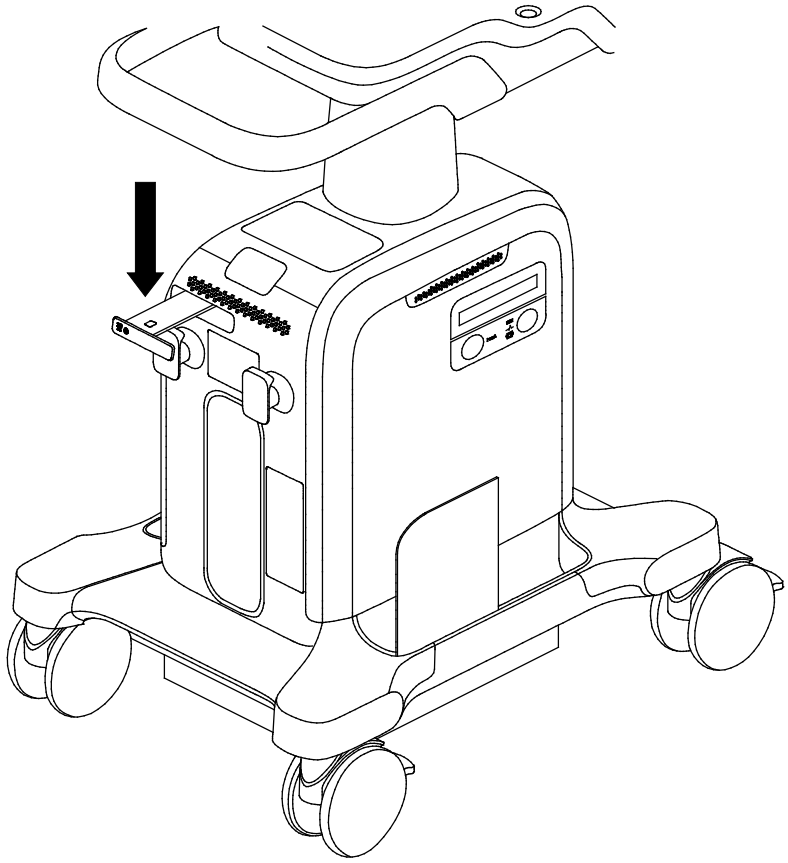
*All other ultrasound system surfaces include the surfaces not listed in the above table and also include the storage bin and transducer holders.

✓ = approved

NA = not approved

Cleaning the Air Filter

The ultrasound system has a removable, washable air filter. Check and clean the air filters 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 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 tray with running water and allow the filter to completely dry.

   To hasten drying, you may gently shake the air filter tray, 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.

Caring for Batteries

⚠ **WARNING:** Do not strike or drop batteries, allow batteries to contact water or other fluids, disassemble batteries, allow conductive object to contact a battery's terminals, cause a battery to become short circuited, heat batteries, or expose batteries to fire. Any of these actions can compromise the structural integrity of a battery. Compromising the structural integrity of a battery can result in battery leakage, heat generation, fire, or explosion, causing possible personal injury.

⚠ **WARNING:** Do not use a battery if it leaks fluid or has changed shape. If skin or clothing comes in contact with fluid from the battery, thoroughly wash the area immediately with clean water. If any fluid comes in contact with a user's eyes, immediately flush their eyes with water and seek medical attention.

⚠ **WARNING:** Replace batteries with the same or equivalent type. Use of incompatible batteries can result in battery leakage, heat generation, fire, or explosion, causing possible personal injury.

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

⚠ **WARNING:** Do not attempt to recharge non-rechargeable batteries, such as the batteries included on printed circuit boards. Recycle non-rechargeable batteries according to local, state, and regional laws and regulations.

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.

Hazardous Substances

The 54.5 cm (21.5 inch) flat panel display monitor does not contain mercury.

Recycling Batteries

⚠ **WARNING:** Never dispose of batteries by burning or by flushing into any waste water system, for example, a lavatory. Compromising the structural integrity of a battery can result in leakage or explosion and the potential for personal injury.

⚠ **WARNING:** Do not throw batteries into the trash. Collect and recycle used batteries separate from other waste.

Recycle batteries according to local, state, and regional laws and regulations. Use a battery collection program available in your country to recycle batteries.

To the extent required by local, state, and regional laws and regulations, Siemens Healthineers will collect and recycle batteries for this product at no charge. Contact your local Siemens Healthineers representative for battery shipment instructions.

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 Disposing 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
Bracket for needle guides	(Available only for the reusable bracket) 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 protective 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.
Air filter tray	**See also:** Cleaning the Air Filter, p. 2-32 The air filter tray is reusable. Replace the air filter tray 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 tray slot.

Energy Efficient Usage: Energy Conservation

See also: For information about the QuikStart feature and supplying power to the ultrasound system, refer to Chapter 3 in this manual.

For moderate energy conservation when the ultrasound system is not in use, activate system standby.

For improved energy conservation 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 (**I** = ON).

For maximum energy conservation when the ultrasound system is in storage, power off and unplug the system from the power supply (supply mains). Ensure the circuit breaker (mains switch) on the ultrasound system is in the off position (O = OFF). Implementing maximum energy conversation for long periods of time can shorten the life of the system batteries.

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Initial Setup

⚠ **WARNING:** Do not tip the system in any direction more than 10 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 Startup

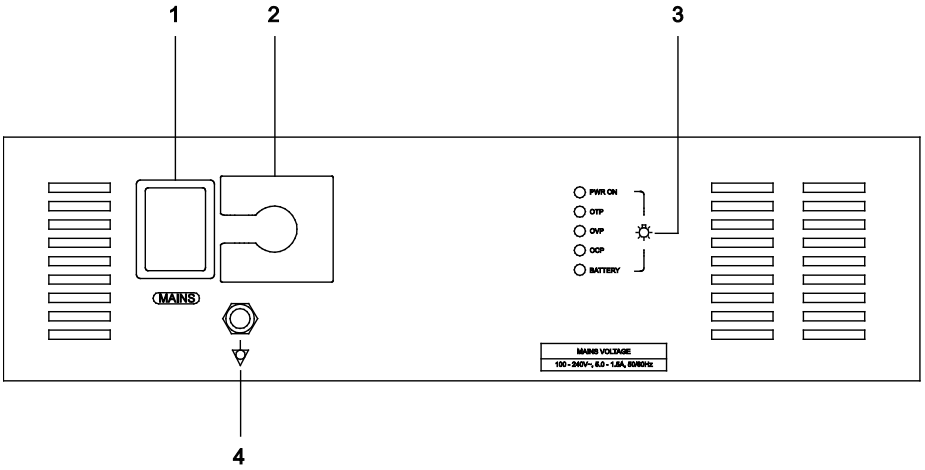
⚠ **WARNING:** Operating the ultrasound system in close proximity to other equipment can cause reciprocal interference. You should observe and ensure normal operation of the ultrasound system and other equipment.

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

Plugging in the Ultrasound System

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

The ultrasound system has a non-detachable power cord.



Example of power supply unit on the ultrasound system.

1 Mains switch
2 Connector cover for power cord
3 Status indicator lights for service diagnostics
4 Equipotential terminal

To plug in the ultrasound system:

- 200V~ to 240V~ systems: plug the power cord into a standard power supply outlet (mains outlet). For example, a "Schuko" outlet (CEE 7/7 standard).
- 100V~ to 120V~ systems used in the U.S.A.: plug the power cord into a hospital-grade power supply outlet (mains outlet).
- 100V~ to 120V~ systems outside the U.S.A.: plug the power cord into a standard power supply outlet (mains outlet).

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
Blue	Powered on
Amber	Standby
Off (not lit)	Powered off

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

To power on and off the ultrasound system:

⚠ **Caution:** Wait approximately 20 seconds between powering the system off and then on again. This allows the system to complete its shutdown sequence.

Note: You cannot shut down and restart the ultrasound system when the battery support feature is activated.

1. To power on the system, press the partial power on/off control.
2. Visually check the on-screen displays and lighting as indicated in the daily checklist before using the ultrasound system.

   See also: Refer to the daily checklist in Chapter 2 in this manual.

3. To power off the system, press the partial power on/off control.
   - If you configured the system to display a confirmation message, click Shutdown.
   - To cancel the shutdown, click **Close**.

To completely disconnect the ultrasound system from the power supply (supply mains):

1. Power off and unplug the ultrasound system from the power supply.
2. Ensure the circuit breaker on the ultrasound system (mains switch) is in the off position (O = OFF).

Activating System Standby

System standby decreases the time to power off and on the ultrasound system.

The ultrasound system preserves patient data when in system standby. To avoid the possibility of data loss, close the current patient study, activate 2D-mode, and wait until the system finishes writing data to external storage media before activating system standby.

Use the configuration settings to close the current study when system standby is activated.

System standby is not available during video playback or use of an application. Examples of applications include: Stress Echo and SieScape.

To activate system standby:

1. Briefly press the partial power on/off control.
2. Click **Standby** and wait approximately 15 seconds for the standby feature to activate.
3. To power on the ultrasound system, press the partial power on/off control.
   The system is ready for use in less than 15 seconds.

Activating QuikStart (Battery-Powered System Standby)

Activate system standby and power on the ultrasound system using the battery-powered QuikStart feature during a portable exam. When the system is disconnected from the power supply outlet, the available standby time is dependent on the installed battery pack.

- Battery packs only for QuikStart: approximately 50 minutes
- Battery packs for both QuikStart and battery support: approximately 180 minutes

The status of the battery charge is indicated by the lighting of the power on/off control.

Illumination of the Control	Battery Status
Steady amber	More than 60% charge remaining
Flashing amber (slow)	More than 50% charge remaining
Flashing amber (fast)	Battery power is low
Flashing amber (fast) with audible beep	Battery power is very low. If the ultrasound system is not plugged into the power supply outlet, the system shuts down within 5 minutes.

To activate QuikStart:

1. Briefly press the partial power on/off control.
2. Click **Standby**.
3. Wait approximately 15 seconds and then unplug the ultrasound system from the power supply outlet (mains outlet).

   The ultrasound system activates the standby feature.
4. Plug the power cord into a power supply outlet (mains outlet).
5. To power on the ultrasound system, press the partial power on/off control.

Activating the Battery Support Feature

Use the battery support feature to scan a patient when the ultrasound system is unplugged from the power supply outlet and powered by the battery pack. The fully charged battery pack provides a maximum of 60 minutes of operation during 2D imaging without use of any documentation devices or accessories installed on the ultrasound system.

The battery support feature is not recommended for use during biopsy, stress echo, contrast, and 3D/4D volume imaging, or during intraoperative, transesophageal, or endocavity scanning.

Note: Perform the following tasks only when the ultrasound system is connected to the power supply outlet: installing system software or software updates, backing up or restoring configuration settings, and backing up or restoring patient data.

The ultrasound system displays icons and on-screen messages to indicate the level of battery pack charge, the recharging status of the battery, and any errors about the battery.

The number of bars on the on-screen icon indicates the level of battery pack charge. The color of the icon changes to yellow or red and the ultrasound system emits an audible beep when the battery reaches a low level of charge or is fully discharged. A power cord on the icon is visible when the ultrasound system is plugged into a power supply outlet and recharging the battery pack.

Example of the icon depicting a partially charged battery pack.

Example of the icon when the system is using power from the battery pack.

The capacity of a rechargeable battery degrades with use and over time. Expect an approximate 20% reduction in the original capacity after 200 full cycles of charging and discharging the battery. For more information on replacing the battery, contact your customer service representative.

To activate and use the battery support feature:

Note: You cannot shut down and restart the ultrasound system when the battery support feature is activated.

1. Plug the ultrasound system's power cord into a power supply outlet (mains outlet).
2. Power on the ultrasound system and wait approximately for 210 minutes to fully charge the battery pack.

   Note: A battery pack can require approximately 210 minutes to fully charge at 25°C; however, the time required to fully charge a battery pack is dependent upon the existing battery pack charge and environmental factors, such as temperature and humidity. Expect an increase in the time to recharge a battery pack if the ultrasound system is not used daily or improperly shuts down. The capacity of a battery pack degrades over time and with use.

   The following on-screen icon indicates a fully charged battery pack. The ultrasound system is plugged into a power supply outlet.

3. Unplug the ultrasound system from the power supply outlet (mains outlet) to provide power to the ultrasound system from the battery pack.

   The following on-screen icon indicates a fully charged battery pack. The ultrasound system is unplugged from the power supply outlet and is using battery power.

4. Observe the status of the battery charge indicated by the battery icon on the image screen during system use.

   The following on-screen icon indicates a critically low level of battery charge.

Troubleshooting On-Screen Messages

Follow the instructions included in the on-screen messages if the battery reaches a low battery level or exceeds the acceptable thermal limit.

Message	Displays when	Recommended Action
The system is out of battery. Connect the AC power.	The remaining level of battery charge is approximately 30%.	1. Observe the level of battery charge indicated by the on-screen icon during use of the ultrasound system. 2. Plug the power cord of the ultrasound system into the power supply outlet.
The system is out of battery. Connect the AC power. Or, the system will shut down in a few minutes.	The remaining level of battery charge is approximately 15%. The ultrasound system emits an audible beep.	1. Observe the level of battery charge indicated by the on-screen icon during use of the ultrasound system. A red icon blinks indicating the remaining battery charge is approaching a critically low level. 2. Immediately plug the power cord of the ultrasound system into the power supply outlet.
The system will shut down in a few seconds.	The remaining level of battery charge is approximately 0%. The ultrasound system emits an audible beep and can shut down within seconds.	1. Wait until the ultrasound system completely shuts down. 2. Plug the power cord of the ultrasound system into the power supply outlet to recharge the battery pack.
The battery is overheated. Wait until the battery temperature reaches a normal operation level with the AC power connected.	The battery temperature exceeds the normal operation temperature limit.	**Note:** Do not unplug the power cord of the ultrasound system from the power supply outlet. 1. Stop using the ultrasound system when the battery pack is overheated and the ultrasound system displays the following on-screen icon. 2. Wait until the ultrasound system removes the exclamation mark (!) from the on-screen icon and then continue to use the ultrasound system.

Recalibrating the Battery Pack

Recalibrate the battery pack every 180 days to maintain optimal battery performance. The ultrasound system is not available for use during the recalibration process. Battery recalibration requires several hours. Prior to recalibrating the battery pack, consult with your customer service representative.

To recalibrate the battery pack:

1. Plug the ultrasound system's power cord into a power supply outlet (mains outlet).
2. Power on the ultrasound system and wait approximately for 210 minutes to fully charge the battery pack.

   Note: A battery pack can require approximately 210 minutes to fully charge at 25°C; however, the time required to fully charge a battery pack is dependent upon the existing battery pack charge and environmental factors, such as temperature and humidity. Expect an increase in the time to recharge a battery pack if the ultrasound system is not used daily or improperly shuts down. The capacity of a battery pack degrades over time and with use.

   The following on-screen icon indicates a fully charged battery pack.

3. Do not use the ultrasound system for an additional two hours and then unplug the ultrasound system from the power supply outlet.
4. Wait until the battery pack is completely discharged and the ultrasound system shuts down.

   The following on-screen icon indicates a completely discharged battery pack.

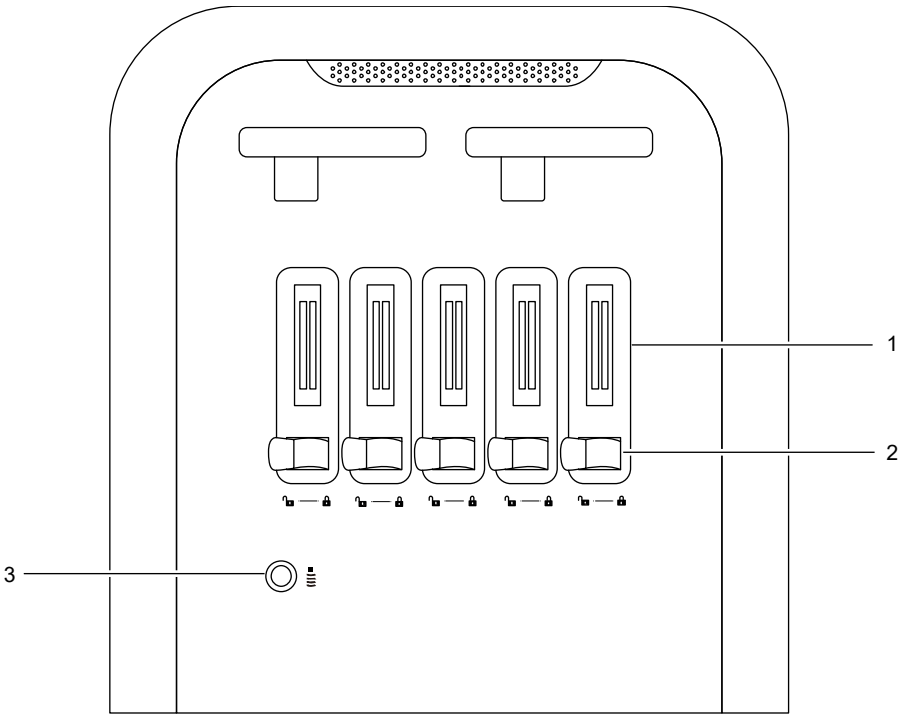
5. Do not use the ultrasound system for an additional two hours.
6. Repeat steps 1 and 2 to fully recharge the depleted battery pack.

Connecting and Disconnecting Transducers

⚠ **Caution:** You must freeze the system before connecting or disconnecting a transducer. If a transducer is disconnected before the image is frozen, the system will display an error message, and it will be necessary to reset the system before continued use.

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

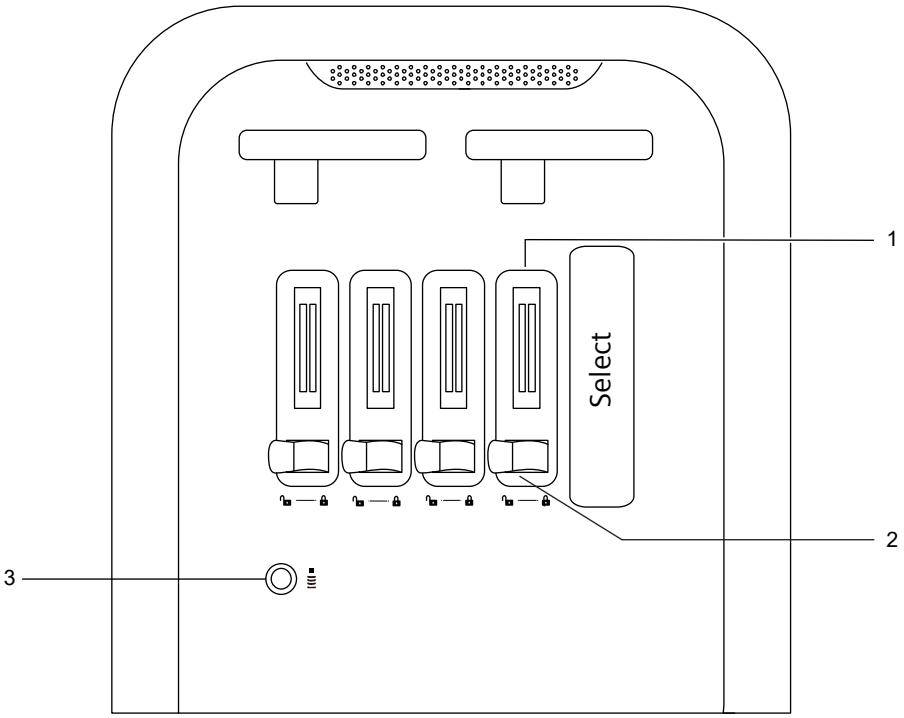
ACUSON Juniper System



Example of transducer ports.

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

ACUSON Juniper Select System



Example of transducer ports.

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

Array Transducers

When array transducer connectors 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.

To connect an array transducer:

1. Make sure the locking lever below the transducer port is in the unlocked position.

2. Insert the transducer connector into the port, taking care to align the connector for a smooth fit.
3. Push the locking lever to the locked position.

The system detects the transducer and displays the transducer name on the image screen and touch screen.

To disconnect an array transducer:

1. Push the locking lever to the unlocked position.

2. Firmly grasp the transducer connector and carefully pull it straight out from the transducer port.

See also: For information on cleaning, disinfecting, and storing transducers, refer to Chapter 6 in this manual.

Continuous Wave Transducers

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

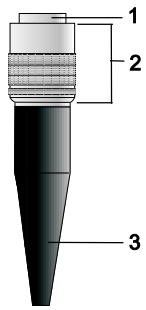
To connect a continuous wave transducer:

1. Align the connector key until the connector fits smoothly into the receptacle.
2. Insert the connector into the 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 6 in this manual.



1 Connector
2 Retractable connector housing
3 Transducer cable

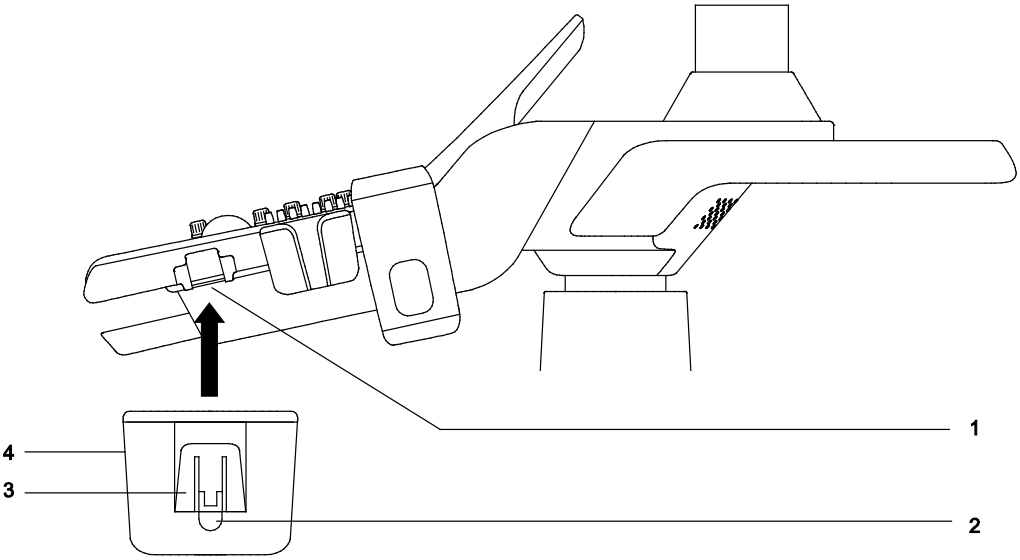
Example of the connector on a continuous wave transducer.

Protective Transducer Holders and Gel Holders

⚠ **Caution:** Transducer holders have variable sizes both in depth and diameter. To avoid transducer damage, you must use the holder and/or 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 standard-size and large-size gel bottles.

The transducers holders are interchangeable and replaceable.



Example of transducer holders.

1 Point of attachment
2 Tab
3 Support
4 Holder

Note: The gel holder for the large bottle uses the same point of attachment as the transducer holders.

To install a holder:

1. Press the tab against the holder.
2. Align the support on the holder with the attachment slot on the system and slide the holder upward until it snaps into place.

To remove a holder:

1. Locate the tab underneath the holder.
2. Press the tab against the holder and pull the holder downward.

Transducer Cable Management

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

After you connect and secure a transducer, drape the transducer cable through one of the cable hooks located on the ultrasound system. These hooks 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.

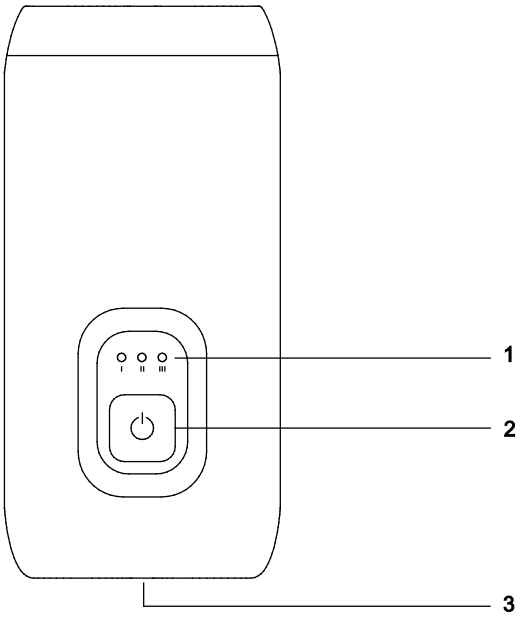
Gel Warmer

⚠ **WARNING:** To avoid electrical shock and damage to the control panel resulting from ingress of liquid, place the gel bottle and gel warmer on the side of the ultrasound system closest to the patient.

⚠ **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.

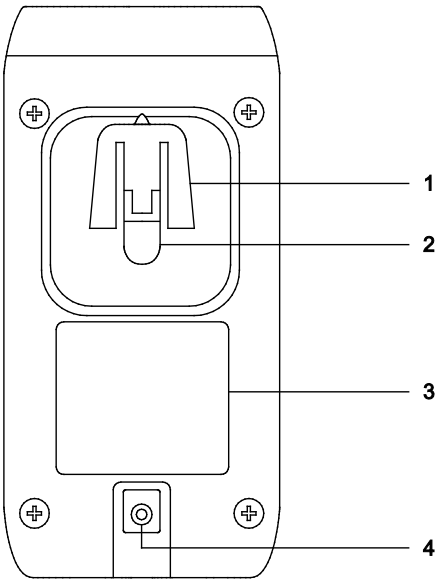
See also: For information on cleaning and disinfecting the gel warmer, refer to Chapter 6 in this manual.

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
2 Control for power and temperature
3 Cap for the inverted gel bottle



Example of the gel warmer, back view.

1 Support
2 Tab
3 Label
4 Power cable connector

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.
   a. Reach under the holder to locate the tab on the holder. The tab extends below the point of attachment to the ultrasound system.
   b. Squeeze the tab towards the holder and pull the holder downward.
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 ultrasound system.
   b. Align the support on the gel warmer directly below the point of attachment on the ultrasound system and firmly push upwards until the gel warmer snaps into place.

To use the gel warmer:

1. Press the control on the front of the gel warmer to power on the gel warmer, if necessary.

   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 control on the front of the gel warmer to adjust the temperature of the gel warmer.

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

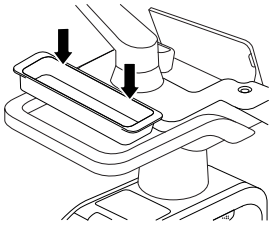
3. Invert the bottle of gel, and insert the bottle into the gel warmer.

Installing the Storage Container

You can attach or remove the basket or storage bin on the system.

To install the basket on the ultrasound system:

1. Attach the basket on the rear handle of the system.

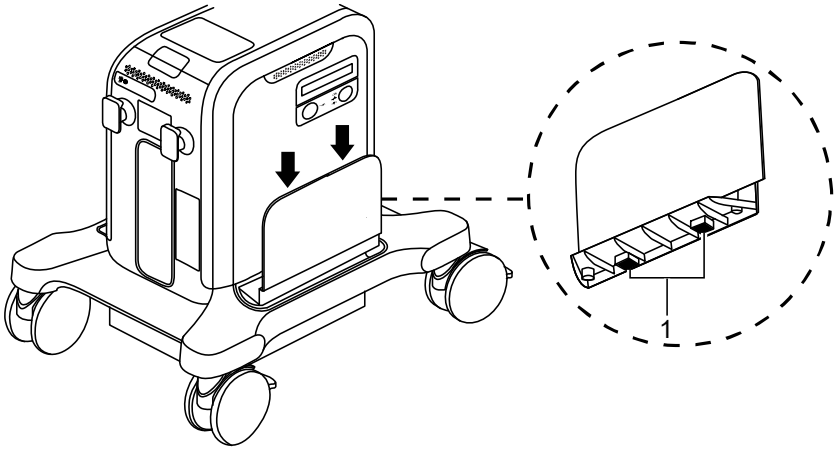


Example of attaching the basket on the rear handle.

2. To remove the basket from the system, gently lift the basket vertically from the rear handle.

To install the storage bin on the ultrasound system:

1. Attach the storage bin on either the right side or left side of the system.
   An audible click indicates the storage bin is properly attached to the system.



Example of attaching the storage bin on the side of the system.

1 Magnets at the bottom of the storage bin for attachment to the system

2. To remove the storage bin from the system, gently lift the storage bin vertically from the system.

Adjusting the Audio Volume

You can adjust the Doppler volume and adjust the volume of audible tones (beeps) that confirm key presses and store functions.

Use the configuration settings to adjust the audio volume and enable or disable confirmation beeps.

To adjust the volume settings:

Prerequisite: Assign adjustment of the volume to the touch screen controls in the configuration settings.

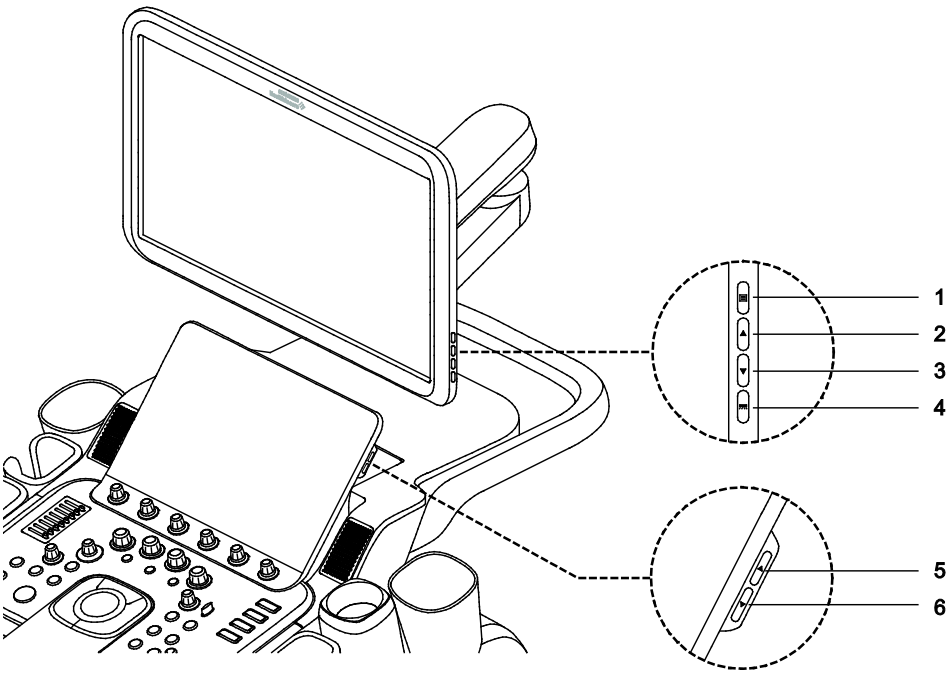
1. Rotate **[Volume]**.
2. To mute the volume, tap **Mute** or rotate **[Volume]** to turn off the volume.

Adjusting the Screen Brightness

You can increase or decrease the brightness of the touch screen and adjust settings on the monitor for the image screen. Make adjustments to the brightness and contrast of the monitor before adjusting the print quality of installed documentation devices.

Note: Factory-defined imaging presets were created using default settings for the brightness of the monitor. Adjusting the brightness on the monitor may affect the image optimization intended by the factory-defined image presets.

Note: The language setting on the monitor menu is separate from the language setting of the ultrasound system.



Example of monitor and touch screen controls.

1 accesses the menu for the monitor
2 ▲ adjusts settings on the monitor
3 ▼ adjusts settings on the monitor
4 accesses brightness settings for the lamp brightness
5 ▲ increases brightness of the touch screen
6 ▼ decreases brightness of the touch screen

To adjust the brightness of the monitor:

1. Press the monitor menu control.

2. Press the up or down controls to adjust the setting.

   ▲▼

   Note: To restore the default contrast setting, simultaneously press the up and down controls.

3. To exit the menu, press the monitor menu control.

To adjust the brightness of the touch screen:

- Press the up or down controls to adjust the setting.

  ▲▼

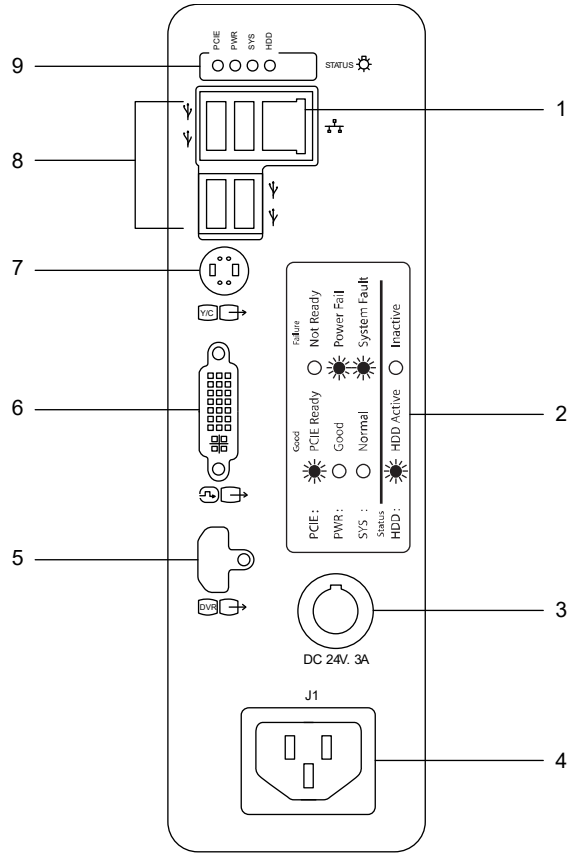
Input/Output Connections

⚠ **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.

Network, audio, and video connections are located on the input/output panel.



1 Ethernet network port
2 Input/output service status label
3 Black and white printer port
4 Accessory Power Outlet
5 Accessory outlet information
6 HDMI output (for DVR)
7 DVI output
8 S-Video output
9 USB ports
10 Status indicator light for service diagnostics

Example of input/output panel.

Connecting Peripheral Equipment and Accessories

⚠ **WARNING:** Equipment connected to the ultrasound system and in the patient environment must be powered from a medically-isolated power supply outlet (mains outlet) 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.

Connect peripheral devices and accessories to the USB ports located on the ultrasound system. For example, you can connect a medical grade printer, a medical grade DVR, or a USB storage device to the ultrasound system.

Use the configuration settings for the ultrasound system to add a printer to the list of devices recognized by the ultrasound system.

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 supply unit (PSU) 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 connector. 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 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.

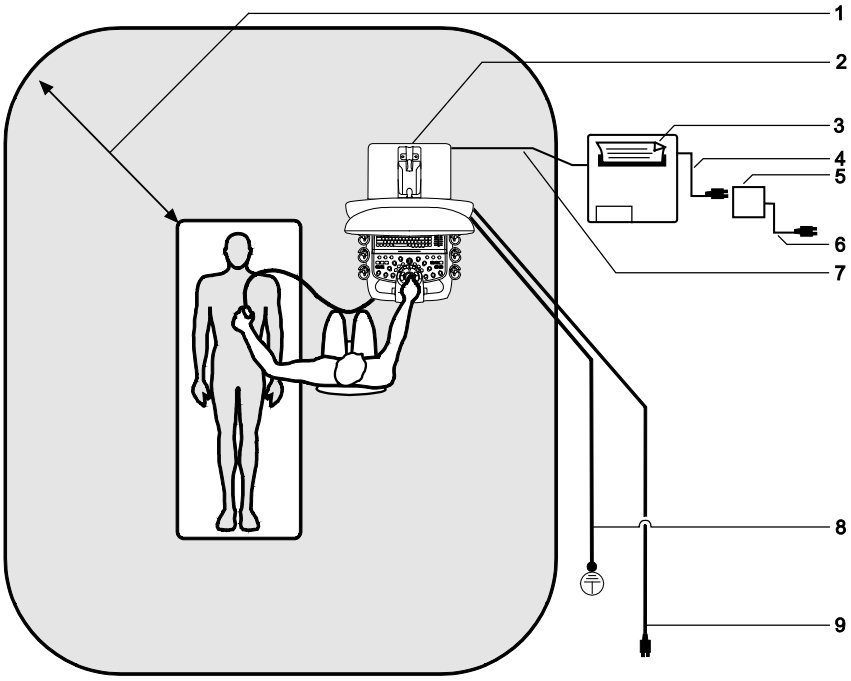
To connect a peripheral device to the ultrasound system:

1. Insert the connector from the peripheral device into the appropriate port on the input/output panel.

   Note: If a printer is not recognized by your ultrasound system, use the configuration settings for the ultrasound system to add a printer to the list of recognized devices.

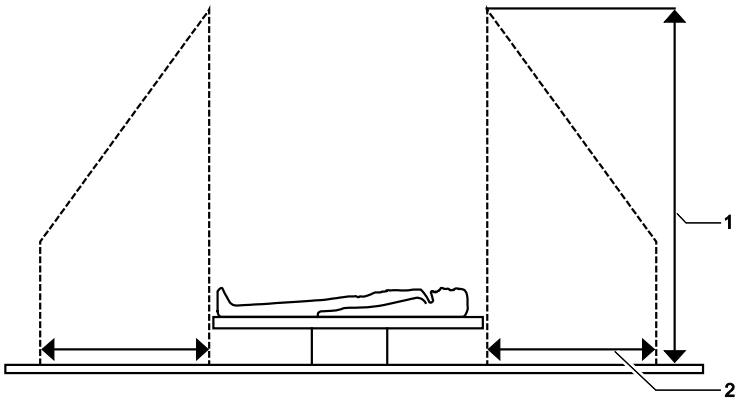
2. Observe the peripheral equipment connections and patient environment shown in the following diagrams to support the normal operation of the ultrasound system.

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



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.



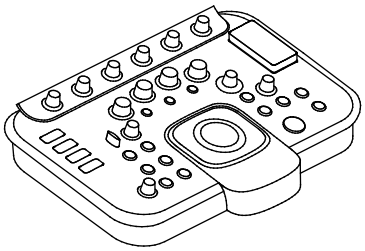
Example of a peripheral equipment connection and patient environment.

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

Protective Overlay

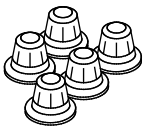
To install the protective overlay on the control panel:

1. Cover the control panel with the protective overlay.

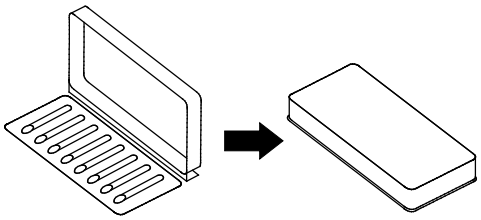


Example of overlay for the control panel.

2. Place the following protective overlays over the controls.



Example of overlays for rotary controls.



Example of overlay for the depth gain compensation controls.

3. Cover the touch screen with the protective overlay.

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.

Wired Connection

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

Prerequisite: The network administrator has configured the required wired connection on the ultrasound system.

1. Connect the network cable to the Ethernet port located on the input/output panel.
2. Connect the network cable to the hospital or clinic network port.

   If the ultrasound system is connected to a wired network, the ultrasound system disconnects from the wireless network. The system then connects to the LAN through the wired connection and displays an icon in the system status bar indicating a wired connection.

   Example of the icon indicating a wired connection.

Wireless Network Connections

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

The ultrasound system displays an icon indicating the status and signal strength of the wireless network in the system status bar.

Icon	Description
	Indicates the signal strength of the wireless network.
	Indicates the wireless network is not transmitting a signal. Use the configuration settings to enable connections to a wireless network.

Use of Wireless Adapters

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

⚠ **WARNING:** To prevent the loss of data over a wireless network and to avoid damaging the ultrasound system, never use a wireless adapter not recommended by Siemens Healthineers.

For information on the transmission and reception frequencies used by the wireless adapter, refer to the manufacturer's operating instructions included with the wireless adapter.

You must abide by the regulatory requirements of your country to use a wireless adapter. Refer to the manufacturer's operating instructions for information regarding certified use of the wireless adapter in your country.

For information on the compatible wireless adapters, contact your customer service representative.

Virtual Communication for Remote Assistance

(Available only for ultrasound systems with the service option for remote assistance)

⚠ **WARNING:** To maintain patient confidentiality, do not use the camera and headset within the patient environment. You must remove the camera from the ultrasound system after the conclusion of a remote service session.

You can use the optional camera and headset from Siemens Healthineers for virtual communication with a Siemens Healthineers service representative.

To begin a remote service session:

Note: If the camera attachment is not installed on the ultrasound system, inform your service representative.

1. Locate the camera and headset for use with the ultrasound system.
2. Initiate the remote assistance session using the phone number provided by your Siemens Healthineers service representative.
3. Follow the instructions provided by your Siemens Healthineers service representative to set up the session of virtual communication, including connections of the camera and headset.

   The following ports on the input/output panel of the ultrasound system are compatible with the camera and headset:

   – Only the USB ports on the input/output panel
4. Conclude the remote service session as directed by your representative.

   Note: If you do not disconnect from the remote service session, the session ends after 30 minutes of inactivity.
5. Disconnect the camera and headset from the ultrasound system and then store the camera and headset in a location designated by your department.

Moving the System

⚠ **WARNING:** Preparations before moving the ultrasound system are important to minimize potential damage to sensitive components and to avoid safety hazards. Review the moving instructions before moving the system.

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

⚠ **Caution:** 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.

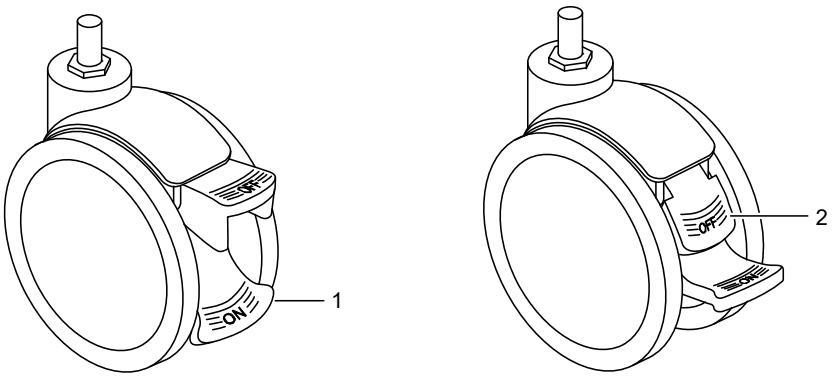
Securing the Wheel Locks

The ultrasound system has locking wheels. Use your foot to lock or unlock each wheel.

Wheels with a directional swivel lock are not available on all ultrasound system models.

See also: For information about each system model, refer to Appendix A in this manual.

Wheels without Swivel Locks



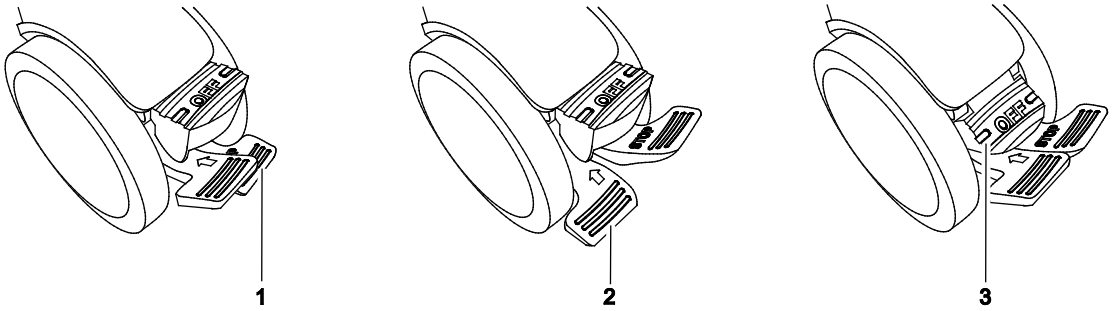
Example of a wheel with a locking lever and unlocking lever.

1 Locked wheel
The **ON** lever is in a downward position.
2 Unlocked wheel
The **OFF** lever is in a downward position.

To lock and unlock the wheels:

- To prevent the wheels from rolling, push downward on the **ON** levers.
- To unlock the wheels, push downward on the **OFF** levers.

Wheels with Swivel Locks



Example of a wheel with a locking lever, swivel lock lever, and unlocking lever.

1 Locked wheel
The **STOP** lever is in a downward position.
2 Swivel locked wheel
The arrow lever is in a downward position.
3 Unlocked wheel
The **OFF** lever is in a downward position.

To lock and unlock the wheels:

- To prevent the wheels from rolling and swiveling, push downward on the **STOP** levers.
- To prevent the wheels from swiveling, push downward on the arrow levers.
- To unlock the wheels, push downward on the **OFF** levers.

Before the Move

⚠ **WARNING:** To avoid damage to the monitor and the potential for personal injury to the user, ensure the monitor does not swivel during transport. Ensure the monitor is in the vertical, locked position prior to moving the ultrasound system according to the directions provided in this section.

⚠ **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.

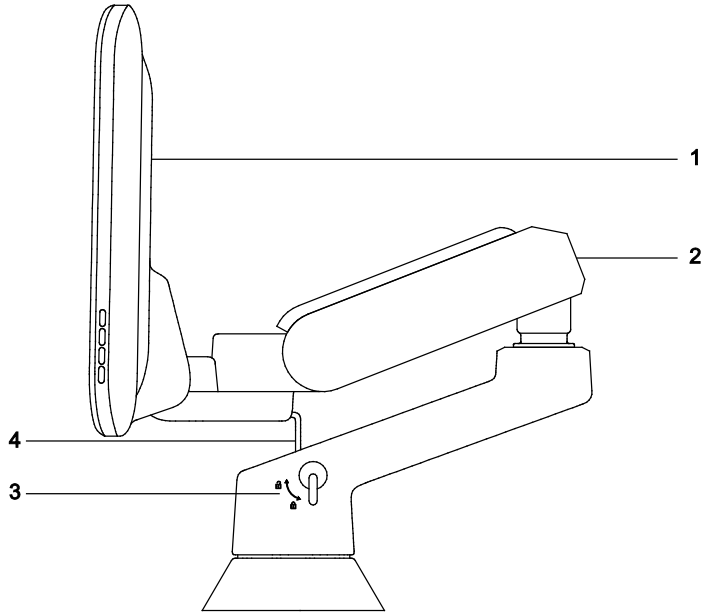
⚠ **Caution:** To prevent damage to the system during a move, retract or close any doors and trays on documentation devices or components on the ultrasound system. Ensure components do not protrude from the system.

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

ACUSON Juniper System

To prepare the ultrasound system for the move:

1. Power off the ultrasound system.
2. Unplug the power cord from the power supply 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.
6. Close any doors and trays on documentation devices or components on the ultrasound system and retract the keyboard, if necessary.
7. Transport gel and disk media separately.
8. Position and lock the monitor for transport:
   a. Align the monitor to the front, center of the ultrasound system.
   b. Rotate the transport lock into the locked position. Ensure the locking pin engages with the hole on the adjustable arm.



1 Flat panel monitor
2 Adjustable arm
3 Transport lock
4 Locking pin

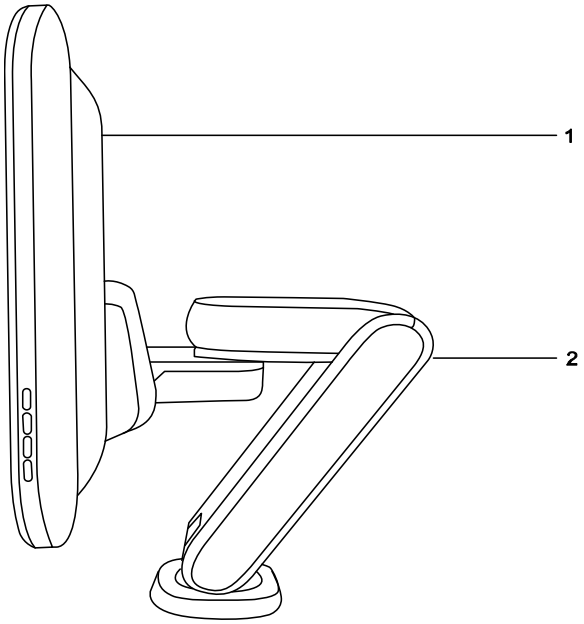
Example of monitor in vertical position for transport.

9. Unlock the front and rear wheels.

ACUSON Juniper Select System

To prepare the ultrasound system for the move:

1. Power off the ultrasound system.
2. Unplug the power cord from the power supply 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.
6. Close any doors and trays on documentation devices or components on the ultrasound system and retract the keyboard, if necessary.
7. Transport gel and disk media separately.
8. Align the monitor to the front, center of the ultrasound system.



1 Flat panel monitor
2 Adjustable arm

Example of monitor in vertical position for transport.

9. Unlock the front and 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:** For systems installed with an on-board documentation device located on the rear shelf of the ultrasound system, avoid damage to cables and connectors protruding from the documentation device, particularly when moving the system around corners or through doorways.

⚠ **Caution:** Do not move the ultrasound system by pushing on the monitor, touch screen, 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 or reposition 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 so the system to avoid shifting or movement 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: Make sure the system is not placed against walls or fabrics that obstruct perimeter air flow to the system cooling fans.
2. Lock the front and rear wheels.
3. Plug the power cord into a hospital-grade or local equivalent power supply outlet (mains outlet).
4. Reconnect devices to the system, including the network cable, off-board peripheral devices, system accessories, and transducers.
5. Power on the ultrasound system.

Shipping the Ultrasound System

You must prepare the system for shipment over long distances or 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.

Installing Software Updates

When the remote update handling feature is enabled on your ultrasound system, Siemens Healthineers can send a software update to the ultrasound system over a network connection. An installation message notifies you an update is available when you power on the system.

To install or defer software updates:

- Power on the ultrasound system.

  The system displays an installation message if a software update is available.

To	Do This
Install the software update	1. Ensure the ultrasound system is connected to the network. 2. Click **Yes**. **Note:** Do not power off the ultrasound system while the installation is in progress. The installation requires up to 40 minutes depending on the specific software update. The system restarts when the installation is complete.
Postpone installation of the software update	▪ Click **Defer**. **Note:** Siemens Healthineers recommends that you install a software update within five days after the update is available for installation.
View a description of the software update	▪ Click **Description**.

Installing System Software

You can install new system software or reinstall existing system software with or without keeping your user-defined settings and patient data.

Note: Siemens Healthineers recommends that you retain user-defined settings and patient data. Whether you retain or remove user-defined settings and patient data, you should make a backup copy of system configuration settings and user-defined exams before installing software.

See also: For information on storing and retrieving system configurations and user-defined exams, refer to Chapter 1 in the System Reference manual.

Use the configuration settings to verify the system software version.

To install the system software:

Prerequisite: If your system is not equipped with the retractable keyboard, connect a keyboard to the USB port. The touch screen keyboard is not available during software installation.

1. Connect the installation media to the USB port.
2. Briefly press the partial power on/off control.
3. Keep pressing and releasing **F11** on the keyboard until the system displays the window for BIOS password input.
4. Enter the BIOS password provided by your Siemens Healthineers representative and then press enter on the keyboard.

   The system displays the boot menu to select the installation media.
5. Select the installation media inserted and then press enter on the keyboard.

   The system displays the software installation window.
6. Specify the required settings for the software installation:
   - **Language** specifies the language for the operating system.
   - **Retain patient data** (available only for reinstallation) saves and restores the patient data even after installation.
   - **Retain user data** (available only for reinstallation) saves and restores the user-defined configuration settings even after installation.
7. Click **Apply** and then click **OK** when the system displays a confirmation message.

   The system restarts when installation is complete.

   Note: Do not power off the ultrasound system while the installation is in progress.
8. Remove the installation media from the USB port.

Installing a Software-Based Option

To install a software-based option:

1. Tap the configuration icon.

2. Tap **Service**.
3. Click **Service** to access the settings in the service software and then click **OK** to display the user-configurable settings.
4. Click **Configuration**.
5. Click **Licensing**.
6. Connect the installation media to the USB port.
7. Click **Select New License File**.
8. Click the license file in **Browse** or **History**.
9. Click **Save**.

   The software-based options are displayed in the **Available Features** section.

10. Click **Home**.

    The system displays a restart dialog box.

11. Click **OK**.

    The system restarts and confirms the installation of the options.

Activating Anti-Virus Protection

⚠ **Caution:** Enabling the anti-virus protection option in the configuration settings may slow down the system startup time. Although you can disable the option, we recommend using the ultrasound system with the option enabled to provide protection from security threats and vulnerabilities.

Use the configuration settings to enable or disable SolidCore anti-virus protection on the ultrasound system. SolidCore provides protection from security threats and vulnerabilities by preventing the installation or activation of all unauthorized executable files and Whitelisting trusted applications.

To enable or disable anti-virus protection:

1. Access the configuration settings and then tap **Service**.
2. Click **Service** to access the settings in the service software.
3. Click **OK** to display the user-configurable settings.
4. Click **Configuration** and then click **SolidCore**.
5. To enable the option, click **On**.
6. To disable the option and remove anti-virus protection, click **Off**.
7. To save the changes:
   a. Click **Save**.
      The system displays a confirmation message.
   b. Click **OK**.
      The system restarts after processing the anti-virus protection option.

      Note: Do not power off the ultrasound system while the anti-virus protection option is being processed.
8. To exit without saving the changes, click **Home**. Or, click **Finish**.

Accessing Help on the System

You can access, view, and search information in the user manual for the ultrasound system.

Use the export function to save the user manual to an external storage device and view information as required.

To	Do This
Access or view the user manual on the image screen	1. Tap the help icon. ? 2. To scroll through the file, use the arrows on the keyboard or the trackball and trackball keys on the control panel. 3. Search for the information using a keyword, if necessary.
Select a user manual in a different language	▪ Select the required language from the **Language** list.
Export the user manual file	**Prerequisite:** Connect a USB storage device to a USB port. 1. Click **Export**. 2. Ensure the external storage device is connected and the available storage space is sufficient to save the user manual file. – **Destination** selects the external storage device to save the file. – **Directory** displays the destination path for the export location and available storage space. – **File Name** displays the file name. 3. Click **Export**.

4 Examination Fundamentals

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Preventing Unauthorized Access

The security package on the ultrasound system protects patient information from unauthorized access by requiring a user account and password 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 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 name and password 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 log in to the ultrasound system:

1. Enter your user name and password on the login screen.
2. Click **OK**.

To	Do This
Prevent unauthorized access to the ultrasound system	1. Tap the login button. 2. Select **Lock System**. The ultrasound system displays the login screen.
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. Enter the emergency access user name on the login screen. 2. Click **OK**. The ultrasound system enables limited access to patient data.

To	Do This
Change your password	(Available only when enabled for the currently logged-in user account in the configuration settings) 1. Tap 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. Tap the login button. 2. Select **Log in Different User**. 3. Enter your user name and password. 4. Click **OK**.
Log off the ultrasound system	1. Tap the login button. 2. Select **Log Off** <User Name> (where User Name is your assigned user name). The ultrasound system displays a confirmation message to end the current session and log off the system. 3. Click **Yes**.

Registering a Patient

You can register a patient before you begin an exam, or start the exam without registering a patient and then update the patient information at any time before ending the exam.

See also: For a description of the fields in the registration form, refer to Appendix B in this manual.

Registering a Patient Using the Patient Registration Form

You can use a barcode reader to insert the following information in the registration forms: patient name and identification, performing physician, accession number, and sonographer.

To register a patient and begin an exam:

1. Press **PATIENT**.
2. Tap **New Patient**, if necessary.
3. Enter the required information in the registration form. Press tab on the keyboard to select the next field in the form.

   Note: You can enter the first three characters of the last name or patient identification code to display a list of matching patients.

   Note: To enter information using a barcode reader, position the pointer in the required field and then scan the barcode, if specified in configuration settings.

4. To close the patient registration form and save the patient data, choose a method:
   - Click **OK**.
   - Press **2D**.
   - Press enter on the keyboard.
   - Press the control assigned to the print/store function.
   - Press **PATIENT** again.

   The system saves the patient data and activates real-time imaging. If you used the print/store control, the system also captures an image of the completed form.
5. To close the patient registration form without saving your changes, click **Cancel**.

Registering a Patient Using the Patient Browser

You can retrieve patient information from a previous study on the ultrasound system's hard disk.

To register a patient using the patient browser:

Prerequisite: The previous study must be closed before you use the patient browser to register a patient.

1. Press **PATIENT**. Or, press **REVIEW**.
2. Tap **Browser**.
   The system displays a list of all patient studies saved in the selected location.
3. Select the ultrasound system's hard disk from the **Source Media** list, if necessary.
4. Select the patient name from the study list and then click **New Study**.
   The system displays the information for the selected patient in the registration form.
5. Edit the fields, if necessary, and then click **OK** to begin the exam.

Registering a Patient Using a Worklist

You can retrieve patient information from a previous study on a worklist server.

To register a patient using a worklist server:

Prerequisite: A worklist server must be defined and enabled in the configuration settings.

1. Press **PATIENT**. Or, press **REVIEW**.
2. Tap **Browser**.
3. Click **Worklist** on the menu and then enter the search criteria.

   – Select the first, middle, or last name of the patient or physician; patient identification code; requested procedure identification; or accession number.
   – Enter a specific date or date range for the scheduled procedures.
   – Select the required check box to search for scheduled procedures:
     - **US Only** searches all ultrasound systems.
     - **This system only** searches only this ultrasound system.
4. Click **Search**.
5. Select a study from the **Worklist** and then select a procedure from the **Scheduled Procedure(s)** list.
6. Click **Select**.
7. Edit the fields in the registration form, if necessary, and then click **OK** to begin the exam.

   Note: You cannot edit the patient demographic information and accession number retrieved from a worklist.

   Note: If the previous study is not closed, the system closes the study and then begins the exam.
8. If MPPS is set up, the system displays a message to close the current scheduled procedure when a current procedure is in progress.
   – Click **Completed** to close the current procedure and begin the selected scheduled procedure.
   – Click **Discontinued** to cancel or defer the current procedure.

To edit a scheduled procedure during an exam:

Prerequisite: An MPPS server must be defined and enabled in the configuration settings.

1. Press **PATIENT**. Or, press **REVIEW**.
2. Tap **Browser**.
3. Tap **MPPS**.
4. Select **Click here to append** and then click **Append**.
5. Edit the fields in the registration form, if necessary, and then click **OK** to begin the exam.

Restarting an Exam for a Registered Patient

You can add images, reports, measurements, annotations, and body markers to an existing exam.

To restart an exam:

1. Press **PATIENT**. Or, press **REVIEW**.
2. Tap **Browser**.
3. Select the search period from the **Search Files** list, if necessary.
4. Select the ultrasound system's hard disk from the **Source Media** list, if necessary.
5. Enter the patient's first or last name, identification number, gender, date of birth, and the timeframe for the study and then click **Search**.

   The system displays the information for the specified patient.
6. Click the exam to view the patient information.
7. To clear the search fields, click **Clear Search**.
8. Click **OK** to restart the exam and then edit the fields, if necessary.

Editing Patient Information

You can update the patient data at any time before ending the exam.

To edit patient information during an exam:

1. Press **PATIENT**.
2. Tap **Edit Patient**.
3. Enter the required information in the registration form.
4. Click **OK**. Or, click **Cancel** to discard the changes.

Beginning an Exam

When you finish registering a patient, the system activates the selected exam. You can also begin an exam without registering the patient and then enter the patient registration information at any time during an exam.

To immediately begin an exam without registering a patient:

- Press the control assigned to the print/store function.

  The system inserts an asterisk (*) for the patient name and assigns a patient identification number using the current date and time.

Selecting or Customizing the Exam Type

An exam type consists of a set of optimized imaging settings and a compatible transducer. The system includes the following factory-defined exams:

- **Abd** (Abdominal)
- **Abd-Difficult** (Abdominal Difficult)
- **Renal**
- **Bowel**
- **FAST** (Focused Assessment with Sonography in Trauma)
- **Lung**
- **OB** (Obstetrics)
- **Early OB** (Early Obstetrics)
- **Fetal Echo**
- **OB(Adv)** (Advanced Obstetrics)
- **GYN** (Gynecology)
- **Pelvic Floor**
- **Breast**
- **Testis**
- **Penile**
- **Thyroid**
- **Ped Hip** (Pediatric Hip)
- **Ped Abd** (Pediatric Abdomen)
- **Neo Head** (Neonatal Head)
- **Carotid**
- **Venous**
- **Arterial**
- **TCD** (Transcranial)
- **Pelvis**
- **Prostate**
- **Spine**

- **MSK** (Musculoskeletal)
- **Nerve**
- **Digital**
- **IO Abd** (Intraoperative Abdomen)
- **Adult Echo**
- **Ped Echo** (Pediatric Echo)
- **Neo Echo** (Neonatal Echo)
- **TEE** (Transesophageal Echocardiography)

To select a different exam type:

- Tap the required transducer, if necessary, and then tap the exam type.

  The system activates the transducer and the imaging settings assigned to the selected exam.

Customizing Exams

You can create, edit, and delete user-defined exams. You can also change the default exam type assigned to the selected transducer.

To create a user-defined exam:

1. During imaging, adjust the imaging settings required for the new exam.
2. Tap **Add Exam**.
3. Enter a name for the exam.
   a. To link the active transducer to the new exam, select the **Set as Default for Selected Transducer** check box.
   b. Click **OK**.

   The system saves the settings and adds the new exam to the list.

To edit an exam:

1. Tap the required transducer tab and then tap **Edit**.
2. Select the required exam.
3. To overwrite the selected exam with the current imaging settings, click **Overwrite**.

   The system saves the edited exam.
4. To rename the user-defined exam, enter an exam name and then click **Rename**.
5. To change the default exam for the selected transducer, select the required exam and then click **Set Default**.
6. To restore the settings, click **Restore Settings**.
7. To delete a user-defined exam, click **Delete**.

   Note: You must exit a user-defined exam before you can delete the exam.

Activating and Deactivating Operating Modes

When you begin an exam, the system activates 2D imaging. You can activate multiple operating modes, for example, 2D with Color or Doppler. When you activate a mode, the system assigns priority to the selected mode and displays touch screen controls for the priority mode. You can assign priority to another mode at any time.

To activate or deactivate an operating mode:

1. Press the required 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. Or, press **UPDATE**.

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

eSieScan Workflow Protocol

An eSieScan protocol is a pre-defined checklist that guides you through a clinical workflow. The protocol consists of one or more views. A protocol view is an image or clip that can also include measurements, a body marker, and annotations. When the image or clip is saved and the measurements are performed, a view is complete.

Use the configuration settings to create and customize user-defined workflow protocols.

To activate and select a workflow protocol:

1. Tap **eSieScan** and then select the required protocol view on the touch screen.
   The system displays a blue border around the active view.
2. Press the control assigned to the print and store function, for example, **PRINT STORE 1**.
   If the protocol view includes a measurement, the system selects the required measurement label and activates the default measurement method for the label.
3. Position and anchor all measurement markers required for the measurement, if necessary.

To temporarily modify a current workflow protocol:

To	Do This
Pause the protocol view	▪ Tap **Pause Protocol**. Or, press **SELECT**. Images saved during a paused protocol are not saved as protocol views.
Resume a paused protocol	▪ Tap **Resume Protocol**. Or, press **SELECT**.
Copy a protocol view	▪ Tap **Copy View**.
Change the name of a protocol view	1. Tap **Rename View**. 2. Enter a name and then click **OK**.
Delete a protocol view	▪ Tap **Delete View**. **Note:** Deleted measurement will not be deleted from the report.
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.

Optimizing Images

During real-time imaging, you can optimize the image using the control panel and on-screen controls.

Use the configuration settings to customize the imaging parameters assigned to on-screen controls.

Adjusting the Settings for General Imaging Parameters

The following imaging parameters apply to all operating modes.

To	Do This
Adjust the digital gain compensation	▪ Slide the DGC controls on the control panel to the required positions.
Adjust the gain for the priority mode	▪ Rotate the required mode control on the control panel. For example, to adjust color gain, rotate **C**.
Adjust the transmit frequency for the active transducer	▪ Rotate **[MultiHertz]**. A higher frequency typically increases resolution; a lower frequency improves penetration. **Note:** Available settings depend on the transducer.
Adjust transmit power for the active transducer	▪ Rotate **[Tx Power]**.
Adjust the imaging depth	▪ Rotate or push **DEPTH / FOCUS** as specified in the configuration settings. The system displays the depth in centimeters (cm) below the image.
Adjust the focal zones	1. Press **DEPTH / FOCUS** to activate the multiple transmit focal zones and then push or rotate the control to reposition the transmit focal zones in the image as specified in the configuration settings. 2. To adjust the distance between multiple focal zone markers, rotate **[Focus Width]**.
Magnify an image	(Not available for a rotated image) 1. Rotate **ZOOM** to adjust the magnification. The system activates the zoom function and displays a **Z** below the image. 2. To deactivate the zoom function, press **ZOOM** again.
Activate the high-density zoom	(Not available for a rotated image) 1. Press **ZOOM**. 2. Position the region of interest. 3. Press **ZOOM** again. When the image is magnified, the system displays **HD Z** next to the depth indicator on the image screen.
Pan a magnified image	▪ Roll the trackball to pan the image in the required direction.

2D Imaging

During 2D imaging with a curved or phased array transducer, the system displays an adjustable field of view (FOV).

Optimizing 2D Images

You can use an image preset to apply predefined image optimization settings for 2D. You can also adjust imaging settings individually to refine the optimization.

To	Do This
Resize or reposition of the field of view (FOV)	(Available only for phased and curved array transducers) 1. Press **SET**, if necessary. – **Position** indicates the trackball is assigned to repositioning the FOV. A dotted line outlines the FOV. – **Size** indicates the trackball is assigned to resizing the FOV. A dotted line outlines the FOV. 2. Roll the trackball to adjust the size or position and then press **SET**.
Reduce or enlarge the size of the 2D image	1. Tap the required button in **FOV Size** to adjust the size of the 2D image. – To reduce the image size, tap the left arrow. ◀ – To enlarge the image size, tap the right arrow. ▶ 2. To restore the image size, tap **Full FOV**.
Extend the field of view to 224°	(Available only for the 9MC3 transducer) ▪ Tap **Wide FOV**.
Adjust the overall contrast resolution (dynamic range) of an image	▪ Rotate **[Dyn R]**.
Select a processing curve that assigns echo amplitudes to gray levels	▪ Rotate **[Map]**.
Change the color tint applied to the 2D image	▪ Rotate **[Tint]**.

To	Do This
Create a visible smoothing effect by maintaining lines of image data for each frame of image data	▪ Tap **Persist** and then tap the required setting. A higher setting includes more frames in the image data.
Distinguish the contours of a structure during real-time imaging using edge enhancement	▪ Tap **Edge** and then tap the required setting.
Activate Tissue Harmonic Imaging (THI) to enhance visualization, improve image contrast and spatial resolution, or reduce noise	▪ Tap **THI**.
Adjust the balance between the image line density (resolution) and the frame rate (speed)	▪ Rotate **[R/S]**.
Reduce speckle and enhance tissue differentiation in 2D images using Advanced SieClear spatial compounding	▪ Rotate **[Adv. SieClear]**.
Reduce speckle and enhance contrast using Dynamic Tissue Contrast Enhancement (DTCE)	▪ Rotate **[DTCE]** to select the required setting: – **Off** disables the function. – **Low** applies the low level of speckle reduction. – **Med** (Medium) applies the medium level of speckle reduction. – **High** applies the high level of speckle reduction.
Reverse the orientation of the image	▪ Tap **L/R Flip** to reverse the horizontal (left/right) orientation. ▪ Tap **U/D Flip** to reverse the vertical (up/down) orientation. **Note:** If an image is rotated in 90-degree increments, you cannot reverse the vertical orientation.
Rotate the image	(Available only for a single 2D-image acquired with a linear array transducer) (Not available for a magnified image or a frozen image with HD zoom) 1. Tap **Rotate Image**. 2. Tap the required setting: – **90°** rotates the image clockwise in 90-degree increments. – **-90°** rotates the image counterclockwise in 90-degree increments. – **0°** resets the image to the starting position. **Note:** A rotated image cannot be scaled to fit the image area.

To	Do This
Enable or disable the display of one real-time and one frozen image in a side-by-side format	(Also available when color is activated) 1. Press **DUAL** to display an image on the left side of the screen. 2. Press **DUAL** again to display an image on the right side of the screen. 3. To change the active image, press **UPDATE**. 4. To exit dual imaging, press **2D**.
Enable or disable a side-by-side display format	▪ Tap **Split**. **Note:** During color imaging, the color ROI is displayed only on the right side of the screen.
Activate 4B mode to display four separately acquired images	1. Tap **4B**. 2. To continue to display images, repeat step 1.
Enable or disable a trapezoid image formats	(Available only for linear array transducers) ▪ Tap **Trapezoid**.
Adjust the angle of the field of view	(Available only for linear array transducers) ▪ Push **STEER**.
Optimize the uniformity of image brightness in the field of view using eSieImage technology	1. Press **ESIEIMAGE**. The system displays the eSieImage icon on the image screen when the feature is activated. 2. To update the image quality, rotate **[TEQ Gain]**. 3. To exit eSieImage, press **ESIEIMAGE** twice.
Decrease artifacts in a 2D-mode image	1. Tap **Clarify VE**. 2. To adjust the clarify level, tap **Clarify VE Levels**.

Color Imaging

When you activate color imaging, the system displays an adjustable color region of interest (ROI). The system supports the following functions.

- Color Doppler Velocity (CDV) applies color to the velocities and directions of blood flow within the ROI.
- Color Doppler Energy (CDE), or Power mode, applies color to the energy measurement generated by the blood flow within the ROI.
- Doppler Tissue Imaging (DTI) applies color to the mean velocities of tissue in the ROI.
- Doppler Tissue Energy (DTE) applies color to the Doppler signal energy returning from the tissue.

To	Do This
Resize or reposition the color region of interest (ROI)	1. Press **SET**, 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.

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 1 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 PRF setting is low. (Acoustic streaming flow is typically visible between 1 to 2 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.

Optimizing Color Images

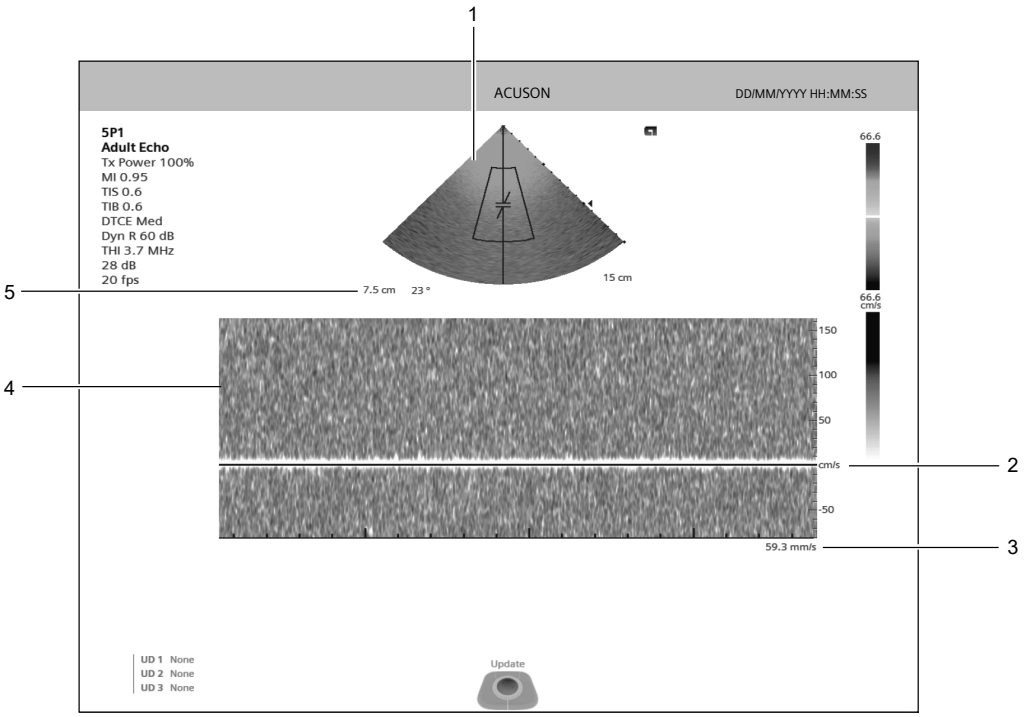
To	Do This
Activate Color Doppler Velocity or Color Doppler Energy	▪ Tap **CDV** or **CDE**.
Activate Doppler Tissue Imaging or Doppler Tissue Energy	▪ Tap **DTI** or **DTE**.
Extend the range of displayed velocities in one direction by repositioning the color baseline	▪ Rotate **[Baseline]**.
Adjust the range of displayed color velocities by adjusting the scale factor of pulse repetition frequency (PRF)	▪ Rotate **[Scale]**.
Adjust the angle of the color region of interest	(Available only for linear array transducers) ▪ Push **STEER**.

To	Do This
Select an image preset to optimize hemodynamic flow conditions	▪ Rotate **[Flow]** to select the required 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). – **Med** (Medium) 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.
Reduce clutter by adjusting the level of motion discrimination during real-time imaging	▪ Rotate **[Filter]**.
Adjust the time that the colors corresponding to blood flow velocity remain in the region of interest before decaying or being replaced by another color	▪ Rotate **[Persist]**.
Adjust the threshold for overlaying color pixel information on the 2D image	▪ Rotate **[Priority]**.
Display or hide color information in the region of interest	▪ Tap **Color Display**.
Adjusts the balance between the image line density (resolution) and the frame rate (speed)	▪ Rotate **[R/S]**. A color bar indicates the range of colors for the selected map.
Assign color to velocity or energy information	▪ Rotate **[Map]**.
Adjust the level of spatial (both axial and lateral) averaging used to smooth the flow pattern display	▪ Rotate **[Smooth]**.
Invert the colors depicting forward and reverse flow in the color ROI and in the color bar	▪ Tap **Invert**.
Designate or tag a specific blood flow velocity or a range of blood flow velocities in real-time or frozen image or during CINE review	▪ Tap **VelTag** and then select the required settings.
Display energy generated by the direction of blood flow	(Available only with CDE) ▪ Tap **Dir Power**.
Adjust the blending of color and 2D data on the image	▪ Rotate **[α-Blend]**.

Pulsed Wave Doppler

When you activate pulsed wave Doppler, the system displays the Doppler cursor and gate on the 2D image before activating the Doppler spectrum. You can adjust the position of the cursor and the size of the gate before you activate the Doppler spectrum.

Use the configuration settings to define your pulsed wave Doppler preferences, for example, bypassing the cursor adjustment step before displaying the Doppler spectrum, selecting the units (Hz or cm/s) displayed in the Doppler spectrum, and selecting the display format for the Doppler spectrum and 2D image.



Example of image screen with pulsed wave Doppler activated.

1 2D image
2 Doppler units (frequency or velocity)
3 Sweep Speed
4 Doppler spectrum
5 Flow angle value in degrees and depth of the Doppler gate in centimeters

Optimizing the Doppler Spectrum

To	Do This
Activate or deactivate steerable continuous wave Doppler	(Available only for phased array transducers) ▪ Press **CW**.
Reposition the Doppler cursor	▪ Roll the trackball.
Resize the Doppler gate	▪ Rotate **[Gate]**.
Pause the Doppler spectrum and refresh the 2D image	▪ Press **UPDATE**.
Adjust the overall contrast resolution (dynamic range) of an image in 5 dB increments	▪ Rotate **[Dyn R]**.
Display only the Doppler spectrum and hide the 2D image	▪ Tap **Full D**.
Correct the flow angle	▪ To adjust the flow angle in 60° increments (60°, 0°, and -60°), press **ANGLE**. ▪ To adjust the flow angle in 1° increments, rotate **ANGLE**.
Extend the range of displayed velocities by repositioning the Doppler baseline	▪ Rotate **[Baseline]**.
Adjust the scale factor of pulse repetition frequency (PRF) to improve flow sensitivity or to control aliasing	▪ Rotate **[Scale]**.
Adjust the interval for refreshing the 2D image	▪ Tap **Update Rate** and then tap the required setting.
Adjust the scrolling speed of the Doppler spectrum	▪ Rotate **[Sweep]**.
Select a processing curve that assigns echo amplitudes to gray levels	▪ Rotate **[Map]**.
Change the color of the Doppler spectrum by adding blue, red, yellow, or green to the gray in a gray map	▪ Rotate **[Tint]**.
Reject signals below the selected frequency setting, for example, signals generally caused by tissue clutter	▪ Rotate **[Filter]**.
Enable or disable the simultaneous display of the 2D and color image and Doppler spectrum in real time	▪ Tap **Simult**.

To	Do This
Reverse the Doppler spectrum relative to the baseline and invert the Doppler audio	▪ Tap **Invert**.
Adjust the Doppler audio volume	▪ Rotate **[Volume]**.
Enable or disable the audio volume	▪ Tap **Mute**.
View Doppler statistics on a real-time spectrum	1. Tap **Auto Stat**. 2. Tap **Trace Direction** and then select the method for analyzing the Doppler spectrum. – **Above** displays statistics for Doppler data above the baseline. – **Below** displays statistics for Doppler data below the baseline. – **Both** displays 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. 3. To adjust the sensitivity level of the detection, tap **Sensitivity**. 4. To display the velocities or frequencies on the spectrum as a mean graphical trace, tap **Mean Trace**. The blue trace indicates a mean velocity or frequency. The yellow trace indicates the maximum value.
View Doppler statistics on a frozen spectrum or a spectrum during review	**Prerequisite:** Freeze the Doppler spectrum or view the Doppler spectrum during review and then activate the measurement function. 1. Tap **PI Auto**. 2. Position and anchor the beginning and ending markers on the spectrum at the peak systole and end diastole. 3. To change the method for analyzing the Doppler spectrum, tap **Trace Direction** and then select the required method: – **Above** displays statistics for Doppler data above the baseline. – **Below** displays statistics for Doppler data below the baseline. – **Both** displays statistics for Doppler data above and below the baseline. 4. To adjust the sensitivity level of the detection, rotate **[Sensitivity]**. 5. To display the velocities or frequencies on the spectrum as a mean graphical trace with the maximum graphical trace, press **[Mean Trace]**. The blue trace indicates a mean velocity or frequency. The yellow trace indicates the maximum value.
Adjust the angle of the Doppler gate left or right	(Available only for linear array transducers) ▪ Push **STEER**.
Activate Doppler Tissue Imaging	(Available only for phased array transducers) ▪ Tap **DTI**.

M-mode

When you activate M-mode, the system displays the M-mode cursor on the 2D image before activating the M-mode sweep. You can adjust the position of the cursor before you activate the M-mode sweep.

Use the configuration settings to define your M-mode preferences, for example, bypassing the cursor adjustment step before displaying the M-mode sweep and selecting the display format for the M-mode sweep and 2D image.

To position M-mode cursor:

- Use the trackball to position the cursor in the required location.

Optimizing the M-mode Sweep

To	Do This
Adjust the overall contrast resolution (dynamic range) of an image in 5 dB increments	▪ Rotate **[Dyn R]**.
Adjust the angle of the M-mode cursor	(Available only for linear array transducers) ▪ Push **STEER**.
Display or hide the 2D image	▪ Tap **Full M**.
Adjust the scrolling speed of the M-mode sweep	▪ Rotate **[Sweep]**.
Distinguish the contours of a structure during real-time imaging using edge enhancement	▪ Rotate **[Edge]**.
Select a processing curve that assigns echo amplitudes to gray levels	▪ Rotate **[Map]**.
Change the color of the M-mode sweep by adding blue, red, yellow, or green to the gray in a gray map	▪ Rotate **[Tint]**.

Examples of Imaging Settings

The image screen displays exam and imaging settings for the priority operating mode.

Settings for All Modes

Example	Description
5C1	Transducer
Abdomen	Exam type
Tx Power 100%	Transmit power, a percentage of the maximum acoustic intensity and mechanical index for the active transducer
MI 0.78	Mechanical Index
TIS 1.7	Soft tissue thermal index
TIB 1.7	Bone tissue thermal index

2D Settings

Example	Description
ASC 1	Advanced SieClear spatial compounding
DTCE Med	Dynamic Tissue Contrast Enhancement
Dyn R 75 dB	Dynamic range
3.3 MHz	Frequency **Note:** The system displays **THI** in front of the frequency when Tissue Harmonic Imaging is enabled.
29 dB	2D gain
36 fps	Frames per second

Color Settings

Example	Description
2.3 MHz	Frequency
1220 Hz	Pulse Repetition Frequency (PRF)
Flow Med	Color flow image preset
5 dB	Color gain
8 fps	Frames per second

Pulsed Wave Doppler Settings

Example	Description
2.3 MHz	Frequency
1775 Hz	Pulse Repetition Frequency (PRF)
Gate 1.5 mm	Size of the Doppler gate
11 dB	Doppler gain
8 fps	Frames per second

M-mode Settings

Example	Description
2.3 MHz	Frequency
30 dB	M-mode gain
24 fps	Frames per second

General Contrast Agent Imaging Settings

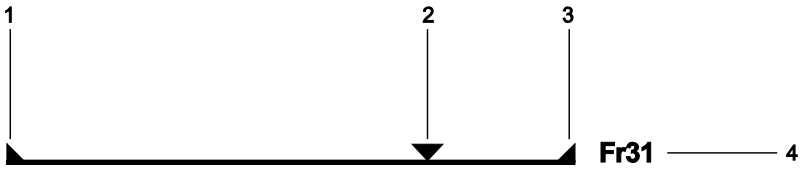
Example	Description
Contrast	Imaging feature
1.8 MHz	Frequency
7 dB	Gain during contrast agent imaging
Dyn R 60 dB	Dynamic range
P 2	Persistence, a visible smoothing effect
Peak Hold	Peak hold, the maximum intensity projection

CINE

CINE continuously stores recently acquired data in a memory buffer in all operating modes. You can view data stored in CINE memory in continuous playback or frame-by-frame review. You can also scroll through the images and add measurements and annotations to any frame.

CINE memory is fixed. However, the length of playback varies based on the complexity of the images. The simpler the image, the more images can be retained.

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



Example of a CINE bar.

1 Indicates the beginning of the CINE data. Reposition this marker to edit the length of the CINE data.
2 Indicates CINE playback. The marker depicts the location of the current frame within the loop of CINE data.
3 Indicates the end of the CINE data. Reposition this marker to edit the length of the CINE data.
4 Indicates the number of frames played back.

To review CINE data:

1. Press **FREEZE**.
   The system displays the CINE bar.
2. To start or stop CINE playback, press **SET**.
3. To adjust the speed of CINE playback, rotate **[Cine Speed]**.
4. To adjust the length of the clip, roll the trackball and then tap **Set Start Marker** or **Set End Marker** to position the current frame marker at the required location on the image screen.
5. To restore the original position of the markers, tap **Reset Markers**.
6. To exit CINE, press **FREEZE**.

Capturing Images and Clips

When you capture an image or clip, the system saves the data to the hard drive and displays a thumbnail of the image or clip in the thumbnail panel. You can use the review function to view saved images and clips, perform measurements, add annotations and body markers, and add images to reports.

To capture an image or clip:

- Press the control assigned to the image or clip store function (for example, **PRINT STORE 1**, **UD 1**, **CLIP STORE**, or the optional footswitch).

Reviewing Images and Clips

Use the review function to view, evaluate, measure, and annotate the results of the current examination or a previous examination saved to the hard disk.

Printing Images

Note: Refer to the manufacturer's user manual for the proper handling and operating instructions for the device connected to your system.

You can print images from a current examination, a patient report, CINE data, or an image retrieved from a previous study.

To print an image:

- Press the control assigned to the print function (for example, **PRINT STORE 1**).

Video Recording a Study

Note: Refer to the manufacturer's user manual for the proper handling and operating instructions for the device connected to your system.

The ultrasound system does not have controls for video playback.

To record a study:

Prerequisite: Use the configuration settings to assign the video recording function to the user-defined controls on the control panel.

- Use the controls on the video recording device. Or, press the control assigned to the video recording function (for example, **UD 1** or **UD 2**) to record and pause video recording.

To stop recording:

- Use the controls on the video recording device. Or, end the current patient examination.

When recording on a video recording device is in progress or paused, the ultrasound system displays a video icon in the system status bar.

Icon	Description
	Indicates data recording is in progress.
	Indicates data recording is paused.

Completing an Examination

You can end an examination from the review screen or the patient registration screen.

To end the current patient examination, choose a method:

- Tap **End Exam**.

5 Examination Review

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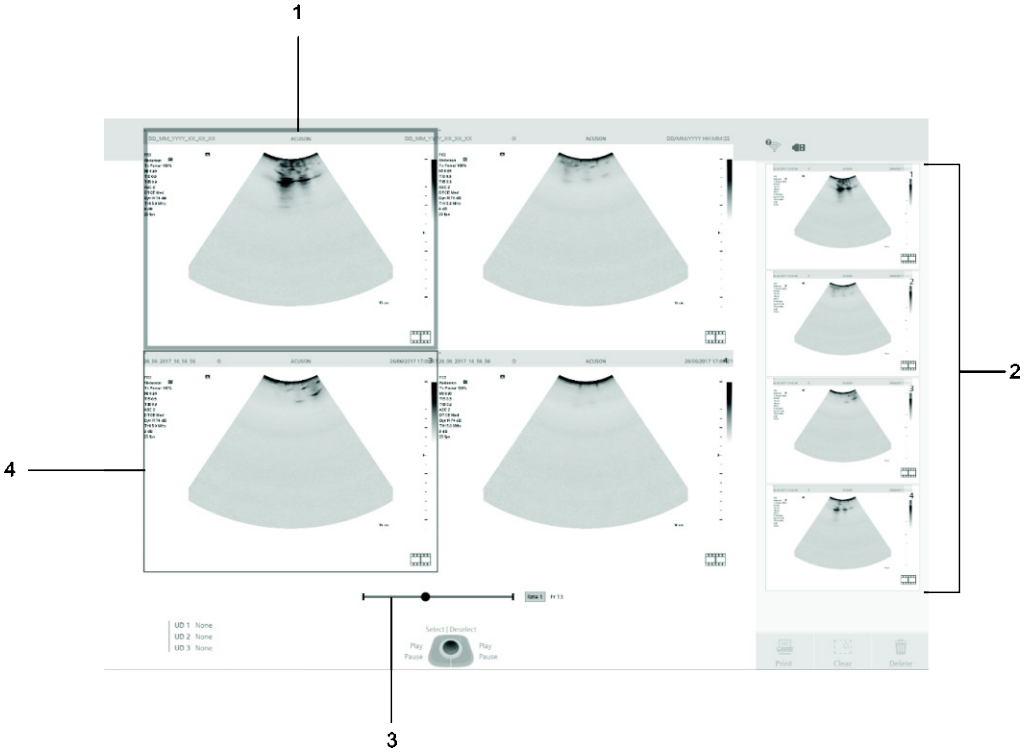
Playing and Editing Clips 5
Exporting Images and Clips 6

Reviewing Current and Previous Exams

Use the review function to view and evaluate the results of the current examination or a previous examination saved in the local database (system hard disk).

Activating Review

When you activate review, the system displays all images and clips saved with the study. You can also view archived reports during review.



Example of review screen.

1 Active image. The system displays a wide transparent white border around the currently active image.
2 Thumbnail panel
3 CINE bar
4 Selected image. The system displays a white border around a selected image.

To activate review:

1. To activate review during an exam, press **REVIEW**. Or, double-click a thumbnail.
2. To activate review of a saved exam:
   a. Tap **Browser**.
   b. Select a patient from the patient list and then select a study from the study list.
   c. Double-click the selected study.
3. To change the layout of the images:

To	Do This
Change the display format of the saved images and clips	Selects a display format on the touch screen: ▪ **1x1** ▪ **1x2** ▪ **2x2** ▪ **3x3** ▪ **4x4** ▪ **5x5**
Scroll through multiple pages of images or clips	▪ Rotate **[Page]**.
View the active image or thumbnail in a full-screen layout	▪ Double-click the active image or required thumbnail.
Select an image on the review screen or thumbnail panel	1. Click the image or required thumbnail. 2. To cancel the selection, click the image again. 3. To select all images on the review screen, tap **Select all**. 4. To cancel the selection of all images, tap **Deselect All**.
Print selected images on the review screen or thumbnail panel	1. Click **Print**. 2. Select the required printer and then click **OK**.
Delete selected images on the review screen or thumbnail panel	1. Tap **Delete**. 2. Tap **OK** to confirm the deletion. 3. To continue without deleting the images, click **Cancel**.
View the selected images on the review screen	1. Tap **Show Selected**. 2. To cancel the selection of selected images, tap **Show All**.
View the slide show for the selected images	1. Tap **Slide Show**. 2. To stop the slide show, click **Stop**. 3. To continue playing the slide show, click **Start**. 4. To exit the slide show and activate review, click **Exit**.
View a report from a saved exam	1. Tap **Archived Report**. 2. To exit the report, tap **Close**.
Activate the arterial health package (AHP)	1. Tap **AHP**. 2. To exit the screen, tap **Exit**.
View the carotid intima-media thickness (CIMT) report	1. Tap **AHP**. 2. Click **CIMT** Report.
Exit review and activate real-time imaging	▪ Press **REVIEW**. Or, press **2D**.
Exit review and end the exam	▪ Tap **End Exam**.

Playing and Editing Clips

When the active image is a clip, the system activates the clip playback controls.

Use the configuration settings to configure your preferences for clip playback.

To	Do This
Play or pause playback of one or more clips	▪ To start playback, tap the play button. ▪ To pause playback, tap the pause button.
Review the first or end CINE frame	▪ To review the first CINE frame, tap the first frame button. ▪ To review the end CINE frame, tap the end frame button.
View a clip frame-by-frame	▪ Rotate **[Cine Frame]** to display the next or previous frame in the clip.
Adjust the playback speed	▪ Rotate **[Cine Speed]** to select the required speed. **Note:** Playback speed is a multiple of the speed at acquisition. For example, if the clips were acquired at 30 fps (frames per second), specify a playback speed of 1/2 to play back the clips at 15 fps.
Change the current frame	1. Pause clip playback. 2. Drag the current frame marker to the new location. Or, rotate **[Cine Frame]**.
Change the length of a clip	1. To change the starting frame of the clip, rotate **[Cine Start Marker]**. 2. To change the ending frame of the clip, rotate **[Cine End Marker]**. 3. To restore the original clip length, tap **Reset Marker**.
Capture a clip	▪ Tap **Save**.
Store the current frame of a clip	1. Pause playback of the clip. 2. Press the control on the control panel assigned to the image or clip store function.

Exporting Images and Clips

You can export images and clips to external media, for example, a DVD or USB storage device.

Note: You can also export images, clips, and complete studies from the patient browser.

To export images:

1. Select one or more images on the review screen and then tap **Export**.
   The system displays a dialog box to select the format and destination for the exported images.
2. Select the required **Format**:
   – **jpeg / avi**
   – **DICOM**
3. To remove any patient-identifying information from the images:
   – Select the **De-identify** check box.

   Note: You can enter text to replace **Anonymous** as the patient name.
4. Select the target location, for example, a USB port, for the exported images in the **Destination** list.
5. Enter the destination path for the export location in the **Directory** box.
6. Click **Export**.
   The system displays progress information until the export is complete.
7. When the export process is complete, click **Close**.

6 Transducer Care and Accessories

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Caring for Transducers

See also: For information on cleaning and disinfecting transesophageal transducers, refer to Chapter D3 in the Clinical Applications Guide.

⚠ **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.

The methods for cleaning and disinfecting or cleaning and sterilization by classifying the use of the transducer are defined 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	Noncritical

Important Information

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

- ACUSON Juniper system
  - Laparoscopic
- ACUSON Juniper Select system
  - Laparoscopic
  - Intraoperative
  - Transesophageal

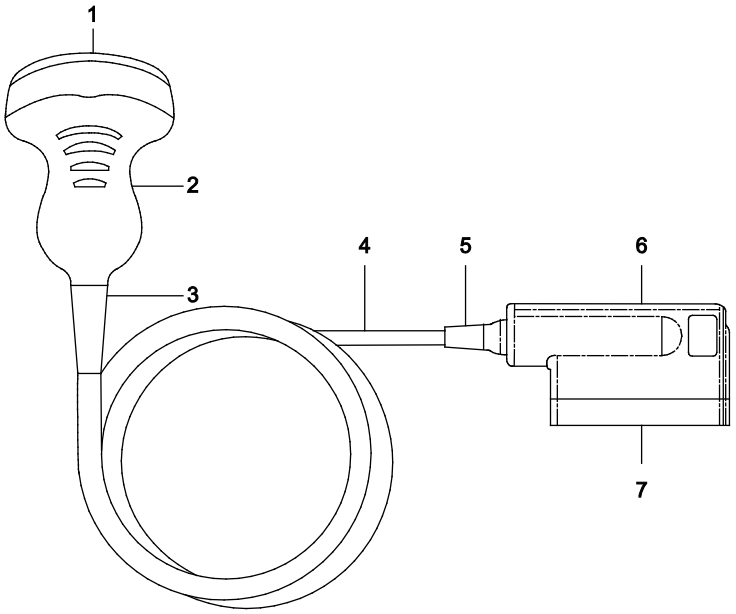
Reprocessing Methods

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

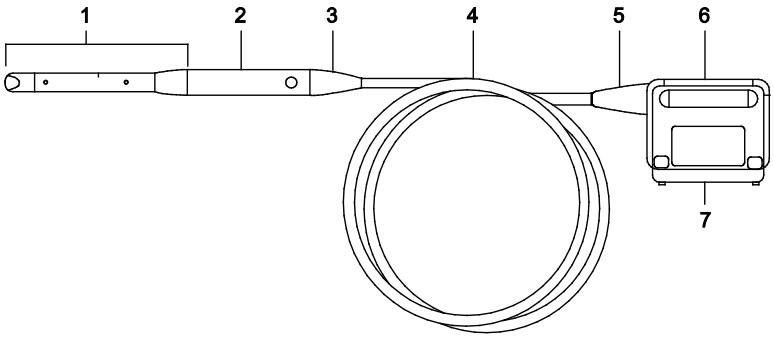
See also: Contact your customer service representative if you require additional information about reprocessing a transducer.

Examples of Transducer Components



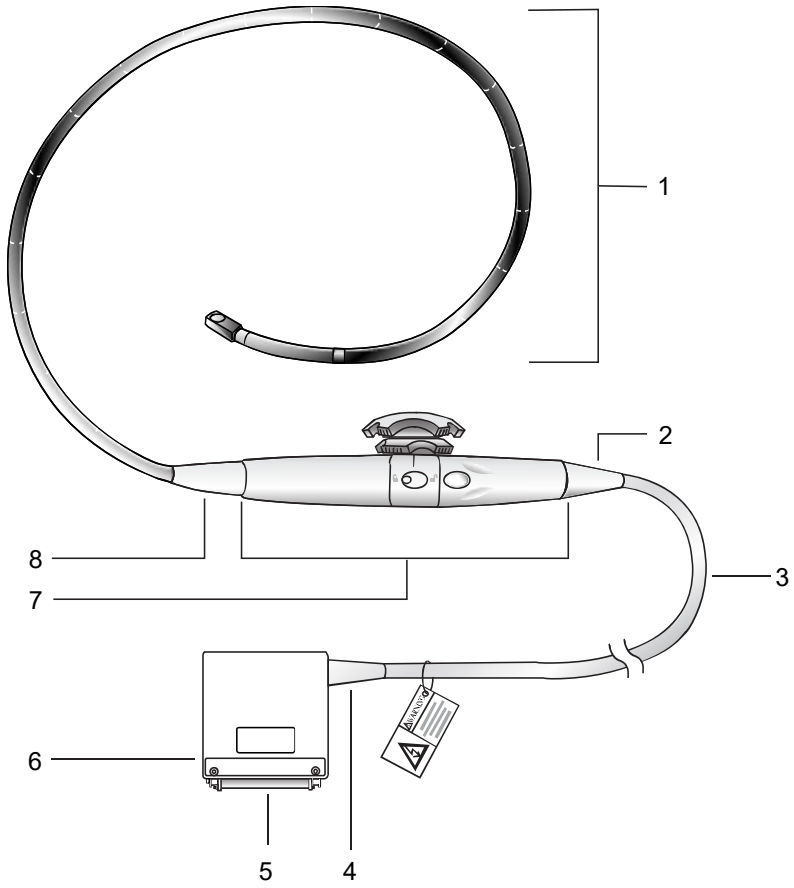
1 Transducer surface in contact with the patient
2 Handle
3 Strain relief for the transducer
4 Cable
5 Strain relief for the connector
6 Connector
7 Electrical component on the connector

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.



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

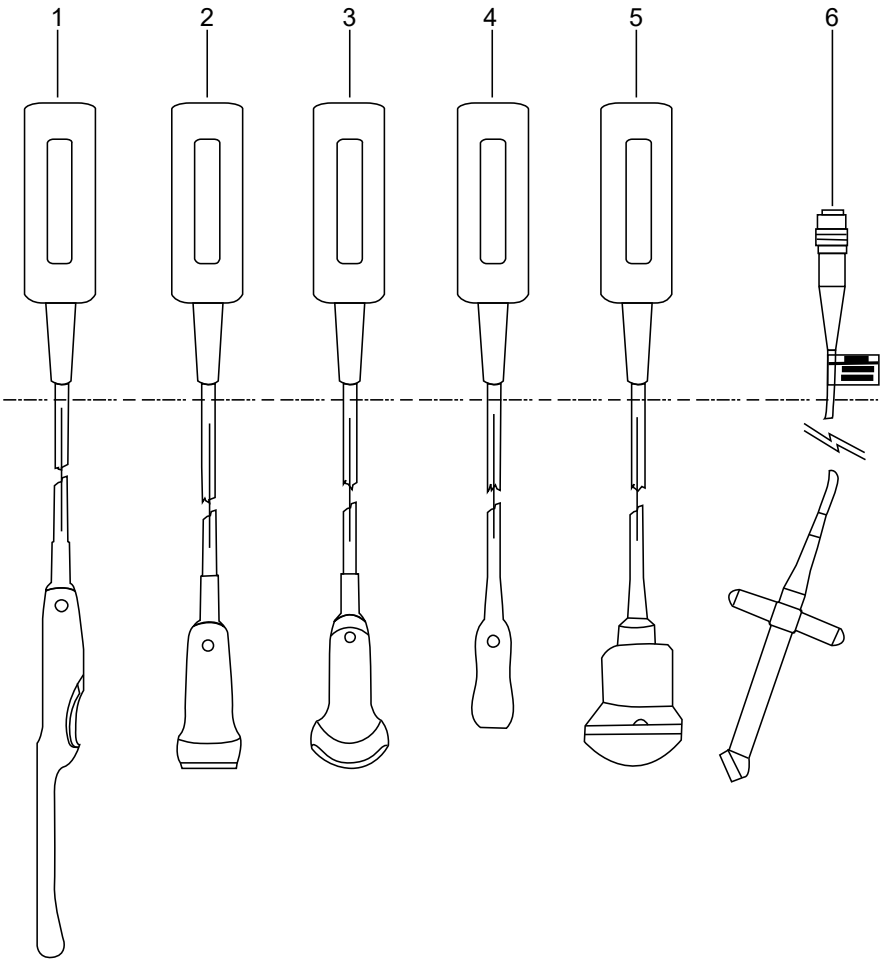
Example of transesophageal transducer components.

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 CW 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 *four*Sight 4D
6 Continuous Wave (CW)

See also: For transesophageal transducer immersion levels, refer to Chapter D3 in the Clinical Applications Guide.

Cleaning, Disinfecting, and Sterilizing 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.	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.	p. 6-3
Disconnect the transducer.	Chapter 3
Observe the required method of cleaning and disinfecting for the transducer.	p. 6-5
Wipe visible soil and contaminants from the transducer immediately after each use.*	p. 6-10
Clean the transducer.*	p. 6-11
Disinfect the transducer.*	p. 6-12
Sterilize the transducer, as required.	p. 6-13
Store the transducer.	p. 6-4

*Information on cleaning and disinfecting transesophageal transducers is located in Chapter D3 in the Clinical Applications Guide.

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 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 6-14.

   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 or sterilization.

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 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 6-14.

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 6-8.
   - 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 patient exam.

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 and temperature of the solution and contact time when disinfecting the surface of the transducer.

   See also: For a list of approved disinfectants, refer to page 6-15.

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.
   - 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 6-8.
   - 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.

Sterilizing a Transducer

Sterilization is required for transducers in contact with normally sterile tissue or body space, for example, transducers used in an intraoperative or laparoscopic environment. Sterilize a transducer to destroy pathogens and other microorganisms and to prepare the transducer for the next patient exam.

To sterilize a transducer:

Prerequisite: Clean the transducer. Disinfect the transducer, if necessary.

1. Select an approved sterilization system and sterilant for the transducer.
   See also: For a list of approved sterilization systems and sterilants, refer to page 6-16.
2. Ensure the transducer is clean and dry before placing into the sterilization system.
3. Carefully follow the sterilization system manufacturer's instructions.
4. Follow the sterilization system manufacturer's instructions for removing the transducer from the sterilization system.
   - Use sterile technique when removing the transducer from the sterilization system.
   - Examine the transducer for any signs of damage and sterilant residue.
5. Follow the sterilization system manufacturer's instructions for drying 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
5C1	✓	✓	✓	✓	✓
6C1	✓	✓	✓	✓	✓
7C2	✓	✓	✓	✓	✓
12L3	✓	✓	✓	✓	NA
11L4	✓	✓	✓	✓	✓
13L4	✓	✓	✓	✓	✓
14L4	✓	✓	✓	✓	✓
16L4	✓	✓	✓	✓	✓
18H5	NA	✓	✓	✓	NA
11M3	NA	✓	✓	✓	✓
5P1	✓	✓	✓	✓	✓
8V4	✓	✓	✓	✓	✓
10V4	✓	✓	✓	✓	✓
9MC3	✓	✓	✓	✓	✓
10MC3	✓	✓	✓	✓	✓
8VC3	NA	NA	NA	✓	NA
9VE3	NA	NA	NA	NA	✓
CW2	✓	✓	✓	✓	✓
CW5	✓	✓	✓	✓	✓
CW8	NA	✓	✓	NA	✓

✓ = 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: A approved disinfectant may discolor the transducer. There is no associated degradation of imaging performance or transducer reliability.

	CIDEX	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 with NanoNebulant*	trophon EPR with Sonex-HL*	trophon2 with NanoNebulant*	trophon2 with Sonex-HL*
5C1	✓	✓	✓	✓	✓	✓	✓	NA	NA	NA	NA
6C1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
7C2	✓	✓	✓	✓	✓	✓	✓	NA	NA	NA	NA
12L3	✓	✓	NA	✓	✓	✓	NA	NA	NA	NA	NA
11L4	✓	✓	NA	✓	✓	✓	✓	✓	✓	✓	✓
13L4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
14L4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
16L4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
18H5	✓	✓	NA	✓	✓	✓	NA	✓	✓	✓	✓
11M3	✓	✓	✓	✓	NA	NA	✓	✓	✓	✓	✓
5P1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
8V4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
10V4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
9MC3	✓	✓	✓	✓	NA	✓	✓	✓	✓	✓	✓
10MC3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
8VC3	✓	✓	NA	NA	✓	✓	NA	✓	✓	✓	✓
9VE3	✓	✓	NA	NA	✓	✓	✓	✓	✓	✓	✓
CW2	✓	✓	✓	✓	✓	✓	✓	NA	NA	✓	✓
CW5	✓	✓	✓	✓	✓	✓	✓	NA	NA	✓	✓
CW8	✓	✓	✓	✓	✓	✓	✓	NA	NA	NA	NA

✓ = approved
NA = not approved
An asterisk (*) 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.

List of Approved Sterilization Systems and Sterilants

Follow the sterilization system manufacturer's instructions for sterilizing the transducer.

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

STERRAD 100NX Sterilizer System

- Compatible transducers: 18H5
- Manufacturer: Advanced Sterilization Products (Johnson & Johnson)
- Sterilization method/type: Hydrogen peroxide gas plasma
- Approved sterilization cycles:
  - Standard
  - Express

  See also: For information about the sterilization cycles and required accessories, refer to the sterilization system manufacturer's instructions.

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	*four*Sight 4D
Transducer Sheath	All	All	All	All
Biopsy Needle Guide Set	5C1 6C1 7C2	11L4 12L3 13L4 14L4 16L4	---	---
Needle Guides	9MC3 10MC3	---	---	9VE3

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.

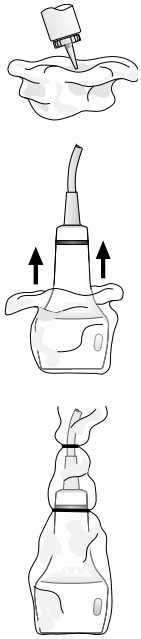
Using a disposable latex transducer sheath on a transducer reduces the possibility of cross-contamination. Always use a protective transducer sheath for endocavity exams, and when scanning an open wound or an area where the skin is not intact.

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.

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9VE3 Transducer

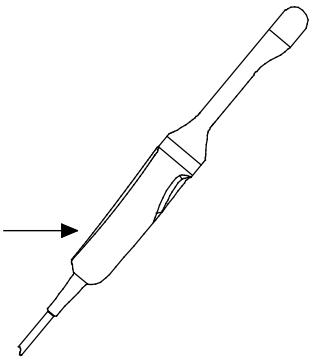
⚠ **WARNING:** Before attempting to use endocavity transducers, you should be trained in ultrasonography and endocavity scanning techniques, and you should be thoroughly familiar with the safe operation of the ultrasound imaging system.

See also: Safety and Care, Chapter 2, Instructions for Use

The 9VE3 transducer is a *four*Sight 4D (curved array) transducer.

Transducer Markings

The transducer is designed with the following orientation indicator on the handle of the transducer.



Imaging with the Transducer

The transducer supports all of the functions and controls that are available in 2D-mode, M-mode, Color, Power, Pulsed Doppler, and during volume acquisition.

To	Do This
Select a steering angle	▪ Rotate **[Steering Angle]**. The steering angle increases or decreases relevant to the scan angle. An on-screen icon indicates the steering angle of the transducer when the steering angle is greater or less than 0°. *Example of icon during 2D-mode imaging.* *Example of icon during volume acquisition.*
Select a scan angle (to determine the amount of data for volume acquisition)	▪ Rotate **[Angle]**. During 3-Scape imaging, the system computes the scan duration based on the selected angle, acquisition speed, and the current frame rate and displays the steering angle and acquisition time on the image screen.
Adjust the image quality	▪ Rotate **[Quality]**.

9VE3 Technical Data

See also: Technical Description, Appendix A, Instructions for Use

Transducer type:	Mechanically-driven curved array
Number of Elements:	128
Focus:	35 mm ±5%
Minimum Depth:	3 cm
Maximum Depth:	14 cm
Operating modes:	2D-mode, M-mode, 2D/M-mode, 2D/Doppler, Color, Power, Pulsed Doppler
Maximum displayable field of view:	145°±1°
Maximum scan angle (wobble angle):	±45°
Radius of Curvature:	10.8 mm
Orientation:	On-screen graphical icon indicates steering angle

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Standard Features

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.

System Operating Software

- Windows®-based operating software
- Multi-language capability, selectable during software installation
- User-modifiable configuration settings, including libraries of annotations and body markers
- Feature for defining specific exam, transducer, and image parameter settings
- Compatible with remote update handling for remote application support and remote troubleshooting

Monitor

- 54.5 cm (21.5 inch) high-resolution flat panel display (Monitor)
- 16:9 wide screen format
- 1920 x 1080 resolution
- Brightness controls
- ±178° wide viewing angle
- Energy saving feature enables a screen saver after a specified time period
- Variable positioning adjustments:

  ACUSON Juniper system

  – Range of height: 141 cm to 163.4 cm; folds down for transport or portable exams to 122 cm
  – Left and right swivel: ±90°
  – Tilt front (+65°) and back (-15°)

  ACUSON Juniper Select system

  – Range of height: 140 cm to 154 cm; folds down for transport or portable exams to 119 cm
  – Left and right swivel: ±80°
  – Tilt front (+80°) and back (-15°)
- Monitor arm adjustments:

  ACUSON Juniper system

  – Left and right swivel: ±320°
  – Vertical: up to 20°

  ACUSON Juniper Select system

  – Left and right swivel: ±80°
  – Horizontal: forward (+30°) and backward (-30°)

Operator Control Panel

- Backlit for controls and keys
- Control panel height adjustment for standing and sitting positions

  ACUSON Juniper system
  - Left/right swivel: ±90°
  - Range of height: 11 cm

  ACUSON Juniper Select system
  - Range of height: 11 cm
- Language-specific control panel
- Control panel layout supports ambidextrous operation
- Touch screen with brightness controls:
  - 33.8 cm (13.3 inch)
  - 1920 x 1080 resolution
  - Extended wide-angle viewing angle: ±80°
  - Variable tilt angle: 40° to 60°
  - Language-specific virtual keyboard

Mobility

- ACUSON Juniper system
  - Four locking wheels
  - Directional swivel lock on each rear wheel
- ACUSON Juniper Select system
  - Four locking wheels
- Compact and lightweight industrial design
- Large steering handle for portability and maneuvering
- Transducer holders and cable management
- Tilt-down flat panel monitor
- Locking arm for flat-panel monitor

Transducer Technology and Design Attributes

- 1.5 to 14.5 MHz frequency range capability
- *four*Sight 4D transducer technology
- Wideband MultiHertz multiple frequency imaging
- Hanafy lens acoustic technology
- Virtual format imaging
- Transducer ports:

  ACUSON Juniper system

  – Five ports for array transducers
  – One auxiliary continuous wave transducer port

  ACUSON Juniper Select system

  – Four ports for array transducers
  – One auxiliary continuous wave transducer port

- Removable transducer holder for all transducer designs and gel bottle storage
- Adjustable temperature gel warmer connects to the ultrasound system's DC power socket and attaches to the side of the system in place of a transducer holder.
- Lightweight, ergonomic transducer design with SuppleFlex cables
- Range of operating frequencies

Transducer	2D-mode	Doppler
5C1	2.5 MHz - 5.0 MHz	2.0 MHz - 2.7 MHz
6C1	2.5 MHz - 5.0 MHz	2.0 MHz - 4.0 MHz
7C2	3.6 MHz - 5.7 MHz	2.7 MHz - 3.3 MHz
12L3	6.2 MHz - 13.3 MHz	4.0 MHz - 6.7 MHz
11L4	6.2 MHz - 10.0 MHz	4.0 MHz - 6.2 MHz
13L4	6.2 MHz - 13.3 MHz	4.0 MHz - 6.2 MHz
14L4	6.2 MHz - 14.0 MHz	4.4 MHz - 6.2 MHz
16L4	8.0 MHz - 13.3 MHz	5.3 MHz - 6.2 MHz
18H5	8.0 MHz - 14.5 MHz	6.2 MHz - 7.3 MHz
11M3	4.0 MHz - 8.0 MHz	3.6 MHz - 4.4 MHz
5P1	1.6 MHz - 4.0 MHz	1.8 MHz - 2.5 MHz
8V4	4.2 MHz - 7.2 MHz	3.6 MHz - 6.7 MHz
10V4	4.0 MHz - 8.9 MHz	4.0 MHz - 6.2 MHz
5VT	3.6 MHz - 5.7 MHz	2.9 MHz - 3.8 MHz
9MC3	4.2 MHz - 7.3 MHz	4.0 MHz - 5.3 MHz
10MC3	5.0 MHz - 9.4 MHz	4.0 MHz - 6.2 MHz
8VC3	3.3 MHz - 6.2 MHz	2.7 MHz - 3.3 MHz
9VE3	4.7 MHz - 7.3 MHz	4.0 MHz - 5.3 MHz
CW2	---	2.0 MHz
CW5	---	5.0 MHz
CW8	---	8.0 MHz

  - 2D-mode includes fundamental and harmonic imaging, without contrast
  - Doppler includes pulsed wave, continuous wave, and color imaging

User-Accessible Connections

- On-board location for up to two image recording devices
- USB ports on the left side of the touch screen and back of the system for off-board printer connectivity, importing and exporting protocols, archiving data, and serviceability.
- Ethernet connection
- HDMI port for optional external monitor
- ECG connector socket
- Auxiliary ECG connector socket

User-Accessible Cables

Cable Type	Shielded	Length (m)	Ferrite
AC Mains Input (System power)	No	≤ 5.00 m	No
Footswitch	Yes	≤ 3.00 m	No
Barcode Reader	Yes	≤ 2.20 m	No
Gel Warmer	No	≤ 0.40 m	No
Black and White Printer (DC type)			
Power Cable (DC Input)	No	≤ 1.00 m	No
USB Cable	Yes	≤ 0.90 m	No
Color Printer			
Power Cable (AC Mains Input)	No	≤ 0.90 m	No
USB Cable	Yes	≤ 0.90 m	Yes
DVR			
USB Cable	Yes	≤ 0.90 m	Yes
Power Cable (AC Mains Input)	No	≤ 0.90 m	No
Power Cable (AC/DC Adapter)	No	≤ 1.85 m	Yes
HDMI Cable	Yes	≤ 1.20 m	Yes
ECG			
ECG Cable	Yes	≤ 2.95 m	Yes
ECG Leads	Yes	≤ 1.00 m	Yes
Transducer Cables			
5C1	Yes	≤ 2.10 m	No
6C1	Yes	≤ 2.20 m	Yes
7C2	Yes	≤ 2.10 m	No
12L3	Yes	≤ 2.10 m	No
11L4	Yes	≤ 2.10 m	No
13L4	Yes	≤ 2.20 m	Yes
14L4	Yes	≤ 2.20 m	Yes
16L4	Yes	≤ 2.10 m	No
18H5	Yes	≤ 2.10 m	No

Cable Type	Shielded	Length (m)	Ferrite
11M3	Yes	≤ 2.10 m	No
5P1	Yes	≤ 2.10 m	No
8V4	Yes	≤ 2.10 m	No
10V4	Yes	≤ 2.10 m	No
5VT	Yes	≤ 1.99 m	Yes
9MC3	Yes	≤ 2.10 m	No
10MC3	Yes	≤ 2.10 m	No
8VC3	Yes	≤ 2.10 m	No
9VE3	Yes	≤ 2.10 m	Yes
CW2	Yes	≤ 1.83 m	No
CW5	Yes	≤ 2.10 m	No
CW8	Yes	≤ 2.20 m	No

Gel Warmer

(Standard feature on the ACUSON Juniper system; available as an option on the ACUSON Juniper Select system)

- Heats the bottle of gel inserted into the gel warmer

Storage Container

(Standard feature on the ACUSON Juniper system; available as an option on the ACUSON Juniper Select system)

- Basket attaches to the rear handle of the system.
- Side storage bin attaches to either the right or left side of the system

DICOM Connectivity

Note: The ultrasound system is the DICOM Storage Class User.

- Connectivity for digital data transfer to a DICOM network for storage
- Includes DICOM Worklist for querying and retrieving the patient worklist schedule from the hospital or radiology information system.

DICOM Structured Reporting

- Enables transfer of measurements to offline personal computers, workstations, and archiving systems
- Available only with the following exams: Cardiac, Obstetrics, Gynecology, Vascular

Left Ventricular Opacification (LVO)

- Provides improved resolution of endocardial borders and optimal evaluation for wall motion during contrast agent imaging
- Compatible transducers and exam types:
  - 5P1: Adult Echocardiography

Operating Modes

- 2D-mode
  - 2D-mode with Harmonic imaging
- Color flow Doppler
  - Color (velocity)
  - Power (energy)
- Pulsed Wave Doppler
  - Pulsed Wave Doppler Tissue Imaging
  - High Pulsed Repetition Frequency Pulsed Wave Doppler
- Continuous Wave Doppler
  - Steerable Continuous Wave Doppler for phased array transducers
  - Auxiliary Continuous Wave Doppler for pencil transducers
- M-mode
  - M-mode with Harmonic 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
- 2D-mode with Elastography
- 2D-mode with Contrast Agent Imaging
- 2D/Anatomical M-mode

Formats

- Single and dual image display
- Display formats for M-mode and Doppler: side by side, 1/2 2D - 1/2 trace, 1/3 2D - 2/3 trace, 2/3 2D - 1/3 trace
- Full screen format for only the M-mode sweep or Doppler spectrum
- Virtual format imaging: linear, steered linear, sector, vector, or trapezoidal format
- Image display formats during review: 1x1, 1x2, 2x2, 3x3, 4x4, 5x5

General Imaging Functions

- User-adjustable transmit power: 0.20% to 100%
- User-adjustable field of view (FOV) format
- User-adjustable display depth: transducer dependent (1 cm to 35 cm)

Transducer	Maximum Display Depth (cm)
5C1	35
6C1	35
7C2	30
12L3	16
11L4	16
13L4	16
14L4	16
16L4	6
18H5	8
11M3	15
5P1	30
8V4	15
10V4	15
5VT	24
9MC3	14
10MC3	14
8VC3	30
9VE3	14
CW2	---
CW5	---
CW8	---

2D-Mode Features

- Fundamental frequency, transducer dependent: up to 4
- Harmonic frequency, transducer dependent: up to 5
- Adjustable size and position of field of view
- Adjustable image size
- Gain in one decibel increments: -30 dB to 30 dB
- Dynamic range in one decibel increments: 10 dB to 90 dB
- Focal zones: up to 8
- Magnification: up to 10x
- Acquired 2D-mode frame rates, depending on the transducer and imaging depth: up to 2,070 fps (frames per second)
- CINE capture: up to 60 seconds
- Res/Speed (resolution/speed): 6 levels
- Persistence, transducer dependent: up to 6 levels
- Edge enhancement: 4 levels
- Dynamic TCE (DTCE) technology for speckle reduction: 3 levels
- Grayscale maps, transducer dependent: up to 9
- Color maps: 16
- SieClear and Advanced SieClear spatial compounding to reduce speckle and enhance contrast resolution
- Tissue Harmonic Imaging (THI) technology to enhance visualization and reduce noise
- eSieImage technology to optimize image brightness uniformity in the field of view by changing the DGC and overall gain
- Clarify Vascular Enhancement (Clarify VE) technology to increase the contrast resolution and enhance the boundary detection: 7 levels
- Custom Tissue Imaging (CTI) to optimize the 2D image by adjusting the speed of sound
- Wide Field of View (Wide FOV) to extend the field of view to 224°
- Left ventricular opacification Contrast (LVO Contrast) technology, which is a low power harmonic imaging intended for use with injectable ultrasound contrast agents to improve visualization of the endocardial borders and optimal evaluation for wall motion.

M-Mode Features

- Gain in one decibel increments: -30 dB to 30 dB
- Dynamic range in one decibel increments: 10 dB to 90 dB
- Multiple sweep speed selections: 10
- Edge enhancement settings: 4
- Fundamental frequency, transducer dependent: up to 4
- Harmonic frequency, transducer dependent: up to 5
- Grayscale maps, transducer dependent: up to 9
- Colorization maps: 16
- Anatomical M-mode for cardiac exams supports visualization of an M-mode sweep by angle or marker.

Pulsed Wave Doppler

- Gain in one decibel increments: -30 dB to 30 dB
- Dynamic range in one decibel increments, transducer dependent: 10 dB to 90 dB
- Simultaneous 2D-mode and Doppler display and 2D/Doppler with color (Triplex)
- Multiple sweep speed selections: 10
- Transducer frequencies, transducer dependent: up to 4
- Grayscale maps: 7
- Colorization maps: 12
- Angle correction in one degree increments: 0° to 89°
- Pulse Repetition Frequency (PRF) range: 152 Hz to 39,100 Hz
- Velocity scale range with 0 angle correction, transducer dependent: ±0.8 cm/s to ±840 cm/s
- Adjustable gate size: 0.5 mm to 20 mm
- Wall filter selections, depending on the transducer: up to 7
- Baseline shift: up to 13 levels
- Spectral invert
- System-generated trace function
- Spectral DTI (Doppler Tissue Imaging) to depict movement of tissue
- Auto Statistics (Auto Stat)

Steerable Continuous Wave Doppler

(Available with the phased array transducer)

- Gain in one decibel increments: -30 dB to 30 dB
- Multiple sweep speed selections: 10
- Transducer frequencies: up to 3
- Grayscale maps: 7
- Colorization maps: 12
- Pulse Repetition Frequency (PRF) range: 152 Hz to 52,100 Hz
- Velocity scale range with 0 angle correction, transducer dependent: ±1.15 cm/s to ±1,100 cm/s
- Wall filter selections, depending on the transducer: up to 7
- Baseline shift: up to 13 levels
- Spectral invert

Auxiliary Continuous Wave Doppler

- Gain in one decibel increments: -30 dB to 30 dB
- Multiple sweep speed selections: 10
- Transducer frequencies: 1
- Grayscale maps: 7
- Colorization maps: 12
- Pulse Repetition Frequency (PRF) range: 152 Hz to 52,100 Hz
- Velocity scale range with 0 angle correction, transducer dependent: ±0.75 cm/s to ±1,000 cm/s
- Wall filter selections, depending on the transducer: up to 7
- Baseline shift: up to 13 levels
- Spectral invert

Color Doppler

- Gain in one decibel increments: -20 dB to 20 dB
- Pulse Repetition Frequency (PRF) range: 100 Hz to 25,500 Hz
- Velocity scale range, transducer dependent: ±0.5 cm/s to 330.9 cm/s
- Adjustable color region of interest
- Levels of baseline shift: up to 13
- Color Doppler Velocity (CDV) transducer frequencies: up to 4
- Color Doppler Energy (CDE) transducer frequencies: up to 4
- Color maps (CDV only): 10
- Power maps (CDE only), transducer dependent: up to 9
- Persistence: 5 levels
- Tissue/Priority: 5 selections
- Smoothing: 4 levels
- Wall filter: up to 4
- α-Blend: up to 4
- Color Doppler Tissue Imaging (DTI)
- Doppler Tissue Energy (DTE)

3-Scape Imaging

- The 3D Imaging feature acquires three-dimensional ultrasound images. Multiplanar rendering (MPR) provides a view of each segment of the volume as an arbitrary slice.
- Real-time reconstruction after free-hand acquisition
- Multiplanar rendering demonstrates imaging planes not accessible with normal scanning techniques

syngo eSieCalcs Software

- Provides area, circumference, and maximum diameter measurements using a border detection algorithm
- User defines the region of interest
- Can be used wherever manual trace is available

eSieScan Workflow Protocols

An eSieScan protocol is a predefined checklist to guide you through a clinical workflow.

- Define protocol steps (views) that include an image or clip with measurements, body markers, and annotations
- Change the sequence of views during a protocol
- Pause and resume a protocol
- Create new workflow protocols or modify existing protocols
- Import or export protocols using a USB storage device

Clips

- Prospective capture of motion image data
- Retrospective capture of motion image data
- Variable clip length (1 second to 60 seconds)
- AVI format
- DICOM format
- Supports storing of individual images within clips

Wireless

- Sends data, such as studies, images, and clips to a network location over a wireless network

Storage and Archiving

The ultrasound system supports storage and review of completed ultrasound studies, including static images, dynamic clips, measurements, calculations, and reports.

Accessories and Options

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.

Note: The system software with a power cord and one bottle of coupling agent (gel) are included with the ultrasound system.

⚠ **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.

Note: To ensure compliance with the Medical Device Regulations, use only the devices listed in this chapter with your ultrasound system.

Options

Note: For information about the combination of options available for purchase, contact your Siemens Healthineers representative.

Options	Description
*four*Sight 4D Imaging	▪ Compatible transducers and exam types: – 8VC3: Obstetrics, Early Obstetrics, Advanced Obstetrics, Abdominal, Gynecology, Pelvic Floor – 9VE3: Obstetrics, Early Obstetrics, Advanced Obstetrics, Gynecology, Pelvic Floor ▪ Provides general features for 4D imaging. ▪ Provides advanced features for 4D Imaging: – MultiSlice – Thick slice imaging (TSI) – Curved multiplanar rendering (MPR)
SieScape Panoramic Imaging	▪ Compatible with all imaging transducers (except CW and phased array transducers) ▪ SieScape panoramic imaging acquires two-dimensional ultrasound images with a composite, extended field of view
syngo Arterial Health Package	(Requires the physio module option) ▪ Compatible with 2D-mode clips or images acquired with a linear transducer ▪ Provides a method of quantifying Carotid Intima-Media Thickness (CIMT) ▪ Uses semi-automated border detection to determine the maximum and average thickness of the intima-medial layer of the carotid artery
eSie Left Heart (Available only on the ACUSON Juniper system)	(Requires the physio module option) ▪ Compatible transducers and exam types: – 5P1: Adult Echocardiography ▪ Clinical software program to perform left heart volume measurements using 2D-mode data – Traces the contours of the endocardial border of the left ventricle and the left atrium on the end-diastolic and end-systolic images in an apical four-chamber or apical two-chamber view – Includes methods for manually tracing the contours of the left ventricle or the left atrium ▪ Displays the user-confirmed end-diastolic or end-systolic frames

Options	Description
syngo Auto Follicle	▪ Compatible transducers and exam type: – 5C1, 7C2, 8VC3, 10MC3, 9VE3, 9MC3: Gynecology ▪ Provides system-detected distance measurements for user confirmation.
syngo Auto OB	▪ Compatible transducers and exam types: – 5C1, 7C2, 8VC3, 9MC3, 10MC3, 9VE3: Obstetrics, Early Obstetrics, Advanced Obstetrics – 12L3, 11L4, 13L4: Obstetrics ▪ Provides system-detected measurements of specific fetal parameters for user confirmation.
syngo Velocity Vector Imaging (Available only on the ACUSON Juniper system)	▪ Compatible transducers and exam types: – 5P1: Adult Echocardiography, Pediatric Echocardiography – 8V4, 10V4, 11M3: Neonatal Echocardiography, Pediatric Echocardiography – 5VT: Transesophageal Echocardiography ▪ Tracks and estimates tissue velocity and other motion and deformation parameters at selected points on a user-defined outline of a structure ▪ Assists analysis of rotation, displacement, and radial strain of the left ventricle ▪ Assists evaluation of fetal or adult cardiac contraction by analyzing the systolic and diastolic ventricular strain and rotation
Stress Echo (Available only on the ACUSON Juniper system)	(Requires the physio module option) ▪ Compatible transducers and exam types: – 5P1: Adult Echocardiography
eSie Measure Workflow Acceleration Package	(Requires the physio module option) ▪ Compatible transducers and exam types: – 5P1: Adult Echocardiography, Pediatric Echocardiography – 8V4, 10V4, 11M3: Neonatal Echo, Pediatric Echocardiography ▪ Reduces the keystrokes required to perform measurements in 2D-Mode, M-Mode, and pulsed wave Doppler

Options	Description
eSieScan Workflow Protocol	▪ Predefined checklist for a clinical workflow
eSie Touch Elasticity Imaging (Available only on the ACUSON Juniper system)	▪ Provides a qualitative representation of relative tissue stiffness for the region of interest ▪ Compatible transducers and exam types: – 16L4, 12L3, 11L4, 13L4: Breast, Thyroid – 18H5: Thyroid
Virtual Touch Quantification (Available only on the ACUSON Juniper system)	▪ Virtual Touch quantification measures tissue shear velocity (Vs) and elasticity (E) for a selected region of interest. Virtual Touch quantification uses acoustic radiation force impulse (ARFI) technology of diagnostic ultrasound to induce tissue displacement. A time-controlled sequence of "push pulses" from the transducer induces a small displacement of tissue. The ultrasound system measures shear wave velocity and elasticity at the region of interest. ▪ Provides measurement labels for sites, lesions, and liver segments, which display in the liver assessment section of the abdomen report ▪ Compatible transducers and exam types: – 5C1: Abdominal
Needle Visualization (Available only on the ACUSON Juniper system)	▪ Compatible transducers and exam types: – 16L4: Bowel, Focused Assessment with Sonography for Trauma, Lung, Testis, Penile, Thyroid, Pediatric Hip Joint, Carotid, Breast, Musculoskeletal, Digital, Nerve – 12L3, 11L4, 13L4: Bowel, Focused Assessment with Sonography for Trauma, Lung, Obstetrics, Breast, Testis, Penile, Thyroid, Pediatric Hip Joint, Carotid, Peripheral Venous, Peripheral Arterial, Spine, Musculoskeletal, Digital, Nerve. – 18H5: Testis, Penile, Thyroid, Musculoskeletal, Digital, Nerve, Intraoperative Abdomen, Carotid ▪ Enhances the visualization of the needle during the biopsy or needle puncture procedures
Contrast Agent Imaging (Available only on the ACUSON Juniper system)	**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 – Flash Sequencing ▪ Compatible transducers: – 6C1 – 14L4

Options	Description
Battery Support	▪ Uses the ultrasound systems with battery power assistance. Allows a continuous scan without connecting the ultrasound system to the power supply outlet or even during power service interruptions.
ECG Leads	▪ ECG leads, standard U.S.A. ▪ ECG leads, standard European
Barcode Reader	▪ Provides direct entry of patient information in the registration form, for example, the patient name and ID, the performing physician, or the sonographer ▪ Connects to a USB port on the ultrasound system. ▪ Barcode Reader, DS8108
Card Reader	(Available only for systems in Japan) ▪ Provides direct entry of patient information in the registration form, for example, the patient name and ID, the performing physician, or the sonographer
Large Gel Holder	▪ Holder for storing large bottles of gel on the ultrasound system in place of a transducer holder
Alphanumeric Keyboard	▪ Retractable alphanumeric keyboard for attachment below the control panel
QuikStart Option	▪ For use during portable studies ▪ Decreases the time required to power on or off the ultrasound system using the installed battery to place the ultrasound system in a standby status
Footswitch	▪ Configurable dual watertight footswitch ▪ Requires connection to the ultrasound system with a USB connector ▪ Footswitch, FSU-2000U

Options	Description
Physio Module	▪ Physiologic function – ECG cable and leads – ECG auxiliary input/output cables – Stress adapter cable set – Auxiliary ECG function – Auxiliary signal – Respiratory trace ▪ Provides the ability to configure ECG capabilities for specialty applications that require display and monitoring of physiologic traces without continuous wave Doppler capabilities
Virtual Communication for eSieLink Remote Assistance	▪ Enables virtual communication for remote assistance with a Siemens Healthineers representative. ▪ Requires using the phone number provided by your Siemens Healthineers representative to initiate remote assistance. The representative guides you through the setup of each communication session ▪ Includes a headset, camera, and camera attachment
eSiePrep	▪ Provides pre-configuration of Internet Based Connectivity (IBC) and Smart Remote Services (SRS) connection
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. ▪ Data storage encryption – Protects patient 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

Transducer Options

ACUSON Juniper System

Options	Description
Transducers, Curved Array	▪ 5C1 ▪ 6C1 ▪ 7C2 ▪ 11M3
Transducers, *four*Sight 4D	▪ 8VC3 ▪ 9VE3
Transducers, Linear Array	▪ 12L3 ▪ 11L4 ▪ 13L4 ▪ 14L4 ▪ 16L4 ▪ 18H5
Transducers, Phased Array	▪ 5P1 ▪ 8V4 ▪ 10V4 ▪ 5VT
Transducers, Continuous Wave	▪ CW2 ▪ CW5 ▪ CW8
Transducers, Endocavity	▪ 9MC3 ▪ 10MC3
Transducer Accessories	▪ Transducer Sheaths (except CW transducers) ▪ Biopsy Needle Guide Set – Verza Guidance System: 6C1, 13L4, 14L4 – In-plane ultrasound needle guide, Ultra-Pro II: 5C1, 7C2, 11L4, 12L3 – In-plane ultrasound needle guide, Infiniti Plus: 16L4 ▪ Reusable Endocavity Needle Guide: 9VE3, 9MC3, 10MC3 ▪ Disposable Endocavity Needle Guide: 9MC3, 10MC3

ACUSON Juniper Select System

Options	Description
Transducers, Curved Array	▪ 5C1
Transducers, *four*Sight 4D	▪ 8VC3
Transducers, Linear Array	▪ 12L3 ▪ 11L4
Transducers, Phased Array	▪ 5P1
Transducers, Continuous Wave	▪ CW2 ▪ CW5
Transducers, Endocavity	▪ 10MC3
Transducer Accessories	▪ Transducer Sheaths (except CW transducers) ▪ Biopsy Needle Guide Set – In-plane ultrasound needle guide, Ultra-Pro II: 5C1, 11L4, 12L3 ▪ Reusable Endocavity Needle Guide: 10MC3 ▪ Disposable Endocavity Needle Guide: 10MC3

Digital Documentation Devices

Note: Up to two documentation devices (black and white printer and color printer or DVR) can be integrated into the system.

- Black and White Printer, P95DW-DC(S), Mitsubishi[1]
- Black and White Printer, UP-D898DC, Sony
- Black and White Printer, UP-D711, Sony
- Color Printer, CP30DW, Mitsubishi[1]
- Color Printer, UP-D-25MD, Sony
- DVR UR-50BD-SK Recorder (NTSC/PAL, 115V/230V), TEAC[2]

[1]Not available for sale
[2]Not available for sale or use in the European Union

Disposables

- Disposable Transducer Sterile Sleeve
- Disposable Transducer Sterile Cover
- Disposable ECG Electrodes
- 3-lead ECG Cable
- Stress Echo Adapter Cable Set
- Protective Overlay for Control Panel
- Disposable Needle Guides and Brackets

Consumables

- Contact Scan Gel
- Sterile Contact Gel
- Black and White Printer Paper

Measurements, Calculations, and Reports

Two categories of measurements and calculations are available on the ultrasound system: general and exam-specific.

General Functions

- 2D-mode, M-mode, and Doppler support up to twenty (20) measurements per image
- Label then Measure or Measure then Label workflows
- Customizable reports

2D-Mode Measurements and Calculations

- Distance
- Angle
- Circumference
- Area
- Volume
- Disk Volume
- Stenosis Ratio

M-Mode Measurements and Calculations

- Distance
- Time
- Heart Rate
- Slope
- Distance Ratio
- Time Ratio

Doppler Measurements and Calculations

- Velocity
- Heart Rate
- Time
- Time Ratio
- Acceleration
- Flow Volume
- Resistive Index (from peak systolic velocity and end diastolic velocity)
- Pulsatility Index (from system-generated trace or user-generated trace)
- Velocity Ratio
- Velocity Time Integral
- Pressure Half Time

Exam-Specific Measurements and Calculations

The measurement function is arranged by exam type and is available for use with all exam types. All exam types support the following measurement and report features:

- All general measurements and calculations
- Exam-specific patient report (editable)
- User-defined anatomy descriptions

See also: For information about exam-specific measurements and calculations, refer to the measurement chapters in the Clinical Applications Guide.

Clinical Measurement Range and Accuracy

The following table describes the variability in accuracy for each parameter:

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	0 cm – 35 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 tolerance using trace tool is user-dependent.
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. **Note:** Measurement results on SieScape images may vary depending on the user's scanning technique. Improper skill or technique can cause inaccurate measurements.
Trace Area	0 cm^2 – 972 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.
Time	0 sec – 18.0 sec	Less than ±1% of the sweep speed or ±10 msec, whichever is greater.
Velocity	0 cm/sec – 2200 cm/sec	10% of the velocity or 5 cm/s; whichever is greater using a calibrated flow phantom.
Physio		
Heart Rate	30 bpm - 300 bpm	Less than ±2 beats per minute or ±1%, whichever is greater.

2D-Mode Measurements

2D-mode Measurements	Range or Formula	Minimum Value	Maximum Value
Distance	0 cm – 35 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 – 972 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	0 cm/sec – 2200 cm/sec	V-Tol(V)	V+Tol(V)
Time @ Slow Sweep	0 sec – 18.0 sec	T-Tol(T)@ Slow Sweep	T+Tol(T)@ Slow Sweep
Time @ Med Sweep	0 sec – 4.0 sec	T-Tol(T)@ Med Sweep	T+Tol(T)@ Med Sweep
Time @ Fast Sweep	0 sec – 1.0 sec	T-Tol(T)@ Fast Sweep	T+Tol(T)@ Fast Sweep
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	$(MnVel_1+MnVel_2+\ldots+MnVel_N)/N$	$(MnVel_1-Tol(MnVel_1)+MnVel_2-Tol(MnVel_2)+\ldots+MnVel_n-Tol(MnVel_n))/N$	$(MnVel_1+Tol(MnVel_1)+MnVel_2+Tol(MnVel_2)+\ldots+MnVel_n+Tol(MnVel_n))/N$
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-ED)/TAV	(PS-Tol(PS)-ED-Tol(ED))/(TAV+Tol(TAV))	(PS+Tol(PS)-ED-Tol(ED))/(TAV-Tol(TAV))
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
Slow Sweep	Slow sweep
Med Sweep	Medium sweep
Fast Sweep	Fast sweep
MxVel	Maximum velocity
N	Number of velocities averaged
MnVel	Mean velocity
MdVel	Mode velocity
PS	Peak systolic velocity
ED	End diastolic velocity
TAV	Time averaged velocity
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 – 35 cm	D-Tol(D)	D+Tol(D)
Time @ Slow Sweep	0 sec – 18.0 sec	T-Tol(T) @ Slow Sweep	T+Tol(T) @ Slow Sweep
Time @ Med Sweep	0 sec – 4.0 sec	T-Tol(T) @ Med Sweep	T+Tol(T) @ Med Sweep
Time @ Fast Sweep	0 sec – 1.0 sec	T-Tol(T) @ Fast Sweep	T+Tol(T) @ Fast Sweep
Heart Rate	30 bpm – 300 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
Slow Sweep	Slow sweep
Med Sweep	Medium sweep
Fast Sweep	Fast sweep
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

Virtual Touch Clinical Measurements: Range and Accuracy

Transducer	Direct Measurement	Range	Tolerance Symbol	Tolerance Function or Value (Accuracy)
5C1	Shear Wave Velocity	1.0 m/s to 5.0 m/s	Tol(Vs)	±10% over the depth range of 2.0 - 8.0 cm
	Elasticity (Young's Modulus)	3.0 kPa to 75.0 kPa	Tol(E)	±20% over the depth range of 2.0 - 8.0 cm
6C1	Shear Wave Velocity	1.0 m/s to 5.0 m/s	Tol(Vs)	±10% over the depth range of 2.0 – 8.0 cm
	Elasticity (Young's Modulus)	3.0 kPa to 75.0 kPa	Tol(E)	±20% over the depth range of 2.0 – 8.0 cm

System Requirements

Power Supply Requirements

Requirement		Ultrasound System
Input	**MAINS Voltage**	100V~ to 240V~
	Maximum Current	5.9 amps
	Frequency	50/60 Hz
Accessory Outlet	**Outlet Voltage**	100V~ to 240V~
	Maximum Current	150 VA
	Frequency	50/60 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 the *Instructions for Use* 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 Signal for Video and Data Transmission Connections

Port	Location	Connector
HDMI	Input/Output panel	19-pin HDMI (1 output)
USB	Input/Output panel	Series A type (4 ports)
USB	Left side of touch screen	Series A type (2 ports)
Ethernet (10BaseT/100BaseT)	Input/Output panel	RJ45 (1 port)
Digital Video Interface (DVI)	Input/Output panel	24-pin DVI-type (1 output)
S-Video	Input/Output panel	4-pin MINI-DIN (1 output)

Video Standard

- HDMI
- Digital Video Interface (DVI)
- S-Video

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.

	During Operation	**Ambient (During Storage or Transportation)**
Atmospheric pressure:	700 hPa to 1060 hPa	500 hPa to 1060 hPa
Relative humidity:	10% to 80%, non-condensing	10% to 95%, non-condensing
Temperature:	---	---
System (without a battery pack)	+10°C to +40°C	-20°C to +60°C
System (with a battery pack)	+10°C to +35°C	-20°C to +50°C
Array Transducers (except 5P1, 11M3, 9MC3, 8VC3, 9VE3, 5VT)	+10°C to +40°C	-40°C to +60°C
10MC3	+10°C to +40°C	-40°C to +60°C
5P1, **5VT**, **6C1**	+10°C to +40°C	-10°C to +50°C
11M3, **9MC3**	+10°C to +40°C	-20°C to +60°C
8VC3, **9VE3**	+10°C to +40°C	-30°C to +70°C
14L4, **CW2**, **CW5**, **CW8**	+10°C to +40°C	-40°C to +60°C

Protective Measures

Explosion protection: This product is not designed for operation in areas subject to explosion hazards.

Maximum Physical Dimensions

ACUSON Juniper System

Width: 585.3 mm

Height: 1634 mm

Depth: 845.1 mm

Weight: 76 kg without documentation devices

Not to exceed 100 kg

ACUSON Juniper Select System

Width: 507.5 mm

Height: 1540 mm

Depth: 845.1 mm

Weight: 70 kg without documentation devices

Not to exceed 100 kg

System Classifications

- Type of protection against electrical shock:
  - Class I, external powered
- Degree of protection against electrical shock:
  - Type BF applied part for transducers
  - Type CF defibrillation-proof applied part for ECG
- Degree of protection against harmful ingress of water:

  Ordinary equipment (transducers and footswitch: IPX8)
- 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

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 B)

  Note: The system is a Class A device when the barcode reader is in use.

  Note: The system is a Class A device when the DVR is in use.

- 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 Patient Data

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Patient Registration Form

The patient registration form contains general and exam-specific information. Use the configuration settings to select a long version of the patient registration form to include all fields on the form or to select a short version of the form.

Note: Alphanumerics and special character, single quotation mark (') are allowed to enter in the patient ID and patient name.

Patient Demographics

Field	Description
Last Name*	Patient's last name
First Name*	Patient's first name
Mi	Patient's middle initial(s)
Pre	List of prefixes, for example, Dr., Mrs., Ms.
Suf	List of suffixes, for example, Jr., II
Patient ID*	Identification code for the patient. If you do not enter a patient identification code, the system generates a unique identifier starting with the system date and time. This code displays on the image screen. If there is not enough space for the entire code to display on the image screen, the system displays part of the code followed by three dots (…).
Date of Birth*	Patient's date of birth using the date format specified in the configuration settings. When you enter or change this value, the system calculates and displays the value for **Age**.
Age	The system calculates and displays the patient's age based on the date of birth, if entered.
Gender*	Patient's sex. If **Male** or **Female** is not selected, the system selects **Other**.
Height	Patient's height using the measurement system, metric or U.S, as specified in the configuration settings
Weight	Patient's weight using the measurement system, metric or U.S, as specified in the configuration settings
BSA	Patient Body Surface Area in m^2. The system calculates the body surface area (BSA) using metric or U.S. formulas based on height and weight, as specified in configuration settings. ▪ Metric: BSA = 0.007184 x $(weight)^{0.425}$ x $(height)^{0.725}$ ▪ U.S. BSA = 0.007184 x $(weight \times 0.454)^{0.425}$ x $(height \times 2.54)^{0.725}$ The BSA is included in the patient report.
BP mmHg	Patient's blood pressure

*Indicates the fields also available on the short patient registration form.

Exam

Field	Description
Transducer*	List of the available transducers
Exam*	List of the exam types available for the selected transducer
Accession No.	Identification code used for billing purposes indicating the sequence of the current study as related to other studies for this patient. Typically generated by a worklist server, for example a hospital information system or radiology information system.
Indication	Information describing the symptom or particular circumstance regarding the advisability or necessity of a specific medical procedure
Protocol	List of workflow protocols

*Indicates the fields also available on the short patient registration form.

Medical Information

The information in this section of the patient registration form depends on the selected exam.

Use the configuration settings to specify the date format.

Field	Description
Date*	Start date of the patient's Last Menstrual Period (LMP) or the date of In-Vitro Fertilization (IVF). When you enter or change this value, the system calculates and displays values for the estimated fetal age in weeks (w) and days (d) and estimated date of confinement. **Note:** On the short form, the system displays a field only for the date of the last menstrual period.
EDC*	Estimated Date of Confinement. The system updates the LMP or IVF and estimated fetal age. **Note:** If an estimated fetal age, LMP, or IVF already exists, the system updates the estimated date of confinement.
Fetal Age w d*	Fetal age in weeks (**w**) and days (**d**). The system updates the LMP or IVF and estimated date of confinement. **Note:** If a date already exists for LMP or IVF, the system updates the estimated fetal age.

Field	Description
Gravida	Patient's history of pregnancies.
Para	The system includes this information in the patient report, but not on the image screen.
Aborta	
Ectopic	
BP (Right) mmHg	Blood pressure of the right arm, using the systole over diastole measurement in mmHg.
BP (Left) mmHg	Blood pressure of the left arm, using the systole over diastole measurement in mmHg.
ABI (Left/Right)	Ankle Brachial Index
Additional Info	Additional information about the patient
PSA	(Available only for Pelvis and Prostate exams) ▪ Prostate Specific Antigen

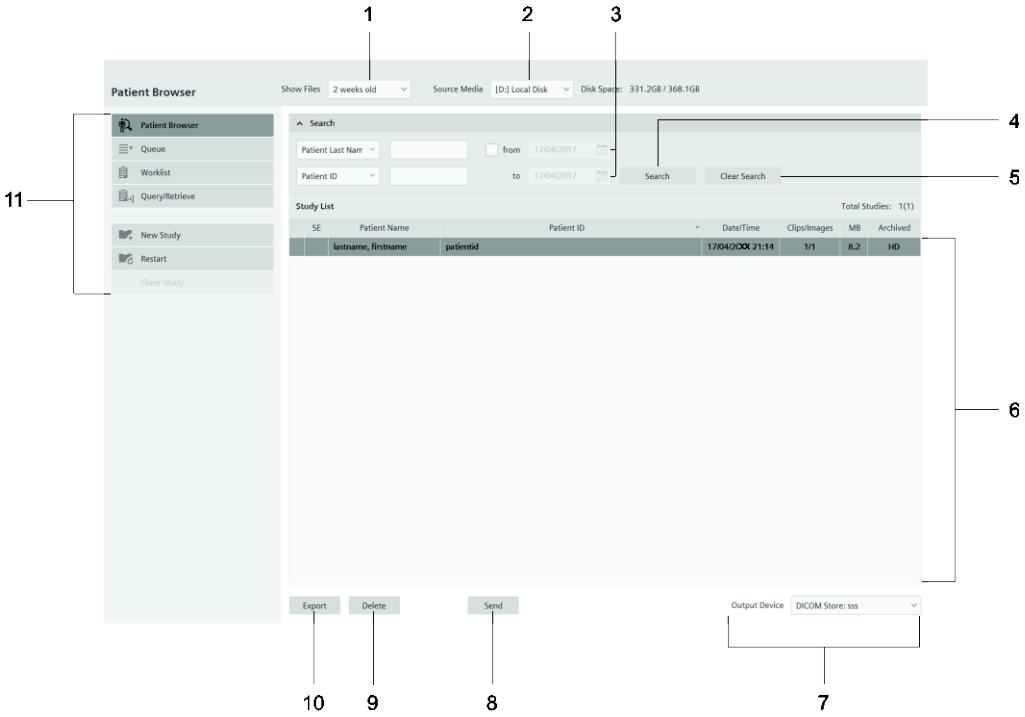
*Indicates the fields also available on the short patient registration form.

Other Information

Field	Description
Performing MD	Identifying information for the performing physician
Referring MD	Identifying information for the referring physician
Sonographer	Identifying information for the sonographer

Patient Browser

Use the patient browser to search for patient records and view patient data. The patient browser displays a list of patient studies in the selected storage location, for example, the local database (hard disk), a configured server, or a USB storage device. You can also delete studies from the patient browser and export or copy studies to external media.



Example of the patient browser.

1 **Show Files**
Select the date range of studies to include in the search. For example, you can display all studies or only studies performed within the last month.

2 **Source Media**
Select the storage location of studies to include in the search.

3 Search criteria
Use these fields to filter the list of studies. For example, you can search by patient name, study type, or a range of dates.

4 **Search**
Click this button to activate the search based on the search criteria.

5 **Clear Search**
Click this button to display all studies stored in the selected location and to remove the search criteria.

6 **Study List**

Use this list to view study information, select a study for review, or restart a study. The system displays a graphical indicator to the left of the study currently open.

7 **Output Device**

Select the export location for the selected studies. For example, you can send selected studies to a DICOM storage server, a network export server or a printer.

8 **Send**

Click this button to export selected studies to the selected external device or printer. For example, you can send selected studies to a DICOM storage server, a network export server, or a printer.

9 **Delete**

Click this button to delete the selected studies from the system hard disk.

10 **Export**, **Import**

Click this button to display selections for exporting or importing studies.

11 Navigation menu

Use these controls to display other patient information screens, for example, the DICOM queue or the patient registration form.

Study List

Column Name	Description
Patient Name	Patient name entered on the patient registration form
Patient ID	Patient identifier entered on the patient registration form
Date/Time	Date and time the study was performed
Clips/Images	Number of clips and images saved with the study. For example, 4/18 indicates the study includes 4 clips and 18 static images.
MB	Size of the study in megabytes
Archived	Location of the archive of saved studies, for example, **HD** (hard disk) or **USB**
SE	Status of the stress echo protocol, for example, active, paused, or completed.

Selections for Exporting Patient Studies

Selection	Description
Destination	Identifies target location for the exported studies
Identification	---
De-identify	Removes patient identifying information from the patient study **Note:** You can enter text to replace the patient name in the text box.
Format	---
DICOM	Exports images in the DICOM (Digital Imaging and Communications in Medicine) format
Tiff/Avi	Exports images in Tagged Image File Format and exports clips in Audio Video Interleaved format
Option	---
Finalize	Prevents additional storage to the inserted media
Eject	Ejects the media from the external device after the export is complete when the check box is selected
Eject	Ejects the media from the external device when the button is pressed
Status	Displays export progress
Export	Confirms the export is complete
Close	Closes the export dialog box
Send	Sends the study to the DICOM server

Selections for Managing Transfer Jobs

Use the queue in the patient browser to view and manage studies including images sent to a DICOM storage and a DICOM print server. Page tabs display along the top of the DICOM Store Queue and DICOM Print Preview.

Selection	Description
DICOM Job Queue	---
Type	Operation type, for example, **Store** (storage) or **Commit** (storage commitment)
Patient Name	Patient name entered on the patient registration form
Server	Destination server to receive the study
Time Sent	Date and time when the job was sent to the storage server
Information	Size of the files and the number of images or studies
State	Archive status of the study, for example, **None** (not archived) or **Stored** (archived)
Status	Information about the job, for example, in-progress or successful
Details	Error description if the job failed **Note: SR** indicates the content is a structured report.
Refresh Job	Updates the status information for all jobs in the queue
Retry Job	Resends the selected jobs, for example, if the transfer failed
Delete	Removes the selected jobs from the queue when the button is pressed
Delete All	Removes all jobs from the queue when the button is pressed
DICOM Print Preview	---
Printer Alias	Text entry to identify the configured device
Printer Type	Print output, for example, monochrome or color
Film size	Size of the print output
Orientation	Print orientation, for example, portrait or landscape
Copies	Text entry for the number of copies to print
Layout	Layout for the print output
Delete	Removes the image outlined from the layout page.
Cut	Outlines the selected image in yellow.
Paste	Inserts the image.
Print Page	Sends the current page of images to the queue
Print All	Sends all pages of images to the queue

Appendix C Cybersecurity

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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 all 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.

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.
  - Security updates are periodically 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, detection, and removal of malware.

- The ultrasound system incorporates McAfee SolidCore; only software signed by the medical device manufacturer is executable.
- Anti-malware settings are user configurable.
- The ultrasound system captures security-related activities in a security log file.
- Ultrasound systems connected to Smart Remote 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.	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.
  - The default password can be changed after system installation. It is the responsibility of the user to manage the changed password.
- A software-based firewall is configured with restrictions and activated.
- 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.
- Unnecessary software applications are not included on the ultrasound system.
- Unauthorized software or hardware cannot be installed on the ultrasound system.
- 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 2, 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 6, System Reference
Configure rigorous password requirements.	Chapter 6, 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.
- 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 6, 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.	Chapter 6, 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 6, 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.	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.

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 6, 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 log off 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 3, 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 4, 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.	Chapter 1, Instructions for Use
Remove (anonymize) patient-identifying information from a study, as required, before exporting patient data.	Chapter 5, Instructions for Use Appendix B, Instructions for Use Chapter 5, System Reference

Assuring Integrity and Confidentiality during Data Transmission

The ultrasound system is designed to ensure the integrity and confidentiality of transmitted patient data.

- Supports secure wireless network communication with the ultrasound system by authorizing a client certificate.
- 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 a secure wireless network transmission.	Chapter 1, 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 2, System Reference Chapter 5, System Reference
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 6, 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 6, 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 6, 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 6, 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 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

Smart Remote Services can monitor the vulnerability of the ultrasound system and offer product updates of relevant operating system and product security patches.

Smart Remote 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

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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).

Default Displayed MI and TI Values by Transducer

(Per transducer/mode that exceeds default MI value of 0.01 or TI value of 0.1)

Trans-ducer	Mode															
	B		M		PWD		SCW		Color		CWD		Elasticity		Contrast	
	MI	TI	MI	TI	MI	TI	MI	TI	MI	TI	MI	TI	MI	TI	MI	TI
5C1	1.01	0.2(S^1) 0.2(B^2)	1.10	0.8(S^1) 1.7(B^2)	0.56	1.0(S^1) 1.8(B^2)	-	-	0.95	0.5(S^1) 0.5(B^2)	-	-	1.45	0.6(S^1) 1.6(B^2)	-	-
6C1	1.39	0.5(S^1) 0.5(B^2)	1.39	0.5(S^1) 1.4(B^2)	0.57	2.4(S^1) 4.6(B^2)	-	-	1.33	1.4(S^1) 1.4(B^2)	-	-	1.46	0.7(S^1) 2.4(B^2)	0.08	<0.1(S^1) <0.1(B^2)
7C2	0.94	0.9(S^1) 0.9(B^2)	1.15	0.8(S^1) 1.5(B^2)	0.59	1.5(S^1) 1.9(B^2)	-	-	0.91	1.2(S^1) 1.2(B^2)	-	-	-	-	-	-
12L3	1.06	0.1(S^1) 0.1(B^2)	0.57	<0.1(S^1) 0.1(B^2)	0.95	1.0(S^1) 1.0(B^2)	-	-	0.99	0.8(S^1) 0.8(B^2)	-	-	-	-	-	-
11L4	1.19	0.3(S^1) 0.3(B^2)	0.99	0.2(S^1) 0.2(B^2)	0.83	0.3(S^1) 0.5(B^2)	-	-	1.35	1.1(S^1) 1.1(B^2)	-	-	-	-	-	-
13L4	0.60	0.1(S^1) 0.1(B^2)	0.60	<0.1(S^1) 0.2(B^2)	0.76	0.5(S^1) 1.3(B^2)	-	-	1.00	0.7(S^1) 0.7(B^2)	-	-	-	-	-	-
14L4	0.73	0.1(S^1) 0.1(B^2)	0.73	0.1(S^1) 0.3(B^2)	0.98	0.3(S^1) 1.1(B^2)	-	-	0.85	0.5(S^1) 0.5(B^2)	-	-	-	-	0.09	<0.1(S^1) <0.1(B^2)
16L4	1.01	0.1(S^1) 0.1(B^2)	0.69	<0.1(S^1) <0.1(B^2)	0.82	0.4(S^1) 0.9(B^2)	-	-	1.05	0.5(S^1) 0.5(B^2)	-	-	-	-	-	-
18H5	0.75	0.2(S^1) 0.2(B^2)	0.75	<0.1(S^1) <0.1(B^2)	1.14	0.3(S^1) 0.8(B^2)	-	-	1.38	1.4(S^1) 1.4(B^2)	-	-	-	-	-	-
11M3	0.82	1.5(S^1) 1.5(B^2)	0.93	1.1(S^1) 1.1(B^2)	0.61	0.5(S^1) 1.1(B^2)	-	-	0.83	0.8(S^1) 0.8(B^2)	-	-	-	-	-	-
5P1	0.82	0.6(S^1) 0.6(B^2)	1.40	0.3(S^1) 1.2(B^2)	0.54	0.5(S^1) 1.6(B^2)	0.09	1.0(S^1) 2.8(B^2)	0.94	0.6(S^1) 0.6(B^2)	-	-	-	-	-	-
8V4	0.64	0.5(S^1) 0.5(B^2)	1.01	0.1(S^1) 0.4(B^2)	0.64	0.7(S^1) 0.9(B^2)	0.05	0.5(S^1) 1.4(B^2)	0.68	0.6(S^1) 0.6(B^2)	-	-	-	-	-	-
10V4	0.66	0.4(S^1) 0.4(B^2)	1.25	0.2(S^1) 0.5(B^2)	0.51	0.6(S^1) 1.5(B^2)	0.05	0.6(S^1) 1.6(B^2)	0.69	0.6(S^1) 0.6(B^2)	-	-	-	-	-	-
5VT	0.31	0.3(S^1) 0.3(B^2)	0.57	0.3(S^1) 0.3(B^2)	0.17	0.2(S^1) 0.4(B^2)	0.04	0.3(S^1) 0.8(B^2)	0.39	0.3(S^1) 0.3(B^2)	-	-	-	-	-	-
9MC3	1.18	0.2(S^1) 0.2(B^2)	0.88	0.5(S^1) 0.5(B^2)	0.58	1.0(S^1) 1.0(B^2)	-	-	1.15	0.5(S^1) 0.5(B^2)	-	-	-	-	-	-
10MC3	0.46	0.5(S^1) 0.5(B^2)	0.65	0.4(S^1) 0.4(B^2)	0.52	0.6(S^1) 0.6(B^2)	-	-	0.48	0.5(S^1) 0.5(B^2)	-	-	-	-	-	-
8VC3	0.90	0.8(S^1) 0.8(B^2)	1.31	1.0(S^1) 2.3(B^2)	0.67	0.7(S^1) 1.2(B^2)	-	-	0.86	0.7(S^1) 0.7(B^2)	-	-	-	-	-	-
9VE3	0.88	<0.1(S^1) <0.1(B^2)	1.33	0.4(S^1) 0.5(B^2)	0.72	0.4(S^1) 0.5(B^2)	-	-	0.89	0.2(S^1) 0.2(B^2)	-	-	-	-	-	-
CW2	-	-	-	-	-	-	-	-	-	-	0.07	1.0(S^1) 3.5(B^2)	-	-	-	-
CW5	-	-	-	-	-	-	-	-	-	-	0.05	1.1(S^1) 2.4(B^2)	-	-	-	-
CW8	-	-	-	-	-	-	-	-	-	-	0.04	0.6(S^1) 1.2(B^2)	-	-	-	-

S^1: Soft Tissue Thermal Index, B^2: Bone Thermal Index

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**."

Transducer Model	Operating Mode							
	2D-mode	M-mode	Pulsed Wave Doppler	Color Flow Doppler	Steerable Continuous Wave Doppler	Continuous Wave Doppler	Elasticity	Contrast
(Available on the ACUSON Juniper system and the ACUSON Juniper Select system)								
5C1	X	X	X	X			X	
12L3	X	X	X	X				
11L4	X	X	X	X				
5P1	X	X	X	X	X			
10MC3	X	X	X	X				
8VC3	X	X	X	X				
CW2						X		
CW5						X		
(Available only on the ACUSON Juniper system)								
6C1	X	X	X	X			X	X
7C2	X	X	X	X				
13L4	X	X	X	X				
14L4	X	X	X	X				X
16L4	X	X	X	X				
18H5	X	X	X	X				
11M3	X	X	X	X				
8V4	X	X	X	X	X			
10V4	X	X	X	X	X			
5VT	X	X	X	X				
9MC3	X	X	X	X				
9VE3	X	X	X	X				
CW8						X		

The following rules apply to the summary table:

2D-mode	No other mode active. Only MI (when larger than 1.0) is reported for this mode.
M-mode	May include simultaneous 2D-mode.
Pulsed Wave Doppler Steerable Continuous Wave Doppler Continuous Wave Doppler	In duplex modes, the largest displayed TIS (scanned or non-scanned) is reported if it is larger than 1.0.
Color Flow Doppler	Includes simultaneous color flow, M-mode, 2D-mode, and Pulsed Wave 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		
FDA	**IEC**	**FDA**	**IEC**	**Units**
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
-	$p_{ra,\alpha}$ at z_{MI}	-	Attenuated peak-rarefactional acoustic pressure at depth for mechanical index	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 the max [min ($W_{.3}(z)$, $I_{TA.3}(z)$ x 1 cm^2)], where $z > z_{bp}$	Depth for TIS	cm
z_{sp}	z_b	Axial distance at which TIB is a maximum (i.e., $z_{sp} = z_{B.3}$)	Depth for *TIB*	cm
-	z_{MI}	-	Depth for mechanical index	cm
z@$PII_{.3max}$	$z_{pii,\alpha}$	The 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.3 $_{max}$	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	Derated pulse-average intensity at the maximum of the derated spatial-peak pulse intensity integral	Same as FDA	W/cm^2
-	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	-	Attenuated spatial-peak temporal-average intensity at depth for peak attenuated pulse intensity integral	mW/cm^2
-	I_{spta} at z_{pii} or z_{sii}	-	Spatial-peak temporal-average intensity at depth for peak pulse intensity integral	mW/cm^2
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
TX Level (transmit level)	n/a
Focus	n/a
a This Index is not relevant to this operating mode.	n/a
b This transducer is not intended for transcranial or neonatal cephalic uses.	n/a
c This formulation for TIS is less than that for an alternate formulation in this mode.	n/a
# No data is provided for this operation condition since the maximum index value is not reported for the reason listed.	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: **5C1** Operating mode: **2D-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.50	1.71		1.71		5.40
Index Component Value				1.71	1.71	1.71	1.71	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.00					
	P	(mW)		#		186.85		715.36
	P_{1x1}	(mW)		106.46		106.46		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	4.60					
	$z_{pii,\alpha}$	(cm)	4.60					
	f_{awf}	(MHz)	1.79	3.37		3.37		2.53
Other Information	*prr*	(Hz)	#					
	srr	(Hz)	40.40					
	n_{pps}	-	2.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	208.17					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	19.46					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	31.91					
	p_r at z_{pii}	(MPa)	2.48					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	60.00	40.00		40.00		200.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.48	1.67		3.81		4.07
Index Component Value				0.93	1.67	0.81	3.81	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.41					
	P	(mW)		#		195.11		450.71
	P_{1x1}	(mW)		89.84		96.48		
	z_s	(cm)			4.30			
	z_b	(cm)					4.30	
	z_{MI}	(cm)	0.50					
	$z_{pii,\alpha}$	(cm)	1.30					
	f_{awf}	(MHz)	2.71	2.16		1.76		2.55
Other Information	*prr*	(Hz)	720.00					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	130.04					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	80.06					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	102.09					
	p_r at z_{pii}	(MPa)	1.81					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	20.00	100.00		60.00		200.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **Pulsed Wave Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.50	1.23		3.73		2.66
Index Component Value				0.50	1.23	0.84	3.73	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.11					
	P	(mW)		#		124.03		323.93
	P_{1x1}	(mW)		52.45		87.71		
	z_s	(cm)			4.60			
	z_b	(cm)					3.80	
	z_{MI}	(cm)	5.80					
	$z_{pii,\alpha}$	(cm)	5.80					
	f_{awf}	(MHz)	2.00	2.00		2.01		2.56
Other Information	prr	(Hz)	390.63					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	407.05					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	313.76					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	684.97					
	p_r at z_{pii}	(MPa)	3.06					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	80.00	150.00		40.00		200.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **Color Flow Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.50	1.22		1.22		4.05
Index Component Value				0.58	0.58	0.58	0.58	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.44					
	P	(mW)		#		88.99		196.42
	P_{1x1}	(mW)		46.73		46.73		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	1.30					
	$z_{pii,\alpha}$	(cm)	1.40					
	f_{awf}	(MHz)	2.67	2.59		2.59		2.01
Other Information	prr	(Hz)	#					
	srr	(Hz)	67.60					
	n_{pps}	-	12.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	330.12					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	10.10					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	21.88					
	p_r at z_{pii}	(MPa)	2.72					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	20.00	40.00		40.00		40.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **Elasticity**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.49	0.90		2.21		1.97
Index Component Value				0.36	0.78	0.39	2.08	
Acoustic Parameters	**IEC**	**Units**						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.58					
	P	(mW)		#		128.27		141.96
	P_{1x1}	(mW)		37.64		#		
	z_s	(cm)			4.00			
	z_b	(cm)					6.20	
	z_{MI}	(cm)	3.50					
	$z_{pii,\alpha}$	(cm)	3.50					
	f_{awf}	(MHz)	3.05	2.02		2.03		2.02
Other Information	*prr*	(Hz)	39.10					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	359.31					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	27.42					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	43.54					
	p_r at z_{pii}	(MPa)	3.42					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	50.00	92.00		77.00		92.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **6C1** Operating mode: **2D-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.39	1.92		1.92		5.29
Index Component Value				1.92	1.92	1.92	1.92	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	1.97					
	P	(mW)		#		204.23		626.84
	P_{1x1}	(mW)		136.51		136.51		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	3.80					
	$z_{pii,\alpha}$	(cm)	3.80					
	f_{awf}	(MHz)	2.07	2.96		2.96		1.76
Other Information	*prr*	(Hz)	#					
	srr	(Hz)	35.21					
	n_{pps}	-	2.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	197.66					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	53.84					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	95.42					
	p_r at z_{pii}	(MPa)	2.36					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	240.00	40.00		40.00		190.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **6C1** Operating mode: **M-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.39	1.91		5.36		4.90
Index Component Value				0.95	1.91	0.95	5.36	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	1.97					
	P	(mW)		#		377.38		377.38
	P_{1x1}	(mW)		129.71		129.71		
	z_s	(cm)			3.50			
	z_b	(cm)					3.50	
	z_{MI}	(cm)	3.80					
	$z_{pii,\alpha}$	(cm)	3.80					
	f_{awf}	(MHz)	2.07	1.54		1.54		1.54
Other Information	*prr*	(Hz)	720.05					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	197.66					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	192.02					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	337.61					
	p_r at z_{pii}	(MPa)	2.36					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	240.00	190.00		190.00		190.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **6C1** Operating mode: **Pulsed Wave Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.39	2.43		5.33		4.72
Index Component Value				1.22	2.43	1.06	5.33	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.25					
	P	(mW)		#		358.45		130.91
	P_{1x1}	(mW)		98.39		109.06		
	z_s	(cm)			4.00			
	z_b	(cm)					4.30	
	z_{MI}	(cm)	5.20					
	$z_{pii,\alpha}$	(cm)	5.20					
	f_{awf}	(MHz)	2.64	2.61		2.05		2.05
Other Information	prr	(Hz)	610.35					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	341.99					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	304.24					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	788.66					
	p_r at z_{pii}	(MPa)	3.37					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	60.00	100.00		80.00		10.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **6C1** Operating mode: **Color Flow Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.39	2.47		2.47		6.00
Index Component Value				2.39	2.39	2.39	2.39	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.25					
	P	(mW)		#		272.17		711.19
	P_{1x1}	(mW)		151.32		151.32		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	4.80					
	$z_{pii,\alpha}$	(cm)	4.80					
	f_{awf}	(MHz)	2.64	3.32		3.32		2.05
Other Information	prr	(Hz)	#					
	srr	(Hz)	85.21					
	n_{pps}	-	9.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	367.68					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	61.49					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	127.50					
	p_r at z_{pii}	(MPa)	3.35					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	55.00	40.00		40.00		240.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **6C1** Operating mode: **Elasticity**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.51	1.44		3.10		3.40
Index Component Value				0.81	1.27	0.82	2.92	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.39					
	P	(mW)		#		204.72		289.24
	P_{1x1}	(mW)		67.96		#		
	z_s	(cm)			4.20			
	z_b	(cm)					5.60	
	z_{MI}	(cm)	3.90					
	$z_{pii,\alpha}$	(cm)	3.90					
	f_{awf}	(MHz)	2.50	2.50		2.50		2.48
Other Information	prr	(Hz)	#					
	srr	(Hz)	2.21					
	n_{pps}	-	#					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	475.49					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	322.42					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	655.26					
	p_r at z_{pii}	(MPa)	3.26					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	42.00	66.00		60.50		92.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **6C1** Operating mode: **Contrast**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.38	1.88		1.88		5.46
Index Component Value				1.43	1.43	1.43	1.43	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	1.75					
	P	(mW)		#		206.77		523.54
	P_{1x1}	(mW)		122.20		122.20		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	6.30					
	$z_{pii,\alpha}$	(cm)	6.30					
	f_{awf}	(MHz)	1.67	2.46		2.46		2.47
Other Information	prr	(Hz)	#					
	srr	(Hz)	22.68					
	n_{pps}	-	2.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	159.67					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	46.43					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	67.85					
	p_r at z_{pii}	(MPa)	2.25					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	80.00	40.00		40.00		190.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **7C2** Operating mode: **2D-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.38	3.51		3.51		6.00
Index Component Value				3.51	3.51	3.51	3.51	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.48					
	P	(mW)		#		213.98		728.40
	P_{1x1}	(mW)		165.22		165.22		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	0.50					
	$z_{pii,\alpha}$	(cm)	1.30					
	f_{awf}	(MHz)	3.20	4.46		4.46		3.18
Other Information	*prr*	(Hz)	#					
	srr	(Hz)	65.62					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	252.60					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	8.27					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	20.89					
	p_r at z_{pii}	(MPa)	2.14					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	20.00	20.00		20.00		40.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **7C2** Operating mode: **M-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.38	2.41		2.87		4.98
Index Component Value				2.41	1.84	2.41	2.87	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.48					
	P	(mW)		#		184.64		417.09
	P_{1x1}	(mW)		159.38		159.38		
	z_s	(cm)			1.90			
	z_b	(cm)					2.00	
	z_{MI}	(cm)	0.50					
	$z_{pii,\alpha}$	(cm)	1.30					
	f_{awf}	(MHz)	3.20	3.18		3.18		3.15
Other Information	*prr*	(Hz)	720.00					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	252.60					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	149.95					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	170.19					
	p_r at z_{pii}	(MPa)	2.14					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	20.00	40.00		40.00		120.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **7C2** Operating mode: **Pulsed Wave Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.49	2.09		3.80		3.62
Index Component Value				2.09	1.66	1.74	3.80	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.71					
	P	(mW)		#		110.15		358.81
	P_{1x1}	(mW)		137.84		110.15		
	z_s	(cm)			1.90			
	z_b	(cm)					1.40	
	z_{MI}	(cm)	1.20					
	$z_{pii,\alpha}$	(cm)	1.30					
	f_{awf}	(MHz)	3.31	3.18		3.31		3.16
Other Information	prr	(Hz)	1220.70					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	366.23					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	473.78					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	637.82					
	p_r at z_{pii}	(MPa)	3.04					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	20.00	40.00		20.00		200.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **7C2** Operating mode: **Color Flow Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.49	0.99		0.99		0.74
Index Component Value				0.99	0.99	0.99	0.99	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.48					
	P	(mW)		#		84.38		49.11
	P_{1x1}	(mW)		65.60		65.60		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	1.00					
	$z_{pii,\alpha}$	(cm)	1.50					
	f_{awf}	(MHz)	2.75	3.18		3.18		3.15
Other Information	prr	(Hz)	#					
	srr	(Hz)	114.86					
	n_{pps}	-	12.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	225.09					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	11.85					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	25.78					
	p_r at z_{pii}	(MPa)	2.73					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	20.00	40.00		40.00		60.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **12L3** Operating mode: **2D-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.14	0.93		0.93		1.87
Index Component Value				0.93	0.93	0.93	0.93	
Acoustic Parameters	**IEC**	**Units**						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.27					
	P	(mW)		#		159.52		159.52
	P_{1x1}	(mW)		31.28		31.28		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	2.00					
	$z_{pii,\alpha}$	(cm)	2.00					
	f_{awf}	(MHz)	4.09	6.27		6.27		6.27
Other Information	*prr*	(Hz)	#					
	srr	(Hz)	79.52					
	n_{pps}	-	2.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	255.40					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	18.13					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	29.37					
	p_r at z_{pii}	(MPa)	2.88					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	20.00	80.00		80.00		80.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **12L3** Operating mode: **M-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			0.83	1.13		1.13		0.97
Index Component Value				1.13	0.63	1.13	0.52	
Acoustic Parameters	**IEC**	**Units**						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.08					
	P	(mW)		#		50.37		50.37
	P_{1x1}	(mW)		37.69		37.69		
	z_s	(cm)			2.00			
	z_b	(cm)					2.00	
	z_{MI}	(cm)	1.20					
	$z_{pii,\alpha}$	(cm)	2.00					
	f_{awf}	(MHz)	6.04	6.27		6.27		6.27
Other Information	*prr*	(Hz)	720.00					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	95.56					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	26.97					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	78.26					
	p_r at z_{pii}	(MPa)	2.61					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	60.00	80.00		80.00		80.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **12L3** Operating mode: **Pulsed Wave Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.46	1.49		1.88		1.73
Index Component Value				1.49	0.48	0.62	1.88	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.91					
	P	(mW)		#		32.59		26.13
	P_{1x1}	(mW)		50.06		32.59		
	z_s	(cm)			1.70			
	z_b	(cm)					1.50	
	z_{MI}	(cm)	2.40					
	$z_{pii,\alpha}$	(cm)	2.40					
	f_{awf}	(MHz)	4.00	6.25		4.02		4.05
Other Information	prr	(Hz)	610.35					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	592.67					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	372.18					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	713.83					
	p_r at z_{pii}	(MPa)	3.98					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	30.00	40.00		15.00		5.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **12L3** Operating mode: **Color Flow Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.46	1.12		1.12		1.64
Index Component Value				1.12	1.12	1.12	1.12	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.92					
	P	(mW)		#		49.54		140.28
	P_{1x1}	(mW)		37.06		37.06		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	1.90					
	$z_{pii,\alpha}$	(cm)	1.90					
	f_{awf}	(MHz)	4.02	6.35		6.35		4.00
Other Information	prr	(Hz)	#					
	srr	(Hz)	68.15					
	n_{pps}	-	12.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	558.45					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	24.79					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	42.91					
	p_r at z_{pii}	(MPa)	3.80					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	20.00	30.00		30.00		30.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **11L4** Operating mode: **2D-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.28	2.48		2.48		2.55
Index Component Value				2.48	2.48	2.48	2.48	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.24					
	P	(mW)		#		109.47		159.33
	P_{1x1}	(mW)		79.97		79.97		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	1.20					
	$z_{pii,\alpha}$	(cm)	1.20					
	f_{awf}	(MHz)	6.61	6.51		6.51		6.67
Other Information	prr	(Hz)	#					
	srr	(Hz)	58.09					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	325.78					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	1.70					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	2.94					
	p_r at z_{pii}	(MPa)	3.73					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	30.00	50.00		50.00		70.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **11L4** Operating mode: **M-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.50	1.23		1.23		0.98
Index Component Value				1.23	0.61	1.23	0.70	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.80					
	P	(mW)		#		41.06		41.06
	P_{1x1}	(mW)		41.06		41.06		
	z_s	(cm)			1.60			
	z_b	(cm)					1.60	
	z_{MI}	(cm)	1.20					
	$z_{pii,\alpha}$	(cm)	1.20					
	f_{awf}	(MHz)	6.59	6.27		6.27		6.27
Other Information	prr	(Hz)	720.00					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	518.39					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	78.52					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	139.42					
	p_r at z_{pii}	(MPa)	4.84					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	15.00	70.00		70.00		70.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **11L4** Operating mode: **Pulsed Wave Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.49	2.31		2.35		1.96
Index Component Value				2.31	1.19	2.31	2.35	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.03					
	P	(mW)		#		81.15		81.15
	P_{1x1}	(mW)		81.15		81.15		
	z_s	(cm)			1.60			
	z_b	(cm)					1.60	
	z_{MI}	(cm)	1.50					
	$z_{pii,\alpha}$	(cm)	1.50					
	f_{awf}	(MHz)	4.07	5.99		5.99		5.99
Other Information	prr	(Hz)	976.56					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	293.81					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	336.41					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	525.61					
	p_r at z_{pii}	(MPa)	3.73					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	20.00	50.00		50.00		50.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **11L4** Operating mode: **Color Flow Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.50	1.60		1.60		1.02
Index Component Value				1.60	1.60	1.60	1.60	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.70					
	P	(mW)		#		59.06		49.90
	P_{1x1}	(mW)		55.09		55.09		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	0.60					
	$z_{pii,\alpha}$	(cm)	1.00					
	f_{awf}	(MHz)	6.04	6.08		6.08		6.08
Other Information	prr	(Hz)	#					
	srr	(Hz)	169.85					
	n_{pps}	-	12.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	559.68					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	93.54					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	147.90					
	p_r at z_{pii}	(MPa)	4.09					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	10.00	7.50		7.50		7.50

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **13L4** Operating mode: **2D-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.42	1.04		1.04		1.12
Index Component Value				1.04	1.04	1.04	1.04	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.70					
	P	(mW)		#		34.60		66.55
	P_{1x1}	(mW)		32.41		32.41		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	0.60					
	$z_{pii,\alpha}$	(cm)	0.70					
	f_{awf}	(MHz)	6.73	6.76		6.76		6.36
Other Information	prr	(Hz)	#					
	srr	(Hz)	98.89					
	n_{pps}	-	2.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	473.70					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	12.64					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	18.32					
	p_r at z_{pii}	(MPa)	4.27					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	10.00	5.00		5.00		50.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **13L4** Operating mode: **M-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.43	1.15		1.15		1.06
Index Component Value				1.15	0.62	1.15	0.75	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.69					
	P	(mW)		#		37.42		28.85
	P_{1x1}	(mW)		37.42		37.42		
	z_s	(cm)			1.40			
	z_b	(cm)					1.40	
	z_{MI}	(cm)	0.50					
	$z_{pii,\alpha}$	(cm)	0.70					
	f_{awf}	(MHz)	6.76	6.44		6.44		6.37
Other Information	prr	(Hz)	720.05					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	297.22					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	88.28					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	122.34					
	p_r at z_{pii}	(MPa)	2.77					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	5.00	70.00		70.00		40.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **13L4** Operating mode: **Pulsed Wave Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.43	1.67		1.73		2.17
Index Component Value				1.67	0.83	0.63	1.73	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.31					
	P	(mW)		#		24.53		24.53
	P_{1x1}	(mW)		58.92		24.53		
	z_s	(cm)			1.70			
	z_b	(cm)					0.50	
	z_{MI}	(cm)	0.50					
	$z_{pii,\alpha}$	(cm)	0.60					
	f_{awf}	(MHz)	5.35	5.94		5.39		5.39
Other Information	prr	(Hz)	151.99					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	456.45					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	59.11					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	73.76					
	p_r at z_{pii}	(MPa)	3.55					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	10.00	70.00		5.00		5.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **13L4** Operating mode: **Color Flow Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.45	1.01		1.01		1.48
Index Component Value				1.01	1.01	1.01	1.01	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.35					
	P	(mW)		#		44.24		87.76
	P_{1x1}	(mW)		36.21		36.21		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	1.30					
	$z_{pii,\alpha}$	(cm)	1.30					
	f_{awf}	(MHz)	5.27	5.88		5.88		5.94
Other Information	prr	(Hz)	#					
	srr	(Hz)	187.33					
	n_{pps}	-	12.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	520.98					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	21.21					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	29.41					
	p_r at z_{pii}	(MPa)	4.17					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	21.00	24.70		24.70		69.60

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **14L4** Operating mode: **2D-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.40	0.90		0.90		1.11
Index Component Value				0.90	0.90	0.90	0.90	
Acoustic Parameters	**IEC**	**Units**						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.19					
	P	(mW)		#		43.74		71.75
	P_{1x1}	(mW)		27.21		27.21		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	1.20					
	$z_{pii,\alpha}$	(cm)	1.20					
	f_{awf}	(MHz)	6.94	6.97		6.97		6.97
Other Information	*prr*	(Hz)	#					
	srr	(Hz)	52.13					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	400.04					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	12.71					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	18.64					
	p_r at z_{pii}	(MPa)	3.88					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	20.00	60.00		60.00		60.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **14L4** Operating mode: **M-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.40	0.81		0.82		0.92
Index Component Value				0.81	0.49	0.65	0.82	
Acoustic Parameters	**IEC**	**Units**						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.19					
	P	(mW)		#		28.81		37.18
	P_{1x1}	(mW)		37.18		28.81		
	z_s	(cm)			1.60			
	z_b	(cm)					1.40	
	z_{MI}	(cm)	1.20					
	$z_{pii,\alpha}$	(cm)	1.20					
	f_{awf}	(MHz)	6.94	4.55		4.72		4.55
Other Information	*prr*	(Hz)	720.00					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	400.04					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	62.80					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	102.57					
	p_r at z_{pii}	(MPa)	3.88					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	20.00	80.00		60.00		80.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **14L4** Operating mode: **Pulsed Wave Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.39	1.23		1.55		1.36
Index Component Value				1.23	0.63	0.67	1.55	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.19					
	P	(mW)		#		26.52		13.48
	P_{1x1}	(mW)		42.67		26.52		
	z_s	(cm)			1.60			
	z_b	(cm)					1.10	
	z_{MI}	(cm)	1.20					
	$z_{pii,\alpha}$	(cm)	1.30					
	f_{awf}	(MHz)	5.36	6.05		5.32		5.39
Other Information	prr	(Hz)	243.00					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	405.36					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	74.05					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	112.52					
	p_r at z_{pii}	(MPa)	3.68					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	60.00	80.00		30.00		5.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **14L4** Operating mode: **Color Flow Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.40	0.72		0.72		1.07
Index Component Value				0.71	0.71	0.71	0.71	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.43					
	P	(mW)		#		33.65		26.02
	P_{1x1}	(mW)		24.28		24.28		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	1.30					
	$z_{pii,\alpha}$	(cm)	1.30					
	f_{awf}	(MHz)	6.05	6.10		6.10		5.37
Other Information	prr	(Hz)	#					
	srr	(Hz)	71.77					
	n_{pps}	-	12.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	599.18					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	38.84					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	56.56					
	p_r at z_{pii}	(MPa)	4.50					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	20.00	10.00		10.00		10.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **14L4** Operating mode: **Contrast**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.40	0.82		0.82		0.99
Index Component Value				0.55	0.55	0.55	0.55	
Acoustic Parameters	**IEC**	**Units**						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.19					
	P	(mW)		#		25.05		44.29
	P_{1x1}	(mW)		17.73		17.73		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	1.20					
	$z_{pii,\alpha}$	(cm)	1.20					
	f_{awf}	(MHz)	6.94	6.51		6.51		6.51
Other Information	*prr*	(Hz)	#					
	srr	(Hz)	29.26					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	400.04					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	7.13					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	10.46					
	p_r at z_{pii}	(MPa)	3.88					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	20.00	20.00		20.00		60.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **16L4** Operating mode: **2D-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.20	0.60		0.60		1.23
Index Component Value				0.60	0.60	0.60	0.60	
Acoustic Parameters	**IEC**	**Units**						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.06					
	P	(mW)		#		52.56		52.56
	P_{1x1}	(mW)		15.69		15.69		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	1.00					
	$z_{pii,\alpha}$	(cm)	1.00					
	f_{awf}	(MHz)	6.84	8.09		8.09		8.09
Other Information	*prr*	(Hz)	#					
	srr	(Hz)	79.52					
	n_{pps}	-	2.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	428.79					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	20.10					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	27.96					
	p_r at z_{pii}	(MPa)	3.63					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	12.50	40.00		40.00		40.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **16L4** Operating mode: **M-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.05	0.49		0.49		0.52
Index Component Value				0.49	0.28	0.49	0.36	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.95					
	P	(mW)		#		12.74		12.74
	P_{1x1}	(mW)		12.74		12.74		
	z_s	(cm)			1.00			
	z_b	(cm)					1.00	
	z_{MI}	(cm)	0.70					
	$z_{pii,\alpha}$	(cm)	0.80					
	f_{awf}	(MHz)	8.19	8.09		8.09		8.09
Other Information	prr	(Hz)	720.00					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	259.44					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	50.14					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	78.81					
	p_r at z_{pii}	(MPa)	3.37					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	30.00	40.00		40.00		40.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **16L4** Operating mode: **Pulsed Wave Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.48	0.84		1.92		1.26
Index Component Value				0.84	0.55	0.26	1.92	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.67					
	P	(mW)		#		21.51		22.11
	P_{1x1}	(mW)		28.72		21.51		
	z_s	(cm)			1.00			
	z_b	(cm)					0.40	
	z_{MI}	(cm)	0.80					
	$z_{pii,\alpha}$	(cm)	0.80					
	f_{awf}	(MHz)	6.16	6.15		5.52		6.13
Other Information	prr	(Hz)	976.56					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	703.10					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	426.54					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	581.72					
	p_r at z_{pii}	(MPa)	4.10					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	12.50	40.00		5.00		20.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **16L4** Operating mode: **Color Flow Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.44	0.64		0.64		1.05
Index Component Value				0.64	0.64	0.64	0.64	
Acoustic Parameters	**IEC**	**Units**						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.57					
	P	(mW)		#		31.28		45.17
	P_{1x1}	(mW)		22.01		22.01		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	0.50					
	$z_{pii,\alpha}$	(cm)	0.50					
	f_{awf}	(MHz)	6.17	6.15		6.15		6.15
Other Information	*prr*	(Hz)	#					
	srr	(Hz)	82.46					
	n_{pps}	-	12.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	613.43					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	20.02					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	24.77					
	p_r at z_{pii}	(MPa)	3.80					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	7.50	40.00		40.00		40.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **18H5** Operating mode: **2D-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.49	1.56		1.56		3.14
Index Component Value				1.56	1.56	1.56	1.56	
Acoustic Parameters	**IEC**	**Units**						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	4.02					
	P	(mW)		#		118.63		118.63
	P_{1x1}	(mW)		44.34		44.34		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	0.70					
	$z_{pii,\alpha}$	(cm)	0.70					
	f_{awf}	(MHz)	7.58	7.38		7.38		7.38
Other Information	*prr*	(Hz)	#					
	srr	(Hz)	38.02					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	599.81					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	21.58					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	31.13					
	p_r at z_{pii}	(MPa)	4.57					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	15.00	60.00		60.00		60.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **18H5** Operating mode: **M-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.49	0.86		0.86		0.94
Index Component Value				0.86	0.52	0.86	0.48	
Acoustic Parameters	**IEC**	**Units**						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	4.02					
	P	(mW)		#		24.57		24.57
	P_{1x1}	(mW)		24.57		24.57		
	z_s	(cm)			1.00			
	z_b	(cm)					1.00	
	z_{MI}	(cm)	0.70					
	$z_{pii,\alpha}$	(cm)	0.70					
	f_{awf}	(MHz)	7.58	7.38		7.38		7.38
Other Information	*prr*	(Hz)	720.00					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	599.81					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	81.56					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	115.64					
	p_r at z_{pii}	(MPa)	4.57					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	15.00	60.00		60.00		60.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **18H5** Operating mode: **Pulsed Wave Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.50	2.15		2.15		2.15
Index Component Value				2.15	1.20	2.15	1.33	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.97					
	P	(mW)		#		64.40		45.69
	P_{1x1}	(mW)		64.40		64.40		
	z_s	(cm)			1.20			
	z_b	(cm)					1.20	
	z_{MI}	(cm)	0.80					
	$z_{pii,\alpha}$	(cm)	0.80					
	f_{awf}	(MHz)	7.00	7.00		7.00		7.04
Other Information	prr	(Hz)	1220.70					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	662.70					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	480.28					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	706.86					
	p_r at z_{pii}	(MPa)	4.82					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	15.00	60.00		60.00		30.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **18H5** Operating mode: **Color Flow Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.50	1.40		1.40		1.24
Index Component Value				1.40	1.40	1.40	1.40	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	4.00					
	P	(mW)		#		43.94		46.84
	P_{1x1}	(mW)		41.44		41.44		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	0.60					
	$z_{pii,\alpha}$	(cm)	0.60					
	f_{awf}	(MHz)	7.06	7.10		7.10		7.12
Other Information	prr	(Hz)	#					
	srr	(Hz)	550.06					
	n_{pps}	-	16.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	799.35					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	148.08					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	198.37					
	p_r at z_{pii}	(MPa)	4.63					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	10.00	7.50		7.50		5.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **11M3** Operating mode: **2D-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.50	2.02		2.02		3.25
Index Component Value				2.02	2.02	2.02	2.02	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.18					
	P	(mW)		#		88.77		167.76
	P_{1x1}	(mW)		61.13		61.13		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	1.40					
	$z_{pii,\alpha}$	(cm)	2.30					
	f_{awf}	(MHz)	4.52	6.95		6.95		5.50
Other Information	prr	(Hz)	#					
	srr	(Hz)	79.97					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	155.98					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	55.50					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	113.80					
	p_r at z_{pii}	(MPa)	2.75					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	100.00	80.00		80.00		120.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **11M3** Operating mode: **M-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.50	2.58		2.58		2.34
Index Component Value				2.58	1.07	2.58	0.85	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.19					
	P	(mW)		#		98.12		101.98
	P_{1x1}	(mW)		98.12		98.12		
	z_s	(cm)			2.30			
	z_b	(cm)					2.30	
	z_{MI}	(cm)	1.40					
	$z_{pii,\alpha}$	(cm)	2.30					
	f_{awf}	(MHz)	4.53	5.52		5.52		4.52
Other Information	prr	(Hz)	720.00					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	158.57					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	79.58					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	163.26					
	p_r at z_{pii}	(MPa)	2.78					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	80.00	80.00		80.00		100.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **11M3** Operating mode: **Pulsed Wave Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.45	1.26		1.47		1.40
Index Component Value				1.26	0.63	0.27	1.47	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.05					
	P	(mW)		#		14.90		72.40
	P_{1x1}	(mW)		60.59		14.90		
	z_s	(cm)			2.50			
	z_b	(cm)					1.20	
	z_{MI}	(cm)	1.30					
	$z_{pii,\alpha}$	(cm)	2.70					
	f_{awf}	(MHz)	4.41	4.38		3.76		4.39
Other Information	prr	(Hz)	243.00					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	197.29					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	42.66					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	97.05					
	p_r at z_{pii}	(MPa)	3.05					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	120.00	80.00		20.00		100.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **11M3** Operating mode: **Color Flow Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.46	1.45		1.45		2.35
Index Component Value				0.38	0.38	0.38	0.38	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.09					
	P	(mW)		#		18.79		37.46
	P_{1x1}	(mW)		17.72		17.72		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	1.20					
	$z_{pii,\alpha}$	(cm)	1.20					
	f_{awf}	(MHz)	4.42	4.48		4.48		4.41
Other Information	prr	(Hz)	#					
	srr	(Hz)	273.82					
	n_{pps}	-	10.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	502.59					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	82.77					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	123.08					
	p_r at z_{pii}	(MPa)	3.71					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	20.00	40.00		40.00		120.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **5P1** Operating mode: **2D-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.46	0.91		0.91		2.75
Index Component Value				0.91	0.91	0.91	0.91	
Acoustic Parameters	**IEC**	**Units**						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.39					
	P	(mW)		#		75.52		195.84
	P_{1x1}	(mW)		55.94		55.94		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	1.10					
	$z_{pii,\alpha}$	(cm)	1.40					
	f_{awf}	(MHz)	2.68	3.40		3.40		1.83
Other Information	*prr*	(Hz)	#					
	srr	(Hz)	38.80					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	228.92					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	10.91					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	24.19					
	p_r at z_{pii}	(MPa)	2.48					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	20.00	40.00		40.00		80.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **5P1** Operating mode: **M-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.46	1.07		2.21		2.96
Index Component Value				0.74	1.07	0.63	2.21	
Acoustic Parameters	**IEC**	**Units**						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.39					
	P	(mW)		#		86.84		210.67
	P_{1x1}	(mW)		84.81		72.12		
	z_s	(cm)			4.30			
	z_b	(cm)					5.50	
	z_{MI}	(cm)	1.10					
	$z_{pii,\alpha}$	(cm)	1.40					
	f_{awf}	(MHz)	2.68	1.82		1.83		1.82
Other Information	*prr*	(Hz)	720.00					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	228.92					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	133.39					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	172.83					
	p_r at z_{pii}	(MPa)	2.48					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	20.00	100.00		80.00		100.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **5P1** Operating mode: **Pulsed Wave Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.48	0.86		3.22		1.71
Index Component Value				0.60	0.86	0.53	3.22	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.20					
	P	(mW)		#		81.15		63.89
	P_{1x1}	(mW)		51.60		60.78		
	z_s	(cm)			2.50			
	z_b	(cm)					3.20	
	z_{MI}	(cm)	1.00					
	$z_{pii,\alpha}$	(cm)	1.40					
	f_{awf}	(MHz)	2.21	2.45		1.83		2.51
Other Information	prr	(Hz)	151.99					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	169.98					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	42.60					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	52.97					
	p_r at z_{pii}	(MPa)	2.11					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	20.00	180.00		40.00		20.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **5P1** Operating mode: **Color Flow Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.50	0.38		0.38		0.83
Index Component Value				0.38	0.38	0.38	0.38	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.02					
	P	(mW)		#		43.88		43.16
	P_{1x1}	(mW)		32.50		32.50		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	5.10					
	$z_{pii,\alpha}$	(cm)	5.10					
	f_{awf}	(MHz)	1.83	2.48		2.48		2.48
Other Information	prr	(Hz)	#					
	srr	(Hz)	82.54					
	n_{pps}	-	8.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	379.42					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	74.10					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	119.63					
	p_r at z_{pii}	(MPa)	2.67					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	80.00	40.00		40.00		40.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **5P1** Operating mode: **Steerable Continuous Wave Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			0.09	1.11		3.56		3.10
Index Component Value				1.02	1.11	1.00	3.56	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	0.12					
	P	(mW)		#		163.22		165.23
	P_{1x1}	(mW)		118.25		116.81		
	z_s	(cm)			2.00			
	z_b	(cm)					3.50	
	z_{MI}	(cm)	3.20					
	$z_{pii,\alpha}$	(cm)	3.20					
	f_{awf}	(MHz)	1.80	1.80		1.80		1.80
Other Information	prr	(Hz)	1818200.00					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	0.50					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	502.36					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	766.55					
	p_r at z_{pii}	(MPa)	0.15					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	40.00	120.00		110.00		120.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **8V4** Operating mode: **2D-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.41	0.97		0.97		1.11
Index Component Value				0.97	0.97	0.97	0.97	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.50					
	P	(mW)		#		35.91		43.95
	P_{1x1}	(mW)		35.91		35.91		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	2.70					
	$z_{pii,\alpha}$	(cm)	2.70					
	f_{awf}	(MHz)	3.15	5.66		5.66		3.91
Other Information	prr	(Hz)	#					
	srr	(Hz)	159.95					
	n_{pps}	-	2.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	230.89					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	42.96					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	77.25					
	p_r at z_{pii}	(MPa)	3.26					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	30.00	20.00		20.00		30.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **8V4** Operating mode: **M-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.49	0.82		1.15		1.00
Index Component Value				0.82	0.50	0.73	1.15	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.68					
	P	(mW)		#		39.53		39.53
	P_{1x1}	(mW)		36.27		39.53		
	z_s	(cm)			1.50			
	z_b	(cm)					2.70	
	z_{MI}	(cm)	2.70					
	$z_{pii,\alpha}$	(cm)	2.70					
	f_{awf}	(MHz)	3.29	4.73		3.90		3.90
Other Information	prr	(Hz)	720.00					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	157.05					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	90.33					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	168.19					
	p_r at z_{pii}	(MPa)	3.44					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	30.00	30.00		40.00		40.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **8V4** Operating mode: **Pulsed Wave Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.45	0.85		1.93		0.99
Index Component Value				0.85	0.54	0.52	1.93	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.02					
	P	(mW)		#		30.45		39.35
	P_{1x1}	(mW)		41.66		30.45		
	z_s	(cm)			1.50			
	z_b	(cm)					1.80	
	z_{MI}	(cm)	1.00					
	$z_{pii,\alpha}$	(cm)	1.60					
	f_{awf}	(MHz)	4.23	4.28		3.62		4.24
Other Information	prr	(Hz)	243.00					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	190.29					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	30.39					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	62.44					
	p_r at z_{pii}	(MPa)	2.99					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	80.00	20.00		20.00		30.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **8V4** Operating mode: **Color Flow Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.46	0.89		0.89		1.06
Index Component Value				0.41	0.41	0.41	0.41	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.80					
	P	(mW)		#		20.06		20.04
	P_{1x1}	(mW)		20.06		20.06		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	1.90					
	$z_{pii,\alpha}$	(cm)	1.90					
	f_{awf}	(MHz)	3.62	4.28		4.28		4.22
Other Information	prr	(Hz)	#					
	srr	(Hz)	212.89					
	n_{pps}	-	9.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	383.11					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	72.10					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	104.85					
	p_r at z_{pii}	(MPa)	3.50					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	20.00	20.00		20.00		100.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **8V4** Operating mode: **Steerable Continuous Wave Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			0.06	0.46		1.71		0.91
Index Component Value				0.46	0.35	0.46	1.71	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	0.11					
	P	(mW)		#		24.31		24.31
	P_{1x1}	(mW)		24.31		24.31		
	z_s	(cm)			1.00			
	z_b	(cm)					1.20	
	z_{MI}	(cm)	1.30					
	$z_{pii,\alpha}$	(cm)	1.30					
	f_{awf}	(MHz)	4.00	4.00		4.00		4.00
Other Information	prr	(Hz)	4000000.00					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	0.42					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	416.84					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	639.10					
	p_r at z_{pii}	(MPa)	0.14					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	20.00	20.00		20.00		20.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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			1.47	0.88		0.88		1.77
Index Component Value				0.88	0.88	0.88	0.88	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.40					
	P	(mW)		#		49.81		30.88
	P_{1x1}	(mW)		45.97		45.97		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	0.70					
	$z_{pii,\alpha}$	(cm)	1.80					
	f_{awf}	(MHz)	5.20	4.03		4.03		4.04
Other Information	prr	(Hz)	#					
	srr	(Hz)	79.97					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	203.08					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	107.86					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	198.46					
	p_r at z_{pii}	(MPa)	3.58					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	65.00	30.00		30.00		5.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.47	0.69		0.78		0.70
Index Component Value				0.69	0.33	0.41	0.78	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.40					
	P	(mW)		#		21.44		27.33
	P_{1x1}	(mW)		20.54		21.44		
	z_s	(cm)			1.50			
	z_b	(cm)					2.50	
	z_{MI}	(cm)	0.70					
	$z_{pii,\alpha}$	(cm)	1.80					
	f_{awf}	(MHz)	5.20	7.08		4.03		5.17
Other Information	prr	(Hz)	720.00					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	203.08					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	64.86					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	135.76					
	p_r at z_{pii}	(MPa)	3.58					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	65.00	65.00		30.00		30.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **Pulsed Wave Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.52	1.38		1.80		1.38
Index Component Value				1.38	0.69	0.46	1.80	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.41					
	P	(mW)		#		23.78		28.12
	P_{1x1}	(mW)		48.95		23.78		
	z_s	(cm)			1.80			
	z_b	(cm)					1.10	
	z_{MI}	(cm)	0.70					
	$z_{pii,\alpha}$	(cm)	2.10					
	f_{awf}	(MHz)	5.02	5.93		4.06		6.02
Other Information	*prr*	(Hz)	243.00					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	205.65					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	33.94					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	67.41					
	p_r at z_{pii}	(MPa)	3.27					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	90.00	65.00		10.00		5.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **Color Flow Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.49	1.20		1.20		1.50
Index Component Value				1.15	1.15	1.15	1.15	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.35					
	P	(mW)		#		41.44		18.61
	P_{1x1}	(mW)		41.34		41.34		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	1.90					
	$z_{pii,\alpha}$	(cm)	1.90					
	f_{awf}	(MHz)	4.96	5.86		5.86		6.02
Other Information	*prr*	(Hz)	#					
	srr	(Hz)	353.97					
	n_{pps}	-	11.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	657.08					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	128.99					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	223.13					
	p_r at z_{pii}	(MPa)	4.64					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	20.00	20.00		20.00		5.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **Steerable Continuous Wave Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			0.06	1.05		2.12		1.57
Index Component Value				1.05	0.73	0.67	2.12	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	0.12					
	P	(mW)		#		31.78		49.56
	P_{1x1}	(mW)		49.56		31.78		
	z_s	(cm)			1.20			
	z_b	(cm)					1.10	
	z_{MI}	(cm)	1.30					
	$z_{pii,\alpha}$	(cm)	1.30					
	f_{awf}	(MHz)	4.00	4.44		4.44		4.44
Other Information	prr	(Hz)	4000000.00					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	0.50					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	500.50					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	757.21					
	p_r at z_{pii}	(MPa)	0.15					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	15.00	90.00		10.00		90.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **5VT** Operating mode: **2D-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.14	0.63		0.63		0.83
Index Component Value				0.63	0.63	0.63	0.63	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.30					
	P	(mW)		#		25.19		28.40
	P_{1x1}	(mW)		25.19		25.19		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	1.90					
	$z_{pii,\alpha}$	(cm)	1.90					
	f_{awf}	(MHz)	4.02	5.28		5.28		4.23
Other Information	prr	(Hz)	#					
	srr	(Hz)	149.92					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	256.85					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	156.13					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	243.24					
	p_r at z_{pii}	(MPa)	2.99					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	20.00	20.00		20.00		20.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **5VT** Operating mode: **M-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.45	0.59		1.07		0.79
Index Component Value				0.59	0.39	0.51	1.07	
Acoustic Parameters	**IEC**	**Units**						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.00					
	P	(mW)		#		25.27		26.73
	P_{1x1}	(mW)		25.97		25.27		
	z_s	(cm)			1.30			
	z_b	(cm)					1.80	
	z_{MI}	(cm)	1.90					
	$z_{pii,\alpha}$	(cm)	1.90					
	f_{awf}	(MHz)	4.23	4.80		4.23		4.22
Other Information	prr	(Hz)	720.00					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	455.02					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	190.10					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	330.93					
	p_r at z_{pii}	(MPa)	3.96					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	20.00	20.00		20.00		30.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **5VT** Operating mode: **Pulsed Wave Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.45	0.46		1.18		0.74
Index Component Value				0.46	0.33	0.48	1.18	
Acoustic Parameters	**IEC**	**Units**						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.83					
	P	(mW)		#		26.26		25.28
	P_{1x1}	(mW)		25.28		26.26		
	z_s	(cm)			1.30			
	z_b	(cm)					2.30	
	z_{MI}	(cm)	2.30					
	$z_{pii,\alpha}$	(cm)	2.30					
	f_{awf}	(MHz)	3.84	3.83		3.84		3.83
Other Information	prr	(Hz)	151.99					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	447.53					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	69.21					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	132.82					
	p_r at z_{pii}	(MPa)	3.76					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	30.00	50.00		30.00		50.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **5VT** Operating mode: **Color Flow Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.22	0.24		0.24		0.39
Index Component Value				0.24	0.24	0.24	0.24	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.40					
	P	(mW)		#		13.22		13.22
	P_{1x1}	(mW)		13.22		13.22		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	1.80					
	$z_{pii,\alpha}$	(cm)	1.80					
	f_{awf}	(MHz)	3.84	3.84		3.84		3.81
Other Information	prr	(Hz)	#					
	srr	(Hz)	79.39					
	n_{pps}	-	10.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	303.46					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	87.03					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	132.98					
	p_r at z_{pii}	(MPa)	3.05					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	20.00	20.00		20.00		160.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **9MC3** Operating mode: **2D-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.50	0.95		0.95		0.82
Index Component Value				0.95	0.95	0.95	0.95	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.21					
	P	(mW)		#		38.15		45.29
	P_{1x1}	(mW)		34.28		34.28		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	1.40					
	$z_{pii,\alpha}$	(cm)	1.40					
	f_{awf}	(MHz)	4.56	5.81		5.81		4.57
Other Information	prr	(Hz)	#					
	srr	(Hz)	21.32					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	603.80					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	19.39					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	30.11					
	p_r at z_{pii}	(MPa)	3.90					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	15.00	5.00		5.00		5.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **9MC3** Operating mode: **M-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.50	0.85		1.19		0.89
Index Component Value				0.85	0.46	0.75	1.19	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.53					
	P	(mW)		#		35.08		35.08
	P_{1x1}	(mW)		32.45		35.08		
	z_s	(cm)			1.60			
	z_b	(cm)					2.10	
	z_{MI}	(cm)	1.70					
	$z_{pii,\alpha}$	(cm)	1.70					
	f_{awf}	(MHz)	5.56	5.53		4.49		4.49
Other Information	prr	(Hz)	720.00					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	549.43					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	176.37					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	339.36					
	p_r at z_{pii}	(MPa)	4.64					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	20.00	80.00		40.00		40.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **9MC3** Operating mode: **Pulsed Wave Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.48	1.00		2.07		1.50
Index Component Value				1.00	0.55	0.55	2.07	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.99					
	P	(mW)		#		28.08		24.23
	P_{1x1}	(mW)		41.35		28.08		
	z_s	(cm)			1.80			
	z_b	(cm)					0.90	
	z_{MI}	(cm)	1.40					
	$z_{pii,\alpha}$	(cm)	1.40					
	f_{awf}	(MHz)	4.08	5.10		4.09		5.29
Other Information	prr	(Hz)	976.56					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	544.67					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	496.24					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	768.16					
	p_r at z_{pii}	(MPa)	3.60					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	20.00	60.00		10.00		5.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **9MC3** Operating mode: **Color Flow Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.59	0.43		0.43		0.43
Index Component Value				0.43	0.43	0.43	0.43	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.62					
	P	(mW)		#		18.83		22.68
	P_{1x1}	(mW)		17.61		17.61		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	1.00					
	$z_{pii,\alpha}$	(cm)	1.00					
	f_{awf}	(MHz)	5.22	5.10		5.10		5.24
Other Information	prr	(Hz)	#					
	srr	(Hz)	65.75					
	n_{pps}	-	10.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	636.22					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	23.55					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	34.99					
	p_r at z_{pii}	(MPa)	4.18					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	15.00	30.00		30.00		10.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **10MC3** Operating mode: **2D-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.10	0.73		0.73		0.77
Index Component Value				0.73	0.73	0.73	0.73	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.70					
	P	(mW)		#		24.79		43.79
	P_{1x1}	(mW)		22.34		22.34		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	0.60					
	$z_{pii,\alpha}$	(cm)	0.70					
	f_{awf}	(MHz)	6.07	6.86		6.86		5.24
Other Information	prr	(Hz)	#					
	srr	(Hz)	17.89					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	262.44					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	7.57					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	10.59					
	p_r at z_{pii}	(MPa)	2.95					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	10.00	15.00		15.00		10.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **10MC3** Operating mode: **M-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.43	0.57		0.73		0.74
Index Component Value				0.57	0.36	0.32	0.73	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.25					
	P	(mW)		#		13.32		21.55
	P_{1x1}	(mW)		19.80		13.32		
	z_s	(cm)			1.10			
	z_b	(cm)					0.90	
	z_{MI}	(cm)	0.80					
	$z_{pii,\alpha}$	(cm)	0.80					
	f_{awf}	(MHz)	5.02	6.05		5.02		4.82
Other Information	prr	(Hz)	720.00					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	425.58					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	136.78					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	161.74					
	p_r at z_{pii}	(MPa)	3.35					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	15.00	80.00		15.00		80.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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:**10MC3** Operating mode: **Pulsed Wave Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.50	0.76		1.23		1.41
Index Component Value				0.76	0.43	0.37	1.23	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.03					
	P	(mW)		#		19.03		17.46
	P_{1x1}	(mW)		26.84		19.03		
	z_s	(cm)			1.40			
	z_b	(cm)					1.60	
	z_{MI}	(cm)	1.70					
	$z_{pii,\alpha}$	(cm)	1.70					
	f_{awf}	(MHz)	4.08	5.93		4.08		5.29
Other Information	prr	(Hz)	390.63					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	547.53					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	207.93					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	335.75					
	p_r at z_{pii}	(MPa)	3.85					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	20.00	80.00		20.00		5.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **10MC3** Operating mode: **Color Flow Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.32	0.33		0.33		0.69
Index Component Value				0.33	0.33	0.33	0.33	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.03					
	P	(mW)		#		11.74		39.55
	P_{1x1}	(mW)		11.74		11.74		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	0.60					
	$z_{pii,\alpha}$	(cm)	0.70					
	f_{awf}	(MHz)	5.26	5.89		5.89		5.18
Other Information	prr	(Hz)	#					
	srr	(Hz)	66.47					
	n_{pps}	-	10.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	395.78					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	18.44					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	24.65					
	p_r at z_{pii}	(MPa)	3.23					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	10.00	20.00		20.00		15.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **8VC3** Operating mode: **2D-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.49	1.76		1.76		3.42
Index Component Value				1.76	1.76	1.76	1.76	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.31					
	P	(mW)		#		142.34		369.47
	P_{1x1}	(mW)		102.12		102.12		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	3.80					
	$z_{pii,\alpha}$	(cm)	3.80					
	f_{awf}	(MHz)	2.41	3.62		3.62		2.82
Other Information	prr	(Hz)	#					
	srr	(Hz)	21.73					
	n_{pps}	-	2.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	269.53					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	9.21					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	17.91					
	p_r at z_{pii}	(MPa)	3.06					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	40.00	20.00		20.00		80.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **8VC3** Operating mode: **M-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.49	1.19		2.24		2.49
Index Component Value				0.91	1.19	0.91	2.24	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.31					
	P	(mW)		#		117.28		213.00
	P_{1x1}	(mW)		67.68		67.68		
	z_s	(cm)			3.60			
	z_b	(cm)					3.80	
	z_{MI}	(cm)	3.80					
	$z_{pii,\alpha}$	(cm)	3.80					
	f_{awf}	(MHz)	2.41	2.84		2.84		2.82
Other Information	prr	(Hz)	720.00					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	269.53					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	168.89					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	314.57					
	p_r at z_{pii}	(MPa)	3.06					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	40.00	60.00		40.00		80.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **8VC3** Operating mode: **Pulsed Wave Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.50	0.94		2.00		1.54
Index Component Value				0.94	0.75	0.67	2.00	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.45					
	P	(mW)		#		53.04		53.04
	P_{1x1}	(mW)		61.44		53.04		
	z_s	(cm)			1.90			
	z_b	(cm)					1.30	
	z_{MI}	(cm)	4.20					
	$z_{pii,\alpha}$	(cm)	4.20					
	f_{awf}	(MHz)	2.67	3.22		2.67		2.67
Other Information	prr	(Hz)	390.63					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	430.45					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	248.65					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	510.25					
	p_r at z_{pii}	(MPa)	3.48					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	60.00	40.00		20.00		20.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **8VC3** Operating mode: **Color Flow Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.50	0.39		0.39		0.97
Index Component Value				0.39	0.39	0.39	0.39	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.44					
	P	(mW)		#		40.14		105.42
	P_{1x1}	(mW)		25.31		25.31		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	3.50					
	$z_{pii,\alpha}$	(cm)	3.50					
	f_{awf}	(MHz)	2.68	3.22		3.22		2.67
Other Information	*prr*	(Hz)	#					
	srr	(Hz)	70.19					
	n_{pps}	-	10.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	401.91					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	25.93					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	53.30					
	p_r at z_{pii}	(MPa)	3.20					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	40.00	40.00		40.00		200.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **9VE3** Operating mode: **2D-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.41	0.64		0.64		0.72
Index Component Value				0.64	0.64	0.64	0.64	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.24					
	P	(mW)		#		25.82		28.56
	P_{1x1}	(mW)		24.75		24.75		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	0.60					
	$z_{pii,\alpha}$	(cm)	0.70					
	f_{awf}	(MHz)	5.47	5.47		5.47		4.61
Other Information	*prr*	(Hz)	#					
	srr	(Hz)	17.34					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	424.86					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	30.45					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	41.18					
	p_r at z_{pii}	(MPa)	3.47					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	10.00	10.00		10.00		20.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **9VE3** Operating mode: **M-mode**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.50	0.65		0.92		0.81
Index Component Value				0.65	0.41	0.63	0.92	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.35					
	P	(mW)		#		28.81		28.81
	P_{1x1}	(mW)		29.64		28.81		
	z_s	(cm)			1.50			
	z_b	(cm)					1.90	
	z_{MI}	(cm)	1.80					
	$z_{pii,\alpha}$	(cm)	1.80					
	f_{awf}	(MHz)	5.06	4.64		4.56		4.56
Other Information	prr	(Hz)	720.00					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	499.33					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	107.07					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	196.56					
	p_r at z_{pii}	(MPa)	4.27					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	30.00	60.00		40.00		40.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **9VE3** Operating mode: **Pulsed Wave Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.50	0.39		1.01		0.73
Index Component Value				0.39	0.25	0.32	1.01	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	2.99					
	P	(mW)		#		13.20		8.74
	P_{1x1}	(mW)		16.21		13.20		
	z_s	(cm)			1.30			
	z_b	(cm)					0.90	
	z_{MI}	(cm)	1.30					
	$z_{pii,\alpha}$	(cm)	1.30					
	f_{awf}	(MHz)	3.98	5.08		5.08		5.15
Other Information	prr	(Hz)	151.99					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	511.97					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	54.36					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	76.69					
	p_r at z_{pii}	(MPa)	3.39					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	15.00	80.00		15.00		5.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **9VE3** Operating mode: **Color Flow Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			1.50	0.19		0.19		0.21
Index Component Value				0.19	0.19	0.19	0.19	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	3.39					
	P	(mW)		#		7.82		7.01
	P_{1x1}	(mW)		7.67		7.67		
	z_s	(cm)			#			
	z_b	(cm)					#	
	z_{MI}	(cm)	0.60					
	$z_{pii,\alpha}$	(cm)	0.70					
	f_{awf}	(MHz)	5.19	5.09		5.09		5.19
Other Information	prr	(Hz)	#					
	srr	(Hz)	65.76					
	n_{pps}	-	11.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	493.59					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	76.75					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	102.24					
	p_r at z_{pii}	(MPa)	3.27					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	10.00	20.00		20.00		10.00

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **Continuous Wave Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			0.07	1.01		3.42		2.40
Index Component Value				1.01	0.80	1.01	3.42	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	0.10					
	P	(mW)		#		105.75		105.75
	P_{1x1}	(mW)		105.75		105.75		
	z_s	(cm)			1.50			
	z_b	(cm)					1.70	
	z_{MI}	(cm)	1.80					
	$z_{pii,\alpha}$	(cm)	1.80					
	f_{awf}	(MHz)	2.00	2.00		2.00		2.00
Other Information	prr	(Hz)	2000000.00					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	0.34					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	343.40					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	495.14					
	p_r at z_{pii}	(MPa)	0.12					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	#	#		#		#

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **Continuous Wave Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			0.05	1.07		2.38		1.24
Index Component Value				1.07	0.66	1.07	2.38	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	0.12					
	P	(mW)		#		44.86		44.86
	P_{1x1}	(mW)		44.86		44.86		
	z_s	(cm)			1.40			
	z_b	(cm)					1.40	
	z_{MI}	(cm)	1.70					
	$z_{pii,\alpha}$	(cm)	1.70					
	f_{awf}	(MHz)	5.00	5.00		5.00		5.00
Other Information	*prr*	(Hz)	5000000.00					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	0.50					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	501.99					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	918.13					
	p_r at z_{pii}	(MPa)	0.16					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	#	#		#		#

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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: **CW8** Operating mode: **Continuous Wave Doppler**

Index Label			MI	TIS		TIB		TIC
				At surface	Below surface	At surface	Below surface	
Maximum Index Value			0.04	0.62		1.21		1.02
Index Component Value				0.62	0.45	0.62	1.21	
Acoustic Parameters	IEC	Units						
	$p_{ra,\alpha}$ at z_{MI}	(MPa)	0.10					
	P	(mW)		#		16.29		16.29
	P_{1x1}	(mW)		16.29		16.29		
	z_s	(cm)			0.60			
	z_b	(cm)					0.60	
	z_{MI}	(cm)	0.60					
	$z_{pii,\alpha}$	(cm)	0.60					
	f_{awf}	(MHz)	8.00	8.00		8.00		8.00
Other Information	*prr*	(Hz)	8000000.00					
	srr	(Hz)	#					
	n_{pps}	-	1.00					
	$I_{pa,\alpha}$ at $z_{pii,\alpha}$	(W/cm^2)	0.34					
	$I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$	(mW/cm^2)	341.40					
	I_{spta} at z_{pii} or z_{sii}	(mW/cm^2)	475.45					
	p_r at z_{pii}	(MPa)	0.12					
Operating Control Conditions	TX Level	(dB)	0.00	0.00		0.00		0.00
	Focus	(mm)	#	#		#		#

a This Index is not relevant to this operating mode.

b This transducer is not intended for transcranial or neonatal cephalic uses.

c This formulation for TIS is less than that for an alternate formulation in this mode.

No data is provided for this operation condition since the maximum index value is not reported for the reason listed.

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Procedures for activating and using the clinical software program to analyze cardiac clips. Includes an explanation of how the program tracks and estimates tissue velocity and other motion and deformation parameters at selected points on a user-defined outline (trace) of a structure.

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 contain descriptions for the following ultrasound systems:

- ACUSON Juniper diagnostic ultrasound system
- ACUSON Juniper Select diagnostic ultrasound system

Features and options unique to an ultrasound system are identified within the following locations in the user and reference manuals:

- Chapter 1, Instructions for Use
- Chapter 3, Instructions for Use
- Appendix A, Instructions for Use

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 ▪ Technical description of the ultrasound system ▪ Safety and care information for the system and compatible transducers ▪ Descriptions of system controls ▪ Procedures for system setup, examination fundamentals, image acquisition and optimization, and examination review ▪ Information about system security and protection of patient data against security threats ▪ Acoustic output data
Clinical Applications Guide	▪ Explanation of clinical applications and clinical software programs for use on the ultrasound system ▪ Procedures for the physiologic function and the biopsy function ▪ Description of the transesophageal transducer, including cleaning and care of the transducer ▪ General and exam-specific measurements and calculations ▪ Exam-specific annotations
*System Reference**	▪ General and exam-specific measurement and calculation labels ▪ Description of customizable system settings ▪ Information about DICOM connectivity and network capabilities ▪ Clinical references ▪ Information regarding the electromagnetic compatibility (EMC) testing of this system

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

Conventions

Take a moment to familiarize yourself with the following conventions in your user manual.

Convention	Description
Warnings, Cautions, and Notes	⚠ **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 correct operating procedures to prevent the risk of damage to the system. **Note:** Notes contain information concerning the proper use of the system and/or correct execution of a procedure.
Examples of Cross-References	Examples: **See also:** For additional information, refer to Chapter 2 in the System Reference manual. **See also:** Touch screen controls, p. 1-17 **See also:** For a list of transducers compatible with the needle guide accessories, refer to Chapter 5 in this manual.

Typographical Conventions

The following typographical conventions are in descriptions and procedures within your user manual. You can use these conventions to identify the location of a control or selection on the ultrasound system.

Control or Selection on the Control Panel	Description and Convention
Controls on the Control Panel and Keys on the Keyboard	Controls on the control panel are indicated by uppercase, boldface type. The function of the trackball and trackball keys is indicated by on-screen labels displayed on the image screen. Examples: ▪ Push **DEPTH / FOCUS**. ▪ Rotate **2D** to adjust the 2D gain. ▪ Press **CALIPER** to activate the measurement function. ▪ Press and hold the **Alt** key on the keyboard to access the special characters. ▪ Press **UPDATE**. ▪ Position the marker and then press **SET**.
Controls on the Control Panel and Soft Key Selections on the Touch Screen	The touch screen has unlabeled controls located on the control panel. Tap, press, rotate or press and then rotate the control to make a selection or change a setting. The selection assigned to these controls is indicated by boldface type and enclosed in square brackets ([ ]). Examples: ▪ Press **[Tx Power]** downward to decrease transmit power. ▪ Rotate **[Map]**.
Selections on the Image Screen	On-screen selections are indicated by boldface type. Roll the trackball to position the pointer on the on-screen control or object and then press a trackball key. Examples: ▪ Click **Cancel**. ▪ Double-click a thumbnail. ▪ Select the required check box to search for scheduled procedures.
Selections on the Touch Screen	On-screen selections are indicated by boldface type. To access the selection, tap the touch screen. To change the direction of an object displayed on the touch screen, drag the object on the touch screen. Examples: ▪ Tap **Stress Echo**. ▪ Drag the blue dot to indicate the direction of the arrow. ▪ Swipe the page to select the next page.

A1 Annotations

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Annotating with Text

You can annotate an image by using the keyboard to enter text or by selecting system-defined or user-defined text. You can annotate an image with text during imaging or during review.

Use the configuration settings to customize text for the annotation function for each exam type:

- Create user-defined text
- Customize the text libraries
- Enable auto complete. With auto complete, the system displays predefined text matching the characters you enter on the image screen.
- Delete text from the image screen on unfreeze
- Configure user-defined controls to access the libraries of modifiers. The libraries include additional descriptive text to use in conjunction with the primary text describing the anatomy.

To annotate an image with text without activating the annotation function:

- Use the keyboard to enter the required text.

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

To activate the text function:

- Press **TEXT BODY MARKER**.

To	Do This
Define the default position for text on the image screen	1. Use the trackball to position the cursor on the image screen. Or, use the directional arrows on the keyboard to position the cursor. 2. Press **[Set Home]**.
Position the cursor at the default position	▪ Press **[Home Position]**.
Insert annotation text on an image using auto complete	1. Position the cursor on the image screen and then enter the text. The system displays predefined text matching the entered characters, if specified in the configuration settings. When the entered text matches predefined text, the text is highlighted in green. 2. To accept the predefined text, press enter on the keyboard. **Note:** If you reposition the cursor before accepting the predefined text, the system displays only the characters you entered.

To	Do This
Insert predefined or user-defined annotation text on an image	**Note:** Each exam type has libraries of text for anatomical structures, right and left sides, and acquisition planes. 1. Position the cursor on the image screen. 2. Tap the selection for the required text.
Reposition text on the image screen	▪ Position the cursor on the text and then press **SET**. The system highlights the text in green.
Select text on the image screen	▪ Position the cursor on the text and then press **SET**.
Insert or remove characters in text on the image screen	1. Position the cursor between the characters. 2. Use the keyboard to insert or delete characters. The system displays editable text in white.
Delete one word of text on the image screen	1. Double-click the word. 2. Press **[Delete Word]**.
Delete a line of text on the image screen	1. Click anywhere on the line of text. 2. Press **[Delete Line]**.
Temporarily hide annotations	▪ To hide annotations, rotate **[Hide Text]**.
Change the font size of the text	▪ Rotate **[Font Size]** and then select the required setting.
Remove all text, arrows, and body markers from the image screen	▪ Tap **Clear Screen**.
Exit the annotation function	▪ Press **TEXT BODY MARKER**.

Annotating with Directional Arrows

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

To activate the arrow function:

1. Press **TEXT BODY MARKER**.
2. Tap **Arrow**.

To	Do This
Select an arrow	▪ Select an arrow including type, color, and size in **Arrow** using the keys on the touch screen.
Change the angle of the arrow	▪ Drag the blue dot to indicate the direction of the arrow. Or, rotate **[Rotate]**. The system adjusts the angle of the arrow in 30° increments.
Insert an arrow	1. Position the cursor on the image screen. 2. Tap the **Arrow** tab. 3. Press **SET**.
Delete arrows	▪ Press **[Delete]**.
Remove all text, arrows, and body markers from the image screen	▪ Tap **Clear Screen**.
Exit the arrow annotation function	▪ Press **TEXT BODY MARKER**.

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 display one body marker on an image. In Dual mode, you can display one body marker on each image. You can annotate an image with a body marker during imaging or during review.

Use the configuration settings to customize body markers for each exam type:

- Select the body markers included on the annotation menu for each exam type
- Specify the default body marker location on the image screen
- Delete body markers on unfreeze

To activate the body marker function:

1. Press **TEXT BODY MARKER**.
2. Tap **Body Markers**.

   The system displays the first body marker on the annotation menu for the active exam type. The body marker includes a transducer orientation indicator.

To	Do This
Select a different body marker	▪ Tap the required body marker. The selected body marker image is displayed both on the screen and on the touch screen.
Display the transducer marker	▪ Press **[Transducer Marker]**.
Reposition the transducer marker	▪ Drag the transducer image on the touch screen.
Rotate the transducer marker	▪ Drag the blue dot to indicate the direction of the transducer marker. Or, rotate **[Rotate]**. The system adjusts the angle of the transducer marker in 15° increments.
Delete a body marker from the image screen	▪ Press **[Delete]**.
Remove all text, arrows, and body markers from the image screen	▪ Tap **[Clear Screen]**.
Exit the body marker function	▪ Press **TEXT BODY MARKER**.

A2 Biopsy and Puncture Procedures

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Biopsy (Puncture) Guideline Function

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 system displays biopsy guidelines 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.

⚠ **Caution:** Visually inspect the biopsy device before use. Do not attach a damaged biopsy device to a transducer.

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 use touch screen selections to display on-screen guidelines for use with transducers compatible with needle guide attachments. Use the configuration settings to assign activation of a biopsy or puncture procedure to a user-defined control on the control panel.

Activating the On-screen Guidelines

The biopsy function is activated only during real-time imaging in the following modes:

- 2D-mode full field of view (FOV)
- 2D-mode with Color Doppler Energy (CDE)
- 2D-mode with Color Doppler Velocity (CDV)
- 2D-mode with contrast

To activate the Guideline 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** and then tap the required angle setting for the needle guide attached to the transducer.

   The system displays the following message as a precaution:

   Verify that the physical needle guide matches your angle selection.
2. Ensure the selected angle setting on the touch screen corresponds to the needle guide attached to the transducer and then click **OK**.
3. To change the angle setting, tap **Biopsy** and then tap a different setting.

   Available angle settings are transducer dependent.
4. To add another guideline on the image screen, tap **Biopsy Line**.
5. Confirm the target of interest is indicated by the guidelines on the image screen.
6. To exit the biopsy function and remove the guidelines from the image, tap **Biopsy** and then tap **Off**.

System Biopsy Safeguards

⚠ **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.

While using the biopsy function, you can switch to a different acceptable mode or freeze the image. When you freeze the image, the color of the guidelines changes from yellow to white.

If you request an action that is not allowed during the biopsy function, the system displays a message indicating the action is not allowed.

Disconnecting the active transducer while in biopsy causes the system to exit the biopsy function.

Needle Path Verification

Before performing any patient procedure using a needle guide, you must verify that the path of the needle is accurately indicated by the on-screen guidelines.

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 cover
- New, straight, biopsy needle
- Sterilized container of sterilized and degassed water

To verify the path of the needle:

⚠ **WARNING:** The system displays biopsy guidelines 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:** Do not use a needle guide if the path of the needle is not accurately indicated by the on-screen guidelines. The path of the needle must display within the guideline. Contact your Siemens Healthineers service representative if the needle path is not accurately indicated.

1. Attach the needle guide to the transducer.
2. Connect the transducer to the system and activate the transducer.
3. Set the system to the depth of the intended puncture procedure.
4. Tap **Biopsy**.

   The system displays the following message as a precaution:

   Verify that the physical needle guide matches your angle selection.
5. Ensure the selected angle corresponds to the needle guide attached to the transducer and then click **OK**.
6. To change the needle guide angle, tap **Biopsy**.
7. Immerse the head of the transducer into the degassed water and insert the needle into the needle guide.
8. Verify that the path of the needle displays according to the guidelines shown on the image screen.

   After verification, the needle guide is ready for use.

Enhancing Visualization of a Needle

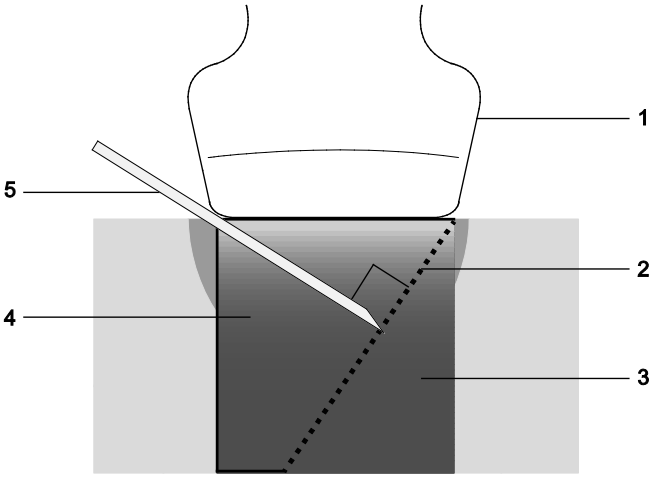
⚠ **WARNING:** Percutaneous procedures always involve heightened risk to the patient and to the clinician handling the needle. Clinicians should be trained in ultrasound needle guidance techniques.

⚠ **WARNING:** To avoid undue discomfort and unnecessary risk and injury to the patient, observe correct positioning of the needle throughout the procedure. Ensure the needle is in the enhanced image area. If the needle is in the unenhanced image area, do not continue the needle procedure until correct needle positioning is achieved.

⚠ **WARNING:** To improve visualization and avoid misinterpretation of the image, ensure the needle is shown perpendicular to the direction of the steered acoustic beam in the enhanced image area. If the needle is not inserted perpendicular, then the needle image may be less enhanced.

During a biopsy or interventional procedure using a needle with the linear transducer, you can select an angle setting for steering the acoustic beam of the transducer to enhance the visualization of the needle image. Visualization of the needle is optimal when the needle is perpendicular to the acoustic beam.

Other factors influence visualization of the needle, including the transducer and imaging parameter settings, needle gauge, insertion angle, tissue type, and user technique.



Example of needle visualization.

1 Linear transducer
2 Direction of the steered acoustic beam (depicted by a dotted line)
3 Unenhanced image area (no blue border)
4 Enhanced image area (depicted by a blue border)
5 Needle

To enhance visualization of a needle during real-time imaging:

(Not available for an image rotated in 90-degree increments)

Note: Use a recommended needle size of 16 to 20 gauge and thoroughly read and understand the warnings and descriptions beginning on p. A2-7.

1. Tap **Needle Visual**. Or, press a user-defined control, if specified in the configuration settings.

   Note: The system disables the following features and functions during needle visualization: Advanced SieClear spatial compounding, changing to a trapezoid image format, and adjusting the angle of the field of view.

2. Select the intended trajectory of the needle.
   - **Angle Shallow** for a needle in a shallow depth.
   - **Angle Medium** for a needle in a mid-range depth.
   - **Angle Deep** for a needle in a deeper depth.

   The system changes the angle of the dotted line on the image.

3. To select the enhancement level of the needle image, rotate **[Needle Enhance]**.
4. To reverse the horizontal (left/right) orientation of the direction of the steered acoustic beam, tap **L/R Flip**.

A3 SieScape Panoramic Imaging

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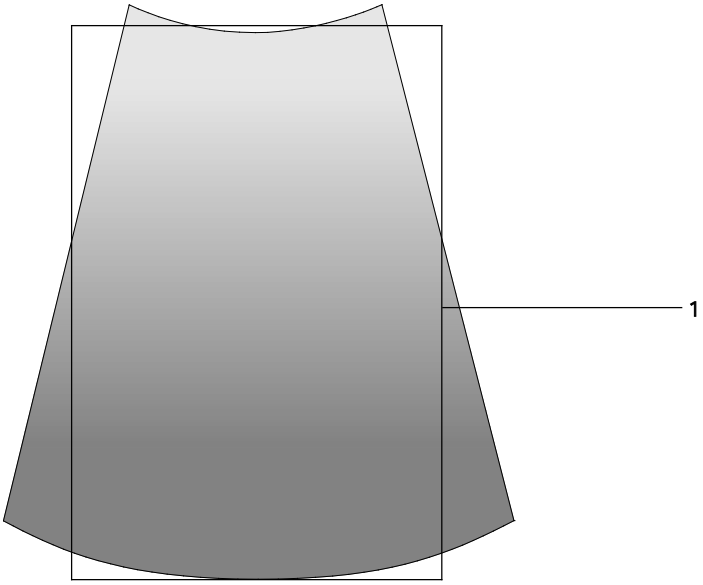
Overview

⚠ **WARNING:** To avoid technique-related artifacts and measurement inaccuracies, read this entire chapter before using the SieScape imaging feature.

SieScape imaging acquires two-dimensional ultrasound images with a composite, extended field of view. Use CINE to review the image composed of hundreds of single frames.

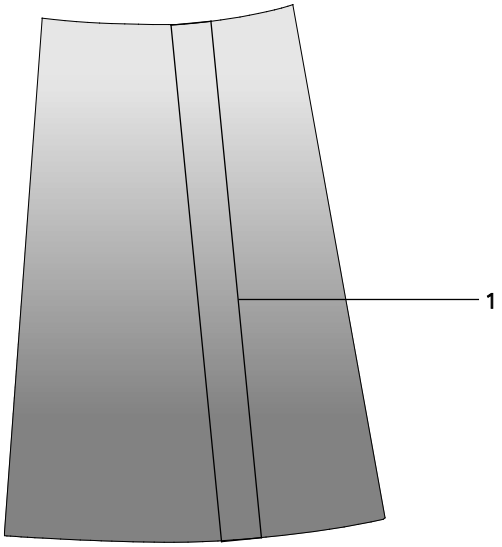
Example Screen

Image creation begins with a standard field of view and extends the view during steady, forward motion scanning.



Example of an image screen during SieScape setup.

1 Bounding box
Section of the scanned image used to create the composite image. If necessary, decrease the image depth to increase the image size so the image fills the bounding box.



Example of an image screen during SieScape image acquisition.

1 Region of Interest (ROI)
Boundary between the composite image and the real-time image.

Acquiring a SieScape Image

Technique Tip: Perform a preview sweep of the scan plane in standard 2D-mode. The maximum length of a composite image depends on the selected depth. You can acquire approximately 8-10 times the selected depth for the length of the composite image for a linear scan.

To acquire a SieScape image:

1. Optimize the 2D image.

   Note: You cannot adjust the number of focal zones or persistence setting during image acquisition. The focal zone markers do not display on the composite image.

2. Position the single focal zone according to the transducer type:
   - Linear array transducers: lower half of image
   - Curved array transducers: upper half of image
3. Tap **SieScape** and then press **SET** to begin acquisition.
   - **Acquire** indicates the trackball keys are assigned to beginning the acquisition.
   - **End** indicates the trackball keys are assigned to ending the acquisition.
4. 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.

   When the memory buffer for the composite image is full, the system stops acquisition and freezes the image.
5. To suspend or resume image acquisition, press **UPDATE**.
   - **Pause** indicates the control is assigned to suspending acquisition.
   - **Continue** indicates the control is assigned to resuming acquisition.

6. To stop image acquisition before the buffer is full, press **FREEZE**.

To	Do This
Review composite images in CINE review	▪ Tap **Cine**.
Display a flexible ruler with markers along the skin line during review or CINE review	▪ Tap **Ruler**. Or, use the configuration settings to enable the display of the ruler.
Resize a composite image after acquisition	▪ To scale the image to full acquisition size, tap **Full Fit**. ▪ To scale the image to fit the image area, tap **Best Fit**. ▪ To adjust the magnification of the image, rotate **ZOOM**. ▪ To scale the image in the size and rotation selected prior to entering CINE, tap **Redisplay**.
Pan or rotate a composite image	1. Press **SET**. – **Pan** indicates the trackball is assigned to panning the image. – **Rotate** indicates the trackball is assigned to rotating the image. 2. Roll the trackball. **Note:** You cannot pan an image when **Best Fit** is selected.
Rotate a frozen, composite image	▪ Rotate **ANGLE** clockwise or counterclockwise. **Note:** If **Best Fit** is selected, rotating the image causes the system to adjust the size of the image.
Activate standard 2D-mode	▪ Press **2D**.
Begin acquisition of a new, composite image	▪ Tap **Restart**.
Set the composite image to the initial mode	▪ Tap **Reset** to set the frozen, rotated, full-fit, or best-fit composite images back to the default display mode.
Redisplay the previously acquired image	▪ Tap **Redisplay**.

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 following 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 SieScape images.*

Measuring a SieScape Image

⚠ **WARNING:** To ensure accuracy, measurements should only be made on SieScape images acquired in a single scan plane.

You can make general 2D-mode measurements on a frozen, full-sized, or best fit composite image. If the structure requiring measurement is contained within the boundary of a single, standard 2D-mode frame, make the measurement on the corresponding frame retrieved from CINE and not on the SieScape image.

Technique Tips: 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 SieScape image
- Across gaps in an image, such as those encountered with a tightly curved scan
- Across a disrupted area of the image, indicated by a jagged flexible ruler along the skin line

Note: The system configuration option to activate the measurement function with the **FREEZE** key is not available during SieScape imaging.

See also: For information on the measurement function, refer to Chapter C1 in this manual.

A4 *four*Sight 4D Imaging and 3-Scape Imaging

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Overview

⚠ **WARNING:** To avoid technique-related artifacts, you must be thoroughly familiar with the techniques of 3D and 4D imaging. Read this entire chapter before using the 3-Scape real-time 3D imaging or *four*Sight 4D ultrasound imaging technology.

Ultrasound data based on three-dimensional imaging methods can facilitate the diagnostic process. You can view and manipulate the volumes to differentiate anatomic structures (for example, by selecting an arbitrary slice, modifying volume rendering, or rotating and magnifying localized areas of interest).

The 3-Scape imaging feature allows the acquisition of three-dimensional ultrasound images.

The *four*Sight 4D imaging feature allows the acquisition and simultaneous viewing of three-dimensional ultrasound images in real-time. You can use the feature to access motion, such as fetal movement.

MultiPlanar Rendering (MPR) provides a view of each plane of the volume (acquisition, elevation, and coronal) as an arbitrary slice.

See also: For information on transducers compatible with 3D or 4D imaging, refer to Appendix A in the Instructions for Use manual.

Activating 3D or 4D

The ultrasound system activates 3D or 4D imaging depending on the selected transducer and exam type, or as specified in the configuration settings.

To activate 3D or 4D:

Prerequisite: Optimize the 2D-mode image before beginning 3D or 4D imaging acquisition.

1. Press **3D / 4D**.
2. Tap **3D** or **4D**.
3. To exit, press **3D / 4D** again. Or, press **2D**.

Acquiring Volumes

During 3D volume acquisition, the system updates the incremental data set or slice (acquired image). The incremental slice is the mid-plane perpendicular to the 2D scan plane. Use the incremental slice to assess imaging artifacts and the position within the selected scan angle. Use the time gauge to estimate an optimal scanning speed. The time gauge depicts the elapsed time, scan length or angle, and scan duration.

During 4D imaging, the system displays one volume at a time and displays the acquisition rate in volumes per second (vps).

Note: At any time during acquisition and viewing, you can pause volume acquisition to review the data sets stored in the CINE buffer.

To acquire a volume:

Prerequisite: Optimize the 2D-mode image before beginning 3D or 4D imaging acquisition.

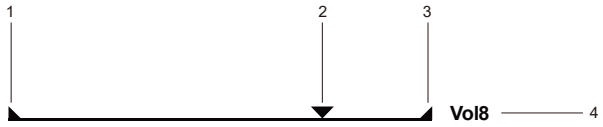
1. Press **3D / 4D**.
2. Tap **3D** or **4D**.
3. Size and position the region of interest.
4. Select the acquisition angle and quality.
   a. Rotate **[Angle]** to adjust the scan angle.
   b. (Available only during 4D imaging for the 9VE3 transducer)
      Rotate **[Steering Angle]** to adjust the transducer scan angle.
   c. Rotate **[Quality]** to adjust the volume acquisition quality.

To	Do This
Select a scan method	(Available only for 3D imaging) 1. Select the scan method: – **Rocked** requires an angular scanning motion. Use the transducer face as a pivot. – **Linear** requires a horizontal or vertical sweep of the transducer. 2. To adjust the scan speed, rotate **[Speed]**. The system determines the scan duration based on your selections and the current frame rate.
Begin acquisition	**Note:** Hold the transducer steady during acquisition. ▪ Press **UPDATE**. An audible tone indicates volume acquisition has begun. A second audible tone indicates volume acquisition is complete. The system will display the volume of interest (VOI) within the region of interest.

To	Do This
Temporarily pause and resume volume acquisition	▪ Press **FREEZE**.
Begin another volume acquisition without saving the displayed volume	1. Press **FREEZE**. 2. Press **UPDATE**.
Cancel the acquisition (for example, for an image artifact)	▪ Press **UPDATE**.
End 3D acquisition before the scan duration on the time gauge elapses	▪ Press **FREEZE**. For 3D imaging, the system processes the acquired information into one or more data sets and then displays the volume.
End 4D acquisition	▪ Press **3D / 4D**.

Reviewing Volumes Stored in the CINE Buffer

When 4D volume acquisition is paused, you can review the volumes stored in the CINE buffer. The system displays a 4D CINE bar at the bottom of the screen when acquisition is paused.



Example of 4D CINE bar.

1 Left CINE marker indicates the beginning of the CINE data.
2 Volume Indicator indicates the location of the volume within the CINE data and the direction of review (backward or forward).
3 Right CINE marker indicates the end of the CINE data.
4 Volume counter indicates the number of the displayed volume.

Viewing Volumes and MultiPlanar Reformatting

The system displays the volume and multiplanar reformatting during 4D volume acquisition, after 3D volume acquisition, or during review of retrieved volumes.

The MPRs are oriented to the center of the volume; each slice is orthogonal to the other two slices. The reference point, represented by a dot within each quadrant, indicates the point of intersection of the MPRs.

Changing the Quadrant Display

Quadrant D contains the volume. Quadrants A, B, and C contain MPRs of the volume; A is the acquisition plane, B is the elevation plane, and C is the coronal plane.

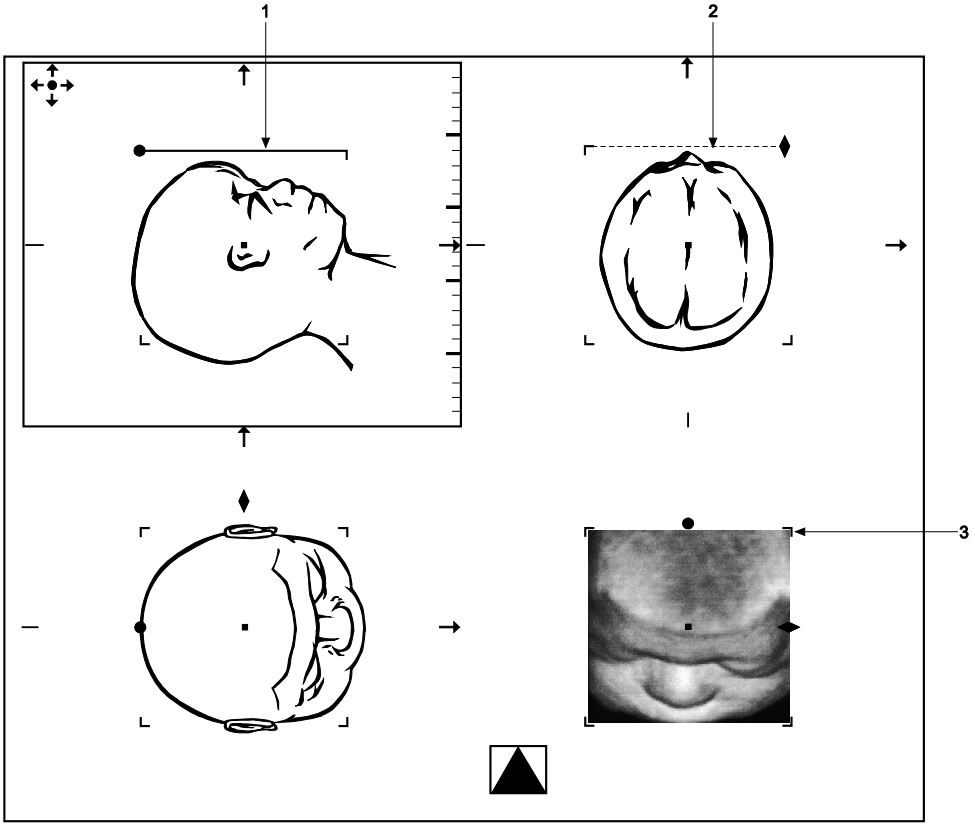
To	Do This
Select a quadrant	▪ Position the pointer on the required quadrant and then press **SET**.
Cycle through quadrants	▪ Tap the required quadrant.
Display or hide the volume quadrant	▪ To hide the volume, tap **Render** and then tap **MPR Only**. ▪ To display the volume, tap **Render** and select a setting other than **MPR Only**.
Select a display method for the volume quadrant	▪ Tap the required method: – **Slice** displays a one-voxel-thick slice in the three-dimensional context. The displayed slice (within the volume) corresponds to the most recently selected slice (MultiPlanar Reformatting or MPR) quadrant. – **Opacity** smooths image contours, creating a soft, sculptured appearance for highlighting surface features. Uses the mode-specific selections for opacity percentage and thresholds. – **MPR Only** increases the rendering speed by displaying the MPRs (arbitrary slices) only. – **MinIP** (Minimum Intensity Projection) limits the display to minimum-value pixels by selecting pixels with the lowest value along each projection of the volume. May be helpful in visualizing hypo-echoic lesions and large vascular structures. – **MaxIP** (Maximum Intensity Projection) limits the display to maximum-value pixels by selecting pixels with the highest value along each projection of the volume. May be helpful in visualizing hyper-echoic structures and fetal skeletons. – **MeanIP** (Mean Intensity Projection) limits the display to average-value pixels by selecting pixels with the arithmetic mean (average) value along each projection of the volume.

To	Do This
Change the display format for the volume and MPRs (for example, 1:1 or 4:1)	▪ Tap **Render** and then tap the required format. – **1:1** displays the selected quadrant only – **2:1** displays two quadrants on the screen – **1:3** display the volume on the left of the screen and the other three quadrants on the right – **4:1** displays all four quadrants on the screen
Display or hide the boundaries of the volume	(Available only when the volume of interest is disabled) ▪ Tap **Wireframe**.

Defining Volume of Interest and View Planes

You can define the data to display in the volume quadrant by enabling the VOI (volume of interest) and then resizing and repositioning the VOI in relation to the acquired volume data.

The system displays the VOI in the volume and the related view plane in each orthogonal MPR. The view plane is the side of the VOI represented by a solid or dotted line.



Example of the VOI and view planes.

1 View plane for the selected quadrant
2 View plane for an unselected quadrant
3 View of interest

To	Do This
Display or hide the VOI	▪ Tap **VOI** and then select the required option: **On**, **Off**.
Change the size of the VOI	1. Select an MPR quadrant. 2. Press **ESC** to display the VOI icon, if necessary. 3. Roll the trackball to adjust the VOI size and then press **SET**. **VOI** icon
Reposition the volume	1. Select the volume quadrant. 2. Tap **VOI** to activate the volume of interest, if necessary. 3. To activate the pan control, press **SET**. 4. Roll the trackball to pan the image. **Pan** (volume)
Reposition an MPR image	1. Select an MPR quadrant. 2. Press **ESC** to activate the pan control, if necessary. 3. Roll the trackball to pan the image. **Pan** (MPR)
Curve the rendering view line of the VOI to exclude extraneous information	(Available only when an MPR is selected) 1. Tap **VOI** and then select **Curved**. 2. Roll the trackball to change the contours of the curve. 3. To size the view plane of the Curved Top VOI: a. Press **SET** and then press **ESC**. b. Roll the trackball to change the size of the Curved Top VOI. 4. Press **ESC** again to access the curve contour. The view plane of the Curved Top VOI displays in quadrant D. **Curved VOI**
Change the render direction of the VOI	1. Tap **RenderDir**. 2. Select the required direction to start the rendering: – **Up/Down** begins rendering from the top – **Down/Up** begins rendering from the bottom – **Front/Back** begins rendering from the front – **Back/Front** begins rendering from the back – **Left/Right** begins rendering from the left – **Right/Left** begins rendering from the right

Changing the Orientation of Volumes and MPRs

Rotating a volume or MPR along any of the three axes can help you visualize an anatomic structure. You can rotate a volume manually or automatically.

The reference orientation indicator in the volume quadrant uses color to indicate the relative location of the data acquired first (blue) and the data acquired last (red). The top (apex) of the pyramid represents the transducer. The base of the pyramid represents the data at the greatest depth.

Axis of rotation	Volume rotation icon	MPR rotation icon
X axis		
Y axis		
Z axis		

Note: The system displays a reverse symbol ("R") on the MPR quadrants with a reversed orientation in relation to the original acquisition.

To	Do This
Manually rotate the volume or MPR	▪ Press **UPDATE** to select the axis of rotation and then roll the trackball to rotate the volume or MPR. ▪ Rotate the required control on the control panel: – **X** rotates along the x axis – **Y** rotates along the y axis – **Z** rotates along the z axis The system displays a rotation icon on the selected MPR or volume. When an MPR is selected, the system also displays a line indicating the axis of rotation on the two corresponding MPRs.
Rotate the volume in 90° increments	▪ Tap the required rotation angle, for example, 0, 90, 180, 270.
Enable automatic rotation of the volume	**Note:** You can change the automatic rotation settings while the volume is rotating. 1. Tap **Animation**. 2. Adjust the settings for speed, angle, axis, and clip time. 3. Tap the play icon. 4. To pause animation, tap the pause icon.

To	Do This
Restore the orientation from the original acquisition for all quadrants	▪ Tap **Reset** and then tap **Reset Ori**.
Restore the orientation and all imaging parameters from the original acquisition	▪ Tap **Reset** and then tap **Reset All**.
Reverse the render direction	▪ Tap **Reset** and then tap **Flip**.
Align the volume with the selected MPR	1. Select an MPR. 2. Tap **Reset** and then tap **Sync**.

Visualizing the Anatomy of Interest in a Volume

The cut plane function helps you visualize the anatomy of interest, such as a lesion, that is not visible on the surface of a volume by controlling the amount of data displayed in the volume.

For example, if anatomy is visible in an MPR but is not visible in the volume, you can use the cut plane function to reveal the anatomy of interest in the volume.

Note: For an optimal view of the cut plane, you can rotate the volume or align the orientation of the volume with that of the selected MPR.

To visualize the anatomy of interest in the volume:

Prerequisite: Disable the volume of interest to control the plane display in the volume.

1. Tap **CutPlane** and adjust the setting:
   – Select **A** to display the data in front of the cut plane.
   – Select **B** to display the data behind the cut plane.

   The system removes all mode-specific volume data beyond the cut plane. A line on the reference orientation indicator indicates the location of the cut plane.
2. To activate the slicing function, roll the trackball.

Displaying Parallel Slices

You can view multiple parallel slices of a plane at the same time. MultiSlice enables you to view anatomy of interest in sequential order, similar to a CT or MRI scan. You can also use MultiSlice to view a 4D CINE sequence.

To	Do This
Activate MultiSlice	▪ Tap **MultiSlice**.
Slice the volume in the selected MPR	▪ Tap **Vertical** or **Horizontal**. The volume quadrant displays a page of the slices. A blue dot indicates the center slice of the acquired volume.
View a slice in full screen format	▪ Press **SELECT**.
Display the next slice of the image	▪ Tap **Next Image**.
Display the previous slice of the image	▪ Tap **Prev Image**.
Display the next page of slices	▪ Tap **Next Page**.
Display the previous page of slices	▪ Tap **Prev Page**.
Change the division between pages	1. Select the quadrant. 2. Roll the trackball to scroll the images.
Adjust the distance between slices	▪ Rotate **[Slice Spacing]**.
Change the number of slices displayed on each page	▪ Tap the required layout.
Change the reference MPR (slice quadrant)	▪ Tap the required plane.

Improving Contrast with Thick Slice Imaging

Thick Slice Imaging (TSI) allows you to adjust the thickness of an individual slice to improve contrast resolution.

To	Do This
Activate TSI	▪ Tap **TSI**.
Display a thick slice image of the coronal plane (with the acquisition plane as reference)	▪ Tap **A/C**.
Display a thick slice image of the acquisition plane (with the acquisition plane as reference)	▪ Tap **A/A**.
Change the thickness of the TSI image	▪ Tap **Slice Thickness** and then select a setting.
Rotate the reference line on the reference plane around the z axis	(Available only for the **A/C** option) 1. Tap **TSI**. 2. Press **UPDATE** to activate the rotation function. 3. Roll the trackball to the required position. The TSI image in the volume quadrant corresponds to the location of the reference line.
Exit TSI	▪ Tap **Exit**.

Straightening Curved Anatomy with Curved MPR

You can use curved MPR to straighten curved anatomy (such as a fetal spine) to facilitate evaluation.

Curved MPR generates cross-sections along a centerline to show details of a curved structure and displays the result with the orthogonal reference image of the displayed volume.

Note: Take care in drawing and interpreting the curved MPR result. Structures outside the path may be distorted because the final image is straightened. To avoid misrepresenting and distorting anatomical structures and their relationships, ensure that the path you draw does not cross the same object more than once.

To activate Curved MPR:

1. Optimize the orientation and display the curved anatomy in quadrant A.
2. Tap **Curved MPR**.

To	Do This
Define a line curve	1. Tap **Line** to draw a straight line. 2. Position and then anchor the starting point. 3. Position and then anchor the ending point.
Define a spline curve	1. Tap **Spline** to draw a line with curved segments. 2. Position and then anchor the starting point. 3. To insert individual points along the curve, roll the trackball and then press **UPDATE** at each interval. 4. Position and then anchor the ending point. The volume quadrant displays the curved anatomy as straightened. The arrows indicate the direction that the curve was drawn. A red dot indicates the center of the drawn line.
Trace a curve	1. Tap **Trace**. 2. Position and then anchor the starting point. 3. Roll the trackball to create a trace and then press **SET**. 4. Position and then anchor the ending point. The volume quadrant displays the curved anatomy as straightened. The arrows indicate the direction that the curve was drawn. A red dot indicates the center of the drawn line.
Reposition the drawn MPR curve to another location on the image	1. To display the repositioning pointer, position the cursor over the center segment of the line. The system displays a hand cursor. 2. Drag the line to the required location and then press **SET**. Or, press the arrow keys to reposition the line to the required location.
Rotate the MPR curve around the center point of the image	1. To display the rotation pointer, position the cursor over either endpoint of the line. 2. Drag the endpoint in the direction of the required rotation and then press **SET**.
Exit Curved MPR	▪ Tap **Exit**.

Removing Data from a Volume

You can remove data from a volume to clarify anatomical structures.

Note: To determine the type of edit required, rotate the volume.

To	Do This
Display the editing tools	▪ Tap **Editing**.
Remove data from inside or outside a polygon	**Note:** You can perform multiple polygon edits. 1. Tap **Polygon**. The system constrains the cursor to the selected quadrant. 2. Position and then anchor the starting point. 3. For each segment of the polygon, roll the trackball to position the ending point and then press **UPDATE**. The system uses the ending point of the segment as the starting point for the next segment. 4. Press **SET** to complete the polygon. 5. Position the cursor where data will be removed (inside or outside the polygon) and then press **SET**.
Remove data between parallel planes	(Available only when the volume of interest is disabled) **Note:** You can simultaneously perform multiple parallel cut edits. 1. Tap **Parallel Cut**. The system displays the wireframe and highlights the active plane. 2. For each plane to be used in the edit, roll the trackball to position the plane and then press **UPDATE**. 3. Press **SET** to complete the edit.
Remove data inside a niche (cube shape)	(Available only when the volume of interest is disabled) **Note:** You can perform one niche edit at a time. 1. Rotate the volume until the area that requires editing is in front. 2. Tap **Niche**. The system outlines a cube in green on the volume. The cube represents the niche edit. 3. To simultaneously adjust the size of all planes of the cube, roll the trackball. 4. To resize one plane of the cube, press **UPDATE**. 5. Press **SET** to complete the edit.

To	Do This
Remove data inside or outside a trace	**Note:** You can perform multiple trace edits. 1. Tap **Trace**. The system constrains the cursor to the selected quadrant. 2. Position and then anchor the starting point. 3. Roll the trackball to trace the area of interest. 4. Position and then anchor the ending point. 5. Position the cursor where data will be removed (inside or outside the traced shape) and then press **SET**.
Erase data in a volume or slice	**Note:** When you complete the edit, the system updates the other quadrants. 1. Select a tool for removing image data: – Tap **Small Eraser** for fine editing. – Tap **Large Eraser** to remove large areas of background data. The system displays a circle-shaped cursor on the most recently selected quadrant. 2. Position and then anchor the starting point. 3. Roll the trackball to erase data. 4. Press **SET** to complete the edit.
Complete the current edit	▪ Choose a method: – Select a different quadrant. – Magnify the selected quadrant. – Change the orientation of the selected quadrant.
Cancel the most recent segment of the current edit (such as an eraser edit)	▪ Rotate **[Undo Last Edit]**.
Cancel all completed edits	**Note:** VOI edits cannot be canceled. ▪ Tap **Undo All Edit**.

Creating Presets for Volume Imaging

User-defined presets are an optimized configuration of imaging parameters for use during 3D or 4D imaging.

To create a preset for 3D or 4D:

1. Adjust the image optimization settings.
2. Tap **SubPreset** and then tap **Define**.
3. Click **New** and enter a name for the preset.
4. To enable the new preset as the default exam type for subsequent patient studies, select the **Set as default** check box**.**

   The system displays an asterisk next to the name.
5. Click **OK**.
6. Click **Close**.
7. To begin using the new preset, click **Apply**.

To edit a preset for 3D or 4D:

1. Adjust the image optimization settings.
2. Tap **SubPreset** and then tap **Define**.

To	Do This
Enable an existing preset as a default exam type	1. Select a preset. 2. Click **Default**. The system displays an asterisk next to the name.
Rename an existing preset	1. Select a preset. 2. Click **Rename** and enter a new name. 3. Click **OK**.
Overwrite an existing preset	1. Select a preset. 2. Click **Overwrite**. 3. Click **OK**.
Delete a preset	**Note:** You cannot delete system-defined presets. 1. Select a preset. 2. Click **Delete**.

Measuring 3D and 4D Images

The basic measurement tools are valid for measurements on a quadrant.

Do not measure across the MPR quadrants or volumes. Perform each measurement in an individual MPR quadrant.

See also: For information about the measurement function, refer to Chapter C1 in this manual.

Storing and Printing Volumes and Images

Images are stored as single-frame images in screen capture format on the system. The images are stored within the series object that contains the volume. Series objects are accessible from the patient browser.

Note: An image of the volume can be printed. The volume itself (all of its multiple frames) cannot be printed.

Use the patient browser to transfer volumes (and their representative images) to connected devices that support multi-frame images.

To	Do This
Store a 3D or 4D volume	1. Press **UPDATE**. 2. Press the key assigned to the clip store function. 3. (Available only for 4D volumes) a. Press **FREEZE**. b. Select **4D Single volume** and then click c. **OK**.
Store a 3D clip of the volume during automatic rotation	1. Tap **Animation**. 2. Tap the play icon. 3. Press the key assigned to the clip store function.
Temporarily store a 4D clip of the volumes in the CINE buffer	1. Press **UPDATE** to acquire a volume. 2. Press the key assigned to the clip store function. 3. Press **FREEZE**. 4. Select **4D Cine**. 5. Click **OK**.

Exporting Volumes or Clips

You can export the volumes or clips of images to a storage location.

See also: For information about exporting a patient study, refer to Chapter 5 in the System Reference manual.

Imaging Techniques

Adequate Gel

Apply a generous amount of coupling agent (gel) along the entire area to be scanned to avoid disrupting the scan sweep. Insufficient gel causes the transducer to drag on the skin during a linear scan.

Preview Sweep

Before volume acquisition, perform a preview scan of the anatomy in standard 2D-mode. To be sure you acquire a complete structure of interest, include some of the surroundings in the 2D-mode image.

Scan Speed (for 3D imaging methods)

Scan at a constant rate. An irregular movement pattern may result in motion artifacts or distortions of the 3D image.

Transducer (Linear and Rocked Scan Methods)

To ensure a constant elevation position during a linear scan, hold the transducer so that your little finger is in contact with the skin alongside the transducer face. This acts as a guide to ensure that the transducer is parallel to and in full contact (perpendicular) with the skin surface.

For a rocked scan, ensure a steady, even scan motion.

A5 eSie Touch Elasticity Imaging

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eSie Touch Elasticity Imaging

eSie Touch elasticity imaging detects the relative stiffness of tissue during real-time 2D-mode imaging. Elasticity imaging is a qualitative visualization method that displays the relative stiffness of tissue as an elastogram. During image acquisition you generate elastograms by performing cycles of small, manual compression during routine 2D-mode imaging. Images can be displayed in full-screen or dual format.

To activate elasticity imaging:

- Tap **Elasticity**.

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

  A gray overlay box indicates too little or too much axial motion or excessive lateral motion.

  The system also displays a real-time quality factor (QF) score. A QF value greater than 60 indicates minimal global motion artifact. A QF value less than 50 indicates a less than optimal result; perform another acquisition.

To	Do This
Generate an elastogram	1. Use cycles of gentle up and down compression while avoiding lateral and vertical movement of the transducer. **Note:** The natural compressions generated by a patient's respirations may be sufficient to generate the elastogram. 2. Optimize the 2D-mode image, if necessary. **Note:** During elasticity imaging, SieClear automatically adjusts to level 2.
Optimize the size of the live, dual format on the screen	▪ Rotate **ZOOM** to adjust the view scale. As you enlarge the image, the system crops the edges of the image while maintaining the aspect ratio.
Apply a gray scale map	**Note:** This selection is available during live imaging, system freeze, or CINE. ▪ Rotate **[Maps]**.

To	Do This
Apply a color map	1. Tap **EI Color** to select a color map. – **1** applies a range of color to depict tissue stiffness from soft to hard. – **2** applies blue to depict harder tissue and red to depict softer tissue. The system displays an elasticity imaging bar above the color bar. The elasticity imaging bar represents the range of color available for depicting the stiffness of the tissue from **SF** (soft) to **HD** (hard). 2. To change the map index for the selected color map, tap **EI Map Index**. – **0** is the standard map and the natural result of the strain estimation from the echo signal without compensation for pre-compression (stress) or non-uniform stress applied by the user. – **1** is the normalized map and compensates for the potential that non-uniform stress is applied with the transducer during scanning. – **2** is the inverse map. 3. To remove the color map, tap **EI Color**.
Display a full screen elastogram or a dual display	▪ Press **UPDATE**. Or, tap **Split**.
Exit Elasticity Imaging	▪ Tap **Exit**.

Basic Measurements

Basic measurements are available with eSie Touch elasticity imaging, including the area ratio and distance ratio. You can perform all basic measurements (distance, ellipse, and trace) on either the left image or the right image in a dual screen format.

When the shadow function is active, the system duplicates the measurement markers positioned by the user and displays a dotted line on the shadow image.

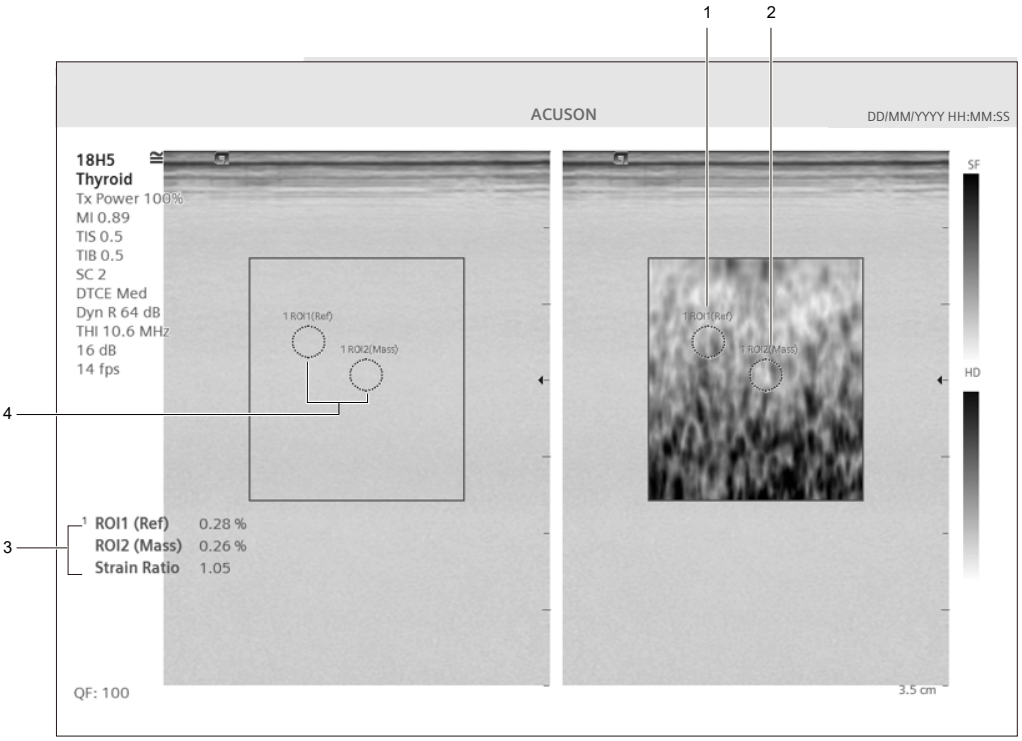
To	Do This
Activate the shadow function during measurements with elasticity imaging active	1. During the measurement function, press **CALIPER**. 2. Tap **Shadow**. 3. Perform the required measurements.
Exit the shadow function	▪ Tap **Shadow** again.

See also: For information on measurements and calculations, refer to Chapter C1 in the Clinical Applications Guide.

Strain Ratio

Elasticity imaging provides a compound measurement tool to compare the relative stiffness of tissue within two regions of interest (ROI), for example, compare the average strain of a lesion and the average strain of the surrounding tissue. A strain ratio of 1 indicates that the stiffness of the tissue in both regions of interest is equal. A strain ratio greater than 1 indicates that the tissue in the first region of interest (for example, the surrounding tissue) is softer than the tissue in the second region of interest (for example, a lesion). A strain ratio less than 1 indicates that the tissue in the first region of interest is harder than the tissue in the second region of interest.

Note: When interpreting the results of strain ratio calculations, consider the type of tissue within each region of interest. For example, results will be different depending on whether you selected the lesion or the surrounding tissue as the first region of interest.



Example of elasticity imaging screen.

1 **ROI1 (Ref)** identifies surrounding tissue
2 **ROI2 (Mass)** identifies a possible lesion
3 Elasticity imaging measured results
4 Duplicated measurement markers on an activated shadow image

To determine the strain ratio:

1. Freeze the image.
2. Press **CALIPER**.
3. Tap **Strain Ratio**.

   The system activates the strain ratio tool.

   Note: If the strain ratio ROI extends beyond the elastogram, the system calculates the strain ratio using only the portion of the ROI within the elastogram. To prevent the ROI from extending beyond the elastogram, expand the elastogram to include the entire image.

4. Determine the first region of interest for reference.
   a. Roll the trackball to position the first marker.
   b. To resize the diameter of a ROI, rotate **[ROI Diameter]**.
   c. Press **SET**.
5. Determine the second region of interest for a mass.
   a. Roll the trackball to position the second marker.
   b. To resize the diameter of a ROI, rotate **[ROI Diameter]**.
   c. Press **SET**.

   The system displays the strain ratio and the average strain (%) for both regions of interest in the measured results.

Calculated Results of the Strain Ratio Tool

Results	Abbreviation
Region of interest for reference (surrounding tissue)	**ROI1 (Ref)**
Region of interest for a mass (possible lesion)	**ROI2 (Mass)**
Strain ratio by comparing the relative stiffness of tissue within two user-selectable regions of interest	**Strain Ratio**

Patents

Patent numbers in the United States of America for the eSie Touch Elasticity Imaging feature include the following numbers:

6,270,459

A6 Virtual Touch Applications

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Acoustic Radiation Force Impulse Technology

⚠ **WARNING:** To prevent the possibility of inadvertently heating tissue, avoid repeated image acquisitions near the interface of bone and tissue within a short period of time.

The following features use acoustic radiation force impulse (ARFI) technology to obtain qualitative visualizations or quantitative measurements of tissue stiffness:

- Virtual Touch quantification

ARFI technology uses a time-controlled sequence of "push pulses" from the transducer, rather than manual compression or palpation cycles, to induce a small displacement of tissue. The image qualitatively depicts the relative stiffness of tissue within a selected region of interest compared to surrounding tissue. The system can also provide a quantitative measurement of shear velocity (Vs) or elasticity (E) at a specific anatomical location.

During acquisition, ARFI technology combines a period of pulse sequences with a temporary freeze period of no transmit power. A timer indicates the remaining time in seconds until the transducer is available for imaging. This duration is typically a few seconds depending on the transducer and imaging conditions. The cooling timer prevents possible heating of the transducer surface from the momentary shear wave generation pulses.

Cooling 5

Example of Virtual Touch timer.

The system uses an optimization algorithm to ensure acceptable levels for the $I_{SPTA.3}$, the Mechanical Index (MI), and the Thermal Index (TI) during use. When imaging is activated, you cannot adjust imaging parameters that affect the transmit power output until the acquisition is complete.

Virtual Touch Quantification

Use Virtual Touch quantification to measure tissue for a selected region of interest as shear velocity (Vs) or elasticity (E).

Note: Because shear waves do not propagate through fluid, do not use Virtual Touch quantification to measure fluids.

Virtual Touch quantification supports the following transducers and exam types:

- 5C1 (abdominal exam)
- 6C1 (abdominal, abdominal difficult exams)

Use the configuration settings to display shear wave measurements as velocity (m/s) or elasticity (kPa).

To activate Virtual Touch quantification:

- During 2D-mode or 2D-mode with THI active, tap **Elasticity**.

  The system displays a region of interest (ROI) box with a horizontal reference line on the image.

To	Do This
Reposition the region of interest	▪ Roll the trackball to reposition the ROI. The software restricts the depth of the ROI. **Note:** You cannot adjust the ROI size.
Begin acquisition	▪ Press **UPDATE**. An audible tone indicates when volume acquisition begins and when acquisition is complete. When acquisition is complete, the system automatically freezes and displays the tissue shear velocity (Vs) or elasticity (E) and ROI depth in the measured results. During system freeze, a cooling timer indicates the remaining time (in seconds) until the transducer is available for image acquisition. **Note:** If the system displays the measurement values as x.xx, the confidence interval threshold for measurement quality was not reached. Repeat the acquisition until the system displays a numerical value instead of x.xx.
Reactivate Virtual Touch quantification after the automatic freeze period ends	1. Unfreeze the image. 2. Adjust the ROI position, if necessary. 3. Press **UPDATE** to begin acquisition.
Exit Virtual Touch quantification	▪ Tap **Exit**.

Virtual Touch Quantification Measurements

Virtual Touch quantification provides a set of shear velocity and elasticity measurement labels for abdomen exams:

- Up to four sites for generic locations
- Up to four lesions
- Up to 9 liver segments based on the Couinaud segmentation system

After each measurement, the system displays a counter below the image to indicate the number of valid measurements and the total number of all measurements assigned to each liver assessment measurement label. A valid measurement is any measurement that displays a numerical value in the measured results.

Site 1: 8 Valid / 10 Total

Example of measurement counter.

Note: You can make as many measurements as required, however the ultrasound system can only save up to 20 measurements. When you make the twenty-first measurement, the ultrasound system deletes the earliest measurement and saves the latest measurement; the first measurement is replaced with the twenty-first measurement.

To label then measure shear velocity or elasticity:

1. Tap **Measurement**.
2. Select the required measurement label.
3. Press **UPDATE**.

   The system displays the measurement in the measured results.

To measure then label shear velocity or elasticity:

1. Press **UPDATE**.
2. Tap **Measurement**.
   The system displays the measurement in the measured results.
3. Select the required label from the list.

To	Do This
Save a measurement to the abdomen patient report	▪ Press **SET**.
Perform another measurement with the current label	▪ After the automatic freeze period ends, unfreeze the image and then press **UPDATE**.
Perform another measurement with a different measurement label	1. After the automatic freeze period ends, unfreeze the image. 2. Tap **Measurement** and then tap the required measurement label. 3. Press **UPDATE**. 4. To copy the measurements to the report, press **SET**.
Perform an unlabeled measurement	1. Tap **Measurement** and then tap **No Label**. 2. Press **UPDATE**.
To hide or display the shear wave velocity or elasticity	▪ Tap **m/s** or **kPa**. **Note:** The system displays the measurement results in velocity (m/s) or elasticity (kPa) depending on the configuration settings.

Virtual Touch Quantification Patient Report

When you have made Virtual Touch quantification measurements, the abdomen patient report lists measurements for each liver assessment measurement label.

VTQ Measurement	Description
Vs (m/s)	Shear velocity
E (kPa)	Elasticity
Depth (cm)	Depth of the region of interest
Median	Median calculation for all measurements associated with the assigned label
Mean	Mean calculation for all measurements associated with the assigned label
Std Dev	Standard deviation calculation for all measurements associated with the assigned label
IQR	Interquartile range (the distance between the 75th percentile and the 25th percentile) for all measurements associated with the assigned label
IQR/Median	Ratio of the interquartile range to the median calculation for all measurements associated with the assigned label
Overall Statistics	---
Median	Median calculation for all measurements included in the report
Mean	Mean calculation for all measurements included in the report
Std Dev	Standard deviation calculation for all measurements included in the report
IQR	Interquartile range calculation for all measurements included in the report
IQR/Median	Ratio of the interquartile range to the median calculation for all measurements included in the report

To delete a measurement:

- Click **Delete** and then confirm the deletion.

Delete icon.

Virtual Touch Quantification Scanning Technique Hints

Scanning Techniques to Mitigate Technical Limitations of Virtual Touch Quantification

- To obtain reproducible results in the liver with Virtual Touch quantification, take measurements in the right lobe of the liver using an intercostal scanning approach. Advise the patient to breathe normally and to momentarily stop breathing and then take measurements. Avoid taking measurements during deep inspiration and breath hold as the literature cites that this action increases central venous pressure. Elevated central venous pressure can artificially elevate shear wave velocity and elasticity measurements.

  Siemens Healthineers recommends maintaining a measurement region of interest (ROI) depth between 3 cm and 6 cm to minimize the effects of depth on shear wave velocity and elasticity measurements.

- To obtain reliable and repeatable results with Virtual Touch quantification, apply the appropriate amount of scanning pressure.

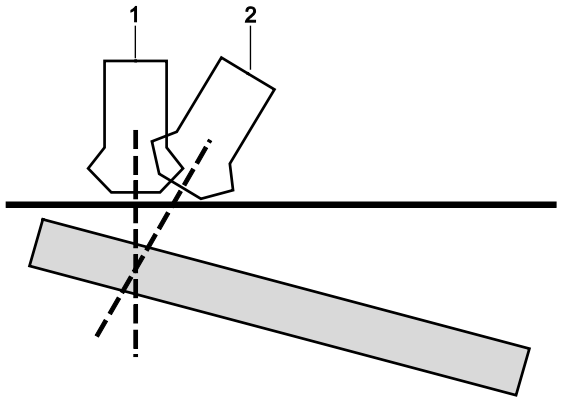
  Siemens Healthineers recommends using minimal to mild compression for optimal results. Applying excessive pressure with the transducer on the body may artificially elevate shear wave velocities and result in unreliable shear wave velocity and elasticity.

- Measurement values for shear wave velocity, elasticity, and other image display settings are relative indexes intended only for the purpose of comparison with other measurements performed using this ultrasound system. Absolute values for shear wave velocity and elasticity measurements may vary among different manufacturers due to multiple system-dependent factors, including shear wave frequency, excitation beam (push beam) frequency, shear wave detection techniques, and shear wave velocity and elasticity estimation methods.

Note: The system displays the following message on the screen during Virtual Touch quantification and in the report if shear wave speed measurements are saved to the report: "Shear wave speed and elasticity values may vary among manufacturers!"

- In general, use a transducer angle of 90 degrees to the skin surface for the highest measurement accuracy.

  An out-of-plane transducer angle less than 50 degrees to the skin surface can result in artificially low shear wave velocities and elasticity values due to loss of transducer contact with the flat scanning surface.

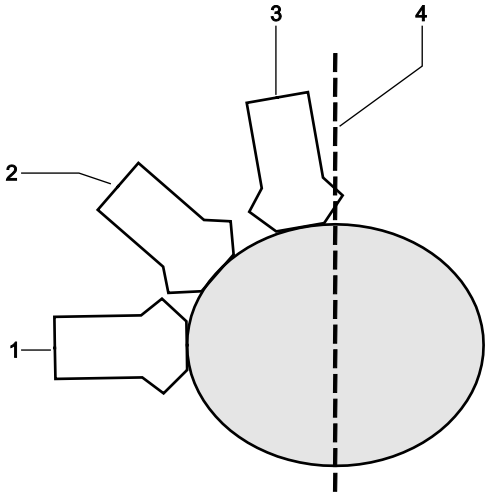


1 90-degree transducer angle
2 60-degree transducer angle

Transducer angle on a flat surface.

- Maintain adequate contact and be aware of the effects of the transducer angle relative to the contact surface.

  When the transducer surface is in continuous contact with the skin surface and follows the contour of the curved surface, shear wave velocity and elasticity measurements are accurate and stable.



1 90-degree transducer angle
2 50-degree transducer angle
3 10-degree transducer angle
4 Vertical axis

Transducer angle on a curved surface.

Shear Wave Velocity and Elasticity Measurements in Liver Assessment

Virtual Touch quantification can provide a reliable measure of shear wave velocity and elasticity in the liver when proper technique is used.

The following factors can result in abnormally high values in the liver:

- Excessive transducer pressure on the liver, such as in subcostal scanning where transducer pressure is used to displace intervening bowel gas
- Elevated central venous pressure due to heart failure or valsalva maneuvers (including deep inspiration and breath hold)
- Significant portal hypertension
- Poor contact with the skin surface or oblique transducer angles relative to the liver
- Elevated aminotransferase levels
- Food intake less than 2 to 3 hours prior to examination
- Liver location (liver segment measured)
- Liver fibrosis

The following techniques should be used in liver assessment to ensure measurements using Virtual Touch quantification in liver assessment are reliable:

- Measurements are most reliable at least 1 cm to 2 cm deep to the liver capsule using the intercostal scanning approach along a mid-axial line in liver segments 5 and/or 8.
- The patient should breathe normally with measurements taken after the patient is asked to momentarily suspend respiration.
- Multiple measurements in the same location should be taken to ensure measurement repeatability with the median shear wave velocity and elasticity value representing the most reliable single measure when there are measurement outliers.
- The Virtual Touch quantification measurement region of interest (ROI) should be maintained between 3 cm and 6 cm depth whenever possible to minimize the effect of depth on measurements. Values can be higher at depths less than 3 cm and lower at depths greater than 6 cm.
- An IQR/median shear wave velocity and elasticity ratio less than 0.3 is indicative of reliable liver assessment with Virtual Touch quantification. A higher ratio indicates significant variability in the measurements, decreasing the reliability of measurement results.

A7 Contrast Agent Imaging

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Basic Measurements 7

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 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 Siemens Healthineers 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.

To activate contrast agent imaging:

1. Tap **Contrast**.

   The system activates a single display format for the cardiac exam and a dual display format for other supported exams.

2. To exit, tap **Exit**.

Using Contrast Agent Imaging

Note: Contrast agent imaging supports pulsed wave Doppler and continuous wave Doppler for the cardiac exam.

Prerequisite: Activate contrast agent imaging.

To	Do This
Enhance areas of low contrast agent concentration	(Not available for the cardiac exam or during the burst process) ▪ Tap **Peak Hold** to enable maximum intensity projection.
Adjust transmit power	(Not available during the burst process) ▪ Rotate **[Tx Power]**.
Adjust the frame rate	(Not available for the cardiac exam or during the burst process) ▪ Rotate **[Frame Rate]**.
Increase or decrease brightness of the displayed image	▪ During the cardiac exam, rotate **2D**. ▪ During other supported exams, rotate **[Contrast Gain]**.
Identify the ultrasound contrast agent	(Not available for the cardiac exam or during the burst process) ▪ Tap **Contrast Agent** 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	1. Tap **Timer**. The system displays the elapsed time on the image screen. 2. To stop and remove the timer from the image screen, tap **Timer** again.
Display the recorded time during CINE	▪ Press **FREEZE**.

To	Do This
Emphasize the contrast agent, the tissue, or both	(Not available for the cardiac exam) 1. Tap the required setting for the left image of a dual display format. – **Contrast Only** to emphasize the contrast agent. – **2D Only** to emphasize the tissue. – **2D + Contrast** to combine of the contrast agent and tissue. 2. To display the left image in full-screen format, tap **Split**. 3. To redisplay the image in dual format, tap **Split** again.
Change the direction for storing a clip	(Available only for the cardiac exam) 1. Tap **Clip Settings**. 2. Tap **Capture Type** and then select a setting. – **Prospective** acquires a clip of the newly acquired images. – **Retrospective** acquires a clip of the previously stored images.
Change the method for determining the duration of the clip	1. Tap **Clip Settings** and then select a setting. – **Time** defines the length of the clip to capture in seconds. – **Beat** defines the length of the clip to capture in heart cycles. – **R-Wave** defines the capture point based on a delay beyond the R-wave for cardiac exams. 2. Tap the arrow to increase or decrease the clip duration.

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 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.

  Note: Flash sequencing is not available for the cardiac exam.

To use the Burst destruction technique:

1. To specify the duration for destruction of the contrast agent, rotate **[Burst Time]**.
2. Tap **Burst**.
3. To stop the burst process before the specified burst time ends, tap **Burst** again.

To use the Flash Sequence technique:

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.
3. To cancel the flash sequence, tap **Flash Sequence** again.

Configuring the Flash Sequence

You can configure the flash sequence using selections on the touch screen.

To configure the Flash Sequence:

1. Tap **Configure Flash Sequence**.
2. Select the first step of the sequence.
   a. Tap **Burst Time**.
   b. Tap the duration, in seconds, for destruction of the contrast agent.
3. 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. Tap **Imaging Duration** and then select the length of acquisition in seconds.
5. 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.
6. To capture the flash sequence as a clip, tap **Flash Sequence Clip Capture**.
7. 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.

See also: For information on measurements and calculations, refer to Chapter C1 in the Clinical Applications Guide.

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**.

B1 Physiologic Function

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ECG Function 3
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Physiologic Function

The physiologic function includes the ECG function and physiologic inputs. The system can display auxiliary physiologic traces from medically approved, properly isolated devices. You can simultaneously display an ECG trace and a respiratory trace.

ECG Function

⚠ **WARNING:** Do not use the ECG option in conjunction with electrosurgery or diathermy equipment.

⚠ **WARNING:** Use ECG for timing purposes only. It is not intended for diagnostic usage or patient monitoring.

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.

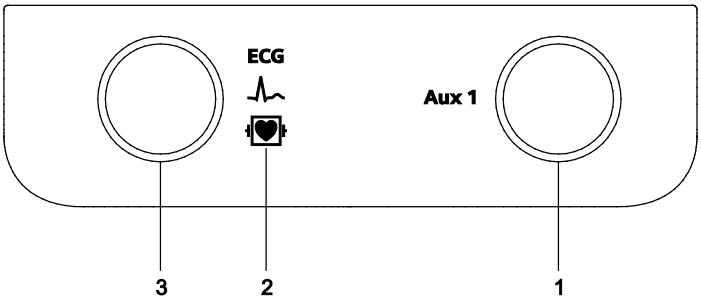
Note: If the physio module detects abnormal input due to electrical interference, the module is designed to shut down to prevent the incorrect display of the physio signals on the image screen. If the physio module shuts down, you must restart the ultrasound system to reset the physio module.

Note: The ECG Inputs are defibrillation proof. However, in the event of defibrillation during 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.

Connecting ECG or Auxiliary Cables

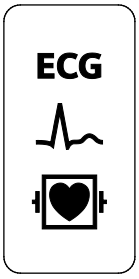
⚠ **WARNING:** To reduce risk of electric shock and burns, use only the cable and patient leads supplied with the physiologic function. Use of other ECG cables could defeat the current-limiting and electrical safety features of the physiologic function.

⚠ **Caution:** To avoid possible damage to the physio cables, do not pull on the cables when disconnecting the ECG connector. Always grasp the connector housing.



Example of physio panel on the left side of the ultrasound system.

1 Auxiliary port
2 ECG port label
3 ECG port



Example of ECG port label.

To connect the ECG cable:

- Connect the 6-pin, 3-lead ECG cable to the ECG port on the ultrasound system.

To connect the Auxiliary cable:

- Connect the 7-pin, auxiliary cable to the auxiliary port on the ultrasound system.

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. Leads for systems that operate at 230V, for example Europe, are green, red, and yellow. Use only ECG leads that comply with the requirements of your country.

The system voltage corresponds to the following ECG leads:

System Voltage	Green	Red	Yellow	White	Black
100V	Left leg	Right arm	Left arm	--	--
115V	--	Left leg (**LL**)	--	Right arm (**RA**)	Left arm (**LA**)
230V	Left leg (**F**)	Right arm (**R**)	Left arm (**L**)	--	--

To connect the leads to the patient:

1. Attach the ECG electrode patches to the patient in the locations specified above.
2. Connect each lead to the appropriate patch.

Use the configuration settings to select the lead type for tracing the voltage between the electrodes (right arm and left arm or right arm and left leg).

Using the Auxiliary Cable

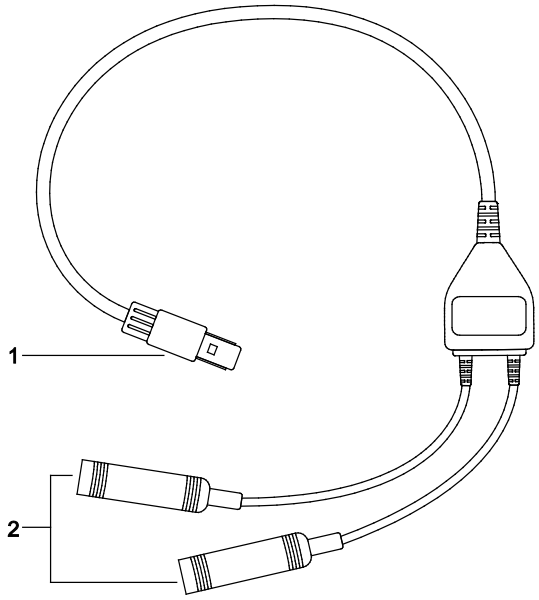
⚠ **WARNING:** To reduce the risk of electrical shock while using the auxiliary port on the ultrasound system, ensure that the external source (peripheral equipment) is properly set up and is designed for direct patient connection.

The stress adapter cable kit contains a stress adapter cable and connector adapters used to attach various peripheral equipment to the ultrasound system.

See also: For information about connecting to peripheral equipment, refer to Chapter 3 in the Instructions for Use manual.

To connect an auxiliary cable to the ultrasound system and to the peripheral equipment:

1. Attach the auxiliary input connector to the auxiliary adapter.
   Note: The auxiliary connector connects to the ultrasound system.

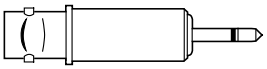


1 Auxiliary connector
2 Auxiliary input (blue) and output (green) connectors

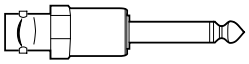
2. Attach one end of the stress adapter cable to the auxiliary adapter.

3. Attach the required connector adapter for the peripheral equipment to the other end of the cable.

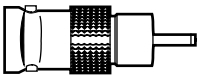
   Note: Refer to the manufacturer's operating instructions for the peripheral equipment to determine the appropriate connector adapter to use.



Phone adapter.



Phone plug (mono).



BNC to Phono plug adapter.

Activating the ECG or AUX ECG Function

You can enable the system to display an ECG trace, an auxiliary trace, or an R-wave indicator, if specified in the configuration settings.

To display an ECG trace:

Note: If baseline wander in the ECG trace becomes a problem, the cause may be respiratory movement (ventilatory excursions). Minimize this artifact by making certain that the ECG leads or cable are not needlessly draped over the patient. Secure the leads and cable off to the side of the patient.

1. Connect the ECG cable to the ECG port.
2. Connect the ECG leads to the patient.
3. Tap **Physio Settings** and then tap **ECG**.

   During CINE, the system displays a yellow vertical line to indicate the relationship of the specific phase of the ECG trace and two purple markers to indicate end diastole and end systole.
4. To activate the respiratory trace during an ECG trace, tap **Resp**.
5. To exit the physio function, tap **ECG** and then tap **Resp**.

To display an auxiliary trace:

1. Connect the auxiliary cable to the auxiliary port.
2. Connect the auxiliary cable to the external ECG monitoring device.
3. Tap **Physio Settings** and then tap **Aux ECG**.

   During CINE, the system displays a yellow vertical line to indicate the relationship of the specific phase of the ECG trace and two purple markers to indicate end diastole and end systole.
4. To exit the physio function, tap **Aux ECG**.

Adjusting the Traces

You can adjust the trace gain and trace position during the exam.

To adjust the trace gain and position:

1. To adjust the gain of the trace, rotate **[Gain]**.
2. To adjust the vertical position of the trace, rotate **[Position]**.
3. To invert the trace, tap **Invert**.
4. To activate automatic gain control, tap **AGC**.

Working with the Trigger Function

You can use triggers at selected points in the cardiac cycle when the system refreshes the 2D image. The trigger function is not compatible with the following modes or features:

- M-mode
- Doppler
- Advanced SieClear

To enable single or dual triggers:

- To display a single trigger, tap **Trigger**.
- To display dual triggers, tap **Trigger** and then tap **Trigger Type**.

  The system detects the R-wave and displays each trigger as a white, vertical line on the ECG trace. During Cine, the system displays a yellow vertical line to indicate the relationship of the specific phase of the ECG trace to the 2D image.

To set the trigger delay:

1. Rotate **[Ch 1 Delay]**.

   Note: The position of the trigger advances in increments of ten milliseconds.

   Note: When you change a trigger delay, a lag period occurs before the new trigger position is activated.

2. To position the second trigger, rotate **[Ch 2 Delay]**.

   Note: If you select two triggers and the triggers have identical values, then the system derives the second update time from the frame rate.

Displaying Auxiliary Signals

You can display auxiliary signals such as respiratory traces or R-wave detection on the ultrasound system.

To display auxiliary signals:

- To display auxiliary signals on the system, tap **Physio Settings**, and then tap **Aux Signal**.

ECG Troubleshooting Guide

Symptom	Possible Cause
ECG trace is not present, or cannot detect an R-wave	▪ The ECG cable is not properly attached to the system. ▪ Leads are poorly connected to the cable. ▪ Leads are poorly connected to the patient. ▪ Leads are incorrectly placed on the patient. Remove the ECG patch, clean the skin, and attach a new ECG patch to the patient. ▪ ECG gain is set too low. Rotate **[Gain]** to adjust the wave amplitude of the trace. Or, tap **AGC** to enable the automatic gain control.
Cannot position a trigger	▪ No R-wave present (see above). ▪ Too much movement by the patient.
ECG trace is noisy, ragged, or erratic	▪ ECG gain is set too high. Rotate **[Gain]** to adjust the wave amplitude of the trace. Or, tap **AGC** to enable the automatic gain control. ▪ 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).
Trigger is not visible on the trace	▪ A trigger may be superimposed on the R-wave. ▪ If dual triggers are used, the first and second trigger may be superimposed. Select **Ch 1 Delay** or **Ch 2 Delay** to reposition a trigger.

B2 Stress Echo

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Stress Echo Protocol Status Indicators 5
Acquiring Clips in a Stress Echo Protocol 6
Selecting Preferred Clips for Analysis 7
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Stress Echo Report **11**

Overview

Note: Siemens Healthineers recommends that you are familiar with stress echo examinations before attempting to acquire stress echo clips. Refer to the American Society of Echocardiography (ASE) protocol in the following publication: Schiller NB, Shah PM, Crawford M, et al. "Recommendations for Quantification of the Left Ventricle by Two-Dimensional Echocardiography." *Journal of the American Society of Echocardiography* 2(5):364, 1989.

You can capture and review cardiac clips for multiple-phase (multiple-stage) predefined and user-defined stress echo protocols. A cardiac clip displays motion from beginning systole to end systole (end diastole to end systole) or R-wave to R-wave, as indicated by the R-wave of the ECG trace.

Working with Stress Echo

Stress Echo acquires clips in views and stages using either continuous or non-continuous acquisition, depending on your configuration of each stage.

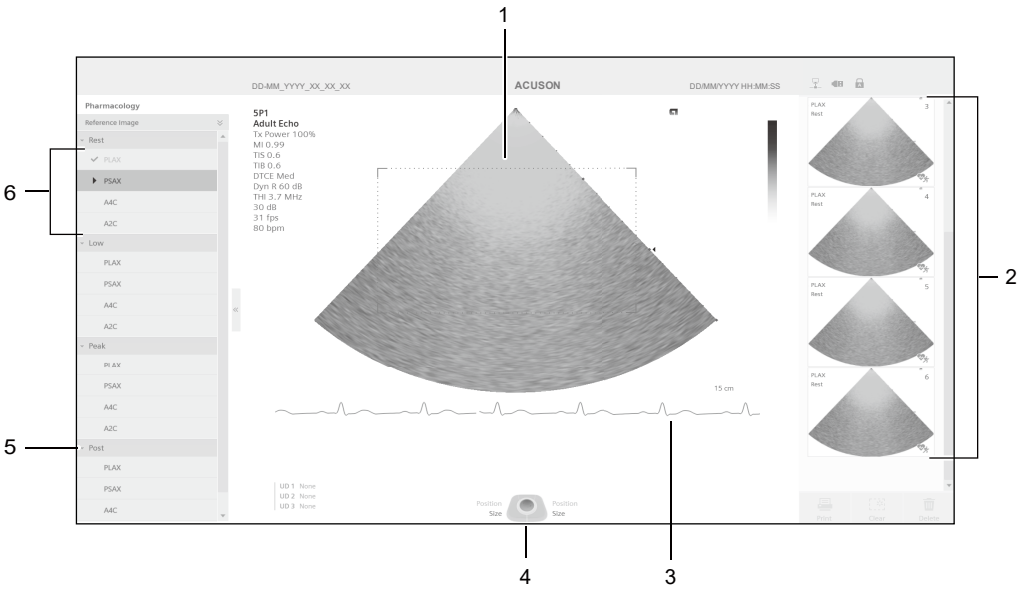
The system includes the following predefined stress echo protocols:

- **Pharmacology**
- **Pharmacology Continuous**
- **Bicycle**
- **Bicycle Continuous**
- **Treadmill**
- **Treadmill Continuous**

You can use a predefined protocol or create a user-defined protocol to configure views, stages, and settings, including prospective or retrospective acquisition, the number of clips per capture, the capture length, the capture delay, the display of the stage timer, and the display of the review screen.

When you complete acquistion for each stage, the system advances to the next task in the protocol as defined in the protocol configuration.

Use the configuration settings to create and modify stress echo protocols.



Example of the setup screen for stress echo.

1 Region of interest (ROI)
2 Image thumbnails acquired during stress echo
3 ECG trace
4 Trackball legend
5 Stages. The total number of acquired clips and the number of remaining captures displays next to the label for each stage during a continuous protocol.
6 Views. The total number of acquired clips displays next to the label for each view during a continuous protocol.

Stress Echo Protocol Status Indicators

The following icons display next to the study name in the patient browser to indicate the status of the stress echo protocol.

Icon	
	The stress echo protocol is activated.
	The stress echo protocol is paused.
	The stress echo protocol is completed.

To activate a stress echo protocol:

- Tap **Stress Echo** and then select the required protocol.

To	Do This
Pause a stress echo protocol	▪ Tap **Pause Protocol**. An on-screen symbol indicates the protocol is paused. ⏸
Complete a stress echo protocol	▪ Tap **End Protocol**. **Note:** You cannot modify a stress echo protocol after the end of the protocol. **Note:** You can only export a completed stress echo protocol.
Restart a paused stress echo protocol from a closed study	1. Access the patient browser and then select the required study. 2. Tap **Stress Echo**.
Select 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.

Acquiring Clips in a Stress Echo Protocol

Use the stress echo configuration settings to enable the timer.

To begin acquiring clips:

1. Adjust the position or size of the capture region of interest, if necessary.

   Note: The adjusted depth, focus, position, and size of the region of interest in the first stage are applied to subsequent acquisitions of the same view.

2. Press **CLIP STORE**.

   The system begins acquiring and labeling clips and starts the stage timer, depending on the selected protocol. If you pause a protocol, the stage timer continues to count the elapsed time.

   When the capture is completed, the background of the view label changes to three dots.

   During a non-continuous protocol, the system stops acquiring clips depending on the setting for capture. During a continuous protocol, the system acquires clips before you press **CLIP STORE** again.

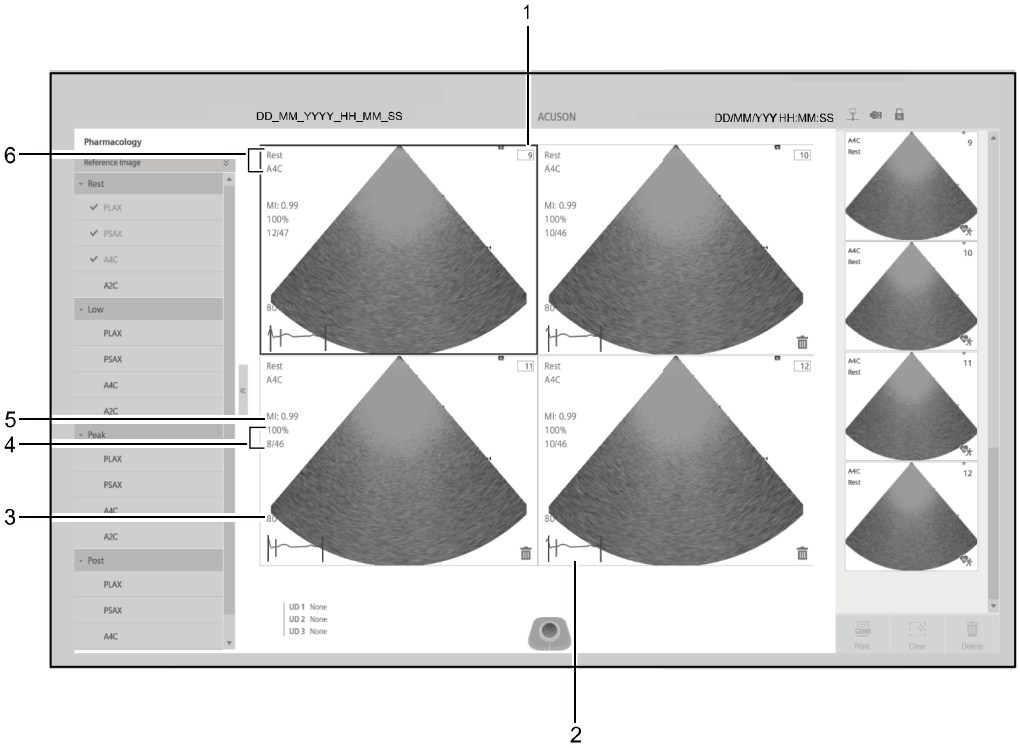
To	Do This
Display the ECG trace	▪ Tap **Physio Settings**.
Activate another view or stage in a workflow protocol	▪ Tap the required view label. Or, rotate **[Stage]** to select the required stage label.
Start or stop the manual timer	▪ Tap **Timer**.
Acquire clips with color activated	1. Press **C**. 2. Press **CLIP STORE**.
Reacquire clips for the current view	▪ Select the label for the required view during acquisition.

Selecting Preferred Clips for Analysis

You can identify clips for review, comparison, and analysis. The system activates the selection task according to 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 clips for views and stages. All images and clips acquired during the exam are numbered in the sequence of acquisition.

Acquired clips not selected are removed at the end of the exam. If you do not complete the selection task before you end the stress echo exam, the system saves all of the acquired clips.



Example of the selection screen during stress echo.

1 Sequence of clips
2 ECG trace
3 Heart rate
4 Playback speed and number of frames indicated by the current frame number and the total frame number
5 Mechanical index
6 Captured stage and view

To select preferred clips after capturing a view or stage:

1. Tap **Accept All**.

   The system displays a blue border around the acquired clips and saves the acquired clips. The system closes the selection window and activates the next view or stage in the protocol.

2. To postpone the selection task, tap **Defer**.

   The system closes the selection window and activates the next view or stage in the protocol.

3. To reject all currently acquired clips and reacquire clips for the current view, tap **Reject All**.

   The system closes the selection window and reactivates acquisition for the current view.

To select preferred clips during stress echo review:

1. Click the preferred clips.

   The system displays a blue border around the selected clips and saves the selected clips.

2. To deselect a preferred clip, click the clip.

   The system removes the blue border from the clip and displays the delete icon to indicate the clip will be removed when you complete the protocol.

Sorting and Comparing Images

During review, the system displays only the clips selected as preferred clips.

To activate stress echo review:

- Tap **Review Mode**.

To	Do This
Cycle through a set of selected clips	▪ The system displays the reverse sequence icon. ▪ Click the forward button to view clips in a forward sequence. ▪ Click the backward button to view clips in a reverse sequence.
Sort the acquired images by view	▪ Tap **Sort** in the left panel and then tap **By View**. Stress review displays the first view for all stages, followed by each subsequent view for all stages.
Sort the acquired images by stage	▪ Tap **Sort** in the left panel and then tap **By Stage**. Stress review displays all the views for the first stage, followed by the views for each subsequent stage.
Compare views for two stages	1. Tap **Compare**. 2. Select the stages to compare from the **Reference** and **Compare** lists.

To activate review:

- Activate stress echo and then press **REVIEW**.

To	Do This
Display the first page of clips acquired for each view	▪ Tap **Go to Next Group**.
Display consecutive pages of clips	▪ Tap **Page**.
Match the playback synchronization of clips	▪ Tap **Sync**.
Select a segment of clips for playback	▪ Tap **Mode** and then select a setting: – **Full R-R** displays the full heart rate cycle of systolic and diastolic portions. – **Adjusted** displays the user-adjusted segment of clips. – **Diastole only** displays only the diastolic portion of the heart cycle. – **Systole only** displays only on the systolic portion of the heart cycle.
Display an end-diastolic frame or end-systolic frame	(Available only in single display format) ▪ Tap **ED Frame** or **ES Frame**.
Display an end-diastolic frame and end-systolic frame simultaneously	▪ Tap **ED/ES Split**.
Display or hide information, for example, the heart rate	▪ Tap **Text Overlay**.
Return to stress echo acquisition mode	▪ Press **REVIEW**.
Display the review screen without exiting a stress echo protocol	▪ Tap **General Review**.
Change a view label	**Note:** The function is only available when the selection mode is activated. ▪ Tap **Rename View**.

Performing Measurements

You can create a trace to measure the volume of the left ventricle (LV) for stress echo.

Note: Measure and then label is not available during a stress echo protocol.

To activate measurements:

1. Select the required clip in a single display format or ES/ED split format in the stress echo review screen.
2. Activate the measurement function.
3. Tap the label on the measurement menu.
   The system activates the Simpson BP measurement labels.
4. Position and anchor all the measurement markers required for the measurement.

See also: For information about the measurement function, refer to Chapter C1 in this manual.

Wall Motion Scoring

The system provides the function for user-assigned wall motion scores. You can assign wall motion scores (WMS) to specific segments within each view (representative loop). You can also assign a normal wall motion score to the currently selected view or to all displayed views.

To assign wall motion scores:

1. Tap **WMS Scoring**.
2. To assign individual scores to each wall motion segment, select a number.
   The system displays the core levels or options for scoring.

To customize the display of wall motion scoring:

1. Tap **Configuration** and then tap **Measurement**.
2. Click **General**.
3. Select a **Report View Type** from the **Wall Motion Scoring** selections, if necessary.
   - **Bull's eye**
   - **View Plane**
   - **Both**

Stress Echo Report

Note: The measurement report for stress echo is displayed only during a stress echo protocol.

To display the report page for stress echo during a stress echo protocol:

- Press **REPORT**.

C1 Measurements and Calculations

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Measurement Tools and Procedures

The measurement function provides general measurements and calculations for all exam types and the following images:

- Real-time or frozen 2D images
- Frozen M-mode sweeps and Doppler spectrums
- Stored images

Note: You can make measurements during imaging or during review.

The system also provides exam-specific measurements and calculations for some exam types. Calculations require one or more specific measurements. When you complete all the measurements required by a calculation, the system displays the result.

Use the configuration settings to customize the measurement function for each exam type.

See also: For information about customizing the measurement function, refer to Chapter 3 in the System Reference manual.

Activating the Measurement Function

Use the configuration settings to configure the **FREEZE** key to activate the measurement function.

To	Do This
Activate the measurement function during imaging	▪ For 2D-mode, press **CALIPER**. Or, press **FREEZE**, if specified in the configuration settings. ▪ For M-mode and Doppler, freeze the sweep or spectrum and then press **CALIPER**.
Activate the measurement function on stored images or clips	**Note:** Images must be stored in ultrasound format, not screen capture format. 1. Press **REVIEW**. 2. Select the required image or clip. 3. Press **CALIPER**. 4. Press the control assigned to the image store function (for example, **PRINT STORE 1**) to save the changes. 5. To store the measured results, press **REPORT** and then press the control assigned to the image store function (for example, **PRINT STORE 1**). The system saves the measured results and a screenshot of the report.
Exit the measurement function	▪ Unfreeze the image. Or, press **CALIPER**.

Measurement Methods

When the measurement function is active, the measurement methods available for the active exam type and operating mode are displayed on the touch screen.

Use the configuration settings to customize the default measurement method for each mode and the default method for each type of calculated measurement, for example, volume.

To	Do This
Select a measurement method	**Note:** If you label first and then measure, the system selects the measurement method. ▪ Tap a measurement method.
Access additional measurement tools	▪ Tap **More**.

Measurement Markers

Measurement markers indicate the beginning and ending points of each measurement. A number or object identifies each set of measurement markers. When a measurement method requires multiple measurements, for example, volume, the system identifies all the required markers with the same number or object.

You can display a maximum of twenty sets of measurement markers on an image at one time. When twenty marker sets are displayed, you must delete one or more marker sets before you can make another measurement.

Use the configuration settings to select an identifier for each set of measurement markers and the initial position of the measurement marker when you activate the measurement function for each exam type.

Example of measurement markers

Note: To prevent loss of a measurement in progress, always anchor the final marker before you display another screen or exit the measurement function.

To	Do This
Position a measurement marker	▪ Roll the trackball. Measurement markers ready to be placed are green.
Anchor a measurement marker	▪ Press **SET**. Or, if indicated in a procedure in this manual, press **SET** twice. Anchored measurement markers are yellow.

Measurement Labels

When you activate the measurement function, the system displays measurement labels for the active exam type and operating mode on the measurement menu. You must label a measurement to include the results in a report.

When you select a label, the system activates the default measurement method for the label.

Use the configuration settings to create or delete user-defined labels, to specify the labels to display on the measurement menu and in reports, and to arrange the sequence of labels on the menu.

To	Do This
Select a measurement label	1. Tap a prefix on the measurement menu, if necessary. – **Right** indicates the right side of the anatomy. – **Left** indicates the left side of the anatomy. – **Prox** indicates a proximal view of the anatomy. – **Dist** indicates a distal view of the anatomy. – **Mid** indicates a middle view of the anatomy. – **None** removes any modifier or prefix from the selected label. 2. Tap the measurement label on the measurement menu.
Display a different page of measurement labels	▪ Swipe the touch screen to view more measurement labels.
Select a label from a different exam type on the measurement menu	1. Tap a different exam type from the exam type list above the measurement menu. 2. Tap an available measurement label on the measurement menu. The system creates a report for the exam type you used for measurements.

Measurement Results

As you make measurements, the system displays the results of incomplete measurements in green and the results of completed measurements in white.

Use the configuration settings to define the default position for the measurements results, to change the background for the results, and to specify the results to display on the measurement screen and in reports.

To	Do This
Change the location of measurement results during the measurement function	1. Position the cursor on the measurement results. 2. Press and hold **SET** and then roll the trackball to the required location.
Change the font size of the measured results	▪ Rotate **[Font Size]**.

Label then Measure or Measure then Label

To	Do This
Label and then measure	1. Activate the measurement function. 2. Tap the label on the measurement menu. The system activates the default measurement method for the label. 3. To use a different measurement method, tap a different measurement method soft key. 4. Position and anchor all the measurement markers required for the measurement.
Measure and then label	**Note:** If you measure and then select a label incompatible with the measurement method, the system retains the first measurement as an unlabeled measurement and starts a new, labeled measurement using the default method for the label you selected. 1. Activate the measurement function. 2. Tap a measurement method. 3. Position and anchor all the measurement markers required for the calculation. 4. Tap a label in the measurement menu.

Editing Measurements

To	Do This
Delete a measurement	**Note:** Measurement results are not removed from the report when you delete a labeled measurement from the image screen. 1. Press **[Delete]** to delete the most recent measurement. 2. Press **[Delete]** again to continue deleting measurements.
Delete all measurements from the image	**Note:** Measurement results are not removed from the report when you delete all measurements. ▪ Press **[Delete All]**.
Edit a completed measurement	1. Press **UPDATE** to select and reposition the ending marker. 2. Press **[Select Next]** repeatedly to select and reposition markers in the reverse sequence.
Edit a completed trace	1. Press **UPDATE** to select the trace. 2. Rotate **[Undo/Redo]** to remove each incorrect segment. 3. Reposition and anchor the marker.
Edit an incomplete trace measurement	▪ Rotate **[Undo/Redo]** to remove each segment.

See also: Modifying Reports, p. C1-24

General 2D-Mode Measurement Methods

Use the configuration settings to customize the default measurement method for each operating mode and the methods used for calculations.

You can make volume measurements on single or dual 2D images. If a volume calculation requires you to make measurements on multiple planes, you can use dual images, or you can change the image plane and measure single images.

Prerequisite: The measurement function is active during 2D-mode.

To	Do This
Measure distance	1. Tap **Distance**. 2. Position and anchor the beginning and ending markers.
Measure multiple distances	1. To measure three distances, tap **4 Point Dist**. 2. To measure four distances, tap **5 Point Dist**. 3. To measure five distances, tap **6 Point Dist**. 4. Position and anchor the beginning and ending markers.
Determine an average distance using two measurements	1. Tap **2 Distance Avg**. 2. Position and anchor the beginning and ending markers.
Determine an average distance using three measurements	1. Tap **3 Distance Avg**. 2. Position and anchor the beginning and ending markers.
Measure the length of a curved structure	1. Tap **Open Spline**. 2. Position and anchor the first marker to start a trace. 3. Trace the structure. a. Position and anchor three or more additional markers. b. Press **SET** twice to anchor the ending marker.

To	Do This
Measure the circumference and area using an ellipse	Use the **Trace** method when the ratio of the axis lengths is more than 2:1. Use the **Ellipse** method when the two axis lengths are close to equal. 1. Tap **Ellipse**. 2. Position and anchor the beginning marker to indicate the first axis of the ellipse. 3. Roll the trackball to rotate the ellipse and size the first axis to fit the ellipse to the structure and then anchor the marker. 4. Adjust the length of the second axis to fit the ellipse to the structure and then anchor the marker.
Measure the circumference and area of an irregular shape	1. Tap **Trace**. 2. Position and anchor the first marker to start a trace. 3. Trace the structure and then anchor the ending marker. If the ending marker does not meet the beginning marker, the system completes the trace.
Measure the circumference and area of an irregular shape using a system-generated trace	1. Tap **eSieCalcs**. 2. Position and anchor the first marker to start a trace. The system displays a region of interest with a center marker. 3. Roll the trackball to align the marker centered within the rectangle to the structure of interest and then press **SET** twice. The system traces the structure and then activates the spline measurement tool.
Measure the length of a curved structure and area	1. Tap **Spline**. 2. Position and anchor the first marker to start a trace. 3. Trace the structure. a. Position and anchor three or more additional markers. b. Press **SET** twice to anchor the ending marker.
Measure the length of an irregular line	1. Tap **Open Trace**. 2. Position and anchor the first marker to start a trace. 3. Trace the structure and then anchor the ending marker.

To	Do This
Measure two angles	1. Tap **Cross Angle**. 2. Position and anchor the beginning and ending markers for the reference line. 3. Position and anchor the beginning and ending markers for the intersecting line to create the angle.
Measure a single angle	1. Tap **Single Angle**. 2. Position and anchor the beginning and ending markers for the reference line. 3. Position the ending marker.
Measure a cardiac axis angle	1. Tap **Cardiac Axis**. 2. Position and anchor the beginning and ending markers for the reference line. 3. Position and anchor the beginning and ending markers for the intersecting line to create the angle.
Determine a volume using one distance	1. Tap **Vol 1 Dist**. 2. Position and anchor the beginning and ending markers for the length.
Determine a volume using two distances	1. Tap **Vol 2 Dist**. 2. Position and anchor the beginning and ending markers for the length. 3. Position and anchor the beginning and ending markers for depth.
Determine a volume using three distances	1. Tap **Vol 3 Dist**. 2. Position and anchor the beginning and ending markers for the length. 3. Position and anchor the beginning and ending markers for the depth. 4. Position and anchor the beginning and ending markers for the width. 5. If using single 2D images, unfreeze the image, acquire and freeze the second image, and then reactivate the measurement function. The system retains the measurements from the first image when you unfreeze the image. 6. Position and anchor the beginning and ending markers for the width on the second image. The system uses the length and depth from the first image and the width from the second image to determine the volume.

To	Do This
Determine a volume using an ellipse	**Note:** Perform an area measurement and identify the axis common to both planes. 1. Tap **1 Ellipse**. 2. Position and anchor the first marker on the axis common to both planes. The dotted line of the ellipse represents the axis common to both planes. 3. Rotate and size the axis and then anchor the ending marker. 4. Adjust the shape of the ellipse along the second axis, and anchor the ending marker.
Determine a volume using an ellipse and a distance	Make the ellipse measurement in one plane and then make the distance measurement for length in a different plane. 1. Tap **Vol 1E + 1D**. 2. Position and anchor the first marker on the axis common to both planes. The dotted line of the ellipse represents the axis common to both planes. 3. Rotate and size the axis and then anchor the ending marker. 4. Adjust the shape of the ellipse along the second axis, and anchor the ending marker. 5. If using single 2D images, unfreeze the image, acquire the second image in another plane, freeze the image and then reactivate the measurement function. The system retains the measurements from the first image even when you unfreeze the image. 6. Position and anchor the beginning and ending markers for the distance measurement.
Determine a volume using the method of disks trace	1. Tap **Disk Trace**. 2. Position and anchor the first marker to start a trace. 3. Trace the structure. a. Position and anchor three or more additional markers. b. Press **SET** twice to anchor the ending marker. If your ending marker does not meet the beginning marker, the system completes the trace and positions the axis line halfway between the two markers.

To	Do This
Determine a volume using the method of disks	1. Tap **Disk**. 2. Position and anchor the first marker to start a trace. 3. Trace the structure. a. Position and anchor three or more additional markers. b. Press **SET** twice to anchor the ending marker.
Determine a percentage stenosis using a distance	**Note:** Requires two diameters of the same vessel. 1. Tap **D-%Stenosis**. 2. Position and anchor the beginning and ending markers to indicate the first diameter of the vessel. 3. Position and anchor the beginning and ending markers to indicate the second diameter of the vessel.
Determine a percentage stenosis using an area	**Note:** Requires two cross-sectional measurements of the same vessel. 1. Tap **A-%Stenosis**. 2. Position and anchor the beginning marker to indicate the first axis of the ellipse. 3. Roll the trackball to rotate the ellipse and size the first axis to fit the ellipse to the vessel and then anchor the marker. 4. Adjust the length of the second axis to fit the ellipse to the vessel and then anchor the marker. 5. Repeat steps 2-4 for the second measurement.
Determine a percentage stenosis using an ellipse trace	1. Tap **ET-%Stenosis**. 2. Position and anchor the beginning and ending markers to indicate the first ellipse of the vessel. 3. Position and anchor the beginning and ending markers to indicate the second ellipse of the vessel.

To	Do This
Determine a percentage stenosis using auto stenosis	1. Tap **Auto Stenosis**. 2. Trace the structure. a. Position and anchor three or more additional markers. b. Press **SET** twice to anchor the ending marker.
Determine a distance using an O marker	1. Tap **O-Marker**. 2. Rotate **SELECT** to determine the O-marker size.
Determine a distance ratio	1. Tap **Dist Ratio**. 2. Position and anchor markers for two distance measurements.
Determine a volume ratio	1. Tap **Vol Ratio**. 2. Position and anchor markers for volume measurements.
Determine an area ratio	1. Tap **Area Ratio**. 2. Position and anchor markers for area measurements.
Determine a ratio of two dimension measurements	1. Tap **d:D Ratio**. 2. Position and anchor markers to measure the two dimensions and the ratio.

General M-Mode Measurement Methods

Use the configuration settings to customize the default measurement method for M-mode and the method used to determine M-mode ratios.

The horizontal axis of the M-mode sweep represents time and the vertical axis represents distance.

Prerequisite: The measurement function is active during M-mode.

To	Do This
Measure distance	1. Tap **Distance**. 2. Position and anchor the first marker. 3. Position and anchor the second marker.
Determine the change in distance over time	1. Tap **Slope**. 2. Position and anchor the first marker. 3. Position and anchor the second marker. A dotted line indicates the slope.
Determine heart rate	1. Tap **HR**. 2. Position and anchor the first marker at the beginning of the cardiac cycle. 3. Position and anchor the second marker at the end of the cardiac cycle.
Measure a time interval	1. Tap **Time**. 2. Position and anchor the beginning and ending markers.
Determine the ratio of two distances	1. Tap **Dist Ratio**. 2. Position and anchor markers for two distance measurements.
Determine the ratio of two time measurements	1. Tap **Time Ratio**. 2. Position and anchor markers for two time measurements.
Measure multiple distances	1. To measure three distances, tap **4 Point Dist**. 2. To measure four distances, tap **5 Point Dist**. 3. Position and anchor the beginning and ending markers.

General Doppler Measurement Methods

Use the configuration settings to customize the default measurement method for Doppler and the methods used for calculations.

The horizontal axis of the Doppler spectrum represents time and the vertical axis represents distance.

Prerequisite: The measurement function is active during Doppler.

To	Do This
Determine a pulsatility index from a system-generated trace	1. Tap **PI Auto**. 2. Position and anchor the first marker. 3. Position and anchor the second marker. The system draws a trace between the two markers, anchors a marker at the peak systole, and activates a marker for the end diastole. 4. Confirm the position at the end diastole and then anchor the marker.
Determine a pulsatility index from a user-generated trace	1. Tap **PI Manual**. 2. Position and anchor the first marker at the peak systole. 3. Position and anchor the second marker to trace one cycle on the spectrum. You draw a trace as you position the marker. When you anchor the marker, the system anchors a marker at the peak systole, and activates a marker for the end diastole. 4. Confirm the position at the end diastole and then anchor the marker.
Measure a velocity or frequency	1. Tap **Velocity**. 2. Position and anchor a marker.
Determine a resistive index	1. Tap **RI**. **RI** 2. Position and anchor the first marker on the peak systole. 3. Position and anchor the second marker on the end diastole.

To	Do This
Determine a flow volume using a diameter	This calculation requires a vessel diameter measurement in 2D-mode and a Doppler velocity trace. Perform the Doppler measurement from peak systole to the next peak systole or from the beginning of the cardiac cycle to the next end diastole. You can perform these measurements in any sequence. 1. Tap **D-Flow**. 2. Position and anchor the beginning and ending markers to measure the diameter of the vessel wall on the 2D-mode image. 3. Position and anchor the beginning and ending markers to include as many cardiac cycles as possible on the Doppler spectrum. **Note:** When you acquire the Doppler spectrum, extend the range of the Doppler gate to fit within the vessel of interest. Rotate **ANGLE** to adjust the Doppler angle parallel to the blood flow.
Determine a flow volume using an area	This calculation requires an area measurement in 2D-mode and a spectral Doppler trace. 1. Tap **A-Flow**. 2. Position and anchor the beginning marker of the ellipse to outline the inner lumen of the cross-sectional vessel on the 2D-mode image. 3. Rotate and size the first axis and then anchor the marker. 4. Adjust the length of the second axis to fit the ellipse to the structure and then anchor the marker. 5. Position and anchor the beginning and ending markers to include as many cardiac cycles as possible on the Doppler spectrum. **Note:** Perform the Doppler measurement from the peak systole to the next peak systole or from the beginning of the cardiac cycle to the next end diastole.
Determine the ratio of two velocity measurements	1. Tap **Velocity Ratio**. 2. Position and anchor the marker for the first velocity. 3. Position and anchor the marker for the second velocity.

To	Do This
Measure acceleration or deceleration	1. Tap **Acceleration**. 2. Position and anchor the beginning and ending markers along the horizontal and vertical axes. A dotted line indicates the slope.
Measure a time interval	1. Tap **Time**. 2. Position and anchor the beginning and ending markers.
Determine a velocity time integral trace	1. Tap **VTI Trace**. 2. Position and anchor the first marker. 3. Position and anchor the second marker to trace one cycle on the spectrum.
Determine a velocity time integral	1. Tap **VTI**. 2. Position and anchor the first marker. 3. Trace the structure. a. Position and anchor three or more additional markers. b. Press **SET** twice to anchor the ending marker.
Determine heart rate	1. Tap **HR**. 2. Position and anchor the first marker at the beginning of the cardiac cycle. 3. Position and anchor the second marker at the end of the cardiac cycle. **Note:** You can manually enter results for heart rate.
Determine a valve area by a pressure half-time	1. Tap **PHT Guide**. 2. Position and anchor the first marker on the spectrum at the peak velocity. 3. Position and anchor the second marker on the spectrum on deceleration of the mitral valve.

To	Do This
Determine a valve area on the irregular spectrum by pressure half-time	1. Tap **PHT**. 2. Position and anchor the first marker on the spectrum at the peak velocity. 3. Position and anchor the second marker on the spectrum on deceleration of the mitral valve.
Measure a pressure half time and deceleration time	1. Tap **E/A Vel + DT**. **E/A** 2. Position and anchor the first marker on the spectrum at the peak velocity. 3. Position and anchor the second marker on the spectrum on deceleration of the mitral valve.
Measure a rate of pressure change over time	1. Tap **dP/dt**. **dP/dt** 2. Position and anchor the beginning marker on the spectrum at the baseline of -100 cm/s. 3. Position and anchor the ending marker on the spectrum at the baseline of 300 cm/s.
Determine the ratio of two time measurements	1. Tap **Time Ratio**. 2. Position and anchor markers for two time measurements.

Follicle Measurements

(Available only for gynecology exams)

Use the configuration settings to select the measurement method for evaluating follicles and to enable or disable detection of follicles.

To perform a follicle measurement:

1. Activate the measurement function.
2. Tap the required measurement label.
3. Trace the structure using the method specified in the configuration settings.
4. Repeat steps 2 through 3 for each follicle.

To evaluate follicles with *syngo* Auto Follicle:

1. During a gynecology exam, acquire and freeze a 2D-mode image.
2. Tap **Auto Follicle** to activate the measurement function.

To	Do This
Perform a follicle measurement using Auto Follicle measurements	1. Tap the required measurement label on the touch screen. 2. Roll the trackball to position the measurement marker for each follicle and then press **SET**. The system traces the borders of the follicle and indicates one or two axes of the follicle depending on the Auto Follicle measurement method. *Example of follicle measurement marker.* **Note:** The system displays a message if a follicle cannot be detected. You can reposition the measurement marker and repeat this step. 3. Press **SET** to confirm the measurement. The system updates the measured results for the measured follicle and activates a measurement marker for another follicle. 4. Repeat steps 2 and 3 for each follicle.
Edit a follicle measurement	**Note:** Before editing, press **ESC** if the marker is active. 1. Press **UPDATE** and then use the trackball to select the required follicle measurement for editing. 2. Position and then anchor the measurement marker for the selected follicle. The system displays the updated values in the measured results.
Deactivate follicle measurements	▪ Tap **Auto Follicle** again to turn off.

Performing Pediatric Hip Measurements

(Available only during 2D-mode imaging)

The pediatric hip measurement provides tools to detect dysplasia of the hip joint in infants by measuring the angles of the left and right hip and then determining the stressed and flexed percentages of femoral head coverage. The stability of the pediatric hip joint is determined by Graf classification using the alpha hip angle combined with the beta hip angle and acetabular coverage of the femoral head.

The hip angle measurement requires the placement of intersecting lines including a reference line to measure either the alpha angle only or both beta and alpha angles. Femoral head coverage is assessed by measuring the ratio of the acetabular depth to the diameter of the femoral head.

To determine a hip angle:

Prerequisite: Activate the measurement function and then select the measurement package for pediatric hip.

1. Tap a modifier for the measurement label.
   - **Right** indicates the right hip.
   - **Left** indicates the left hip.
   - **None** indicates a hip is not designated as left or right.
2. Tap the required measurement label.
   - **Rt Hip Angle** for the right hip angle
   - **Lt Hip Angle** for the left hip angle
   - **Hip Angle** for the hip not designated as left or right
3. Tap the required measurement tool.
   - **Hip (α)** determines only the alpha angle.
   - **Hip (α+β)** determines the alpha angle and beta angle.
   - **Hip (β+α)** determines the beta angle and alpha angle.

   A reference line displays on the image screen. The mark on the line indicates the pivot point.
4. Position the reference line:
   a. Position the line along the iliac bone.
   b. Rotate **[Rotate]** to adjust the angle of the line.
   c. Anchor the line.

5. Position the intersecting line to measure the alpha angle.
   a. Position the line at the bony rim of the acetabulum.
   b. Rotate **[Rotate]** to position the line along the lower limb of the iliac bone and intersect the reference line.
   c. Anchor the line.
6. Position the intersecting line to measure the beta angle.

   Note: The intersecting line to measure the beta angle is available only for **Hip (α+β)** and **Hip (β+α)**.

   a. Position the line at the bony rim of the acetabulum.
   b. Rotate **[Rotate]** to position the line along the labrum and intersect the reference line.
   c. Anchor the line.

To determine a stressed or flexed percentage of femoral head coverage:

Prerequisite: Activate the measurement function and then select the measurement package for pediatric hip.

1. Tap a modifier for the measurement label.
   – **Right** indicates the right hip.
   – **Left** indicates the left hip.
   – **None** indicates a hip is not designated left or right.
2. Tap the required measurement label.
   – **Rt Flexed FHC** for the flexed percentage of femoral head coverage (right hip)
   – **Lt Flexed FHC** for the flexed percentage of femoral head coverage (left hip)
   – **Flexed FHC** for the flexed percentage of femoral head coverage (undesignated hip)
   – **Rt Stressed FHC** for the stressed percentage of femoral head coverage (right hip)
   – **Lt Stressed FHC** for the stressed percentage of femoral head coverage (left hip)
   – **Stressed FHC** for the stressed percentage of femoral head coverage (undesignated hip)
3. Tap the required measurement tool.
   – **%FHC** determines the percentage of femoral head coverage.
   – **d:D Ratio** determines the ratio of the acetabular depth to the diameter of the femoral head.

   A reference line displays on the image screen. The mark on the line indicates the pivot point.

4. To determine the percentage of femoral head coverage using **%FHC**:
   a. Position the reference line along the iliac bone.
   b. Rotate **[Rotate]** to adjust the angle of the reference line and then anchor the line.
   c. Position the circle to determine the femoral head diameter.
   d. Rotate **[Size]** to adjust the size of the circle and then anchor the circle.
5. To determine the percentage of femoral head coverage using **d:D Ratio**:
   a. Position and anchor the beginning and ending markers to measure the diameter of the femoral head.
   b. Position and anchor the beginning and ending markers to measure the acetabular depth.

Calculated Results of the Pediatric Hip Tools

Results	Abbreviation
Alpha hip angle	**α**
Beta hip angle	**β**
Flexed percentage of femoral head coverage (undesignated hip)	**Flexed FHC**
Flexed percentage of femoral head coverage (right hip)	**Rt Flexed FHC**
Flexed percentage of femoral head coverage (left hip)	**Lt Flexed FHC**
Stressed percentage of femoral head coverage (undesignated hip)	**Stressed FHC**
Stressed percentage of femoral head coverage (right hip)	**Rt Stressed FHC**
Stressed percentage of femoral head coverage (left hip)	**Lt Stressed FHC**

Patient Reports

Patient reports arrange information into sections and include labeled measurement results and exam-specific information.

Use the configuration settings to customize the reports:

- Show or hide specific report sections and specify the sequence of the sections
- Provide site information, for example, a logo, boilerplate text, and a signature
- Provide login information
- Create predefined comments
- Customize lists of system-defined or user-defined anatomy structures and descriptions, and the sequence of the structures and descriptions in the lists

To access the modifiable report:

- Press **REPORT**.

  Note: You can also view archived reports during review.

To	Do This
Display the exam specific information and measurement results	▪ Tap **Results** or click **Exam Specific Information** on the report menu.
Display anatomy descriptions	▪ Click **Assessment** on the report menu.
Display the biophysical profile	(Available for the obstetric exams only) ▪ Click **Biophysical Profile** on the report menu.
Display captures of my image screen captures and optional layouts	▪ Click **Images** on the report menu.
Display the comments section	▪ Click **Comments** on the report menu.
Open or close a report section	▪ Click the section name in the report.
Page through the report	▪ Click the scroll bar. Or, use the trackball to scroll upward or downward.
Display the image screen	▪ Press **2D**.
Exit the report	▪ Press **REPORT** again. Or tap **Close**.

Modifying Reports

To	Do This
Enter data in a text box	▪ Click the text field and use the keyboard to enter the information.
Select an item from a list	▪ Click the list and then click the item in the list.
Enter a date	1. Click the calendar icon next to the date box. 2. Select the correct month and then click the date.
Edit a measurement	**Note:** If you edit a measurement required for a calculation, the system updates the calculated value. ▪ Click the measurement result and use the keyboard to replace the data. Edited measurements are marked with an asterisk (*). If an edited value is used in data averaging, the calculated average is marked with an asterisk.
Select the method for displaying a measurement value	▪ Select the required option from the drop-down list. – **Min** uses the minimum value. – **Max** uses the maximum value. – **Mean** uses the mean of all measurement values. – **Last** uses the last measurement value.
Insert an image	1. Open the **Images** section. 2. Select the display layout from the drop-down list. 3. Click an image in the thumbnail panel. The system displays the image in the next available position.
Remove an image	▪ Click **X** in the **Images** section.
Insert a predefined comment	1. Open the **Comments** section. 2. Click **Load Comments**. 3. Click the required comment from the list. 4. Click **Select**. Or, click **Cancel** to close the list without selecting a comment. 5. To insert another comment on a new line, press enter on the keyboard.
Insert a new comment	1. Open the **Comments** section in the report. 2. Click the **Comments** field, and type your comment. 3. To insert additional comments on a new line, press enter on the keyboard.

Tracing Areas of Interest

You can use the report drawing function to identify an area of interest on the body marker in the patient report.

Note: Use the prefix labels to indicate the right or left side of the anatomy.

To	Do This
Trace an area of interest	1. Open the **Carotid Assessment** or **Prostate Assessment** section in the report. 2. Scroll to the body marker in the report and then click **Draw**. The cursor becomes a pencil. 3. Use the trackball to trace the area of interest. 4. Press **SET** to stop tracing.
Remove a tracing	1. Click **Delete**. The cursor becomes an eraser. 2. Click a tracing to remove the tracing.
Remove all tracings	▪ Click **Delete All**.

Printing and Exporting Reports

To	Do This
View a report before printing	▪ Tap **Print Preview**. The system displays the preview of the report including registered patient information. **Note:** You cannot edit the report in print preview.
Redisplay the editable report	▪ Tap **Print Preview**.
Save the entire report as an image	▪ Tap **Store Report**.
Send the report to the configured printer	▪ Click **Print Report**.
Save the report as a portable document format (PDF)	1. Connect a USB storage device to a USB port. 2. Click **Export PDF**.

DICOM Structured Reporting

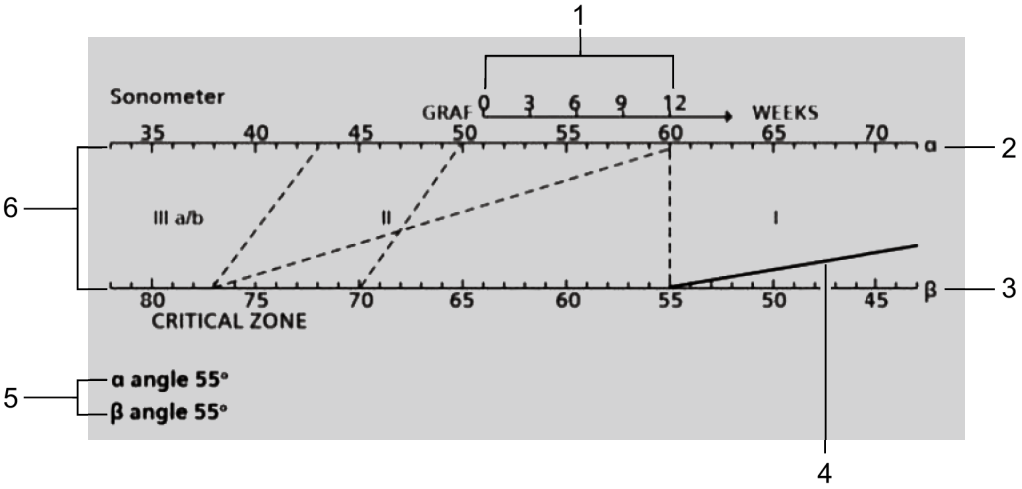
Note: DICOM structured reports are available only for the following exams: Cardiac, Obstetrics, Gynecology, and Vascular.

The ultrasound system generates a DICOM structured report (SR) for the current examination and stores the structured report to the study on the system's hard disk. You must send the structured report to a DICOM device to view the report.

Use the configuration settings to enable the system to send DICOM structured reports to DICOM devices.

Pediatric Hip Report

The pediatric hip report includes an assessment of the left and right hips and the Graf Sonometer, a depiction of the measured angles in a graph.



Example of the Graf Sonometer.

1 Acceptable normal range of alpha angle for patients younger than 12 weeks of age
2 Scale of degrees for the alpha angle
3 Scale of degrees for the beta angle
4 Solid line depicts the measured alpha and beta angles
5 Measured alpha and beta angles
6 Dashed lines indicate classification zones for the hip from dislocated to normal

To assess the left or right hip:

1. Press **REPORT**.
2. Click **Ped Hip Assessment**.
3. Click an option for assessment, for example, the osseous profile, osseous acetabulum, cartilaginous acetabulum, or an anatomical classification (type).
4. Select a classification from a drop-down list.

To view the measured angles in a graph:

(Available only when both the alpha and beta angles are measured)

1. Press **REPORT**.
2. Click the required report section:
   - **Right Hip Sonometer** for the right hip
   - **Left Hip Sonometer** for the left hip
   - **Hip Sonometer** for the hip not designated as left or right

C2 Obstetrical Measurements and Calculations

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Overview

The following obstetric exams are available on the ultrasound system:

- Exams for first trimester studies:
  - Early obstetric
  - Fetal echocardiography
- Exams for second and third trimester studies:
  - Obstetric
  - Advanced obstetric
  - Fetal echocardiography

Each exam type supports multiple gestations up to quadruplets.

You can generate growth analysis graphs to compare actual fetal growth to predicted growth patterns. You can create graphs to display measured results from a single exam, or you can include results acquired over a series of exams.

Use the configuration settings to customize the measurement function:

- Specify the system-defined measurement labels to display on the measurement menu, and customize the sequence, reference authors, and average or direct method for measurements and calculations
- Create user-defined measurement labels
- Create user-defined estimated fetal weight formulas and gestational age tables or formulas
- Create user-defined ratio formulas
- Create user-defined comments
- Customize the report

Obstetric Measurement and Calculation Labels

The obstetric exam types include measurement labels and calculation labels for 2D-mode, M-mode, and Doppler, and you can use the configuration settings to create user-defined measurement labels.

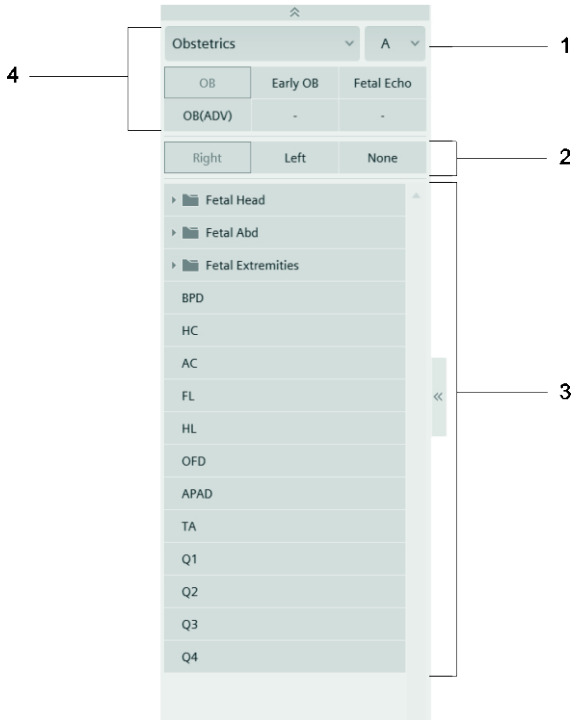
Obstetric calculations use tables or formulas designated by the reference authors specified in the configuration settings. If a measurement or calculation is outside the range specified by the selected reference, the system displays "xx w x d" instead of a result.

Calculation labels are not included on the measurement menu. The system performs the calculations when you make the required measurements. Calculation results are included with measurement results and in patient reports.

See also: For a list of measurement and calculation labels, refer to Appendix C in the System Reference manual.

Controls for the Measurement Function

You can access functions specific to the current operating mode or task using the selections in the left panel.



Example of measurement menu during an obstetric examination.

1 Identifier for multiple gestations
2 Prefix labels
3 Measurement labels
For obstetric parameters, the system displays the measurement result and the gestational age for the selected author.
4 Exam type
Displays an exam type. Click the arrow to select the required exam type from the list.

Making Obstetric Measurements

Prerequisite: The measurement function is active.

See also: For more information about general measurements, refer to Chapter C1 in this manual.

Measuring Multiple Fetuses

To	Do This
Measure multiple fetuses	1. Perform the measurements for the first fetus. The first measurements are assigned to fetus **A**. 2. Tap the multiple gestation indicator above the measurement menu and then select the next letter, for example, **B**, **C**, or **D**. 3. Perform the measurements for the next fetus. 4. Repeat steps 2 and 3 for each fetus.
Compare multiple fetuses	1. Perform the measurements for multiple fetuses. 2. Tap **Fetus Compare**. The system displays measured results for each fetus.
Display an estimated gestational age with crown rump length or biparietal diameter measurements	1. Measure a crown rump length or biparietal diameter. 2. Tap **GA by CRL/BPD**.
Assign measured results for APAD to TAD	1. Measure the anterior-posterior abdominal diameter (APAD) and the transabdominal trunk diameter (TAD). 2. Tap **TAD/APAD**.

Measuring Fetal Heart Rate

To measure fetal heart rate:

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 end of the cardiac cycle.

Using Auto OB

The Auto OB measurement method positions measurement markers on detected fetal anatomy. You can reposition any marker, if necessary, and then anchor the final marker to determine the following measurements:

- Biparietal Diameter (BPD)
- Head Circumference (HC)
- Abdominal Circumference (AC)
- Femur Length (FL)
- Humerus Length (HL)

To	Do This
Activate Auto OB	1. Begin an OB exam in 2D-mode and then press **FREEZE**. 2. Press **CALIPER** to activate the measurement function. 3. Tap **Auto OB**. An orange dot indicates available Auto OB measurement labels. 4. Select the required Auto OB measurement label. The system displays the value in the measured results. 5. Reposition the measurement markers, if necessary. 6. Press **SET** to anchor the markers.
Deactivate Auto OB	▪ Tap **Auto OB** again.

Determining an Amniotic Fluid Index

The amniotic fluid index measurement determines a volume from four distance measurements, each measurement on a separate image in each of the four quadrants.

You can perform the procedure in 2D-mode or Dual mode. For 2D-mode, you must acquire a new image for each measurement. For Dual mode, you can make one measurement on each of the first two images and then acquire new images for the last two measurements.

To	Do This
Determine amniotic fluid index by measuring quadrants sequentially	1. Acquire and freeze a 2D image. 2. Tap **AFI** on the measurement menu 3. Position and anchor the beginning and ending markers in the first quadrant. 4. Obtain additional images as required and repeat steps 2 and 3 for each image until all quadrants are measured. The system displays the distance for each quadrant. When the fourth measurement is complete, the system calculates and displays the **AFI**.
Determine amniotic fluid index by measuring quadrants individually	1. Acquire and freeze a 2D image. 2. Tap a quadrant on the measurement menu: **Q1**, **Q2**, **Q3**, or **Q4**. You can make the quadrant measurements in any sequence. 3. Position and anchor the beginning and ending markers. The system displays the result for the selected quadrant and updates the calculated amniotic fluid index. 4. Repeat steps 2 and 3 until all quadrants are measured.
Determine the pocket depth of amniotic fluid	1. Acquire and freeze a 2D image. 2. Tap **Amniotic Pocket** on the measurement menu. 3. Position and anchor the beginning and ending markers to indicate the depth of the amniotic pocket.

Obstetric Reports

See also: For information on accessing, modifying, or printing a report, refer to Chapter C1 in this manual. Appendix C in the System Reference manual includes descriptions of sections in the report.

Viewing Reports for Multiple Gestations

The results for each fetus are included individually in the patient report.

To view a report for a specific fetus:

- Display the patient report and then select the indicator for the required fetus from the drop-down list.

Modifying Measurements and Calculations in Reports

When you modify either the clinical composite gestational age or the clinical estimated date of confinement, the system recalculates the date of last menstrual period.

Note: If you make modifications causing an estimated gestational age or estimated fetal weight to be outside the range specified by the selected reference, the system displays "xx w x d" instead of a result.

To modify a reference author in a report:

- Select a different author in the drop-down list for the required measurement.

  The system updates the measurement and calculation results.

  The system displays the last measured result only.

To select the method for displaying a measurement value:

- Select the required from the drop-down list.
  - **Min** uses the minimum value.
  - **Max** uses the maximum value.
  - **Mean** uses the mean of all measurement values.
  - **Last** uses the last measurement value.

  The system updates the measurement values and corresponding calculations in the report.

Modifying Descriptions in Reports

To assess fetal structures:

- Access the patient report and then click **Description** in left of the report page.

To assess fetal structures:

1. Access the patient report.
2. Tap **Assessment**.
3. Select the assessment from the drop-down list.

To	Do
Apply a predefined group of descriptions to all fetal structures in the report	▪ Click **Load Defaults**.
Clear the descriptions from all fetal structures in the report	▪ Click **Clear All**.
Define a new predefined group of descriptions	1. Select the required setting for each fetal structure. **Note:** You can include blank descriptions in the new predefined group. 2. Click **Set as Default**.

To create a biophysical profile:

1. Access the patient report.
2. Click **Biophysical Profile**.
3. Select a value of 0, 1, or 2 for each description:
   – Fetal Movement
   – Fetal Breathing Movement
   – Fetal Tone
   – Amniotic Fluid Volume

   The system totals the four fields to calculate a score for the biophysical profile.

Viewing Doppler Results

(Available only for advanced obstetric exams)

You can view only Doppler measurements and calculations in the report or all measurements and calculations from all operating modes.

To include Doppler measurements and calculations in the report:

1. Access the patient report.
2. To display only measurements and calculations from Doppler, tap **Doppler Items**.
3. To display all measurements, including Doppler, tap **All Items**.

Displaying Growth Analysis Graphs

The graph section of the patient report includes growth analysis graphs. Growth analysis graphs display the upper limit, mean, and lower limit for predicted fetal growth patterns according to the selected reference for a measurement or calculation. The system plots the measurement results in the current exam on the vertical axis against the clinical age on the horizontal axis.

You can modify the labels and author references used to calculate the graphs. You can also combine results from previous exams with the current exam by manually entering measurement results or by linking to previous exams on the ultrasound system.

Use the configuration setting to create user-defined growth curves.

To view growth analysis graphs:

1. Tap **Growth Graph**.

   Note: If the selection is not on the touch screen, access the report and scroll to view the growth graphs in the report.

2. To change the presentation of the graphs:
   - For advanced obstetric exams:
     - To view the graphs in a quad layout, tap **Display Quad**.
     - To view the graphs in a single layout, tap **Display Single**.
3. To include additional information in the graphs:
   - For early obstetric exams or obstetric exams:
     - To view the graph with data from previous studies, tap **Quik Trend**.
   - For advanced obstetric exams:
     - To view the graphs with the images, tap **Quick Grow Graph**.
     - To view the graphs with standard deviations, tap **Growing**.
     - To view the graphs with all standard deviations for estimated fetal weight, tap **Deviation All**.
     - To view the graphs with only a single deviation for estimated fetal weight, tap **Deviation Single**.
     - To view the graphs with an estimated gestational age, tap **USGA Data Graph**.
4. To modify the labels and references for the graph:
   a. Select a different measurement, ratio, or calculation in the label drop-down list.
   b. Select a different reference in the author drop-down list.

5. To link data from previous exams stored on the ultrasound system:
   a. Click **Link Studies**.
   b. Enter the patient name or patient ID and then click **Search**.
   c. To exclude an exam, clear the check box next to the exam.
   d. Click **Link**.

      The system updates the graphs by combining the results from the previous exams with the current exam.
6. To manually enter results from previous exams:
   a. Click **OB History**.
   b. Click the calendar to enter the date of the exam.
   c. Enter the measurement and calculation results.

      The system does not check this data for accuracy or internal consistency.
   d. Click **OK**.

C3 Cardiac Measurements and Calculations

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Overview

⚠ **WARNING:** Do not use the cardiac measurements and calculations package unless you are thoroughly trained in echocardiography and thoroughly familiar with the safe operation of the ultrasound system.

Imaging the heart necessitates a unique methodology for precision measurements and calculation of equations. 2D-mode, M-mode, and Doppler each have specific measurements and methods for cardiac exams. The system performs calculations when you complete the required measurements and assigns calculation labels to the results. Calculated results display in the Measured Results section of the screen and, along with labeled measurements, are transferred to the patient report.

Use the configuration settings to customize the measurement function:

- Select the default measurement method for each mode
- Select the default measurement method for each type of measurement
- For left-ventricle guided measurements, select measurement labels to include all the measurements for diastole and systole or to exclude specific labels from the guided measurement
- Customize the list of measurement labels for a non-guided measurement type
- Customize display options such as default measurement titles for each mode, the method used for data averaging, the method for determining Heart Rate, and the performing and referring physician information for the patient report
- Create user-defined cardiac measurement group and user-defined measurements label for each measurement group
- Derive the heart rate from a Doppler or M-mode signal, from the ECG trace, or from auto statistics
- Add eSie Measure measurements and series to user-defined eSieScan workflow protocols

To select a cardiac measurement type:

1. Activate the measurement function.
2. Select the name of the measurement group from the measurement menu.

   The corresponding measurement labels are in the measurement menu. The measurement methods for the active mode are available as soft key selections.

See also: For a list of cardiac measurement and calculation labels, refer to Appendix D in the System Reference manual.

Guided Measurements

Guided Measurements are system-defined sequences of individual measurements. You can perform measurements in the specified sequence or individually as non-guided measurements.

Making Cardiac Measurements

Prerequisite: The measurement function is active during system freeze.

See also: For more information about general measurements, refer to Chapter C1 in this manual.

Measuring a Heart Rate

You derive the heart rate from a Doppler or M-mode signal, from the ECG trace, or from auto statistics. In 2D-mode, you can manually edit the heart rate value.

To measure heart rate:

1. Tap **HR**.
2. Position and anchor the first marker at the beginning of the cardiac cycle.
3. Position and anchor the second marker at the end of the cardiac cycle.
4. To manually enter a heart rate, enter the heart rate in the dialog box.
   The system displays the heart rate in yellow.

Entering the Aliasing Velocity for Assessment of PISA

You must manually enter the aliasing velocity value to properly assess mitral regurgitation, aortic regurgitation, and mitral stenosis of the proximal isovelocity surface area (PISA) during 2D-mode imaging and review as the ultrasound system does not display the aliasing velocity value acquired during live imaging.

To enter the aliasing velocity during 2D imaging or review:

1. Activate the measurement function.
2. Tap the **PISA (AR)**, **PISA (TR)**, or **PISA (MR)** measurement folder.
3. Tap the measurement label for the aliasing velocity.
4. Enter a value for the aliasing velocity and then click **OK**.
5. To exit without saving a value, click **Cancel**.

Assessing the Left Ventricular Function

Prerequisite: The measurement function is active during CINE playback of a 2D image or an M-mode sweep.

Analysis of the heart involves the assessment of the Left Ventricular (LV) function using 2D-mode or M-mode measurements.

You can select from the following volume formulas to calculate end-diastolic and end-systolic volumes.

- Formulas using distance and trace measurements:
  - Modified Simpson
  - Single Plane
  - Bi-Plane
  - Bullet
- Formulas using the disk volume method:
  - Simpson Single Plane
  - Simpson Bi-Plane
- Formulas using guided measurements for ventricular distances:
  - Cubed
  - Teichholz
  - Gibson

To perform a guided assessment:

1. Tap the required measurement group on the measurement menu.
2. Perform the measurements at end diastole:
   a. Tap the diastole label on the measurement menu.
   b. Position and anchor the marker on the posterior right ventricular wall.
   c. Position and anchor the marker on the anterior interventricular septum.
   d. During M-mode, position and anchor the marker on the posterior interventricular septum.
   e. Position and anchor the marker on the endocardium of the left ventricular free wall.
   f. Position and anchor the marker on the posterior left ventricular free wall.
3. Perform the measurements at end-systole:
   a. Tap the systole label on the measurement menu.
   b. Position and anchor the marker on the anterior interventricular septum.
   c. Position and anchor the marker on the posterior interventricular septum.
   d. Position and anchor the marker on the endocardium of the left ventricular free wall.
   e. Position and anchor the marker on the posterior left ventricular free wall.
   f. During M-mode, tap **LVET** and then position and anchor the measurement marker on the sweep.
4. Confirm the measured results.

To perform a non-guided assessment:

1. Tap **Cubed**, **Teichholz**, or **Gibson** on the measurement menu.
2. Tap any measurement label, except for the systole or diastole label.
3. Position and anchor the beginning and ending markers.

   The system displays a checkmark next to the completed measurement and next to the diastole or systole series of measurements. The system highlights the next measurement in the group.
4. Continue to select measurement labels and perform measurements, as required.

Determining an End-Diastolic Volume or End-Systolic Volume

Prerequisite: The measurement function is active during CINE playback.

The Simpson Single Plane and Simpson Bi-Plane measurements use the disk volume measurement method.

To determine an end-diastolic volume or end-systolic volume:

1. Select a volume measurement label in the Measurement Menu.
2. Position and anchor the first marker to start a trace.
3. Trace the structure and anchor the ending marker.

   If your ending marker does not meet the beginning marker, the system completes the trace and positions the axis line halfway between the two markers.
4. Position the axis line and anchor the ending marker.
5. Continue to select measurement labels and perform measurements, as required.

Using the eSie Measure Workflow Acceleration Package

(Not available for stored clips during review)

The eSie Measure workflow acceleration package reduces the keystrokes required to perform measurements. For example, the eSie Measure Teichholz activates the calipers and performs each required left ventricle measurement in diastole. When you confirm the measurements, the system copies the results to the patient report.

During M-mode and Doppler, the system displays measurements for at least three completed heart cycles or for all completed heart cycles if less than three measurements were performed.

To perform a measurement using the eSie Measure Function:

Prerequisite: An image or clip with at least one heart beat and an ECG trace.

1. Activate the measurement function.
2. Press **[eSie Measure]**.
3. Tap the required measurement group.

   The system traces the image, displays a set of measurement results, and activates the last marker of the last measurement.
4. To manually perform an eSie Measure measurement or series, select the measurement label in the task pane and then position and anchor the markers.
5. If a message displays indicating that the system was unable to perform the measurement on the current image, click **OK**.

   The system activates the measurement function.
6. To reposition a marker, select and then anchor the marker in the required location.

Cardiac Reports

See also: For information on accessing, modifying, or printing a report, refer to Chapter C1 in this manual. Appendix D in the System Reference manual includes descriptions of sections in the report.

D1 *syngo* Arterial Health Package

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Overview

The *syngo* Arterial Health Package (AHP) software program provides a method of quantifying Carotid Intima-Media Thickness (CIMT). CIMT should be performed by a user who is experienced in CIMT measurement techniques.

Quantification of CIMT provides an estimate of vascular age for use in evaluating the potential risk of cardiovascular events in adults. The software program uses semi-automated border detection to determine the maximum and average thickness of the intima-medial layer of the carotid artery.

Terminology Used in This Chapter

Term	Definition
AHP	*syngo* Arterial Health Package (AHP) software program
CIMT	Carotid intima-media thickness
ASE	American Society of Echocardiography
ARIC	Atherosclerosis Risk in Communities study
CCA	Common carotid artery
CHD	Coronary heart disease
ECA	External carotid artery
ICA	Internal carotid artery
IMB	Intima-media boundary
IMT	Intima-media thickness
LBUL	Left bulb
LCCA	Left common carotid artery
LI	Lumen-intima
LIB	Lumen-intima boundary
LICA	Left internal carotid artery
MA	Media-adventitia
MAB	Media-adventitia boundary
ROI	Region of interest
RBUL	Right bulb
RCCA	Right common carotid artery
RICA	Right internal carotid artery

Acquiring Clips for Use with the Software Program

Note: Siemens Healthineers recommends following a description of the exam protocol, including acquisition of clips and images for analysis, from the American Society of Echocardiography (ASE) consensus statement.

Acquire clips from at least three angles of each blood vessel segment from both the left and the right sides of the body required to complete the selected protocol with an ECG active for adherence to the ASE consensus statement.

Activating the Software Program

You can activate the software program for a selected compatible clip in an active study or a previously saved study.

To activate *syngo* AHP:

1. Press **REVIEW**.
2. Select an image or clip.
3. Tap **AHP**.
   The system displays an edit box for patient age and gender if there is missing patient information.
4. Review and analyze the clip.
5. To select another clip or image, double-click the required thumbnail.
6. To exit, tap **Exit**. Or, press **2D**.

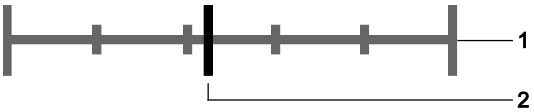
Reviewing Clips

The thumbnail panel displays images and clips.

To review a clip:

- Double-click the required thumbnail.

To	Do This
Display the previous frame of the clip	▪ Click **Prior**. Or, press the left arrow key on the keyboard.
Start playback of the displayed clip	▪ Click **Run**.
Stop playback of the displayed clip	▪ Click **Stop**.
Display the next frame of the clip	▪ Click **Next**. Or, press the right arrow key on the keyboard.
Magnify the current clip or frame	▪ Click **Zoom +**. Or, rotate **ZOOM** clockwise.
Minimize the current clip or frame	▪ Click **Zoom -**. Or, rotate **ZOOM** counterclockwise.
Position the current clip or frame in the display area	▪ Click **Pan**.
Adjust the difference of the light and dark shades	▪ Click **Contrast**.
Lighten or darken shades	▪ Click **Brightness**.
Exclude a frame from quantification and analysis	1. Click **Toggle Exclude Frame**. **Note:** Excluding a frame does not delete the frame. *Example of the symbol indicating the frame is unavailable for quantification and analysis.* 2. To include a frame, click **Toggle Exclude Frame** again.



Example of displayed frame bar.

1 Frame bar (green line)
2 Reference position indicator (white line)

Analyzing Clips

You can analyze any clip with only 2D-mode data and clips acquired with a linear transducer.

To analyze the contents of the clip:

1. Select a population group from the drop-down list on the top of the screen.
2. Select a vessel segment.
3. Select the orientation of vessel.

   The software program outlines the CIMT region of interest (ROI) in red and displays a cursor on the left side of the ROI.

To	Do This
Position the CIMT ROI	▪ Click in the vessel near the far wall. **Note:** The upper edge of the ROI must be within the lumen of the vessel. The software program calculates and displays measurement values on the right side of the screen for the active frame.
Lengthen the CIMT ROI	1. Position the cursor on the outline of the CIMT ROI. 2. Press **SET** and then use the trackball to adjust the position of the CIMT region of interest. The system updates the measurement values.
Reposition the CIMT ROI without changing the length	▪ Press and hold **CTRL** and then press the right or left arrow key on the keyboard.
Edit the semi-automated trace borders	**Note:** Use the setup page to determine the ranges of color to apply to the "thickness" between the lumen-intima and media-adventitia or to only display lines to indicate the borders of the lumen-intima and media-adventitia. **Prerequisite:** Position the CIMT region of interest. 1. Click the required trace to edit and then click a key for the required edit: – **Edit lumen-intima** – **Edit media-adventitia** 2. Position and anchor the markers along the boundary. A crossmark indicates the location of each edit point. 3. Position and anchor the last marker to conclude editing. *Example of the cursor during the edit function.*

To	Do This
Discard the most recent edit	▪ Click **Undo Edit**.
Delete the outline of the CIMT ROI	▪ Click **Clear Borders**.
Trace a border manually	**Note:** Use the setup page to determine the ranges of color to apply to the "thickness" between the lumen-intima and media-adventitia or to only display lines to indicate the borders of the lumen-intima and media-adventitia. 1. Click a trace method: – **Manual trace lumen-intima** – **Manual trace media-adventitia** 2. Position and anchor the markers along the boundary. A crossmark indicates the location of each point. The software program connects the points to draw the line. **Note:** You must trace borders only drawn from left to right. 3. Click a measurement method. 4. Position and anchor the marker along the border of the vessel corresponding to the previous trace. 5. Position and anchor the ending marker after tracing the lumen-intima and media-adventitia. *Example of the cursor during the manual trace function.*
Save CIMT data to the report	▪ Click **Save CIMT**.
Return to the Carotid Intima-Media Thickness (CIMT) screen	▪ Click **CIMT Border**.
Magnify the selected region of interest (ROI)	▪ Click **Zoom to ROI**.

Modifying Settings

You can modify settings at any time. Use the setup page to assign the ranges of color to apply to the thickness between the lumen-intima and media-adventitia or to only display lines to indicate the borders of the lumen-intima and media-adventitia.

To modify settings for the region of interest:

1. Tap **Setup**.

2. Select the **Border** tab.

To	Do This
Determine the range of color to apply or to only display lines to indicate borders	1. Select the required option from the drop-down list in **Display of CIMT area**. CIMT applies color to the lines depicting the borders of the vessel boundaries or applies shades of color or a solid color to the "thickness" between the lumen-intima boundary and the media-adventitia boundary. A color bar displays the range of colors and a corresponding scale that indicates the average vessel thickness. You can assign the color to each color index if the shading option is selected. 2. Select a color scheme to apply to the selected CIMT area.
Specify the length or width of the CIMT region of interest	▪ Select a value in centimeters from the **Search Length**.
Specify the depth or height of the CIMT region of interest for the far wall	▪ Select a value in centimeters from the **Far Wall Search Depth**.
Visually indicate a segment thickness exceeds the user-defined threshold	▪ Select the **Enable Maximum CIMT Threshold** check box.
Specify the maximum threshold for the CIMT	▪ Select a value in millimeters from the **Maximum CIMT Threshold**. When reviewing a clip, the system displays a message indicating the CIMT threshold is exceeded and applies yellow highlights to the corresponding segments.
Enable the zoom feature for the region of interest	▪ Select the **Zoom to ROI on Detection** check box. **Note:** This feature is not applicable for detecting all frames.
Detect boundaries on all frames	▪ Select the **Detect All Frames** check box. **Note:** Detecting all frames may slow performance.
Display the CIMT region of interest	▪ Select the **Show Search Region** check box.
Omit the excluded frames from clip playback	▪ Select the **Skip Excluded Frames on Playback** check box.

3. To save changes, click **Save Page**.
4. To restore settings, click **Restore Page Defaults**.

To modify additional settings:

1. Tap **Setup**.

To	Do This
Customize orientation descriptions for a protocol	1. Select the **Define Protocol** tab. The system displays a list of population sets and data values from the Atherosclerosis Risk in Communities (ARIC) study. 2. Ensure the corresponding protocol name for the specified vessel is displayed in the protocol box. 3. Click **Copy Protocol**. 4. Enter a name for the new protocol. The customized orientations are displayed on the measurements screen for the customized protocol.
Customize the protocol list	1. Select the **Filter Protocols** tab. 2. To display or exclude protocol types from the protocol list, select or clear the checkbox on the measurements screen.
Delete an existing protocol	(Available only with user-defined protocols) 1. Select the **Define Protocol** tab. 2. Select a protocol from the list. 3. Click **Delete Protocol**.
Set up a new report	1. Select the **Report** tab. 2. Click **New** in the Reporting Physician section. 3. Enter a name for a physician. 4. Click **New** in the Recommendations section. 5. Enter a title and description.
Remove a report setting	1. Select the **Report** tab. 2. Click **Remove** in the Reporting Physician or the Recommendations section.
Set up default units	1. Select the **Units** tab. 2. Select an option on the **Units** page and adjust the setting.

2. To save changes, click **Save Page**.
3. To restore settings, click **Restore Page Defaults**.

Accessing the CIMT Report

Prerequisite: *syngo* AHP is active.

The report can display an overall vascular age and an overall risk for potential coronary heart disease. Risk analysis is based on information from the *Framingham Heart Study*.

See also: Clinical References, p. D1-12.

The report can contain the following averages for each segment of the vessel:

- Maximum CIMT
- Mean CIMT
- Mean CIMT percentile (for age, sex and race)

The report can contain the following averages for both the right and left distal CCA segments:

- Mean CIMT
- Mean CIMT percentile
- Vascular age of the segment

The report can contain the following averages across all segments of the vessel:

- Composite mean CIMT
- Composite mean CIMT percentile
- Average vascular age

  Note: To display the average vascular age and composite mean CIMT percentile values in the report, you must measure three angles of each segment. For ARIC protocols, you must measure one angle from each of the six segments.

- Framingham Model CHD Risk (%) (chronological age, blood pressure, cholesterol, diabetes, smoking)

To access the CIMT report:

- Tap **Reports**.

To	Do This
Edit or enter patient data relevant to *syngo* AHP calculations and Framingham assessment	1. Click **Edit Patient Data**. The system displays the screen with selections for entering risk factors. 2. Select the check box for **Perform Framingham Assessment**. 3. Enter the values for systolic and diastolic blood pressure. 4. Enter the values for both the total cholesterol and the HDL cholesterol levels. 5. Select the check box for additional risk factors.
Delete measurements	**Note:** You can delete measurements from the worksheet only. 1. Click **Show Worksheet**. 2. Click **Edit Measurements**. 3. Select the measurements to delete for a particular vessel, view, and wall. 4. Click **Delete**.
Enter sonographer initials, name of person preparing the report, reporting physician, recommendations, and a summary	1. Click **Edit Summary**. 2. Use the keyboard to enter your comments.
Export measurements or report data	▪ Click **Export**.
Display the report or worksheet	▪ To display the report, click **Show Report**. ▪ To display the worksheet, click **Show Worksheet**. ▪ To display the worksheet measurements screen, click **Edit Measurements**.

Distance Measurements in the Report

The software program provides the following measurements of the distances between the lumen-intima boundary and the media-adventitia boundary:

- Maximum CIMT distance for the currently displayed frame
- Mean CIMT distance for the currently displayed frame

Saved measurements display in the report and in the worksheet. You can delete the measurements only on the worksheet.

Clinical References

James H. Stein, Claudia E. Korcarz, Maureen E. Mays, Pamela S. Douglas, Mari Palta, Hongling Zhang, Tamara LeCaire, Diane Paine, David Gustafson, and Liexiang Fan, Madison, Wisconsin, and Issaquah, Washington. "A Semiautomated Ultrasound Border Detection Program That Facilitates Clinical Measurement of Ultrasound Carotid Intima-Media Thickness." *Journal of the American Society of Echocardiography* 18:244-251, 2005.

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Peter W.F. Wilson, Ralph B. D'Agostino, Daniel Levy. "Prediction of Coronary Heart Disease Using Risk Factor Categories." *Circulation*, 97:1837-1847, 1998. *Framingham Heart Study*; National Heart, Lung, and Blood Institute, Framingham, Massachusetts (P.W.F.W., D.L.); Boston University Mathematics Department, Boston, Massachusetts (R.B.D., A.M.B., H.S.); and Framingham Heart Study, Boston University School of Medicine, Framingham, Massachusetts (W.B.K.).

Chambless LE, Heiss G, Folsom AR, Rosamond W, Szklo M, Sharrett AR, et al. "Association of Coronary Heart Disease Incidence with Carotid Arterial Wall Thickness and Major Risk Factors: The Atherosclerosis Risk in Communities (ARIC) Study, 1987-1993." *American Journal of Epidemiology*, 1997; 146:483-94.

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D2 eSie Left Heart

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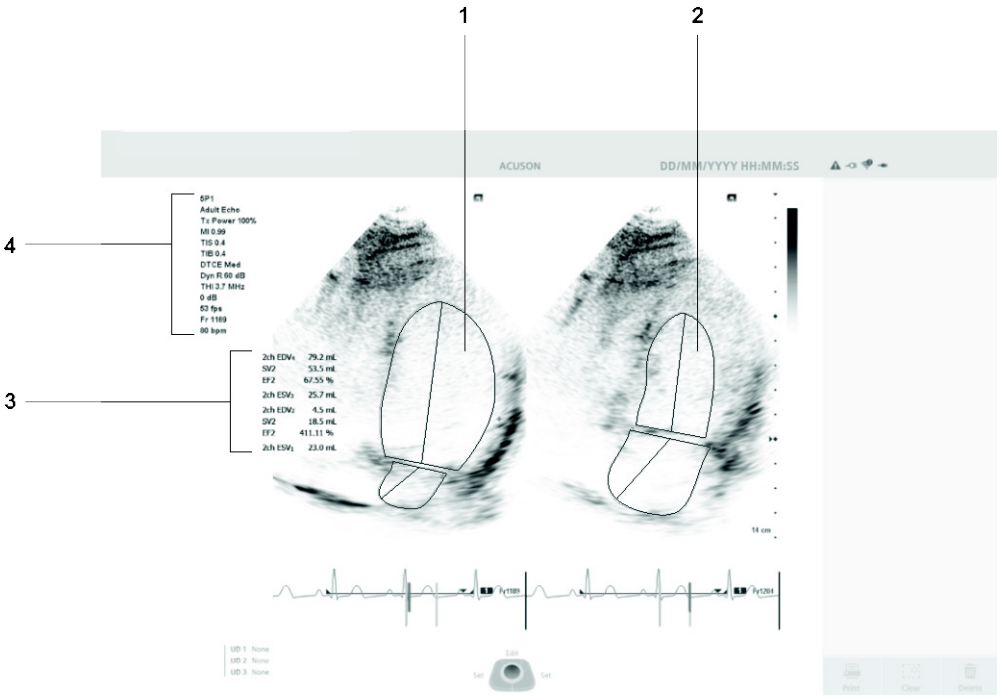
Working with eSie Left Heart 6

Overview of eSie Left Heart

⚠ **WARNING:** This application utilizes 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 application. 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.

eSie Left Heart is a clinical software program that detects the apical four-chamber or apical two-chamber view of the heart and then traces the endocardial borders (contours) of the left ventricle and left atrium. The program displays the contours on the end diastole (ED) and end systole (ES) images in a side-by-side format and generates measured results for end-diastolic volume, end-systolic volume, and ejection fraction. eSie Left Heart technology also includes methods for manually tracing the contours of the left ventricle and/or the left atrium.



Example of eSie Left Heart screen.

1 Traced contours on the end diastole image
2 Traced contours on the end systole image
3 eSie Left Heart measured results
4 eSie Left Heart imaging parameters

Calculation Data and Measurements

When the traced contours for the ED and ES images are complete, eSie Left Heart generates the following measured results.

Note: Ejection Fraction Biplane calculation results are displayed when eSie Left Heart measurements have been completed for both the two-chamber and four-chamber views.

Measurement Label	Description
EF2	Left ventricle ejection fraction, apical 2-chamber view
EF4	Left ventricle ejection fraction, apical 4-chamber view
CO2	Left ventricle cardiac output for 2-chamber
CO4	Left ventricle cardiac output for 4-chamber
SV2	Left ventricle stroke volume for 2-chamber
SV4	Left ventricle stroke volume for 4-chamber
SI2	Stroke index for 2-chamber
SI4	Stroke index for 4-chamber
CI2	Cardiac index for 2-chamber
CI4	Cardiac index for 4-chamber
HR	Left ventricle heart rate
EDV (BP)	Left ventricle end-diastolic volume, bi-plane
ESV (BP)	Left ventricle end-systolic volume, bi-plane
LV 2ch EDV	Left ventricle end-diastolic volume, apical 2-chamber view
LV 2ch ESV	Left ventricle end-systolic volume, apical 2-chamber view
LV 4ch EDV	Left ventricle end-diastolic volume, apical 4-chamber view
LV 4ch ESV	Left ventricle end-systolic volume, apical 4-chamber view
EF (BP)	Left ventricle ejection fraction, biplane
LA EF2	Left atrium ejection fraction, apical 2-chamber view
LA EF4	Left atrium ejection fraction, apical 4-chamber view
LA SV2	Left atrium stroke volume for 2-chamber
LA SV4	Left atrium stroke volume for 4-chamber
LA EDV (BP)	Left atrium end-diastolic volume, bi-plane
LA ESV (BP)	Left atrium end-systolic volume, bi-plane
LA 2ch EDV	Left atrium end-diastolic volume, apical 2-chamber view
LA 2ch ESV	Left atrium end-systolic volume, apical 2-chamber view
LA 4ch EDV	Left atrium end-diastolic volume, apical 4-chamber view
LA 4ch ESV	Left atrium end-systolic volume, apical 4-chamber view
LA EF (BP)	Left atrium ejection fraction, biplane
LA Vol-I	Left atrium volume index

Activating and Exiting eSie Left Heart

You can activate eSie Left Heart on a real-time image containing only 2D-mode data, an ECG trace, and at least one heart cycle.

Note: eSie Left Heart supports clips captured in a reverse orientation using the left/right flip or up/down flip controls, or both.

To activate eSie Left Heart:

Prerequisite: An acquired and paused 2D clip in a full-screen display format.

1. Scroll to any frame in the required heart cycle, if necessary.

   Note: If you select a frame in an incomplete heart cycle, eSie Left Heart uses the most recent complete heart cycle for analysis.

2. Tap **eSie LH**.

   The program displays the end diastole and end systole in a side-by-side display format and displays the measured results. The ED and ES images display the detected contours and major axes of the left ventricle and left atrium in yellow.

   Note: The measured results display calculations only when the program detects the contours of the left atrium and the left ventricle or the contour of the left ventricle only. You can manually draw the contours or edit the program-generated contours.

3. To override the view label assigned by the system:
   a. Tap **2CH** or **4CH**.
   b. Tap the required measurement label for a two-chamber or four-chamber end-diastolic volume or end-systolic volume.

   The system reassigns the measured results and activates measurement labels in the task pane for the selected view.

4. To exit eSie Left Heart, tap **Exit**. Or, press **2D**.

Working with eSie Left Heart

eSie Left Heart displays contours only on the end diastole and end systole frames. You can manually adjust or delete and redraw the program-generated contours. Or, if the program could not detect the contours of the left ventricle or left atrium, you can manually draw the contours.

Note: Clicking the image, pressing **PRINT STORE**, or tapping **Edit** when the contours are displayed in green confirms the displayed the measured results. The editing button is activated on the touch screen only when you initially adjust and confirm the contours. When the contours are confirmed, the color turns to yellow.

To	Do This
Adjust the program-detected contours	1. Position the pointer on the required contour. The program displays the overall contour and segments of the contour in yellow. 2. To adjust a segment of the contour: a. For small adjustments, position the pointer closer to the contour and then click the image. b. For large adjustments, position the pointer farther from the contour and then click the image. The program displays the segment to be edited in green. 3. Reposition and anchor the segment using the trackball. 4. Repeat steps 2 and 3 to perform additional adjustments. When you move the pointer away from the contour, the program displays the contour in yellow.
Manually trace the contours of the left ventricle or left atrium	1. Tap the required location to manually trace the contours, for example **2Ch EDV**, **2Ch ESV**, **4Ch EDV**, or **4Ch ESV**. 2. Manually trace the contour by rolling the trackball. When you move the pointer away from the contour, the program displays the contours and major axes in green and displays the measured results on the screen.

To	Do This
Recalculate the measured results with a user-selected end diastole or end systole frame	1. Tap **Previous frame** or **Next frame** to view and select the required image (end diastole or end systole), if necessary. 2. Tap **Set ED** or **Set ES**. The program displays the detected contours on the end diastole and end systole frames and displays the measured results on the screen. 3. Tap **ED Frame** or **ES Frame** to view the user-confirmed end-diastolic or end-systolic frame.
Reposition the measured results on the screen	1. Click the measurement results. 2. Roll the trackball to the required location and then press **SET**.
Confirm the displayed contours and save the measured results to the patient report	▪ When the contours are displayed in yellow, confirm the contours by clicking the image, pressing **PRINT STORE**, or tapping **Edit**. The program displays the results of the method of disks on the displayed images.

D3 Transesophageal Transducer

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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.

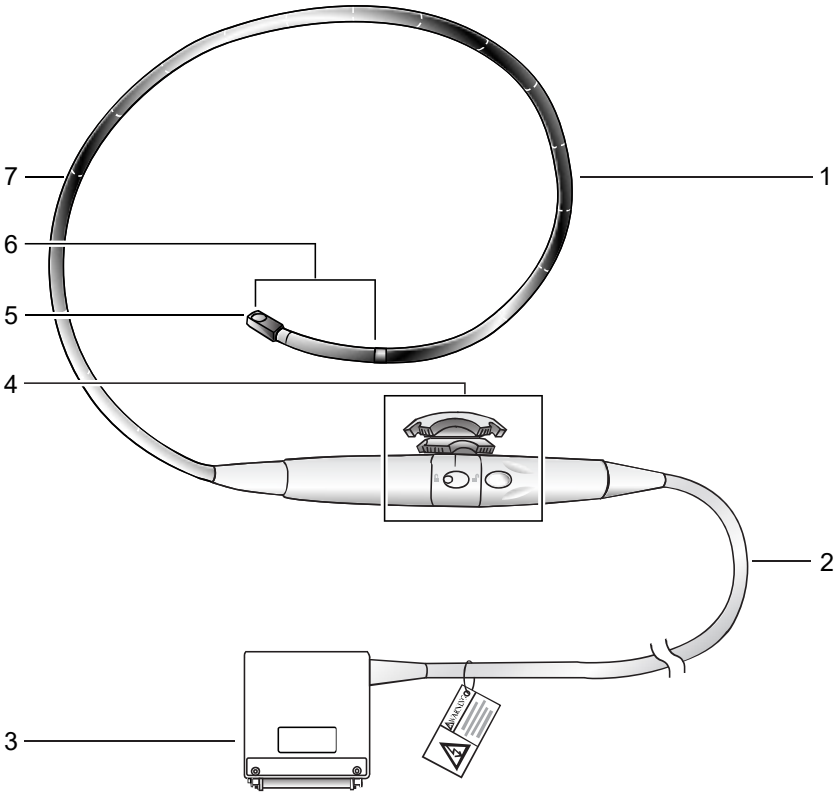
See also: For general ultrasound system and transducer-related safety information, refer to Chapter 2 and Chapter 6 in the Instructions for Use.

⚠ **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.

About the 5VT Transducer

The 5VT is a multi-frequency, multi-plane, phased sector array transducer.



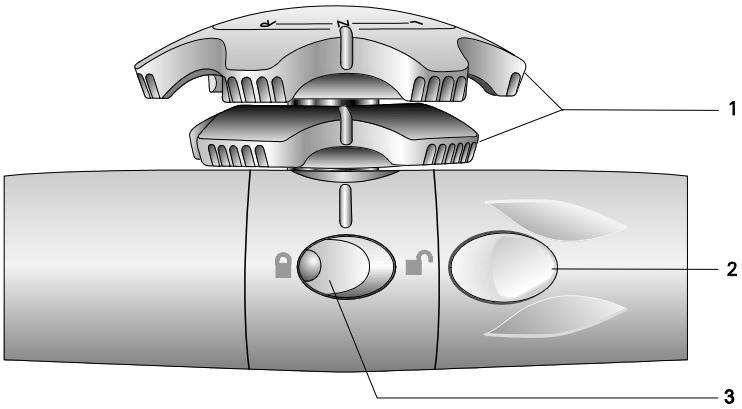
Controls located on the handle of the transducer allow anterior/posterior and left/right deflection of the distal tip and 180° rotation of the transducer array.

1 Flexible shaft
2 Cable
3 Transducer connector
4 Transducer controls
5 Distal tip (Contains rotating array)
6 Articulating section
7 Depth markings (in centimeters)

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 Array Rotation Control, Flex Controls, and Friction Brakes are located on the handle of the transducer.



Example of transducer controls.

1 **Flex Controls**
Bend the articulating section of the transducer shaft

2 **Array Rotation Control**
Rotates the transducer array

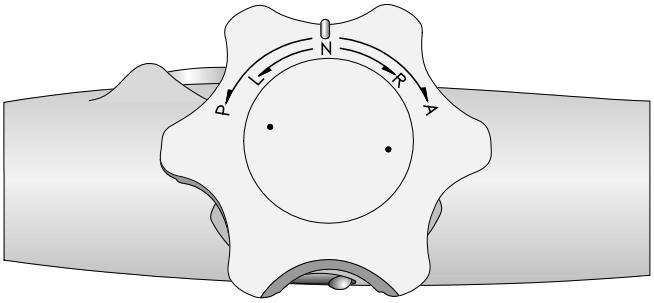
3 **Friction Brakes** (one on each side of the transducer)
Locks the flex controls

Array Rotation Control

The array rotation control rotates the array within the distal tip of the transducer. The position of the array corresponds to the **scan plane**. The scan plane is adjustable from 0° to 180°.

Flex Controls

The flex controls manipulate the movement of the distal tip.



The Flex Controls are located on the handle of the transducer.

Anterior/Posterior Deflection

For anterior deflection (anteflexion) of the distal tip, rotate the anterior/posterior flex control toward the **A** marking to move the tip anteriorly.

For posterior deflection (retroflexion) of the distal tip, rotate the anterior/posterior flex control toward the **P** marking to move the tip posteriorly.

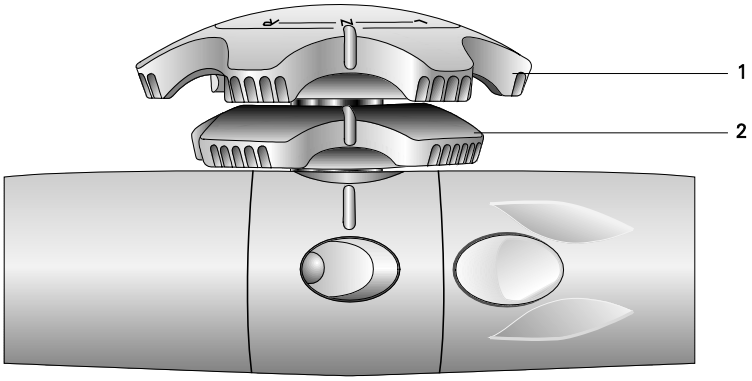
Right/Left Deflection

For right deflection of the distal tip, rotate the left/right flex control toward the **R** marking to move the tip right.

For left deflection of the distal tip, rotate the left/right 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 **N** marking and raised reference lines with the raised reference line on the handle of the transducer.



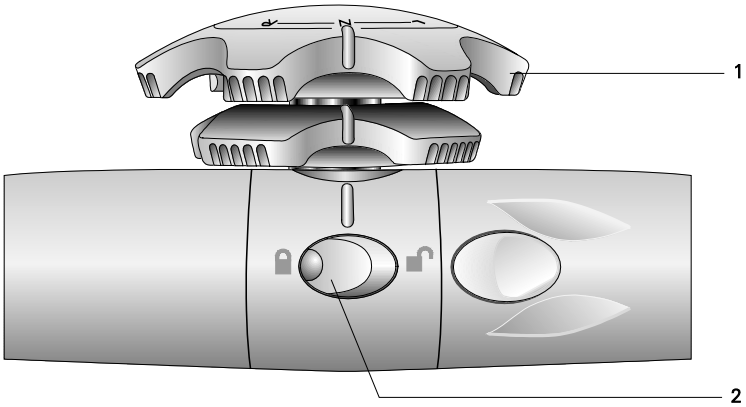
Flex controls in the neutral alignment.

1 Anterior/Posterior flex control
2 Left/Right flex control

Friction Brakes

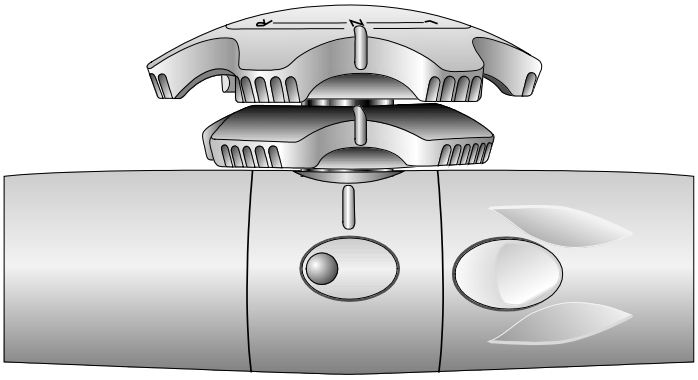
The friction brakes lock the deflection positions of the distal tip. When the brakes are engaged, you can change the scan plane without losing acoustical contact.

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 transducer with locked/unlocked icons. Brake for Anterior/Posterior flex control is in the locked position.

1 Anterior/Posterior flex control (light gray)
2 Brake for Anterior/Posterior flex control (light gray)



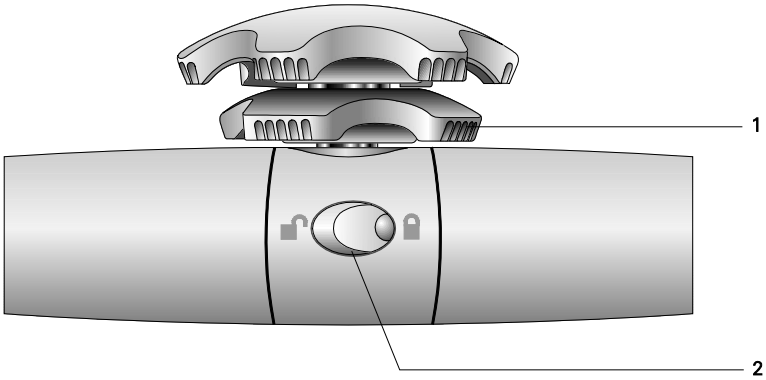
Example of transducer without locked/unlocked icons. Brake for Anterior/Posterior flex control is in the unlocked position.

To lock the anterior/posterior deflection position of the distal tip:

- Press the raised tactile indicator located on the button of the corresponding brake.

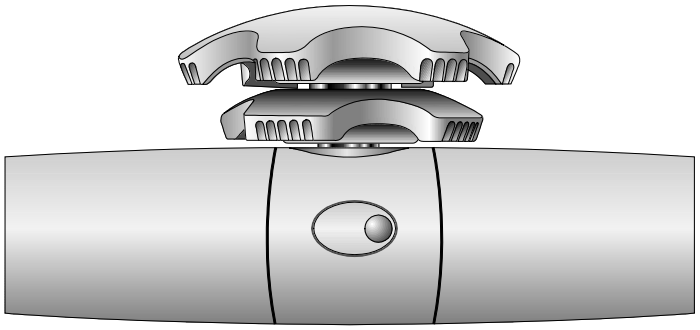
To unlock a brake:

- Press the flat portion on the button of the corresponding brake.



Example of transducer with locked/unlocked icons. Brake for Left/Right flex control is in the locked position.

1 Left/Right flex control (dark gray)
2 Brake for Left/Right flex control (dark gray)



Example of transducer without locked/unlocked icons. Brake for Left/Right flex control is 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 a brake:

- Press the flat portion on the button of the corresponding brake.

Preparation for Use

⚠ **WARNING:** When using an endocavity or intraoperative transducer with a BF or CF type 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 customer service 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 customer service representative.

2. Test the array rotation control to ensure a smooth rotation.
3. 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 customer service 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 customer service representative.

4. 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 6 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. 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 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 customer service 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

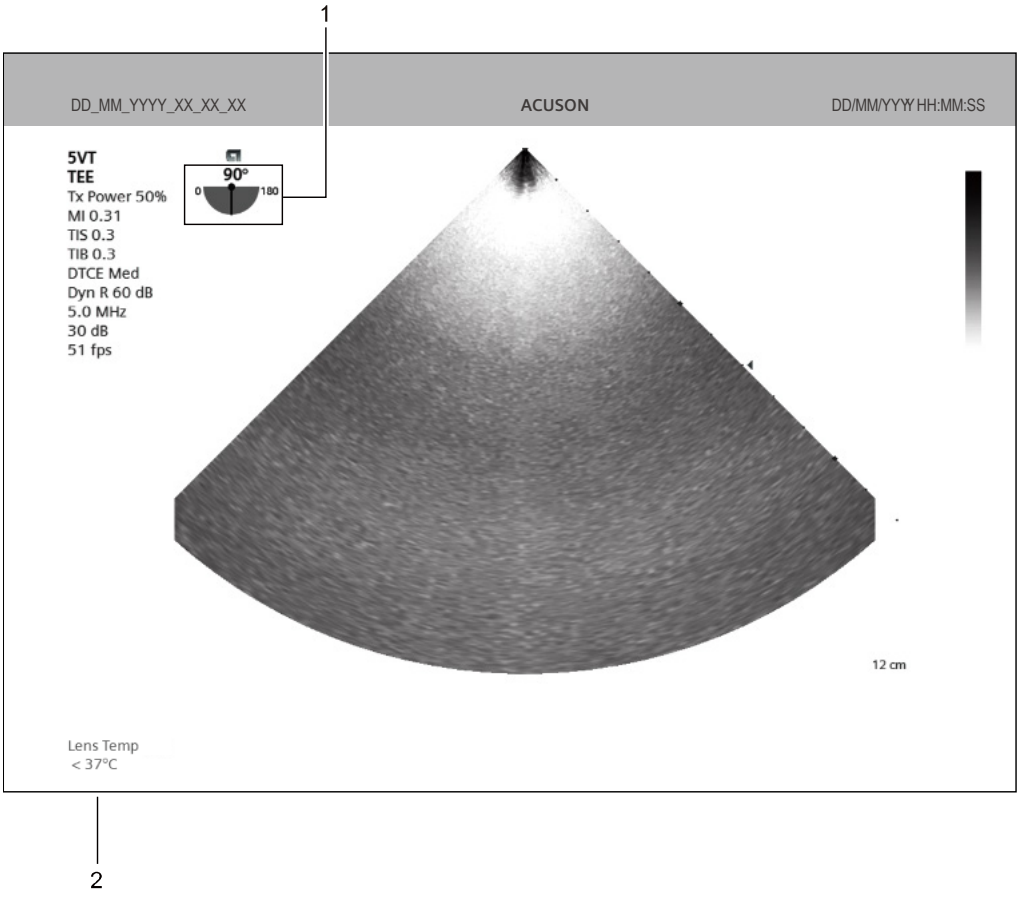
1. Remove dentures, if present, and place them in a protected area until after the procedure.
2. Place a transducer sheath on the transducer, if needed.
3. Place a bite guard around the distal end of the transducer.
4. Ensure that both friction brakes are unlocked and both flex controls are in the neutral 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.

Imaging with the 5VT Transducer

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 transducer is selected.	Click **OK**.

During imaging with the 5VT transducer, information displays on the image screen regarding the rotation angle of the transducer array and regarding an indication of temperature at the lens surface of the transducer array.



Example of the image screen during imaging with the 5VT transducer.

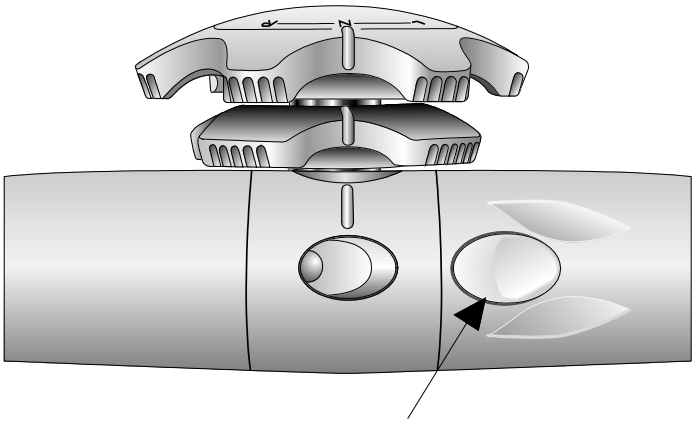
1 Scan plane icon indicating the approximate rotation angle of the scan plane
2 Temperature Indicator
Should normally display as **<37°C**.

Changing the Scan Plane

You can change the imaging plane of the transducer by using the array rotation control to rotate the transducer crystal within the distal tip of the transducer in a 0° to 180° range. The starting position for the transducer is 0°.

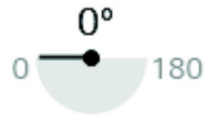
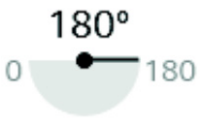
You can also change the imaging plane of the transducer using a selection assigned to the touch screen controls.

See also: For additional information about the touch screen controls, refer to Chapter 4 in the Instructions for Use.



Example of the array rotation control is located on the handle of the transducer.

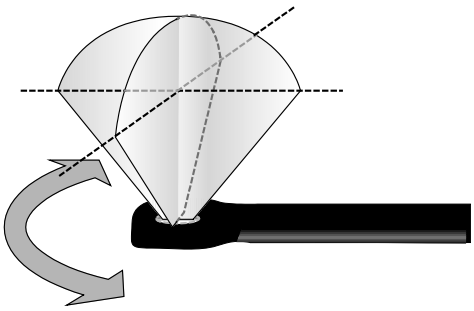
As the array orientation changes, the on-screen scan plane icon updates to indicate the relative direction of the array and the numerical value of the rotation angle.

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 scan plane icon. The array rotation angle is displayed numerically at the top of the icon.

To change the array orientation using the articulation control:

- Press the array rotation control to increase or decrease the array rotation angle. Press and hold the control to rapidly change the angle.



Example of array rotation on the transducer.

To change the array orientation in 90-degree increments:

- To rotate the image clockwise, tap the right arrow for **Rotate 90° (TEE)**.

- To rotate the image counterclockwise, tap the left arrow for **Rotate 90° (TEE)**.

Starting Position of the Transducer Array

When you first select the transducer, the system will automatically rotate the transducer array to the 0° position. If the system is unable to rotate the array to the 0° position, the system displays the following message:

The transducer rotation has not reset properly. Click OK to continue imaging at the current rotation. Or, to reset the transducer rotation, disconnect the transducer from the system, then reconnect it.

Choose a method:

- Click **OK** to continue imaging with the array in the current location.

  The array rotation angle displays as --- at the top of the scan plane icon.
- Reselect or reconnect the transducer to reset the position of the array.

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 and displays the temperature on the screen.

When the temperature is 37°C or above, the system updates the value and color of the temperature indicator.

Temperature Indicator	Color of Temperature Indicator	Range of Lens Temperature
<37.0°C	Gray	Below 37.0°C
(Actual lens temperature)	Yellow	37.0°C to 40.9°C
(Actual lens temperature)	Orange	41.0°C to 42.9°C
43.0°C	Red	43.0°C
>43.0°C	Red	Above 43.0°C

Managing the Lens Surface Temperature

You can reduce the acoustic output to lower the lens surface temperature.

See also: Imaging Functions that Change Acoustic Output, Safety and Care, Chapter 2, Instructions for Use

To reduce the acoustic output:

- Lower the transmit power
- Change the scanning mode

Follow the instructions included in the on-screen messages if the lens surface temperature approaches, reaches, or exceeds the thermal limit.

Message	Displays when	Recommended Action
Transducer temperature is 42°C. Do you want to reduce the transmit power?	The lens surface temperature reaches **42°C**, but the transmit power is not reduced.	▪ Choose a method: – Click **Yes** to automatically reduce the transmit power. – Click **No** to continue imaging while the lens surface temperature is **42°C**. The system resets the override when you end the exam, select another transducer, or cycle power to the system. **Note:** You must disconnect the active transesophageal transducer before you can select a different transducer.
Transducer temperature is 42°C. Press OK to proceed with the current process. Or, wait for the transducer to cool.	The lens surface temperature reaches **42°C**, but the transmit power is reduced.	▪ Choose a method: – Wait for the transducer to cool to **41°C**. – Click **OK** to continue imaging while the lens surface temperature is **42°C**.
Transducer temperature is 43°C. Imaging has been suspended. Allow transducer to cool to continue. Or, disconnect the transducer and reconnect after the transducer has cooled.	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 the transducer temperature cools down to **41°C**.

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 customer 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 Healthineers 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.

Caring for the Transesophageal Transducer

See also: For general ultrasound system and transducer-related safety information, refer to Chapter 2 and Chapter 6 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 are listed 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
5VT	Clinell Universal Wipes & Spray	ANIOXYDE 1000
	ENZOL	CIDEX
	Prolystica 2X Concentrate Enzymatic Presoak and Cleaner	CIDEX OPA
	Protex ULTRA Disinfectant Wipes	gigasept FF (new)
	Sani-Cloth HB Germicidal Disposable Wipe	MetriCide OPA Plus[1]
	Super Sani-Cloth Germicidal Disposable Wipe	TD-5[2]
	Super Sani-Cloth Plus	TD-8[2]
	Transeptic	Tristel Trio Wipes System
	Virex II 256	

[1]For use as a high-level disinfectant, or for use with the ASTRA TEE reprocessing device according to the device manufacturer's instructions for use.

[2]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 D3-24.

   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.

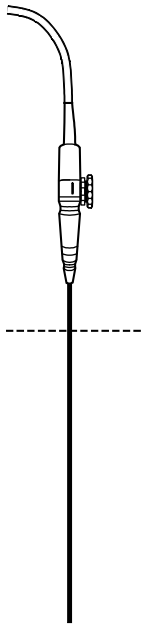
   See also: For a list of approved cleaners, refer to page D3-24.

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 patient exam.



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 D3-24.

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.

Service and Repair

Do not attempt to repair or alter any part of the transesophageal transducer. Contact your local customer service representative 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
When the transesophageal transducer is not in use, store the transducer in a clean, dry, protected environment. Do not store the transducer in a tight coil.	Improper storage	Damage to array elements, cuts and abrasions to the flexible shaft

Transducer Technical Description

Transducer Type:	Phased Array, multiplane
Elements:	64
Array Rotation Angle:	0° – 180°
Distal Tip Articulation:	120° anterior, 90° posterior 45° right, 45° left
Maximum insertion length:	1080 mm
Maximum insertion width:	15 mm
2D-mode Frequencies:	3.6 MHz, 4.0 MHz, 5.0 MHz, 5.7 MHz
M-mode Frequencies:	3.6 MHz, 4.0 MHz, 5.0 MHz, 5.7 MHz
Color Doppler Frequencies:	3.1 MHz, 3.8 MHz
PW Doppler Frequencies:	3.1 MHz, 3.8 MHz
CW Doppler Frequencies:	2.9 MHz, 3.3 MHz
Imaging Modes:	2D-mode Color Doppler (CDV, CDE, DTI, DTE) M-mode Color M-mode (CDV) Pulsed Wave (PW) Doppler Pulsed Wave (PW) Doppler Tissue Imaging (DTI) Steerable Continuous Wave (SCW) Doppler
Maximum Image Field of View:	90°
Image:	Sector
Operating Environment **Temperature:** **Relative Humidity:**	 10°C to +40°C 10% to 80%
Storage Environment **Temperature:** **Relative Humidity:**	 -10°C to +50°C 10% to 85%
Degree of protection against electrical shock:	Transducers with this label are certified as type BF (not defibrillator proof) per IEC 60601-1 Standard for Safety of Medical Equipment
Degree of protection against ingress of fluid:	IPX8
Measurement Accuracy **Rotation angle of the transducer array:** **Temperature:** **Accuracy:**	 ≤±5° 35°C to 47°C <±1°C

D4 *syngo* Velocity Vector Imaging

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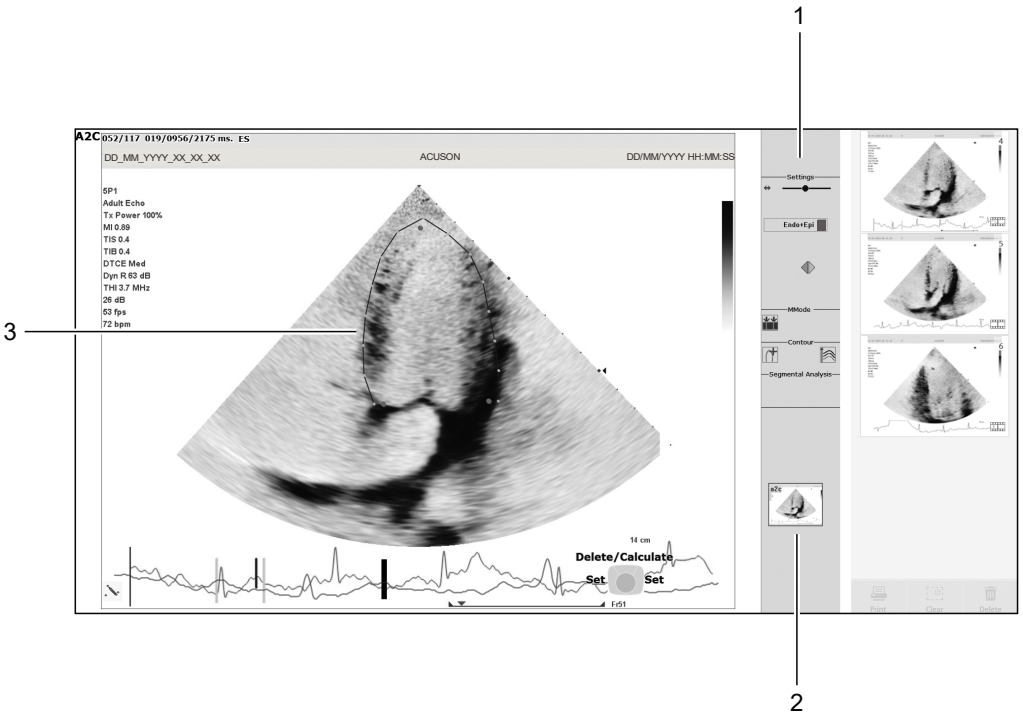
Overview

⚠ **WARNING:** *syngo* Velocity Vector Imaging technology (*syngo* VVI) utilizes 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 program. 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.

syngo VVI is a clinical software program used to visualize, measure, and assess myocardial motion and mechanics using acquired 2D clips. The program tracks and estimates tissue velocity and other motion and deformation parameters at selected points on a user-defined outline (contour) of a structure.

This program illustrates tissue velocity by generating velocity vectors (arrows) on the contour. These velocity vectors are the source of the derived quantitative data, such as velocity and strain rate. You can use this program to analyze rotation, displacement, and radial strain of the left ventricle, right ventricle, and left atrium in pediatric and adult studies.



Example of an anatomy boundary definition on the Contour screen.

1 Selections for displaying and editing the contour
2 Thumbnail of a clip selected for analysis
3 Contour

Selecting a Clip for Analysis

Note: You can activate *syngo* VVI only if you select a valid clip. The system can load up to 10 clips.

You can activate this program using a 2D-mode clip that contains at least six frames of 2D-mode data. If the clip contains more than 700 frames, the program loads the first 700 frames acquired.

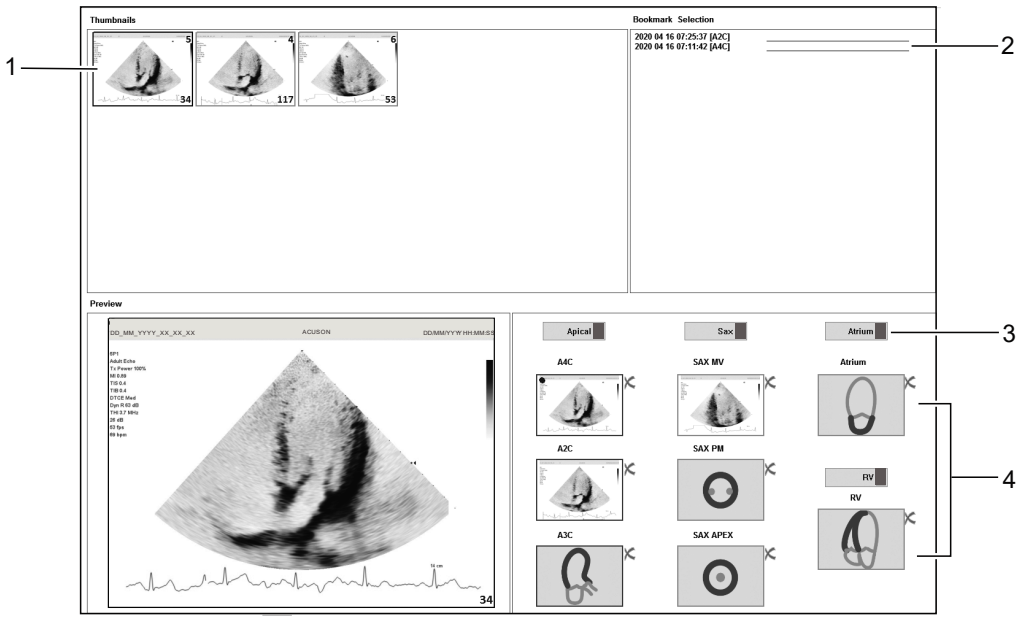
This program also supports the following functionality:

- Playing back and editing clips using the control panel
- Capturing static images

You cannot load 2D color clips, secondary capture images or clips, M-mode or Doppler images, static captures, 2D color dual, 2D live dual clips, 2D dual updated dual clips, and 2D clips with the trigger function enabled.

If you load clips with annotations, you can view the annotations, but you cannot activate the annotation feature.

Analyzing a View



Example of the syngo VVI screen with multiple clips selected.

1 Thumbnails of clips selected during review
2 Bookmarks for accessing previously analyzed views
3 View selection labels
   – **Apical**
   – **SAX** (short axis)
   – **Atrium**
   – **RV** (right ventricle)
4 Thumbnails of clips within the selected view, for example, A4C

To analyze a view:

1. Activate review and then select a 2D-mode clip.

   See also: For information on activating review, refer to Chapter 5 in the Instructions for Use manual.

2. To select multiple clips, select the required 2D-mode clips.

   Note: You can select multiple images for analysis, but you can only process one view at a time.

3. Tap **syngo VVI**.

   Note: You can activate the program only if you select a valid clip.

   See also: For information about supported clips, refer to page D4-4.

4. Click an image in the upper left thumbnails box and then select the corresponding view (Apical, SAX, Atrium, or RV).

   Note: You can select only one thumbnail for each view. If you add a new thumbnail, it replaces the existing thumbnail.

5. Repeat step 4 for each additional image for analysis.

   Note: Each additional image must be within the same view.

6. To process a clip, select an image in the required view and then click the right arrow on the lower right of the screen.

7. To load a previously analyzed view from a bookmark:
   a. Select the required bookmark from the list on the upper right of the *syngo* VVI screen.
   b. Click the right arrow on the lower right of the screen.

8. To delete an image, click the **X** on the upper right of the image.
9. To exit the program, tap **Exit**. Or, press **2D**.

Analyzing a Different Clip in the Same View

Note: To analyze a different clip within the same view, you must have previously selected multiple clips for analysis. The selected clip displays as a thumbnail. You can select only one thumbnail for each view. If you add a new thumbnail, it replaces the existing thumbnail.

To process a trace for a different clip in the same view:

1. Select a clip in the active view.
2. Click the right arrow on the lower right of the screen.

Analyzing a Clip in a Different View

Note: To analyze a clip in a different view, you must exit *syngo* VVI, select an image in the required view, and then restart the program.

To begin processing a trace from a different view:

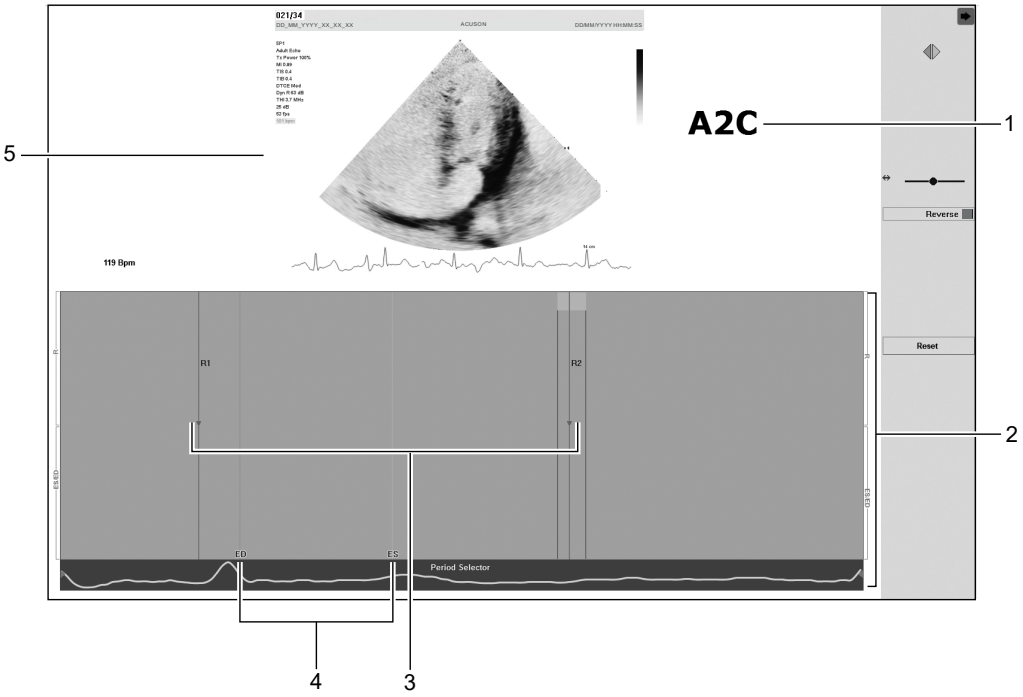
1. To exit the program, tap **Exit**.
2. Select a 2D-mode clip.
3. To select multiple clips from the review page, select the required 2D-mode clips.
4. Tap **syngo VVI**.
5. Click a clip in the upper left thumbnails box and then select the corresponding view (Apical, SAX, Atrium, or RV).
6. To begin processing a clip, select a clip in the required view, and then click the right arrow on the lower right of the screen.

Setting Up a Clip for Processing

If you load a clip with an ECG trace and two R-waves per heart cycle, *syngo* VVI defines the trace and performs the analysis.

If you load a clip without an ECG trace or without at least two R-waves per heart cycle, you must edit the clip margins, set R-wave markers, and adjust the end diastole and end systole frames.

Note: When a clip is loaded for analysis, ensure the end diastole and systole markers on the setup screen align with the ECG trace.



Example of the Setup screen.

1 Selected view of the heart
2 Period Selector and display
3 Current frame marker and R-wave markers
4 End diastole and end systole markers
5 2D clip with an ECG trace

Displaying M-mode Data

You can define an M-mode background for display behind each curve plot. The user-created drawing for the M-mode background can include multiple segments. An M-mode background provides additional timing information.

To display M-mode data by drawing an M-mode trace:

1. Click the sequence/M-mode selection button.

2. To display the M-mode sweep by drawing a trace:
   a. Position the cursor on the 2D image.
      The system displays the pencil icon.

   b. Press **SET** at the beginning of the trace and then roll the trackball to create the trace.
   c. To end the trace, press **SET**. Or, press **UPDATE**.
      Note: It is not always necessary to draw lines. You can also use the CINE controls or trackball keys on the control panel to locate ECG R-waves and place markers as required.
3. Use the CINE controls to adjust the M-mode marker position corresponding to 2D-mode.
4. To add an R-wave marker:
   – Click the required location in the upper half of the M-mode display.
   – Double-click the required location in the lower half of the M-mode display and then click **Set Rwave**.

   Note: ED-ES (end diastole-end systole) lines display in the lower half of the M line when you identify one complete cycle through the placement of R-waves.

5. To delete an R-wave marker:
   a. Position the cursor over a marker.
      The system displays a double-line arrow.
   b. Double-click the R-wave marker. Or, press **UPDATE**.
6. To reposition the markers for valve timing events:
   a. Position the cursor over a marker.
      The system displays a double-line arrow.
   b. Click the required marker and then roll the trackball to drag the marker to the required location.
   c. Press **SET** to confirm the new location.
7. To reverse the grayscale of the M-mode sweep, for example, from black-on-white to white-on-black, select the **Reverse** check box.
8. To reverse all changes, click **Reset**.
9. To display the previous window, click the right arrow on the upper right of the screen.

Drawing and Modifying a Contour

The program displays the Contour screen if you load a clip with an ECG trace and R-wave information. Use the Contour screen to draw or edit an outline of the structure for analysis. You can display the Contour screen to modify or redraw the contour.

Example of the Contour screen.

1 Selections for displaying and editing the contour
2 Gamma slider
3 Placement guide for positioning the trace markers
4 Controls for repositioning the trace markers
5 ECG trace processed by *syngo* VVI (green line)
6 ECG trace displayed in the captured clip (gray line)
7 First marker indicated by a red dot
8 Heart rate
9 Imaging parameters and settings for the displayed clip transferred from the echo image

To create a trace:

Note: You can select a different image from the view on the lower right of the image screen.

1. Position the cursor over the required anatomy on the image.
   The cursor displays as a **+**.
2. To create a trace using the placement guide:
   See also: For an example of the placement guide, refer to page D4-11.
   a. Press **SET** to anchor the first marker.
      A red dot displays at the selected point.

Target	Anchor location of first marker
Left ventricle	Base of the interventricular septum and mitral annulus
Left atrium	Mitral annulus near the interatrial septum
Right ventricle	Tricuspid valve annulus near the lateral wall

   b. Follow the placement guide on the screen to place subsequent markers.
   c. Press **SET** to anchor each marker.
   d. To anchor the final marker and complete the trace, press **SET** twice. Or, press **UPDATE**.
3. To manually create a trace:
   a. Position the cursor over the next position for each segment of the trace, following a clockwise pattern.
   b. Press **SET** to anchor each marker.
      Note: Anchor 7 to 11 markers for apical traces. Anchor at least one marker to each wall segment. For short axis traces, do not anchor the final marker at or beyond the position of the first marker.
   c. To anchor the final marker and complete the trace, press **SET** twice. Or, press **UPDATE**.
4. To reposition a marker, adjust the large markers and then adjust the subsequent smaller markers.
5. To change the brightness and contrast of the image:
   a. Drag the Gamma slider to the right or left to adjust the gamma image setting.

   b. To restore the original brightness and contrast setting, click the restore gamma setting button.

6. To reverse the horizontal orientation of the image, click the pictures mirroring button.

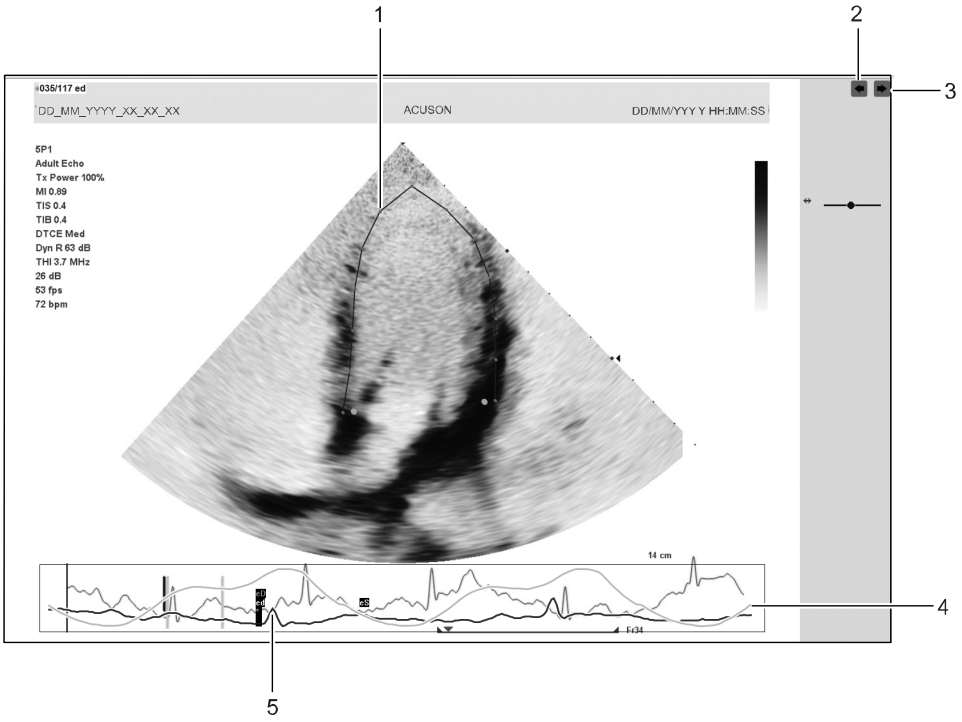
7. To create a single endocardial trace, clear the **Endo+Epi** check box.
8. To create a simultaneous endocardial and epicardial trace:
   a. Select the **Endo+Epi** check box.
   b. Click the green arrows on the right of the image to increase or decrease the distance between the endocardial and epicardial traces.

9. To process the trace, choose a method:
   – Double-click the trace.
   – Press **UPDATE**.
   – Click the start analysis button.

   A message indicates the analysis process is in progress.

Modifying a Contour

The system displays the contour for review and modification of the trace.



Example of a contour.

1 Drag the marker to reposition the marker and modify the contour.
2 Click the arrow to reject (delete) changes to the traced contour.
3 Click the arrow to accept changes to the traced contour.
4 Time volume curve
5 ECG trace

To modify a contour:

1. Use the CINE controls to review the trace.
2. To reposition a marker, adjust the large markers and then adjust the subsequent smaller markers.
3. To accept the changes to the contour and view analysis results, choose a method:
   – Double-click the trace.
   – Press **UPDATE**.
   – Click the accept changes arrow.

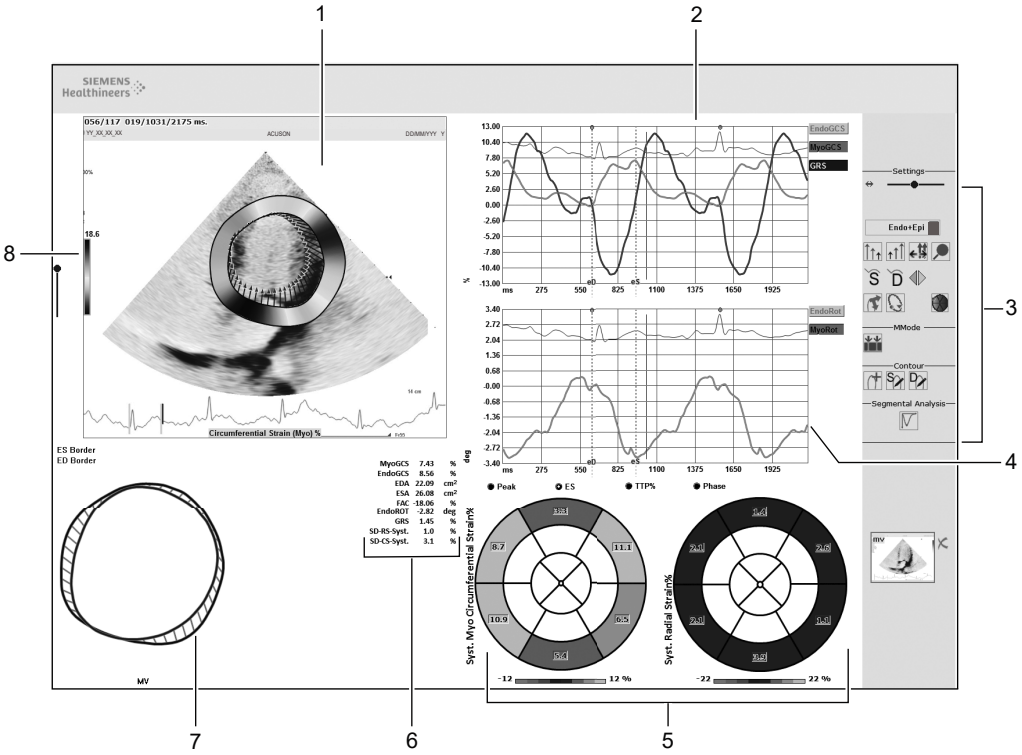
4. To reject the changes to the contour, click the reject changes arrow.

Processing a Contour and Viewing Results

When you process a contour, the program illustrates tissue velocity using velocity vectors (arrows). For each clip frame, the vector length illustrates the magnitude of velocity (speed), and the vector arrowheads illustrate the direction of motion.

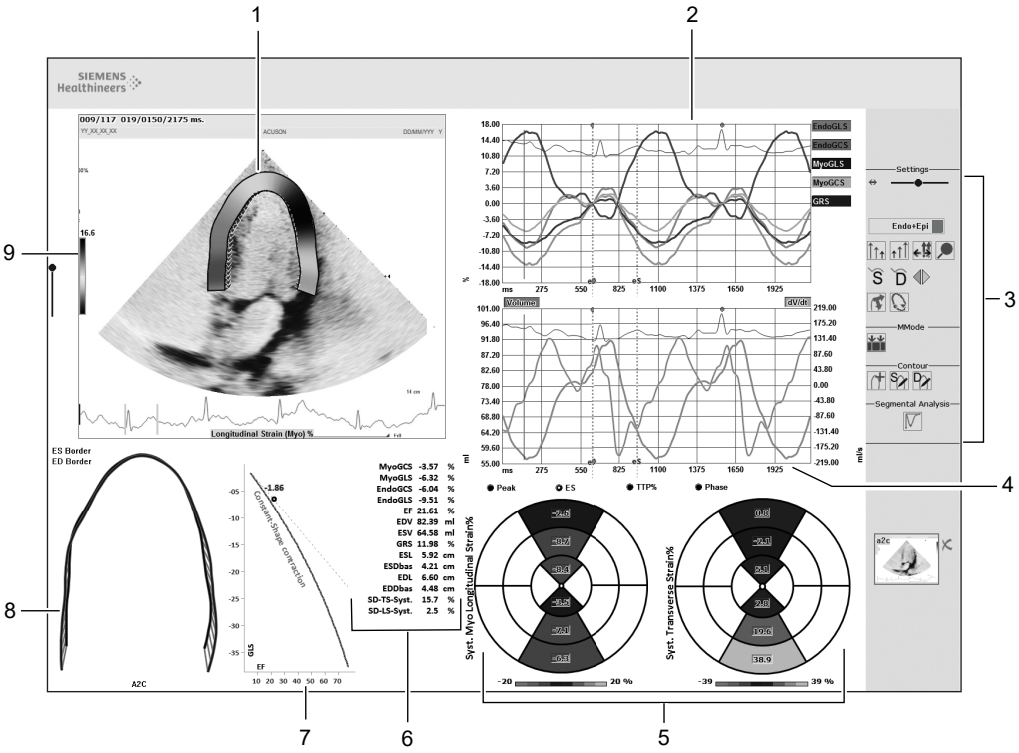
Quantitative data derived from the velocity vectors are depicted as curve plots, parametric M-mode graphs, and parametric segmental diagrams. The specific results displayed depend on the view used to draw the contour, for example, apical view, short axis view, atrium view, or right ventricle view, and the selected parameter, for example, velocity, displacement, strain, or strain rate.

See also: For information about the selections for viewing analysis results, refer to page D4-20.



Example of the Analysis screen with clips displayed in SAX view.

1 2D clip with contour
2 Global circumferential strain in the endocardial layer
3 Selections for viewing analysis results
4 Rotation of endocardial layer
5 Systolic endocardial circumferential strain
6 Analysis results for the selected clip
7 End-systolic border and end-diastolic border
8 Color bar for the selected parameter
The system assigns a unique color bar to each parameter.



Example of the Analysis screen with clips displayed in Apical view.

1 2D clip with contour
2 Global longitudinal and circumferential strain in the endocardial layer
3 Selections for viewing analysis results
4 Rotation of endocardial layer
5 Systolic endocardial longitudinal strain
6 Analysis results for the selected clip
7 Graph displaying the relationship between the left ventricle ejection fraction and left ventricle global longitudinal strain
8 End-systolic border and end-diastolic border
9 Color bar for the selected parameter
The system assigns a unique color bar to each parameter.

Viewing Results in a Bullseye Plot

(Available only for left ventricle images, not available for right ventricle or atrium images)

The bullseye plots support a 16-segment model. You can display summarized results of all analyzed views in the following segmental display formats (bullseye plots):

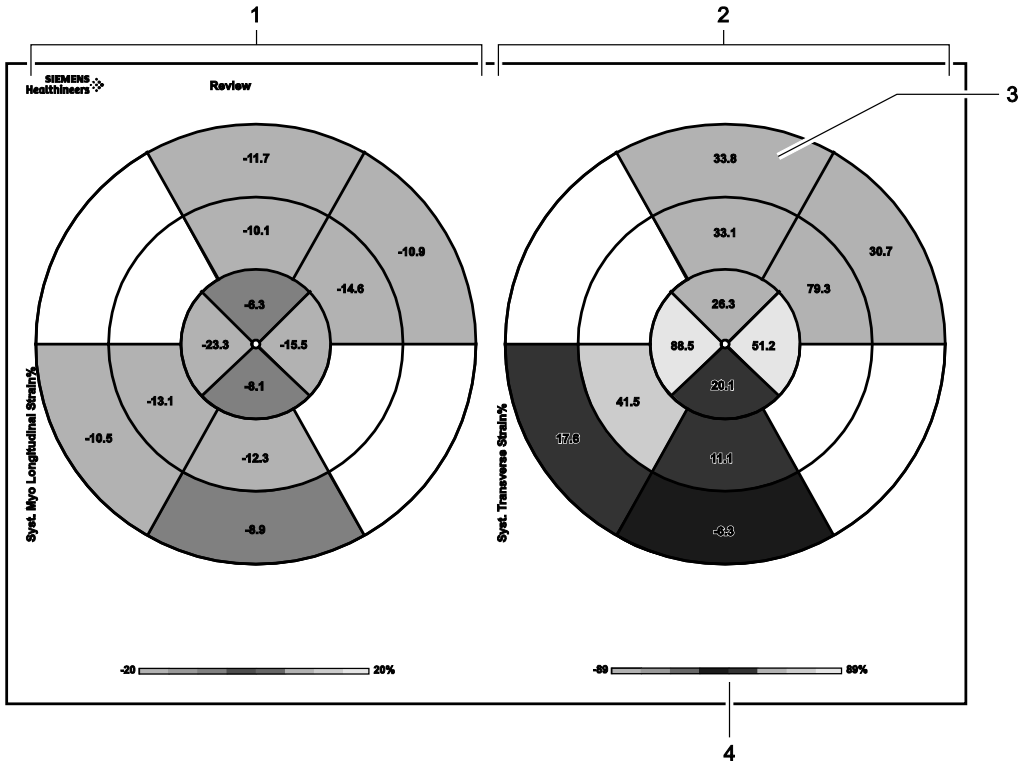
- **Overall Peak or Systolic Peak**

  Note: The program displays overall peak results for the strain and displacement parameters and the systolic peak for the strain rate and velocity parameters.

- **Time to Peak**

The bullseye plots contain results from all clips analyzed in the current analysis group (apical or short axis). The Analysis step displays results only for a particular image. When you perform an analysis for one view of a patient study, the program adds the information to the bullseye plots. When you review an existing study, you must load at least one previously analyzed clip to update the bullseye plot.

Note: If you deactivate a segment in the Analysis step, the results for that segment are not included in the bullseye results and overall average.



Example of bullseye plots and data.

1 Bullseye plot
2 Bullseye plot for strain results
(Available only when the **Endo+Epi** selection is enabled.)
3 Numerical result for the segment of the selected parameter
4 Color bar for the selected parameter; a unique color bar is assigned to each parameter

Analysis Page: Contour

Editing and Deleting a Trace

You can edit systole and diastole frames for a processed trace (contour) after you have completed creating the trace. After editing the trace on end systolic frames for the left ventricle or right ventricle and end diastolic frames for the left atrium, perform the analysis again.

To edit the currently displayed trace:

1. To modify the trace, click the required button.
   – To delete the current trace and starts a new trace, click the new trace button.

   – To modify both end systole and end diastole borders, click the end systole correction button.

   – To modify the end diastole border only, click the end diastole correction button.

2. Create a new trace or modify the displayed trace.
   See also: For information about creating or modifying a trace, refer to page D4-11.
3. To process the modified trace, choose a method:
   – Double-click the trace.
   – Press **UPDATE**.
   – Click the start analysis arrow.

4. To view analysis results, choose a method:
   – Double-click the trace.
   – Press **UPDATE**.
   – Click the accept changes arrow.

To add endocardial and epicardial borders:

1. Select the **Endo+Epi** check box.
2. Click the green arrows on the right of the image to increase or decrease the distance between the endocardial and epicardial traces.

3. To process the modified trace, choose a method:
   - Double-click the trace.
   - Press **UPDATE**.
   - Click the start analysis button.

4. To view analysis results, choose a method:
   - Double-click the trace.
   - Press **UPDATE**.
   - Click the accept changes arrow.

Analysis Page: Settings

To	Do This
Change the brightness and contrast of the image	▪ Drag the gamma slider to the right or left to adjust the gamma image setting. ▪ To restore the original brightness and contrast setting, click the restore gamma setting button.
Adjust the distance between the endocardial and epicardial traces	1. Select the **Endo+Epi** check box. 2. Click the green arrows on the right of the image to increase or decrease the distance between the endocardial and epicardial traces.
Activate or deactivate the zoom function	**Note:** When you use the zoom function, the system displays the image in a 2D full-screen. ▪ Click the zoom in/out button.
Advance to the end systole	▪ Click the go to end systole button.
Advance to the end diastole	▪ Click the go to end diastole button.
Reverse the orientation of the image	▪ Click the pictures mirroring button.
Invert color parametric	▪ Click the switch parametric over B-mode button.
Set the position between the anterior and anteroseptal segment	(Available only in SAX view) ▪ Click the position between anterior and anteroseptal segment button.

To	Do This
Display controls to toggle the contour, vector, orbit line and 2D of the trace	▪ Click the toggle button.
Change the size of the vector	**Prerequisite:** Display vectors before using these controls. ▪ To decrease the height of the vector, click the decrease vector size button. ▪ To increase the height of the vector, click the increase vector size button. ▪ To reset the vector to its original size, click the reset vector size button.

Analysis Page: Display Buttons

Note: The display buttons are available only when the toggle button is selected.

To view the display controls:

- Click the toggle button.

To	Do This
Display a color overlay with vector maps for regional strain	▪ Click the arrows with color button.
Display vector maps for regional strain	▪ Click the arrows button.
Display a color overlay with the contour	▪ Click the borders with color button.
Display the contour only	▪ Click the borders button.
Display orbit lines	▪ Click the trajectories button.
Display segmentation deformation	(Available only when the epicardial border is displayed) ▪ Click the segmental deformation button.
Hide all overlays	▪ Click the no overlay button.

Analysis Page

M-Mode

To	Do This
Select M-mode	▪ Click the sequence/M-mode selection button.

Contour

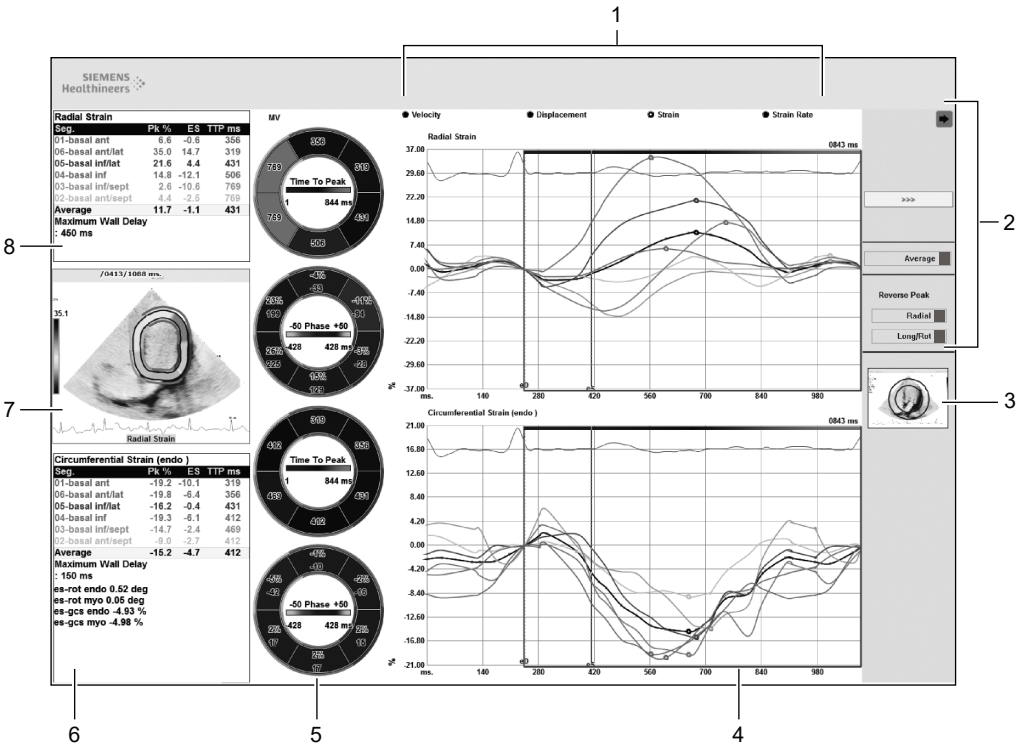
To	Do This
Begin a new trace	▪ Click the new trace button.
Correct the end systole border	▪ Click the end systolic border correction button.
Correct the end diastole border	▪ Click the end diastolic border correction button.

Segmental Analysis

To	Do This
Begin segmental analysis	▪ Click the segmental analysis button.

Segmental Analysis Results

The segmental analysis page displays peak and timing information, for example, time-to-peak values related to velocity, displacement, strain, and strain rate.



Example of the Segmental Analysis Page.

1 Display controls for velocity, displacement, strain, and strain rate
Strain is selected in this example.
2 Display and editing selections
3 Layer selection area
4 Circumferential strain information
5 Time to peak and phase information
6 Summary of circumferential or longitudinal strain data
7 Contour
8 Summary of radial or transverse strain data

Viewing Segmental Analysis Results

Use segmental analysis to view segmental curves and analysis results for segments of the contour. The program displays the clip with the contour, segment diagrams with time-to-peak and phase results, and curve plots for the selected segments. For apical views, the segmental analysis includes a rocking value to indicate motion of the apex.

- To activate or deactivate segments on the segment model, click the required segment on the segment model.

  The curve plots display results only for the activated segments on the segment model.
- To display results for a selected location on the curve plot, position the pointer on the required data point on the curve.

  The program displays the numerical results, segment name and number, and time for the selected location.
- To display or hide the average curve on the curve plots, click **Average**.

  The average curve depicts the average of the analysis results for the currently displayed curves.
- To display the radial results:
  - For minimum radial results, select the **Reverse Peak** - **Radial** check box.
  - For maximum radial results, clear the **Reverse Peak** - **Radial** check box.
- To display the longitudinal/rotational results:
  - For minimum longitudinal/rotational results, select the **Reverse Peak** - **Long/Rot** check box.
  - For maximum longitudinal/rotational results, clear the **Reverse Peak** - **Long/Rot** check box.
- To display analysis results by parameter, click the required display format:
  - **Velocity**
  - **Displacement**
  - **Strain**
  - **Strain Rate**
- To display a different layer of the heart wall, click the required layer:

  Note: Available only when the **Endo+Epi** selection is enabled.
  - **Endo** displays the endocardial layer.
  - **Myo** displays the myocardial layer.
  - **Epi** displays the epicardial layer.

Analysis Display Information

Control	Description
Reverse Peak	For all parameters except strain longitudinal, strain circumferential, strain rate longitudinal, and strain rate circumferential, identifies the lowest point, the point that is 75% of the lowest point, or the point that is 50% of the lowest point, as determined by the "Time To" selection. For parameters strain longitudinal, strain circumferential, strain rate longitudinal, and strain rate circumferential, identifies the highest point, the point that is 75% of the highest point, or the point that is 50% of the highest point, as determined by the "Time To" selection.
	Moves from beat to beat in a continuous cycle when clicked. Disabled if only one beat is captured.
Velocity	Computes and displays values for the selected parameter. ▪ **Longitudinal Velocity** in Apical, Atrial, and Right Ventricular views ▪ **Rotation Velocity** is the rotation rate in SAX view. Counterclockwise rotation is positive. ▪ **Long/Rot** is the longitudinal velocity/rotation velocity rate in SAX view. Counterclockwise rotation is positive. ▪ **Radial Velocity**: – **Transverse Velocity** in Apical, Atrial, and Right Ventricular views – **Radial Velocity** in SAX view
Displacement	Computes and displays values for the selected parameter. ▪ **Longitudinal Displacement** in Apical, Atrial, and Right Ventricular views ▪ **Rotation Displacement** in SAX view ▪ **Long/Rot** is the longitudinal velocity/rotation rate in Apical view. Counterclockwise rotation is positive in SAX view. ▪ **Radial Displacement** requires an endocardial and epicardial trace. – **Transverse Displacement** in Apical, Atrial, and Right Ventricular views

Control	Description
Strain	Computes and displays values for the selected parameter. ▪ **Longitudinal Strain** in long axis and generic curve Apical, Atrial, and Right Ventricular views ▪ **Long/Rot** is the longitudinal/rotation rate in SAX view. Counterclockwise rotation is positive. ▪ **Circumferential Strain** in SAX view ▪ **Radial Strain** requires an endocardial and epicardial trace. – **Transverse Strain** in Apical and Right Ventricular views – **Radial Strain** in SAX view
Strain Rate	Computes and displays values for the selected parameter. ▪ **Longitudinal Strain Rate** in Apical, Atrial, and Right Ventricular views ▪ **Long/Rot** is the longitudinal velocity/rotation rate in SAX view. Counterclockwise rotation is positive. ▪ **Circumferential Strain Rate** in SAX view ▪ **Radial Strain Rate** requires an endocardial and epicardial trace. – **Transverse Strain Rate** in Apical and Right Ventricular views – **Radial Strain Rate** in SAX view

Saving Analysis Results to a Report

You can export analysis results to the patient report.

See also: For information about reports, refer to Chapter C1 in this manual.

To save data to a report:

- Tap **Save to Report**.

Viewing Analysis Results

The specific results displayed on the Analysis screen and exported to the worksheets and report depend on the view used to draw the contour for Apical view or SAX view and the selected parameter, for example, velocity, displacement, strain, or strain rate.

Results by Parameter

The Summary screen and worksheets display radial and longitudinal or circumferential results for each heart wall segment for the selected parameter: velocity, displacement, strain, and strain rate.

The Summary screen also displays the following summary results for the selected parameter:

- Average of all heart wall segments
- Standard deviation
- Maximum opposing wall delay in Apical view
- Maximum wall delay in SAX view

Exporting Images, Clips, and Data

You can export data in the following file formats to an external USB-compatible storage device or a network location.

- ASCII data in a TXT file
- XML data in a Microsoft Excel file

You can also export images and clips to an external USB-compatible storage device or a network location. Exported image files contain the displayed window without the on-screen selections. Exported clip files contain the clip in motion, as displayed within the clip window.

To export data or images:

1. To export data, tap **Export Data**.
2. To export images, select the required images and then tap **Export Image**.
3. Select the available media from the **Destination** list.
4. Click **Export**.

   A message indicates the export is in progress.

See also: For descriptions of exported data files, refer to Appendix H in the System Reference.

To export a clip:

Note: You can export a clip as a video clip. You cannot export a clip as a DICOM clip.

1. Select the required clip.
2. To change the clip frame, use the CINE controls.
3. Tap **Export Clip**.
4. Select the available media from the **Destination** list.
5. Click **Export**.

   A message indicates the export is in progress.

SIEMENS Healthineers

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Diagnostic Ultrasound System
System Reference

US

Complies with
IMDA Standards
DA107142

CE
0123

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Software Version VB11

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Chapter 2 **Network Configuration**

Description of the selections for configuring network settings for the ultrasound system and the devices for storing and retrieving patient information, including worklist servers and network servers.

Chapter 3 **Measurement and Report Configuration**

Description of the selections for customizing measurements and calculations for all exam types using the configuration menu.

Chapter 4 **Clinical Applications Configuration**

Description of the selections for customizing clinical applications, for example Stress Echo, using the configuration menu.

Chapter 5 **Export and Import**

Procedures for exporting and importing studies, including teaching files and slide shows.

Chapter 6 **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 **Measurements and Calculations Reference**

Description of general measurement and calculation methods, and results.

Appendix C **Obstetrical Reference**

Description of measurement and calculation labels for the obstetrical exam. Includes obstetric report reference information.

Appendix D **Cardiac Reference**

Description of measurement and calculation labels for the cardiac exam. Includes cardiac report reference information.

Appendix E **Exam-specific Reference**

Description of measurement and calculation labels for all exam types except obstetrical and cardiac exam. Includes exam-specific report information.

Appendix F **Obstetrical Bibliography**

Bibliography of references for obstetrical examinations.

Appendix G **Cardiac Bibliography**

Bibliography of references for cardiac examinations.

Appendix H **Data File Descriptions**

Description of data files for the following features:

- *syngo* Velocity Vector Imaging

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 contain descriptions for the following ultrasound systems:

- ACUSON Juniper diagnostic ultrasound system
- ACUSON Juniper Select diagnostic ultrasound system

Features and options unique to an ultrasound system are identified within the following locations in the user and reference manuals:

- Chapter 1, Instructions for Use
- Chapter 3, Instructions for Use
- Appendix A, Instructions for Use

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 ▪ Technical description of the ultrasound system ▪ Safety and care information for the system and compatible transducers ▪ Descriptions of system controls ▪ Procedures for system setup, examination fundamentals, image acquisition and optimization, and examination review ▪ Information about system security and protection of patient data against security threats ▪ Acoustic output data
Clinical Applications Guide	▪ Explanation of clinical applications and clinical software programs for use on the ultrasound system ▪ Procedures for the physiologic function and the biopsy function ▪ Description of the transesophageal transducer, including cleaning and care of the transducer ▪ General and exam-specific measurements and calculations ▪ Exam-specific annotations
*System Reference**	▪ General and exam-specific measurement and calculation labels ▪ Description of customizable system settings ▪ Information about DICOM connectivity and network capabilities ▪ Clinical references ▪ Information regarding the electromagnetic compatibility (EMC) testing of this system

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

Conventions

Take a moment to familiarize yourself with the following conventions in your user manual.

Convention	Description
Warnings, Cautions, and Notes	⚠ **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 correct operating procedures to prevent the risk of damage to the system. **Note:** Notes contain information concerning the proper use of the system and/or correct execution of a procedure.
Examples of Cross-References	Examples: **See also:** For additional information, refer to Chapter 2 in the System Reference manual. **See also:** Touch screen controls, p. 1-17 **See also:** For a list of transducers compatible with the needle guide accessories, refer to Chapter 5 in this manual.

Typographical Conventions

The following typographical conventions are in descriptions and procedures within your user manual. You can use these conventions to identify the location of a control or selection on the ultrasound system.

Control or Selection on the Control Panel	Description and Convention
Controls on the Control Panel and Keys on the Keyboard	Controls on the control panel are indicated by uppercase, boldface type. The function of the trackball and trackball keys is indicated by on-screen labels displayed on the image screen. Examples: ▪ Push **DEPTH / FOCUS**. ▪ Rotate **2D** to adjust the 2D gain. ▪ Press **CALIPER** to activate the measurement function. ▪ Press and hold the **Alt** key on the keyboard to access the special characters. ▪ Press **UPDATE**. ▪ Position the marker and then press **SET**.
Controls on the Control Panel and Soft Key Selections on the Touch Screen	The touch screen has unlabeled controls located on the control panel. Tap, press, rotate or press and then rotate the control to make a selection or change a setting. The selection assigned to these controls is indicated by boldface type and enclosed in square brackets ([ ]). Examples: ▪ Press **[Tx Power]** downward to decrease transmit power. ▪ Rotate **[Map]**.
Selections on the Image Screen	On-screen selections are indicated by boldface type. Roll the trackball to position the pointer on the on-screen control or object and then press a trackball key. Examples: ▪ Click **Cancel**. ▪ Double-click a thumbnail. ▪ Select the required check box to search for scheduled procedures.
Selections on the Touch Screen	On-screen selections are indicated by boldface type. To access the selection, tap the touch screen. To change the direction of an object displayed on the touch screen, drag the object on the touch screen. Examples: ▪ Tap **Stress Echo**. ▪ Drag the blue dot to indicate the direction of the arrow. ▪ Swipe the page to select the next page.

1 General System Configuration

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System Configuration Overview

You can modify the configuration settings at any time.

Categories of Settings for System Configuration

Menu Item	Description
General 1	Configure system-wide settings, including the name of the hospital or clinic, system language, date and time formats, audio settings, trackball behavior, and shutdown preferences.
General 2	Configure settings for all exam types, including fields on the patient registration form and the location of body markers, and image settings.
Display	Configure image screen settings, including screen saver behavior, display of the depth gain compensation, Doppler and M-mode cursors.
Custom Keys	Assign functionality to user-definable controls on the control panel and the footswitch.
Soft Keys	Customize the functionality assigned to soft keys and controls.
Exam	Configure settings that can vary by exam type, including freeze behavior, dual display format, physio management, and settings specific to M-mode, Doppler, or color imaging.
Measurement	Select measurement conventions and establish measurement and report preferences for each type of exam.
Text Annotation	Customize libraries of text for each type of exam.
Body Marker	Customize libraries of body markers for each type of exam.
Stress Echo	(Available only for the cardiac exam type) Configure settings for Stress Echo workflow protocols.
eSieScan	Configure settings for user-defined workflow protocols.
Contrast	Configure settings for capturing clips during contrast agent imaging.
Clip Store	Configure settings for capturing clips, including capture length, capture type, and compression.
Printer	Configure printers connected to the system.
Barcode	Configure settings to use a barcode reader to enter patient registration information.
Wireless	Configure settings for connection to a wired or wireless network.
Network	Configure network connections for the local host, storage server, worklist server, and network export server.
Utility	Configure settings for clip playback and slide shows.
Archive	Configure settings for the ultrasound system after studies are archived, including deletion of study history.
Security	▪ Indicates enabled or disabled security features on the ultrasound system. ▪ Provides selections for configuring security settings.
Service	Access password-protected service procedures and access to remote assistance function.
Close	Save changes and exit the current page.

To modify the system configuration settings:

1. Tap the configuration icon.

   The system displays the configuration menu on the left side of the screen and the settings for the selected menu option on the right.
2. Click the menu option for the required settings.
3. Enter the required settings.
4. Repeat steps 2 and 3 for each category of required settings.
5. To exit the configuration settings, click **Close**.

General 1

Selection	Description
Organization	---
Institution Name	Name of your hospital or clinic
Regional Settings	---
Language	System language ▪ English ▪ German ▪ French ▪ Spanish ▪ Italian ▪ Chinese ▪ Russian (applies only to the keyboard)
Date Format	Format for the system date: ▪ Month/Day/Year ▪ Day/Month/Year ▪ Year/Month/Day
Date	Current date
Time	Current time
Time Zone	Current time zone
Height and Weight Units	Units for the patient's height and weight: metric or U.S.
Audio	---
Beep on Button Press	Enable or disable an audible tone when a control is pressed
Beep after Store Completes	Enable or disable an audible tone when storage is completed
Beep Volume	Volume of the beep
Doppler Volume	Volume of Doppler audio

Selection	Description
Power Off	Response of the power on/off control: ▪ **Shut Down with Confirmation Dialog** displays a confirmation message when powering off the system ▪ **Shut Down** immediately powers off the system
Trackball Behavior	---
Trackball Speed	Select the responsiveness of the system to trackball movement. ▪ **Low** repositions an object a short distance with minimal trackball movement. ▪ **Medium** repositions an object a moderate distance with minimal trackball movement. ▪ **Fast** repositions an object a long distance with minimal trackball movement.
System Start Up	---
Active Transducer	Select a transducer port displayed as selected when you power on the ultrasound system. ▪ **T1** ▪ **T2** ▪ **T3** ▪ **T4** ▪ **T5**

General 2

Selection	Description
Patient ID	---
Store Patient Screen on Registration	Enable or disable storing a screen representation of the completed patient data form to the registered patient's study.
Hide Patient Banner	Show or hide the patient banner on the image screen
Patient Data	Show the patient data either by age or by date of birth
Patient Registration	Type of patient registration form: ▪ **Long Form** includes all available fields on the form ▪ **Short Form** includes a reduced amount of fields
Common Mode	---
Delete Body Marker on Unfreeze	Show or hide the body markers when an image is unfrozen
Delete Text on Unfreeze	Show or hide text and arrow annotations when an image is unfrozen
Body Marker Location	Screen location for body markers
Font Size	Select the point size of the font for annotations.
Arrow Type	Select the type of the directional arrows for annotations.
Arrow Size	Select the size of the directional arrows for annotations.
Arrow Color	Select the color of the directional arrows for annotations.
Image Store	---
Store Image with Caliper	Enable or disable the display of measurement markers with a saved image.
S-Video	---
S-Video Format	Select the signal standard format for separate video connection, for example, National Television Standards Committee (NTSC) or Phase Alternating Line (PAL).

Display

Selection	Description
Monitor	---
Enable Screen Saver	Enable or disable the screen saver.
Screen Saver Delay	Time delay in minutes before the system activates the screen saver
Screen Saver Type	Select the background for the screen saver.
DGC	---
DGC Invert with Image Invert	Invert the graphic indicating the DGC curve with the image
DGC Curve Display	Select the display of the depth gain compensation curve on the image screen ▪ **Off** does not display the depth gain compensation curve. ▪ **Always On** displays the depth gain compensation curve continuously. ▪ **Time Out** temporarily displays the depth gain compensation curve after edits to the depth gain compensation.
DGC Control	Select the image depth setting, for example, the current image depth or maximum image depth
Thermal Index Display (Neo Head Exam Only)	Select the display of thermal index during the neonatal head exam. ▪ **TIS/TIB** displays the soft tissue thermal index to the bone tissue thermal index ▪ **TIC** displays the cranial bone thermal index
Doppler / M-Mode	---
Bypass Cursor Mode	Select the response of the M-mode or Doppler control: ▪ Immediately display the M-mode sweep or Doppler spectrum ▪ Display the M-mode or Doppler cursor in the 2D image and then requires a second press of the mode control to display the sweep or spectrum
Doppler Frequency/ Velocity	Unit in the Doppler spectrum: frequency (Hz) or velocity (cm/s)
Doppler Auto Optimization	Select the parameters to use with Doppler auto optimization technology. ▪ **Gain** ▪ **Dynamic Range** ▪ **Scale / Baseline** ▪ **Auto Invert**

Custom Keys

Selection	Description
Key Direction	---
Increase Zoom	Assign a clockwise or counterclockwise rotation to the control to increase the magnification factor
Depth / Focus	Assign a clockwise or counterclockwise rotation or upward or downward movement to the control to adjust the imaging depth or focus: ▪ **Move up Focus** assigns a clockwise or counterclockwise rotation to adjust the imaging focus and an upward or downward movement to adjust the imaging depth. ▪ **Increase Depth** assigns a clockwise or counterclockwise rotation to adjust the imaging depth and an upward or downward movement to adjust the imaging focus.
Key Function	---
Print Store 1 **Print Store 2**	Assign the required functions to the selected control on the control panel: ▪ **PC Printer** ▪ **Image Store** ▪ **Clip Store** ▪ **USB BW** ▪ **USB Color** ▪ **Image Store & DICOM Printer** ▪ **Image Store & PC Printer** ▪ **Image Store & USB BW** ▪ **Image Store & USB Color**
Clip Store	Assign one of following functions to the **CLIP STORE** key. ▪ **Image Store** ▪ **Clip Store**
Left Pedal **Right Pedal**	Assign one of the following functions to each pedal on the footswitch: ▪ **Freeze** ▪ **Image Store** ▪ **Clip Store** ▪ **Caliper** ▪ **Update** ▪ **TEQ Update** ▪ **U/D Flip** ▪ **L/R Flip** ▪ **USB BW** ▪ **USB Color** ▪ **Rotate +90° (TEE)** ▪ **Rotate -90° (TEE)**

Selection	Description
User Defined 1 **User Defined 2** **User Defined 3**	Assign one of the following functions to the selected control on the control panel: ▪ **Full D** activates a full-screen Doppler spectrum ▪ **Full M** activates a full-screen M-mode sweep ▪ **Arrow** activates the arrow annotation function ▪ **Clip Store** acquires and saves a clip or static image ▪ **Biopsy** activates the biopsy function ▪ **TEQ Update** applies updated TEQ optimization settings to the image ▪ **<< Steer** adjusts the angle of the field of view to the left for linear array transducers ▪ **Steer >>** adjusts the angle of the field of view to the right for linear array transducers ▪ **Text A** activates the library of annotations as specified in the configuration settings ▪ **Text B** activates the library of annotations as specified in the configuration settings ▪ **DVR** enables or disables recording for the DVR connected to the system ▪ **Trapezoid** enables or disables a trapezoid image formats ▪ **U/D Flip** reverses the orientation of the image in vertical (up/down) ▪ **L/R Flip** reverses the orientation of the image in horizontal (left/right) ▪ **Full Size** resets the field of view to the full size of the image area ▪ **Needle Visual.** activates the needle visualization function ▪ **Pointer** activates the mouse cursor on the screen ▪ **CW** activates the continuous wave mode ▪ **Simult** enables or disables the simultaneous display of the 2D image and Doppler spectrum in real time ▪ **Dual** enables or disables the display of one real-time and one frozen image in a side-by-side format ▪ **Split** enables or disables the display of two real-time images in a side-by-side format ▪ **4B** enables or disables the display of four separately acquired images ▪ **None** ▪ **Delete** deletes the measurement results, annotations, body markers, and the selected images or clips ▪ **Rotate +90° (TEE)** rotates the image for the transesophageal transducer clockwise in 90-degree increments ▪ **Rotate -90° (TEE)** rotates the image for the transesophageal transducer counterclockwise in 90-degree increments
Configure END Key	Assign one of the following functions to the selected control on the retractable keyboard: ▪ **Not Used** disables the key on the keyboard. ▪ **Close Study** closes the current study.

Soft Keys

You can customize the touch screen controls available during a selected operating mode, including live and frozen imaging for each mode.

To customize the display of soft key selections:

1. Access the configuration settings and then tap **Soft Keys**.
2. Select the required label.
   - **2D Lv** specifies 2D mode with a real-time image
   - **2D Frz**: specifies 2D mode with a frozen image
   - **C Lv** specifies color mode with a real-time image
   - **C Frz**: specifies color mode with a frozen image
   - **P Lv** specifies power mode with a real-time image
   - **P Frz**: specifies power mode with a frozen image
   - **M Lv** specifies M-mode with a real-time image
   - **M Frz**: specifies M-mode with a frozen image
   - **D Lv** specifies Doppler with a real-time image
   - **D Frz**: specifies Doppler with a frozen image
3. To assign a new soft key selection to a button:
   a. Select the required button representing the soft key selection.
   b. Select the required label from the drop-down list.
4. To remove a soft key selection:
   a. Select the required button.
   b. Select **Blank** from the drop-down list.

Exam

Selection	Description
Exam	Configuration settings are available for each selected exam type
(exam type)	Exam type for customization
Freeze Behavior	Assign one of the following functions to the selected control on the control panel: ▪ **Caliper** activates the measurement function ▪ **Cine** activates the CINE function ▪ **Text** activates the text annotation function ▪ **Arrow** activates the arrow function ▪ **Body Marker** activates the body marker function
Seamless Dual	Enable or disable seamless display of dual
Dual Behavior on Freeze	Assign one of the following functions to the Dual mode when the image is frozen: ▪ **Left Dual Image Live** displays a 2D live image on the left side of the screen and the right side of the screen is not activated. ▪ **ED-ES Split** displays an end-diastolic frame and end-systolic frame simultaneously.
2D/M & 2D/Doppler Display Format	Image screen layout when two imaging modes are active: ▪ **1/2 2D – 1/2 Trace** uses one-half of the image screen to present the 2D image above the M-mode sweep or Doppler spectrum. ▪ **1/3 2D – 2/3 Trace** uses one-third of the image screen to present the 2D image above the M-mode sweep or Doppler spectrum. ▪ **2/3 2D – 1/3 Trace** uses two-thirds of the image screen to present the 2D image above the M-mode sweep or Doppler spectrum. ▪ **Side by Side** presents the 2D image side-by-side the M-mode sweep or the Doppler spectrum.
Doppler Update Style	Display of the 2D image during Doppler (frozen or live), or the interval for updating the 2D image: ▪ **2D-Frz / D-Lv** displays 2D frozen and Doppler live ▪ **2D-Lv / D-Lv** displays 2D live and Doppler live ▪ **D-Lv / 2D-1s** displays Doppler live and 2D update in one second intervals ▪ **D-Lv / 2D-2s** displays Doppler live and 2D update in two second intervals ▪ **D-Lv / 2D-4s** displays Doppler live and 2D update in four second intervals ▪ **D-Lv / 2D-8s** displays Doppler live and 2D update in eight second intervals
Doppler Auto Stat	Enable or disable the display of measurements and graphical traces to track mean and/or maximum velocities or frequencies
Doppler Trace Orientation	▪ **Above Baseline** displays a trace above the baseline ▪ **Below Baseline** displays a trace below the baseline ▪ **Both** displays a trace above and below the baseline

Selection	Description
Auto Invert of Color While Steering	Enable or disable inverting the color velocity scale when the region of interest is steered
Auto Invert of Color and Spectrum	Enable or disable inverting the Doppler spectrum and the color bar together in 2D-mode with Color / Doppler when the invert control on the control panel is pressed
2D Steer with Cursor	Enable or disable steering of the 2D image when the Doppler cursor or color region of interest is steered
Auto 2D FOV with Color Activation	Adjust the 2D-mode field of view (FOV) to the color region of interest (ROI).
Physio Management	The lead type for use with the physiologic function
3 Lead ECG	Enable or disable the display of the related trace when the selected exam is activated. The ECG trace is from the ECG input
Aux ECG	Enable or disable the display of the external ECG trace from the auxiliary input for the selected exam
Aux Signal	Enable or disable the display of the external signal from the auxiliary input for the selected exam
Respiration	Enable or disable the display of the respiratory trace for the selected exam
Indicate R-Wave	Enable or disable R-wave triggers during image acquisition or CINE and indicate poor detection of an R-wave
Lead Type I	Lead type convention for the right arm and the left arm
Lead Type II	Lead type convention for the right arm and the left leg
3D/4D Default Selection	Assign 3D imaging or 4D imaging to the selected control on the control panel
eSieImage	Enable or disable **eSieImage** for the selected exam.

Measurement

You can configure the general and exam-specific settings for the measurement function.

See also: For information on configuring the measurement function, refer to Chapter 3 in this manual.

Text Annotation

Each exam type has a library of text annotations and modifiers for anatomical structures, body positions, and acquisition planes.

Note: The system identifies modified text with an asterisk (*).

Selection	Description
Exam	Exam type for customization
Text A, B, C, D	Text for identifying body orientation, direction or proximity for the selected exam
(text box)	Text box for adding or modifying user-defined modifier text for the selected exam
Available Text A, B, C, or **D** (tab)	Predefined text available for adding to the list of text annotations and modifiers for the selected exam.
Selected Text A, B, C, or **D** (tab)	List of predefined text annotations and modifiers for the selected exam.
Library	List of predefined text for the selected exam
(text box)	Text box for entering user-defined text or editing the selected predefined text
Available Annotations	Predefined text available for adding to the list of text annotations for the selected exam
Selected Annotations	Text annotations for the selected exam
Enable Auto Complete	Enable or disable the display of predefined text matching the first letters you enter on the image screen
Modify	Replace the selected text with the characters entered in the text box.
(right arrow)	Add the selected text to the list of selected text.
(left arrow)	Remove the selected text from the list of selected text.
(up arrow)	Reposition the selected text upward in the list.
(down arrow)	Reposition the selected text downward in the list.
Restore Defaults	Deletes the user-defined settings and restores the factory default settings

To customize text annotations:

- Access the configuration settings and then tap **Text Annotation**.

To	Do This
Insert text into the annotation library or a modifier library	1. Enter new text in the text box. Or, select predefined text in the list of available text. 2. Click the right arrow.
Edit text in the annotation library or in a modifier library	1. Select the text from the selected text field. 2. Edit the text in the text box. 3. Click **Modify**.
Remove text from the annotation library or a modifier library	1. Select the text in the list of selected annotations or modifiers. 2. Click the left arrow.
Reset all annotations to the factory settings	Click **Restore Defaults**.
Change the sequence of annotations or modifiers	1. Select the text in the list of selected annotations or modifiers. 2. To reposition the text upward, click the up arrow. To reposition the text downward, click the down arrow.

Body Marker

You can configure body markers for a specific exam to indicate the anatomy under evaluation and the orientation of the transducer.

Selection	Description
Exam	Exam type for customization
Available Body Markers	Body markers available to add to the specified exam.
Selected Body Markers	Body markers selected for the specified exam
(right arrow)	Add the selected body marker to the list of selected body markers.
(left arrow)	Remove the selected body marker from the list of selected body markers.
(up arrow)	Reposition the selected body marker upward in the list.
(down arrow)	Reposition the selected body marker downward in the list.
Restore Defaults	Deletes the user-defined settings and restores the factory default settings.

Stress Echo

You can configure stress echo settings for capturing and reviewing cardiac loops for a multi-phase stress echo protocol.

See also: For information on configuring stress echo settings, refer to Chapter 4 in this manual.

eSieScan

An eSieScan protocol is a pre-defined checklist that guides you through a clinical workflow.

Selection	Description
Protocols	Displays an expandable and collapsible list of protocols and associated views.
Add Protocol	Inserts a blank protocol at the bottom of the protocol list.
Add View	Inserts a blank view at the end of the list of views for the selected protocol.
Copy	Copies 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.
Delete	(Not available for factory default protocols) Removes the selected protocol or view.
Import	Copies a protocol from an external storage device to the ultrasound system.
Export	Copies a protocol from the ultrasound system to an external storage device.
Restore Defaults	(Not available with user-defined protocols) Restores the factory default settings of the selected protocol.
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.
Automatically ends when all views completed	Automatically ends the protocol when the last view is complete.

Selection	Description
End Protocol Behavior	---
Remain in Acquisition	Continues acquisition when the selected protocol is ended.
Enter Review	Activates review when the selected protocol is ended.
Enter Report	Displays the patient report when the view of the selected protocol is ended.
View (tab)	Displays the current settings for the selected view.
View Name	Displays or modifies the name of the selected view.
Mode Selection	Lists available imaging modes to activate for the selected view.
D	Configures the Doppler settings: ▪ **PW** specifies pulsed wave Doppler ▪ **CW** specifies continuous wave Doppler ▪ **DTI** specifies Doppler tissue imaging
Color	Configures the color mode settings: ▪ **CDV** specifies color Doppler velocity ▪ **CDE** specifies color Doppler energy ▪ **DTI** specifies Doppler tissue imaging ▪ **DTE** specifies Doppler tissue energy
2DMode	Configures the 2D-mode settings: ▪ **Dual** specifies dual 2D-mode ▪ **Split** specifies split 2D-mode
M-Mode	Selects M-mode.
Measurements (tab)	Displays the current measurement settings for the selected view.
Label1, **Label2**, or **Label3** (tab)	Selects the first measurement label.
Application	Lists the available exams.
Imaging Mode	Selects the imaging mode to activate for the selected measurement.
Package / Group	Selects the measurement group.
label type (option)	Selects the measurement label for the selected measurement. ▪ Select a measurement label from the list and an additional measurement prefix, for example, right, left or none. ▪ Select an exam type from the list and an additional measurement prefix, for example, proximal, middle, distal, or none.
Press Caliper to Resume	(Available only for **Label2** and **Label3**) Enables or disables the measurement function when the user presses the caliper control on the control panel.

Selection	Description
Text & Body Marker (tab)	Displays the current body marker and annotation settings for the selected view.
Text Annotation	Displays the on-screen annotation.
Location	Provides settings for defining the default location of the text annotation. ▪ Previews the user-defined location on the image screen for text annotation ▪ Defines the default location on the image screen for the text annotation
Apply to all Views	Places the annotations for all views at the selected position.
Body Marker	---
Exam	Lists the available exams.
List	Displays the associated body markers.
All Bodymarkers	Displays all body markers.
Transducer Marker Location	Places the transducer marker at the selected position on the body marker.

Importing and Exporting Workflow Protocols

Prerequisite: Connect an external storage device to the ultrasound system.

To import a protocol from a USB storage device:

1. Access the configuration settings and then tap **eSieScan**.
2. Click **Import**.
   The system displays a list of protocols on the USB storage device and on the ultrasound system.
3. Select the protocols to import:
   – To select one or more protocols, select the check box for each required protocol.
   – To select all protocols, click **Select All**, if necessary.
   – To cancel the selection of all protocols, click **Unselect All**.
4. Click **Import Protocol**.

To export a protocol to a USB storage device:

1. Access the configuration settings and then tap **eSieScan**.
2. Click **Export**.
   The system displays a list of protocols on the ultrasound system.
3. Select the protocols to export:
   – To select one or more protocols, select the check box for each required protocol.
   – To select all protocols, click **Select All**, if necessary.
   – To cancel the selection of all protocols, click **Unselect All**.
4. Select the required USB storage device and then click **Export Protocol**.

Contrast

Selection	Description
LVO Contrast	Provides the clip capture settings for left ventricle opacification contrast agent imaging.
Compression	Specifies the level of clip compression. ▪ **Low** compresses the frames of stored images with the low compression rate. Lower compression retains higher image quality. ▪ **Medium** compresses the frames of stored images with the medium compression rate. ▪ **High** compresses the frames of stored images with the high compression rate. Higher compression results in loss of image quality.
Capture Type	Specifies the clip store type. ▪ **Prospective** indicates a clip capture of the succeeding image. ▪ **Retrospective** indicates a clip capture of the previous image.
Clip Length	Provides measurement options for the duration of a clip capture. ▪ **Time** indicates the duration of each clip in seconds. ▪ **Beat** indicates the duration of each clip in heart beat cycles. ▪ **R-Wave only** indicates the capture point based on a delay beyond the R-wave.
GI Contrast	Provides the clip capture settings for general contrast agent imaging.
Compression	Specifies the level of clip compression. ▪ **Low** compresses the frames of stored images with the low compression rate. Lower compression retains higher image quality. ▪ **Medium** compresses the frames of stored images with the medium compression rate. ▪ **High** compresses the frames of stored images with the high compression rate. Higher compression results in loss of image quality.
Clip Length	Provides measurement options for the duration of a clip capture. ▪ **Time** indicates the duration of each clip in seconds. ▪ **Beat** indicates the duration of each clip in heart beat cycles.

Clip Store

Selection	Description
Compression	Specify the level of image compression and file size
CaptureType	Specify the clip store type: ▪ **Prospective** indicates a clip capture of the succeeding image ▪ **Retrospective** indicates a clip capture of the previous image
Clip Length	Specify the length of the clip capture, measured in time or heart beats: ▪ **Time** indicates the time of each clip. ▪ **Beat** indicates the duration of each clip in heart beat cycles. ▪ **R-Wave only** indicates the capture point based on a delay beyond the R-wave.
Acquisition Rate	Defines the frame rate of the acquisition, for example, **Normal** or **High**.

Printer

Selection	Description
Printer	**Note:** To ensure images print correctly, select the name of the USB printer corresponding to each installed printer from the drop-down list.
PC Printer	Installed PC printers. **Note:** Printing a report or printing multiple images requires a universal PC printer or a black and white printer setting.
USB B&W Printer	Installed black and white printers.
USB Color Printer	Installed color printers.
Status	Status of the most recently assigned printer.
Thumbnails Printer	Output devices for printing thumbnails: ▪ **PC Printer** ▪ **USB B&W Printer** ▪ **USB Color Printer** ▪ **None**

Configuring and Installing Printers

Report printers are either directly connected to the ultrasound system or linked through a network path to the ultrasound system.

You must observe all safety precautions for connecting a non-medical device to the ultrasound system.

To add a network printer:

1. Access the configuration settings and then tap **Printer**.
2. Click **Install**.
   The system displays the screen for installing the printer driver.
3. Click **Next**.
4. Click **Connect to a network printer** and then click **Next**.
   – To install a printer driver manually, click **Install a printer driver**, select a printer driver, and then click **Next**. The print drivers supported by the system only are displayed on the list.
   – The system automatically detects the available printers.
5. Click the required network printer and then click **Next**.
   If the required printer is not detected, click **The printer that I want isn't listed**.
6. Follow the instructions on the screen.
7. Click **Close** when the installation is completed.
   The system displays the message to restart the system.
8. Click **Yes**.
9. To confirm installation, select a printer and then print a report.
10. To save changes and exit the configuration menu, click **Save**.
11. To exit without saving your changes, click **Cancel**.

To select the PC printer or USB printer:

1. Access the configuration settings and then tap **Printer**.
2. Select the required printer from the drop-down list.

Barcode

Selection	Description
Barcode Settings	(Requires a connected barcode reader and your facility's representative barcode sample) Map the barcode sample to entry fields on the ultrasound system's patient registration form.
Scanned Data	Displays the characters transferred from the scanned barcode sample. The position of the cursor is listed beside the barcode characters. **Note:** You can position the cursor in the barcode to determine the starting position (offset) of each entry field.
Offset	Enter the starting position of the selected field in the barcode sample.
Length	Enter or modify the character length of the selected field. **Note:** The length field supports up to 65 characters.
Set	Confirm the offset and length values.
Sample Text	Enter or modify the sample text.
Use Separator	Enable or disable a separator for each barcode entry field. Enter a character in the text box. **Note:** You cannot use letters or numbers as separators.
Order	Specify the sequence of information. **Note:** Available only when **Use Separator** is activated.
(check box)	Enable or disable the selected entry field for use with the barcode reader. ▪ **Last Name** ▪ **First Name** ▪ **Patient ID** ▪ **Performing MD** ▪ **Sonographer** ▪ **Accession No.**
Offset	Enter or modify the starting position of the selected field in the barcode sample.
Length	Enter or modify the character length of the selected field. **Note:** The length field supports up to 65 characters.
Card Reader Setting	Specify the card reader settings to provide the direct entry of patient information in the registration form.
Scanned Data	Displays the characters transferred from the scanned card reader sample.
Patient ID	Displays the patient identification number transferred from the scanned card reader sample.
Offset	Enter the starting position of the selected field in the card reader sample.
Length	Enter the character length of the selected field. **Note:** The length field supports up to 65 characters.

Wired and Wireless Selections

Prerequisite: A working knowledge of networking principles is beneficial for configuring network connections.

The ultrasound system, or local host, can connect 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 connection.

Configuring Wired Connections to a Network

Consult your network administrator for the required configuration settings and ensure a network cable is connected to the network and to the ethernet port on the ultrasound system.

Configuring Wireless Connections to a Network

The ultrasound system uses network profiles (aliases) to store configurations for wireless network connections. You can enable and disable connections to wireless networks without a password even when changes to the wireless network options are protected by a password.

To configure a wireless connection to a network:

Prerequisite: Connect the wireless adapter to the ultrasound system before system startup.

1. Access the configuration settings and then tap **Wireless**.
2. To enable or disable connections to wireless networks, click **On** or **Off**.
3. To install a wireless adapter, click **Install…**

   The system displays the device driver installation window.

   a. Follow the instructions on the image screen.
   b. Click **Close** when the installation is complete.
4. To add a network, enter the following network settings and then click **Apply**.

   Note: Consult your network administrator for the required settings.

Selection	Description
IP Address Settings	---
DHCP	Enable the Dynamic Host Configuration Protocol (DHCP) if the ultrasound system uses dynamic IP addresses assigned by a DHCP server. The ultrasound system disables the **IP Address**, **Subnet Mask**, **Default Gateway** and **MAC Address**.
Static IP Address	Enable the Static Internet Protocol (IP) address if the ultrasound system uses the fixed IP address, and then enter the required settings for **IP Address**, **Subnet Mask**, **Default Gateway**.
Clear	Remove the entered IP address settings.
Apply	Apply the entered IP address settings.

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

1. Access the configuration settings and then tap **Wireless**.
2. Select the required wireless network from **Available Networks** and then click **Connect**.
3. To add a network profile, click **Add** and then enter the required settings.
4. To update the list of available networks, click **Refresh**.
   The list displays the name of the network profile for the wireless network.
5. To modify a network profile:
   a. Select the required wireless network from **Available Networks**.
   b. Click **Edit** and then enter the required settings.
   c. Click **OK**.

Network

You can configure the ultrasound system and connected devices, for example, servers for DICOM by creating, editing, and activating aliases (DICOM configurations).

See also: For information on configuring network settings, refer to Chapter 2 in this manual.

Utility

Selection	Description
Clip Playback	Enable or disable clip playback ▪ **Play Only Active Clips** disables simultaneous playback of all clips in the current study. ▪ **Play All Clips** enables simultaneous playback of all clips in the current study. ▪ **Loop Aligned** begins each playback cycles at the same time.
Slide Show	Configure the image duration and the number of replay loops ▪ **Image Duration (sec)** specifies the length of display for each image. ▪ **Number of Replay Loops** specifies the number of times each clip is played back.

Archive

Selection	Description
General	---
Options for Deleting Archived Studies	Options for managing the study history ▪ **Delete Study History after Study is Deleted** deletes the archived study history after the study is deleted. ▪ **Manually Delete Study History after Study is Deleted** provides the user options to delete the archived study history after the study is deleted. ▪ **Keep Study History after Study is Deleted** saves the archived study history after study is deleted.
Show Deleted Studies in Browser	Enable or disable the display of deleted studies in the patient browser
External Media	---
Copy Showcase to External Media when DICOM format checked.	Enable or disable automatic storage of the DICOM viewer software program with DICOM-formatted data archived to the external media.

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	(Available only for the ultrasound system administrator) Indicates the status of the security feature ▪ **Configure** displays a dialog box to access user accounts. **See also:** For information about configuring user accounts, refer to Chapter 6 in this manual.
Windows 10	Indicates the operating system is Windows 10
Firewall	Indicates the firewall is configured
Ports	Indicates which encrypted 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 1-23
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 saving the security log files to the archive location. ▪ **Detail** displays additional selections for the audit trail. **See also:** For information about the audit trail for user accounts, refer to Chapter 6 in this manual.
FIPS (Federal Information Processing Standard)	(Available only for the ultrasound system administrator) Specifies the configuration of the Federal Information Processing Standard (FIPS) ▪ **Enable** enables or disables FIPS.
BIOS Password	Indicates the ultrasound system has a BIOS (basic input/output system) password
Disk Encryption	Indicates the data storage on the ultrasound system is encrypted
MDS2	Displays the Manufacturing Disclosure Statement for Medical Device Security ▪ **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 an external USB-compatible storage device.

Selection	Description
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.
Client Certificate	(Available only for the ultrasound system administrator) Imports or exports a client certificate for wireless network connection. ▪ **Configure** displays a dialog box for exporting or importing the client certificate. **See also:** For information about importing and exporting the client certificate, refer to page 1-23.

Enabling Ports

(Available only for the ultrasound system administrator)

To open or close a port:

1. Access the configuration settings and then tap **Security**.
2. Click **Detail** for **Ports**.
3. To enable or disable a port, select or deselect the check box for the required port.

Port Number	Port Group	Protocol
104	DICOM	TCP
80	Smart Remote Services	TCP
443		
8226	System Management	TCP
8227		
8228		
12061		
13001		
11080	Remote Assistance	TCP

Importing or Exporting a Client Certificate

You can import or export a client certificate for use with wireless network.

To import or export a client certificate:

1. Access the configuration settings and then tap **Security**.
2. Click **Configure** for **Client Certificate**.
3. Follow the on-screen instructions provided in the Windows wizard to import or export the certificate.

Service

This selection provides the system serial number and software version number, along with password-protected service protocols and remote access for authorized Siemens Healthineers service representatives to troubleshoot and maintain the ultrasound system.

Selection	Description
Service	Displays the **Siemens Healthineers Service Software** window.
Remote	Displays the **Remote Service Access Control** window.
Remote Assistance	Provides information required for a remote service session. A Siemens Healthineers representative guides you through each session of virtual communication.
Restore Factory Settings	Deletes the user-defined settings and restores the factory default settings.

Note: The system displays text on the service screen in English only.

Enabling Anti-Virus Protection

You can enable or disable the anti-virus protection option.

See also: For information on enabling or disabling anti-virus protection, refer to Chapter 3 in the Instructions for Use.

Backing Up and Restoring Configuration Settings

You can backup and restore configuration settings and user-defined exam settings.

File Type Descriptions

Each file type saves a specific set of system settings.

File Type	Description
M&R User Defined Settings	Configuration settings for the measurements and reports
User Defined Exam	All exam types defined by a user and stored on the ultrasound system's hard disk
Service Images	Service images saved to the ultrasound system's hard disk and accessible by the service representative
Service Logs	Service logs saved to the ultrasound system's hard disk and accessible by the service representative
Service Test Report	Service test reports saved to the ultrasound system's hard disk and accessible by the service representative
System Configuration	All configuration settings, except the service information
License Information	Licenses for software-based options
Wireless Settings	Configuration settings for the wireless network
eSieScan Workflow Protocol	Configuration settings for eSieScan workflow protocols
Stress Echo	Configuration settings for stress echo protocols
3D or 4D Settings	Configuration settings for 3D or 4D imaging parameters
Security Settings	Configuration settings for security of the ultrasound system

To back up or restore configuration settings:

1. Access the configuration settings and then tap **Service**.
2. Click **Service** to access the settings in the service software and then click **OK** to display the user-configurable settings.
3. Click **Backup & Restore**.
4. Insert the external storage device into the USB port.

To	Do This
Save configuration settings and user-defined exam settings to a USB storage device	1. Click **Backup** from the **Select** list. 2. Select the check box for each required setting and then click **Next**. 3. Select the required storage device from the **Destination** list. 4. Select the check box for each required file type and then click **Backup**. The system displays a completion message when the process is finished. 5. Click **OK**. 6. Click **X**. Or, click **Home**.
Retrieve saved settings from USB storage device	**Note:** When you retrieve configuration settings, the system overwrites the existing configuration settings. When you retrieve a stored user-defined exam, the system overwrites any existing user-defined exam with the same name. 1. Click **Restore** from the **Select** list. 2. Select the required storage device from the **Destination** list. 3. Select the check box for each required file type and then click **Restore**. 4. Click **OK** to confirm the completion message. 5. To delete all existing user-defined exams on the system and add new user-defined exams: a. Select the **Clean User-Defined Exam(s) on System** check box in the **Options** section. b. Select the user-defined exams in the **User-Defined Exam – Removable Media** section. c. Click **Restore>>**. 6. To add user-defined exams to the system without deleting existing user-defined exams: a. Select the user-defined exams in the **User-Defined Exam – Removable Media** section. b. Click **Restore>>**. 7. Click **Close**. The system displays a message that power must be cycled to the system for completion of the operation. 8. Click **OK** to restart the ultrasound system.

2 Network Configuration

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Configuring Network Settings

Use the configuration settings on the ultrasound system to configure the following devices:

Device	Description
Local Host	Local network settings for the ultrasound system.
Storage Server	Configuration settings for the devices where patient information, images and clips are stored. You can activate multiple storage servers and specify when images are saved to the server.
Worklist Server	Configuration settings for information system servers, for example, a hospital information system (HIS). You can configure the system to perform a search of procedures on the active worklist server.
MPPS Server	Configuration settings for the Modality Performed Procedure Step (MPPS) server that works with the worklist server to provide updates to exam status.
Printer Server	Configuration settings for multiple print servers.
Network Export Server	Configuration settings for the shared folder on the network.

The ultrasound system has integrated networked communication capability. Networked communication is in compliance with the Digital Imaging and Communications in Medicine (DICOM) 3.0 standard (also known as ACR/NEMA 3.0).

Prerequisites

- A working knowledge of Windows networking principles is necessary and beneficial for completing network configuration. An understanding of DICOM principles is necessary and beneficial for completing DICOM configuration.
- Close the patient study before performing configuration. Network configuration is disabled during a patient examination.
- Connect the ultrasound system, or local host, to a local area network (LAN) through a wired or a wireless connection.
- Network setup requires the following information for each configured device. Obtain these settings from your network administrator:
  - Ultrasound system host name, alias, Application Entity (AE) title, Internet Protocol (IP) address, subnet mask, and default gateway information is required
  - Media type and duplex mode required for connection to the host (ultrasound system)
  - Alias, application entity title, internet protocol address, and port number for each network device

Configuring a Local Host

You must configure local network settings for the ultrasound system (the local host) before configuring a network device or location.

Obtain the following information from your network administrator before configuring the local host:

- Alias
- Application Entity (AE) title
- Ultrasound system host name
- MAC address
- Internet Protocol (IP) address, not required if using DHCP
- Subnet mask, not required if using DHCP
- Default gateway information, not required if using DHCP

To configure local host settings:

1. Tap the configuration icon.

2. Tap **Network**.
3. Click **Local Host**.
4. To define a local host configuration, click **New**.
5. To edit an existing configuration, select the name (alias) from the list and then click **Edit**.
6. Configure the host type:
   – If the IP address is dynamic, or assigned by the server, click the **DHCP** check box.
   – If the IP address is static, click the **Static IP Address** check box.

7. Configure additional information, as required.

Selection	Description
IP Address	Internet Protocol (IP) address of the host (ultrasound system). **Note:** If DHCP is used for the export host, then reconfigure this field when the IP address changes.
Subnet Mask	Subnet mask for the host (ultrasound system). Typically identical to the subnet mask for the export host.
Default Gateway	Default gateway for the host (ultrasound system). Typically identical to the default gateway for the export host.
Alias	User-designated name for a host.
AE Title	Application Entity (AE) title for the configured device. **Note:** Disregard this entry. The system automatically populates this field if the ultrasound system is configured for DICOM. Otherwise, the system does not use this information.
Host Name	Name of local host.
MAC Address	Media Access Control (MAC) address detected for the host.
Show Network Status	Enable or disable the status of the network connection on the image screen.
Media Type	▪ **Hardware Default** ▪ **Auto Select** ▪ **10BASE-T** ▪ **100BASE-TX** ▪ **1000BASE-TX**
Duplex Mode	▪ **Hardware Default** ▪ **Half Duplex** communicates in both directions, one direction at a time. ▪ **Full Duplex** communicates simultaneously in both directions.

8. To save changes, click **Apply**. To exit without saving the changes, click **Cancel**.
9. To remove an existing configuration, select the required name (alias) from the list and then click **Delete**.

Configuring a Network Export Server

You can create a shared folder on a destination computer, for example, a workstation, server, or personal computer.

To configure a network export location:

1. Tap the configuration icon.

2. Tap **Network**.
3. Click **Network Export Server**.
4. To define a network export location, click **New**.
5. To edit an existing configuration, select the name (alias) from the list and then click **Edit**.
6. Enter configuration settings for the location.

Note: The export host is the destination device.

Selection	Description
Auto Store to Network	Queues images for transfer to the shared folder on the network when you close the study.
Alias	System-defined "computer name" or user-defined name for the export host. This alias is not used by DICOM.
IP Address	Internet Protocol (IP) address of the configured device. **Note:** If DHCP is used for the server, then reconfigure this field when the IP address changes.
Ping Time Out in Seconds	Time limit in seconds for confirming a successful connection. **Ping** confirms a successful connection to the server. The system displays the results on the screen.
Shared Folder	Exact name of the shared folder on the export host, following standard Microsoft Windows conventions for specifying access.
Account	Account name used to log on to the export host. Examples: "archive1\jsmith" ("computer name" and user name for local account on export host) "jsmith" (user name for local account on export host) "domain1\jsmith" (domain and user name)
Password	Password used to log on to the export host, if applicable.
Test Write	Attempt storing "test" files to the export host.

7. To save changes, click **Apply**. To exit without saving the changes, click **Cancel**.
8. To remove an existing configuration, select the required name (alias) from the list and then click **Delete**.

Configuring a Destination Server

Obtain the following information from your network administrator before configuring the destination device (export host):

- Alias
- Application Entity (AE) title
- Internet Protocol (IP) address

To configure a destination server:

1. Tap the configuration icon.

2. Tap **Network**.
3. Click the required tab, for example **Storage Server**, **Worklist Server**, **Printer Server** or **MPPS Server**.
4. To define a server location, click **New**.
5. To edit an existing configuration, select the name (alias) from the list and then click **Edit**.
6. To remove an existing configuration, select the required alias from the list and then click **Delete**.
7. Enter configuration settings for the device.

   Note: The export host is the destination device.

8. To configure storage server selections, configure additional information, as required:

Selection	Description
Auto Store to DICOM	Queues images for transfer to the DICOM storage server: ▪ **Store During Exam** transfers each image when you store the image to the study. ▪ **Store At End Of Exam** transfers all images when you close the study.
Alias	System-defined "computer name" or user-defined name for the export host. This alias is not used by DICOM.
AE Title	Application Entity (AE) title for the configured device.
IP Address	Internet Protocol (IP) address of the configured device.
Port Number	Network port the configured device uses to communicate with the ultrasound system.
Time Out in Seconds	Time limit in seconds for confirming a successful connection. ▪ **Ping** confirms a successful connection to the server. The system displays the results on the screen. ▪ **Echo** confirms the application entity title and port number. The system displays the results on the screen.
Number of Times to Retry After Failure	Number of attempts to transfer data after an unsuccessful attempt.
Seconds Between Each Retry	Time interval in seconds after an unsuccessful attempt to transfer data before reattempting to transfer the data.
Write Time Out in Seconds	Time interval in seconds for sending data to the queue.
Connect Time Out in Seconds	Time interval in seconds for attempted connections between the host and the server.

Selection	Description
Image Format	Specifies the DICOM format used to transfer images to the storage server. **Note:** Calibration information is included only with the New Ultrasound format. ▪ **Automatic** specifies the highest quality format that is supported by the server: New Ultrasound, Old Ultrasound, or Secondary Capture (listed in sequence from highest quality to lowest quality). ▪ **Original Image** specifies the highest quality format that is supported by the server: Old Ultrasound (highest quality) or Secondary Capture (lowest quality). ▪ **Secondary Capture** specifies the Secondary Capture format. The Secondary Capture format does not support clips.
Monochrome	Specifies the monochrome conversion settings used to transfer the images to the storage server. ▪ **No Monochrome conversion** disables monochrome conversion for gray scale images and clips stored on the storage server. ▪ **Store all Images and Clips as Monochrome** stores all images and clips on the storage server in monochrome format. ▪ **Store all Images as Monochrome** stores all images on the storage server in monochrome format.
Storage Commit Server	Specifies when images are transferred to the storage server: ▪ **After Each Image is Stored** transfers each image to the storage server when you store the image to the study. ▪ **After All Images are Stored** transfers all images to the storage server when you close the study.
Send SR	**Note:** DICOM structured reports are available only for the following exams: echocardiography, obstetrics, gynecology, and vascular. Enable or disable the structured report with the study to this specified device.

9. To configure worklist server selections, configure additional information, as required:

Selection	Description
Simple Search	(Applies to all configured worklist servers) When enabled, the system searches all procedures on the worklist server for the next 24 hours. **Note:** If you perform a streamlined search from the patient data form, the system uses data entered on the form to narrow the search.
Strict Verification	(Applies to all configured worklist servers) When enabled, the system verifies the DICOM standard tags on each study list retrieved from the worklist server.
Maximum number of worklist item	Maximum number of search results to display.

10. To configure MPPS server selections, configure additional information, as required:

Selection	Description
Store Image Format	**Note:** Calibration information is included with the New Ultrasound format only. ▪ **New Ultrasound** specifies the highest quality format that is supported by the server: New Ultrasound, Old Ultrasound, or Secondary Capture (listed in sequence from highest quality to lowest quality). ▪ **Original image** specifies the highest quality format that is supported by the server: Old Ultrasound (highest quality) or Secondary Capture (lowest quality). ▪ **Secondary Capture** specifies the Secondary Capture format. The Secondary Capture format does not support clips.

11. To configure the printer server selections, configure additional information, as required:

Selection	Description
Auto Print to DICOM	Queues images for transfer to the DICOM print server: ▪ **Print when page is full** prints an image when the page is full. ▪ **Print at end exam** prints all images when you close the study.
Orientation	Print orientation, for example, portrait or landscape
Display Format	Column and row format used for assembling pages to print
Copies	Number of copies to print
Film Size	File size to print
Printer Type	Printer type
Show advanced settings	Displays detailed settings for printer server
Medium Type	Specifies the print medium ▪ **Paper** selects paper. ▪ **Clear film** selects a clear film. ▪ **Blue film** selects a blue film.
Border Density	Defines the color of the region outside of the print area: typically black for film and white for paper
Min. Density	**Note:** Consult the print manufacturer for the appropriate value.
Max. Density	**Note:** Consult the print manufacturer for the appropriate value.
Print Priority	Print priority ▪ **High** indicates a high priority ▪ **Medium** indicates a medium priority ▪ **Low** indicates a low priority
Film Destination	Location of the film development ▪ **Magazine** indicates the exposed film sheet is developed in a darkroom. ▪ **Processor** indicates the exposed film sheet is fed directly into a processor and then developed.

Selection	Description
Empty Image Density	Density of the empty image area ▪ **Black** typically used for transparencies ▪ **White** typically used for paper
Polarity	Specifies the print color of the background and font. ▪ **Normal** prints black on white. ▪ **Reverse** prints white on black.
Magnification	Specifies how the system sends data to the camera if pixel interpolation is necessary. Pixel interpolation can be necessary when sending data to a high-resolution camera. ▪ **Replicate** indicates the interpolated value is identical to the last pixel value. ▪ **Bilinear** indicates the interpolated value is calculated linearly between the last pixel value and the next pixel value. ▪ **Cubic** indicates 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. ▪ **None** indicates the image is left as-is.
Configuration	**Note:** This string is sent to the printer exactly as it displays in the field. This field is not required.

12. To save changes, click **Apply**. To exit without saving the changes, click **Cancel**.

Verifying Network Settings

You must test network configuration settings when you add a network server or edit an existing configuration.

To verify network settings for an alias:

1. Select the required alias.
2. To validate an IP address, click **Ping**.

   Note: Your network administrator may have disabled the **Ping** function on your network. Even if **Ping** is disabled, the **Echo** test will still work.

   The system displays the results of the test on the screen.
3. To validate the application entity and port number, click **Echo**.

   Note: An Echo test is performed to verify that the device or server is properly configured for the ultrasound system.

   The system displays the results of the test on the screen.
4. If the **Echo** verification fails:
   a. Check the IP address, Application Entity Title, and port number.
   b. Verify the application entity title of the ultrasound system is registered on the applicable server, if required.
5. Repeat steps 2 through 4 for each new or edited network configuration.

3 Measurement and Report Configuration

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General Measurement Configuration

You can customize measurements for each exam type.

To configure the general measurement options:

1. Tap the configuration icon.

2. Tap **Measurement**.
3. Click **General**.
4. Enter the required settings.

Selection	Description
Guide Line	---
2D Caliper	Select the check box to display a dotted line between the anchored beginning and ending measurement markers.
Doppler / M-Mode	Select the display of lines indicating measurement guides. ▪ **On** displays a line. ▪ **Off** removes the line.
Marker Display Settings	Specify the measurement marker display settings.
Size	Select the measurement marker size, for example, small or large.
Type	Select the display of the measurement marker on the image screen: ▪ **Object** displays different shapes for each measurement marker ▪ **Number** displays consecutive numbers for each measurement marker
Caliper Default Position	Select the location on the image screen of the first measurement marker: ▪ **Center** displays the first marker in the center of the image screen but does not include a depth value. ▪ **Depth** displays the first marker in the center of the image screen, with a dotted line representing the depth from the skin line. The depth value displays on the image screen until you anchor the first marker.
Heart Rate Tool	Select the number of heart cycles.
Shearwave Measurement Units	Select the shear wave measurement unit, for example, velocity (m/s) or elasticity (kPa).
Wall Motion Scoring	---
Segment Model	Select the segment model, for example,16 segments or 17 segments.
Report View Type	Select the display of the report, for example, view plane, bull's eye, or both.
Measurement Results Display Settings	Select the default measurement method for each imaging mode.
2D, **M**, or **Doppler** (tab)	Select the required mode and specify the required display settings.
Font Size	Select the font size for the label in the measurement results.
Default Position	Select the default location to display the measurement results, and position the pointer over the required location.
Background Opacity	Select the background transparency for measurement results (MDA) display.

Selection	Description
Units and Precision (General Tools)	Specify the unit and precision settings for general measurements.
Default Tool	Specify the default measurement method by mode.
2D mode	Specify the default measurement method: ▪ **Distance** selects the default measurement method for measuring distance, for example, **Open Trace** ▪ **Multi-point Distance** selects the default measurement method for a measuring multiple distances, for example, **4 Point Dist** ▪ **Area** selects the default measurement method for measuring an area, for example, **Trace** ▪ **Circumference** selects the default measurement method for measuring a circumference, for example, **Ellipse** ▪ **Stenosis** selects the default measurement method for measuring stenosis, for example, **D-%Stenosis** ▪ **Angle** selects the default measurement method for measuring an angle, for example, **Cross Angle** ▪ **Volume** selects the default measurement method for measuring a volume, for example, **Vol 1 Dist** to measure one volume distance ▪ **Disk Volume** selects the default measurement method for measuring a method of disk volume, for example, **Disk Trace** ▪ **Ratio** selects the default measurement method for determining a ratio, for example, **Dist Ratio** to measure a distance ratio ▪ **Average** selects the default measurement method for determining an average of multiple distance measurements, for example, **2 Distance Avg** ▪ **AP** selects the default measurement method for measuring the pocket depth of amniotic fluid, for example, **AP Depth**
M-mode	Specify the default measurement method: ▪ **Distance** selects the default measurement method for measuring a distance, for example, **4 Point Dist** ▪ **HR** selects the default measurement method for measuring a heart rate ▪ **Slope** selects the default measurement method for measuring a slope ▪ **Time** selects the default measurement method for measuring time ▪ **Dist Ratio** selects the default measurement method for determining a distance ratio ▪ **Time Ratio** selects the default measurement method for determining a time ratio

Selection	Description
Doppler	Specify the default measurement method: ▪ **Velocity** selects the default measurement method for measuring velocity, for example, **PI Auto** ▪ **Acceleration** selects the default measurement method for measuring acceleration or deceleration ▪ **Velocity Ratio** selects the default measurement method for determining a velocity ratio ▪ **Time** selects the default measurement method for measuring time ▪ **Time Ratio** selects the default measurement method for determining a time ratio ▪ **RI** selects the default measurement method for determining a resistive index ▪ **A-Flow Volume** selects the default measurement method for measuring a flow volume using an area ▪ **D-Flow Volume** selects the default measurement method for measuring a flow volume using a distance ▪ **HR** selects the default measurement method for measuring a heart rate ▪ **VTI** selects the default measurement method for measuring velocity time integral ▪ **VTI Trace** selects the default measurement method for measuring a velocity time integral trace. ▪ **PHT Guide** selects the default measurement method for measuring a valve area by pressure half time ▪ **PHT** selects the default measurement method for measuring a valve area on the irregular spectrum by pressure half time ▪ **E/A Vel + DT** selects the default measurement method for measuring a pressure half time and deceleration time ▪ **dP/dt** selects the default measurement method for measuring rate of change of pressure over time.
A-%Stenosis	Specify the default measurement method for measuring stenosis, for example, **Ellipse**
A-Flow Volume	Specify the default measurement method for measuring a flow volume of an area, for example, **Trace**

5. Click **Close**.

Measurement Display Configuration

You can configure the display of information on the measurement menu and on the patient report.

For other exam types you can configure the measurement display options only.

Note: To prevent the exam-specific settings from being overridden by the general settings, configure the general settings first and then customize the exam-specific settings.

To configure the measurement display options:

1. Tap the configuration icon.

2. Tap **Measurement**.
3. Click **General** and then click **Exam Specific**.
4. Select the exam from the **Application** drop-down list.
5. Enter the required settings.

Selection	Description
Measurement Results Display Settings	Select the default measurement method for each imaging mode.
Font Size	Select the font size for the label in the measurement results.
Default Position	Select the default location to display the measurement results, and position the pointer over the required location.
Background Opacity	Select the background transparency for measurement results (MDA) display.
Units and Precision (Measurement Labels)	Specify the unit and precision settings for exam-specific measurements. ▪ **Apply to All Applications** applies the specified measurement unit and precision settings to all exams.

Measurement Display for Obstetrics

Selection	Description
Add 1 week to EDC	Add an additional week to the estimated date of confinement. **Note:** You can change this setting during an exam. The ultrasound system updates the estimated date of confinement, gestational age, or last menstrual period in the report and patient data based on the changed setting. The system does not update information in structured reports previously sent to a network or the patient data stored on images or clips.
Growth Authors	Specify the settings for displaying the obstetric calculations in the measured results and growth analysis graphs for all reference authors. ▪ **Percentile** displays the percentile for the obstetric calculations. ▪ **SD** displays the standard deviation for the obstetric calculations.
OB / Early OB	---
Growth Analysis Graphs	---
Link Studies	Select the segment model, for example, **Manual** or **Automatic**.
Graph Layout	Select the graph layout format. ▪ **1x1** displays one graph on a page in the patient report. ▪ **2x2** displays four graphs on a page in the patient report.
AC Measurement	---
AC with TAD / APAD measurement	Display the values for transverse abdominal diameter and abdominal anteroposterior diameter from the abdominal circumference measurement.

Selection	Description
Display SD / Growth Percentile	---
Notice of estimated Age	Specify the upper limit of the range for the standard deviation.
Display GA	Display or hide the gestational age.
Display EDC	Display or hide the estimated date of confinement.
Auto OB	Enable or disable automatic obstetric measurement.
BPD Outer to Outer	Select the check box to enable the biparietal diameter outer-to-outer measurement.
OB(Adv)	---
Growth Analysis Graphs	---
Link Studies	Select the segment model, for example, **Manual** or **Automatic**.
Graph Layout	Select the graph layout format. ▪ **1x1** displays one graph on a page in the patient report. ▪ **2x2** displays four graphs on a page in the patient report.
Display SD / Growth Percentile	---
Notice of estimated Age	Specify the upper limit of the range for the standard deviation.
Display GA	Display or hide the gestational age.
Display EDC	Display or hide the estimated date of confinement.
Auto OB	Enable or disable automatic obstetric measurement.
BPD Outer to Outer	Select the check box to enable the BPD outer-to-outer measurement.
Multi-Print	---
Configure Multiple Print Format	Specify the multiple print format settings.

Measurement Display for Echocardiography

Selection	Description
Ped Echo / Adult Echo / Neo Echo	---
General	---
HR Measurement Method	Select the measurement method used to detect heart rate: ▪ **ECG** ▪ **Doppler / M-Mode** ▪ **Auto Stat**
Default RAP	Select default value for right atrial pressure.
eSie Measure Setting	---
eSie Measure	Enable or disable the display of eSie Measure.
Display of Heart Cycles	Select the number of heart cycles for display in each imaging mode.

Measurement Display for Gynecology

Selection	Description
GYN	---
Auto Follicle Config	Specify the automatic follicle measurement settings.
Auto Follicle	Enable or disable the automatic follicle measurement.

Measurement Display for Pediatric

Selection	Description
Pediatric Hip GRAF Setting	---
Sonometer on screen option	Show or hide the GRAF sonometer.

User-defined Measurement Selections

You can configure the display of selections available during the measurement function.

To configure measurement function selections:

1. Access the configuration settings and then tap **Measurement**.
2. To create user-defined selections, click **Add New Style**.
3. To edit user-defined selections, click **Edit Style Name**.
4. To delete user-defined selections, click **Delete Style**.
5. Select the required exam type and user-defined selection, and then configure the following selections:

Selection	Description
Touch Screen	Assign selections to the controls corresponding to touch screen selections.
Left Panel	Define the display of settings for measurements, calculations, measurement tools, and measurement labels by exam type and operating mode.
Edit Label	Define the customized measurement and calculation labels by exam type and operating mode.
Formula	Define the customized measurement formula by exam type.
OB Table	(Available for all obstetric exam types) Configure the author reference settings for obstetric measurements.

Touch Screen Selections

You can configure the display of the controls corresponding to the touch screen selections.

To assign the touch screen selections:

1. Select the **Touch Screen** tab.
2. Select the operating mode.
3. Configure the following selections:

To	Do This
Assign the controls corresponding to the touch screen selections	1. Select a measurement type from the list and then select a label. 2. Click the right or left arrow.
Create a measurement group	1. Click **Add Group**. 2. Select a label from the list and then click the right or left arrow. 3. To edit a measurement group, click **Edit Group**. 4. To delete a measurement group, click **Delete Group**.
Change the location of two selections	▪ Click the selections and then click **Swap**.
Restore the default settings	▪ Click **Restore Defaults**.
Enable the system to advance to the next measurement label after you complete a measurement	1. Select the **Measure Continuously** check box. 2. Select the check box for each required measurement label in the required sequence. The system displays the selected measurement in the same color.

Measurement Labels

You can configure the location and sequence of measurement labels in the left panel of the image screen.

To configure the list of measurement labels:

1. Select the **Left Panel** tab.
2. Select the operating mode.

To	Do This
Assign the selections in the left panel	1. Select a measurement type from the list and then select a label. 2. Click the right or left arrow.
Create a measurement group	1. Click **Add Group**. 2. Select a label from the list and then click the right or left arrow. 3. To edit a measurement group, click **Edit Group**. 4. To delete a measurement group, click **Delete Group**.
Change the display order	▪ Select the label and then click the up or down arrow.
Display the measurement results on the image screen	▪ Select a label and then click the right arrow.
Restore the default settings	▪ Click **Restore Defaults**.
Enable the system to advance to the next measurement label after you complete a measurement	1. Select the **Measure Continuously** check box. 2. Select the check box for each required measurement label in the required sequence. The system displays the selected measurement in the same color.

User-defined Measurement Labels

You can create user-defined measurement labels.

To create a user-defined label:

1. Select the **Edit Label** tab.
2. Select the exam type.
3. Click **New**.
4. Specify the following information and then click **Save**.

Selection	Description
Label	Enter the name.
Application	Select the exam.
Lt./Rt.	Select the right or left side of the anatomy for the measurement results.
Prox/Mid/Dist	Select the proximate, middle, or distant view for the measurement results.
Data shared among exams	(Available only with multiple exams) Select the option to display the measurement results of multiple exams.
Highlight Value	Select the option to highlight the measurement results on the image screen.
Display Area	(Available only with calculation labels) Select the measurement result display area or report.
Value Display Type	Select the measurement result display type.
Supporting Tool	---
2D Mode / **M mode** / **D mode** (option)	Select the operating mode.
Available Method	Select the measurement method.
Name / **Units** / **Precision** (list)	Define the name, units, and precision for the selected method.

Obstetric Table

(Available for all obstetric exam types)

You can customize the list of reference authors for obstetric measurements and calculations.

To select a reference author:

1. Select **OB**.
2. Select the **OB Table** tab.
3. Specify the following information:

Selection	Description
Gestational Age	Select the author references for gestational age.
Growth Analysis Graphs	Select the author references for the growth analysis graph.
Ratio	Select the author references for ratio.
Estimated Fetal Weight	Select the author references for estimated fetus growth.
Same Author for All Labels	Select the author reference and apply the same author reference to gestational age.

4. Click **Close**.

   The system applies the reference authors for obstetric measurements and calculations to all obstetric exams.

User-defined Formulas

You can create user-defined formulas.

To create a user-defined formula:

1. Access the configuration settings and then tap **Measurement**.
2. Click the exam type.
3. Click **New** and then enter the required information.
4. To edit a user-added formula, select the required formula and then click **Edit**.
5. To delete a user-added formula, select the required formula and then click **Delete**.
6. To make a correction in the formula, position the cursor after the incorrect element and then press the backspace key on the keyboard.

Selection	Description
Custom (tab)	---
Reference	Specify the reference settings for obstetric measurement result.
Formula Name	Enter the label name.
Output Value	Specify the output value including unit and precision.
Formula	Define the measurement formula: ▪ **Constant** specifies the labels and corresponding value. ▪ **Variable** specifies measurement labels, units and prefix by the imaging mode and exam type. ▪ **Operation** specifies arithmetic operation for calculation.

User-defined Formulas for the Obstetric Exam

The system displays the formula in the text box next to the formula name as you enter each element. Example: "A"*"LOG"("BPD")+"COS")("ATD")-1.8327.

You can use parentheses, but do not use spaces to separate elements in the formula. Do not delete quotation marks entered by the system. You can enter up to 64 characters. To conserve space, you can define a numerical value as a constant.

To create a user-defined formula for obstetrics:

1. Select **OB**.
2. Click the **Formula** tab and select from the following formula tabs:
   – **Gestational Age**
   – **EFW**
   – **Growth Analysis Graphs**
   – **Ratio**
   – **Custom**
3. To create a formula, click **New**.
4. To edit a user-defined formula:
   a. Select the required formula and then click **Edit**.
   b. To make a correction in the formula, position the cursor after the incorrect element and then press the backspace key on the keyboard.
5. Specify the following information:

Selection	Description
Reference	Specify the reference settings for obstetric measurement result for the selected formula: ▪ **Reference (Author)** selects the reference author for determining the measurement results. ▪ **Variable Label** selects the variable label. ▪ **Range** specifies the lower and upper limits in weeks and days of the selected variable used to calculate the fetal growth. ▪ **Data Type** selects the layout for the data, for example, **Table** or **Formula**. ▪ **Result Unit** selects the units for the measurement results, for example, **Week** or **Day**. ▪ **Displayed Value** selects the unit and precision. ▪ **Label Order** selects the sequence for the measurement labels. ▪ **Precision** specifies the precision for the measurement value. ▪ **Deviation** selects the range for the fetal growth for the fetal growth pattern. ▪ **Label Name** inserts the name of the label. ▪ **Output Value** specifies the output value for the unit and precision. ▪ **Measurement Result** selects the option to calculate the fetal growth for the selected measurement label and reference author.
Formula	Define the measurement formula: ▪ **Constant** specifies the labels and corresponding value. ▪ **Variable** specifies measurement labels, units and prefix by the imaging mode and exam type. ▪ **Operation** specifies arithmetic operation for calculation.
SD Limits Formula	Define the standard deviation limit formula: ▪ **Constant** specifies the labels and corresponding value. ▪ **Variable** specifies measurement labels, units and prefix by the imaging mode and exam type. ▪ **Operation** specifies arithmetic operation for calculation.

6. To delete a user-defined formula, select the formula and then click the delete button.
7. Click **Save**.

Reports

You can configure patient report settings and insert user-defined information.

Report Section

You can show or hide sections in the patient report.

To configure a report section:

1. Access the configuration settings and then tap **Measurement**.
2. Click **Report**.
3. Click **Report Section**.
4. Click the exam type.
5. To display a section in the report, select the report section check box.
6. To reposition a section in the report, select the report section and then click the up or down arrow.
7. Click **Close**.

Anatomy Assessments

Anatomy assessments provide descriptions on the patient report, for example, for assessing the condition of an anatomical structure. An anatomy assessment is an area of interest, for example, a fetal position. A selection is a description of the area of interest, for example, breech.

The system identifies user-defined assessments with an asterisk (*).

To configure anatomy assessments:

1. Access the configuration settings and then tap **Measurement**.
2. Click **Report**.
3. Click **Anatomy Assessment**.
4. Click the exam type.

To	Do This
Create a user-defined anatomical assessment or selection	1. Enter a name. 2. To create a new description: a. Click **Assessment Order**. b. Enter a description. 3. To assign a description to an item: a. Click **Selection Order**. b. Enter a description. 4. Click **Add**.
Delete a user-defined anatomical assessment or selection	1. Select the area of interest or the description. 2. Click **Delete**. The item or selection is only removed from report.
Add user-defined anatomical assessment and selection	▪ Select the anatomical assessment check box.
Reposition an anatomical assessment in the list	1. Select the area of interest or the description. 2. Click the up arrow or down arrow.

Comments

You can create up to 20 comments for the patient report.

To configure a comment for the patient report:

1. Access the configuration settings and then tap **Measurement**.
2. Click **Report**.
3. Click **Comments**.
4. Select the exam type and then enter a comment.

Print Preview

You can define a logo and a signature, and customize the display of information for the institution and patient in the patient report.

To configure the print layout for the patient reports:

1. Access the configuration settings and then tap **Measurement**.
2. Click **Report**.
3. Click **Print Preview**.
4. Click the exam type and then specify the following information:

Selection	Description
Site Information	Specifies the logo for the selected exam. ▪ **Load** inserts an image. ▪ **Remove** deletes an image. ▪ **Text 1** inserts text for display with the logo. ▪ **Font** specifies the font for the image.
Signature	Specifies a signature for the selected exam. ▪ **Add** inserts a signature. ▪ **Remove** deletes a signature.
Section Display	When enabled, hides information in the patient report. ▪ **Hide institution** hides institution name and physician- or sonographer-identifying information. ▪ **Hide patient information** hides patient name, identification number, age, gender, height, weight, body surface area (BSA), blood pressure (BP), and study date.

4 Clinical Applications Configuration

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Configuring Stress Echo Settings

You can create, edit, and delete stress echo protocols. The changes take effect the next time you activate the stress echo feature.

Creating and Modifying a Protocol

When you create or edit a protocol, you can configure the stages and the number of clips acquired for views in the stage.

To create or modify a protocol:

1. Tap the configuration icon.

2. Tap **Stress Echo**.

To	Do This
Copy a protocol	1. Select a protocol and then click **Copy**. 2. Enter a name and then click **OK**.
Add a protocol	1. Select a protocol and then click **Add**. 2. Enter a name and then click **OK**.
Rename a protocol	1. Select a protocol and then click **Rename**. 2. Enter a name and then click **OK**.
Modify a protocol:	1. Select a protocol and specify the following fields in **Protocol Settings**. – Check **ROI On** to display the region of interesting area in stress echo setup screen. – Check **Allow Selection of Multiple Clips per View** to select multiple clips. 2. Select the required **Review Settings** option. – Select the required display layout in the stress echo review screen from the **Display Format** drop-down list. – Select the required section of the clip to play when you activate playback from the **Default Playback Mode** drop-down list, for example, **Full R-R**, **Adjusted**, **Diastole Only** or **Systole Only**. – Select the required playback speed in stress echo review screen from the **Default Playback Speed** drop-down list. – Select the required **Default Clip Sorting** option, for example **By View** or **By Stage**.
Delete a protocol	▪ Select a protocol and then click **Delete**.

Creating and Modifying a Protocol Stage

To	Do This
Copy a stage	1. Select a stage and then click **Copy**. 2. Enter a name and then select a unit from the drop-down list. 3. Click **OK**.
Add a stage	1. Select a stage and then click **Add**. 2. Enter a name and then select a unit from the drop-down list. 3. Click **OK**.
Rename a stage	1. Select a stage and then click **Rename**. 2. Enter a name and then select a unit from the drop-down list. 3. Click **OK**.
Modify a stage:	1. Specify the following fields in **Clip Settings**. – Select the required option from the **Clip Store Type** drop-down list: **Retrospective**, **Prospective**, or **Continuous**. – For non-continuous stage, select the number of clips stored when acquisition is activated from the **Clips per Capture**. The maximum number of clips for retrospective is 4, and for prospective is 5. – Select the type of acquisition in **Beat** or **Time** in **Clip Length**. – Select the type of capture offset in **Time** and **R-Wave** in **Capture Offset**. 2. Specify the following fields in **Additional Settings**: – To specify the time to enable **Start Stage Timer**, select **At Start of Stage** or **At First Clip Store**. – To disable **Start Stage Timer**, select **No**. – To specify the location to enter the review screen, select **After View Capture** or **After Stage Capture** in **Enter Review Screen**. – To disable **Enter Review Screen**, select **None**.
Delete a stage	▪ Select a stage and then click **Delete**.

Creating and Modifying a Protocol View

To	Do This
Copy a view	1. Select a view and then click **Copy**. 2. Select the required option. – Select **Pre-defined List** and then select the pre-defined view from the drop-down box. – Select **Custom** and then enter a name for the copied view. 3. Click **OK**.
Add a view	1. Select the view and then click **Add**. 2. Select the required option. – Select **Pre-defined List** and then select the pre-defined view from the drop-down box. – Select **Custom** and then enter a name for the copied view. 3. Click **OK**.
Rename a view	1. Select a view and then click **Rename**. 2. Select the required option. – Select **Pre-defined List** and then select the pre-defined view from the drop-down box. – Select **Custom** and then enter a name for the copied view. 3. Click **OK**.
Delete a view	▪ Select a view and then click **Delete**.

Exporting and Importing Protocols

To export protocols:

1. Connect an external storage device to the ultrasound system.
2. Click **Export**.
3. Select the detected external storage device and the required protocols and then click **Export**.

To import protocols:

1. Connect an external storage device to the system.
2. Click **Import**.
3. Select the detected external storage device and the required protocols and then click **Import**.

5 Export and Import

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Exporting Patient Studies

Use the patient browser to export closed patient studies to external media, for example, a USB storage device.

To export a patient study:

1. Press **PATIENT** and then tap **Browser**.
2. Select the time when the patient study was completed in the **Show Files** list and then select the location of the studies in the **Source Media** list, if necessary.
3. Specify the search options and then tap **Search**.

   The system displays the patient information for available studies in the study list.
4. Select one or more studies in the study list and then tap **Export(Import)**.
5. Select the target location for the exported studies in the **Destination** list.
6. To remove patient-identifying information from the study, select the **De-identify** check box.

   Note: You can enter text to replace the patient name in the text box.
7. Select the format for the exported images:
   - **DICOM** exports images in the DICOM (Digital Imaging and Communications in Medicine) format.
   - **Tiff/Avi** exports images in Tagged Image File Format and exports clips in Audio Video Interleaved format.
8. Select the options for disk media:
   - **Finalize** prevents additional storage to the inserted disk media.
   - **Eject** ejects the disk media.
9. Click **Export**.

   The system displays a progress bar indicating the status of the export process.
10. When the export is complete, click **OK**.

Storing Images and Structured Report to Network Servers

You can send selected studies and included structured report to a connected server. You can also send stored images during the current study when the system is configured for in-progress store.

To send studies to a connected server:

Note: The selected studies must be stored on the hard disk of the ultrasound system.

1. Press **PATIENT**, and then tap **Browser**.
2. Select the time when the patient study was completed in the **Show Files** list, and then select the location of the studies in the **Source Media** list, if necessary.
3. Specify the search options, and then click **Search**.

   The system displays the patient information for available studies in the study list.
4. Select one or more studies in the study list.
5. Select the target location in the **Output Device** list and then tap **Send**.

   The system adds all images from the selected studies to the queue.
6. To verify the status of the queue, tap **Queue**.

See also: For information about the indication of the queue status, refer to Appendix B in the Instructions for Use manual.

Importing Patient Studies

Use the patient browser to import patient studies from external media, for example, a USB storage device.

To import a patient study:

1. Press **PATIENT**, and then tap **Browser**.
2. Select the location of the studies in the **Source Media** list.
3. Select one or more studies from the external media.
4. Click **Export(Import)**.

   The system copies the study to the system hard drive and adds the patient information to the study list.
5. To confirm the studies were imported, select the hard drive in the **Source Media** list.

Creating a Slide Show

You can temporarily hide images on the review screen and display only selected images. You can also view selected images sequentially as a slide show.

Use the configuration settings to specify the length of time to display each image and the number of times to play a clip.

To create a slide show:

1. Choose a method to activate review:
   - To activate review during an exam, press **REVIEW**.
   - To activate review of a saved exam, activate the patient browser and then double-click the patient name in the study list.
2. Select the required images in the review screen.
3. To view selected images and clips as a slide show, tap **Slide Show**.

   The system displays each image or clip in a full-screen display format.
4. To pause the slide show, click **Stop**.
5. To restart the slide show, click **Start**.
6. To stop the slide show and redisplay the previous screen, click **Exit**.

Creating and Editing Teaching Files

You can create a teaching file with images from multiple patient studies in a single file. The system removes all patient-identifying information from the images.

To create a teaching file:

1. Choose a method to activate review:
   - To activate review during an exam, press **REVIEW**.
   - To activate review of a saved exam, activate the patient browser and then double-click the patient name in the study list.
2. Select the required images in the review screen or thumbnail panel.
3. Tap **Teaching File**.
4. Enter a name for the teaching file.
5. Click **New**.

   The system creates a new study with the selected images and adds the study to the patient browser.

To add images to a teaching file:

1. Choose a method to activate review:
   - To activate review during an exam, press **REVIEW**.
   - To activate review of a saved exam, activate the patient browser and then double-click the patient name in the study list.
2. Select the required images in the review screen or thumbnail panel.
3. Tap **Teaching File**.
4. Select the required file from the list and then click **Append**.
5. To add images from another study to the teaching file, open the required study and then repeat steps 2 through 4.

6 Security Configuration

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Overview

The information in this chapter is intended for the ultrasound system administrator.

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 on the ultrasound system.
meduser	A default internal user account.
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**.
User	A single user, identified on the system with a user account.
Group	**Note:** The system provides the group classification only. Permissions cannot be assigned to groups. A classification for a user account. Groups include user groups. The following list includes the default groups: ▪ **Administrator/SecurityAdmins** ▪ **EmergencyAccess** ▪ **Standard**
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, which cannot be deleted: ▪ **Administrator/SecurityAdmins** provides accessibility based on the functional privileges 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.
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.
Federal Information Processing Standard (FIPS)	The Federal Information Processing Standard is a United States government computer security standard used to accredit cryptographic modules.

Configuring Security Settings

You can manage access to patient data on the ultrasound system by configuring user accounts.

Use the configuration settings on the ultrasound system to set up user accounts and passwords, configure groups and roles, update passwords, and configure security log files.

Categories of Settings for Security Configuration

The security package provides configuration options for managing user accounts and providing functional privileges.

User Management includes options for configuring users, groups, and roles.

- **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.
- **Internal Users** lists the internal accounts with access to all patient data and access to configure the ultrasound system.
- **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 provides options for assigning access to patient data and tasks on the ultrasound system.

- **Functional Privileges** lists access to functions and tasks on the ultrasound system.

To configure security settings:

1. Tap the configuration icon.

2. Tap **Security**.
3. Click the **Configure** selection for **syngo Security**.
4. Click the menu option for the required settings.
5. Enter the required settings.
6. Save the changes:
   - To save the settings, click **Apply**. Or, click **OK**.
   - To discard the changes and exit the configuration settings, click **Cancel**.

To enable the Federal Information Processing Standard:

1. Access the security configuration settings.
2. Click the **Enable** selection for the **FIPS (Federal Information Processing Standard)**.

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
- Integrating a group from a network domain
- Configuring, viewing, and archiving the security log file

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 security configuration settings.
2. Click the **Configure** selection for **syngo Security**.
3. Click **Security Configuration**.
4. Select **User Management**.
5. To create a user group:
   a. Click **Groups** and then click **More Actions**.
   b. Select **New** and then select **Group**.
   c. Enter a name and description.
   d. Select the **Members** tab.
   e. To add users, select the users from the **Available Users** list and then click **Add**.
   f. To delete users, select the users from the **Assigned Users** list and then click **Remove**.
6. To create a role:
   a. Click **Roles** and then click **More Actions**.
   b. Select **New** and then select **Role**.
   c. Enter a name and description.
   d. Select the **Owners** tab.
   e. Select a domain from the **Domain** drop-down list.
   f. To add users, select the users from the **Available Users** list and then click **Add**.
   g. To delete users, select the users from the **Assigned Users** list and then click **Remove**.
7. To delete a user-defined group or role:
   a. Click the group or role and then click **More Actions**.
   b. Select **Delete** and then select **Yes**.
8. Save the changes.

Assigning Functional Privileges to Users

You can assign functional privileges to a user account. 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.

- A classification of user accounts includes the following selections:
  - **Everyone** includes all users and all groups
  - **Groups** includes a list of groups
  - **Roles** includes a list of roles
  - **Users** includes a list of individual user accounts
- The system displays a drop-down list of groups or roles based on the filter.

To assign functional privileges to users:

1. Access the security configuration settings.
2. Click the **Configure** selection for **syngo Security**.
3. Click **Security Configuration**.
4. Assign access to tasks on the ultrasound system by selecting the required options.
   a. Select **Security Management** and then select **Functional Privileges**.
   b. Select **By User / Role**.
   c. Select the **Grant** check box next to the required selection and then enter or modify the configuration settings.

      The access is specific to each user or role.

Selection	Description
Privilege	Lists the functions or tasks available to assign to the user account.
Effective	When the check box is selected, Indicates the effective access for the user account.
ArchNet (tab)	**Export** indicates access to export patient data. **Send** indicates access to send patient data.
AuditTrail (tab)	**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 security log file. **View** indicates access to view the security log file.
Common (tab)	**RemoteAssistance** indicates access to launch a remote service session. **ServiceAccess** indicates access to the local service page, including access to the backup and restore feature.

Selection	Description
CorrectRearrange (tab)	**Correct** indicates access to edit the patient registration information.
Filming (tab)	**Expose** indicates access to print patient data.
PatientBrowser (tab)	**Delete** indicates access to delete patient data.
PatientRegistration (tab)	**InvokeRegistration** indicates access to register a patient.
SecuritySystem (tab)	**BypassBlockedSystem** indicates access to bypass a system blocked as a result of the security log file filling the system hard disk. **ConfigurationReadWrite** indicates access to view and edit the security configuration. **InterractiveLogin** indicates access to log in when the system is locked. **OverrideLoginErrors** indicates a user can access the system when the system displays login errors; for example when an exam is in progress. **SetMode** indicates a user can access the system.

5. Save the changes.

Adding a User Account

You can add and configure user accounts, and change a user account password.

To add a user account:

1. Access the security configuration settings.
2. Click the **Configure** selection for **syngo Security**.
3. Click **Security Configuration**.
4. Create a user account.
   a. Select **User Management**.
   b. Click **Users** and then click **More Actions**.
   c. Select **New** and then select **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.

5. To add or remove the user to a group:
   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**.
6. To add or remove the user to a role:
   a. Select the **Owner Of** tab.
   b. Select a group 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**.
7. To delete a user account:
   a. Click the user account and then click **More Actions**.
   b. Select **Delete** and then select **Yes**.
8. Save the changes.

Editing a User Account

To edit a user account:

1. Access the security configuration settings.
2. Click the **Configure** selection for **syngo Security**.
3. Click **Security Configuration**.
4. Select **User Management**, select **Users** and then select the user from the list.
5. To filter the list of users:
   – Select a classification from the drop-down menu.
   – Enter the name of the new filter in the text box and then press enter on the keyboard.
6. To change a user password, select a user and then select the **User** tab.
7. Update the required information.
8. Save the changes.

Configuring the User Account Password

You can configure the password requirement for all user accounts, and reset a specific user account password.

To configure user account passwords:

1. Access the security configuration settings.
2. Click the **Configure** selection for **syngo Security**.
3. Click **Password Configuration**.
4. Select the required tab and then enter or modify the configuration settings.

Selection	Description
Reset Password (tab)	Displays a list of user accounts to reset the password.
Select All	Selects all of the user accounts on the list.
Clear All	Cancels the selection of all user accounts on the list.
Reset Password	Resets the password for the selected user accounts. The system displays a dialog box requesting confirmation to reset the password for the selected user accounts and restart the ultrasound system.
Password Complexity (tab)	Displays the password configuration requirements; for example, a minimum number of uppercase characters.
Default Settings	Selects the default setting for the password of the selected user accounts.
Account Policy (tab)	Displays account configuration requirements; for example, the duration to lock an account.

5. To save the settings, click **OK**.
6. To restart the ultrasound system, click **OK**.

Viewing Security Settings

You can view groups and roles with assigned functional privileges.

To view the security settings:

1. Access the security configuration settings.
2. Click the **Configure** selection for **syngo Security**.
3. Click **Security View**.
   - **Groups/Roles** shows the user groups and roles.
   - **Privileges** shows the functional privileges assigned to a user.

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.

To configure the audit trail:

1. Access the security configuration settings.
2. Click the **Detail** selection for **Audit Trail**.
3. Click **Audit Trail Settings**.
4. Select the required destination for the security log file and then enter or modify the configuration settings.
5. To view the next configuration screen, click **Next**.
6. To view the previous configuration screen, click **Back**.

Selection	Description
Local file system	Selects the ultrasound system as the destination for the security log file.
Audit Trail directory	Selects the location for the archive of the security log file.
Max Size (kBytes)	Specifies the maximum size of the security log file.
Zipped	When enabled, compresses the security log file.
Disk quota checks	**Warning level [%]** specifies the storage capacity level of the security log file as a percentage of the maximum size, when enabled. **Quota limit [%]** specifies the quota limit of the security log file as a percentage of the maximum size, when enabled.
Total diskspace of Audit Trail drive	Displays the quota limit for audit trail in megabytes.
Used diskspace of Audit Trail drive	Displays the amount of the used disk space for audit trail in megabytes.
Central syslog server	Selects a network location as the destination for the security log file.
Host	Specifies the host name of the network location.
Port	Specifies the port number of the network location.
Protocol	Selects the protocol name of the network location.
Encoding	Selects the encoding option of the network location.
Test	Validates the connection to the network location.

To view the audit trail:

1. Access the security configuration settings.
2. Click the **Detail** selection for **Audit Trail**.
3. Click **Audit Trail View**.
   - **Audit Filter** lists the filters available for security log files.
   - **Audit Viewer** lists the viewing selections for security log files.

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:

1. Access the security configuration settings.
2. Click the **Detail** selection for **Audit Trail**.
3. 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.

4. Select the file and then click **Archive**.

   The ultrasound system displays the disk space available on the system in megabytes and total quota limit in percentage.
5. To initiate the archive process after an incomplete archive, click **Restart**.
6. To remove the security log file from the ultrasound system, click **Delete**.

Appendix A EMC Publication

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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 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 B Note: The system is a Class A device when the barcode reader is in use. Note: The system is a Class A device when the DVR is in use.	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 (○ = 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 Measurements and Calculations Reference

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Measurement Methods

The following general measurements apply to all exam types.

2D-Mode Measurement Methods

Measurement Method	Measurement Results	Displayed Results
Distance	Distance	**D cm**
4 Point Dist	Distance	**D1**, **D2**, **D3 cm**
5 Point Dist	Distance	**D1**, **D2**, **D3**, **D4 cm**
6 Point Dist	Distance	**D1**, **D2**, **D3**, **D4**, **D5 cm**
2 Distance Avg	Distance	**D1, D2 cm** **Avg cm**
3 Distance Avg	Distance	**D1, D2, D3 cm** **Avg cm**
Open Trace	Distance	**D cm**
Open Spline	Distance	**D cm**
Ellipse	Distance Circumference Area	**D1**, **D2 cm** **C cm** **A cm^2**
Single Angle **Cardiac Axis**	Angle	**Angle °**
Hip (α)	Angle	**α °**
Hip (α+β) **Hip (β+α)** **Cross Angle**	Angle	**α °** **β °**
1 Ellipse	Distance Circumference Area Volume	**D1**, **D2 cm** **C cm** **A cm^2** **V cm^3**
Vol 1E + 1D	Distance Circumference Area Volume	**D, D1**, **D2 cm** **C cm** **A cm^2** **V cm^3**
Vol 1 Dist	Distance Volume	**D cm** **V cm^3**
Vol 2 Dist	Distance Volume	**D1, D2 cm** **V cm^3**
Vol 3 Dist	Distance Volume	**D1**, **D2**, **D3 cm** **V cm^3**

Measurement Method	Measurement Results	Displayed Results
Disk **Disk Trace**	Disk Volume	**V cm^3**
Dist Ratio	Distance	**A**, **B cm**
Volume Ratio	Ratio	**A/B**
Area Ratio		**B/A**
d:D Ratio		**(A-B)/A**
%FHC	Distance	**D cm**
	Distance	**d cm**
	Ratio	**%FHC %**
eSieCalcs	Distance	**D cm**
	Circumference	**C cm**
	Area	**A cm^2**
Trace	Circumference	**C cm**
Spline	Area	**A cm^2**
D-%Stenosis	Distance	**D1**, **D2 cm**
	Percentage stenosis	**%Steno %**
A-%Stenosis	Area	**A1**, **A2 cm^2**
ET-%Stenosis	Percentage stenosis	**%Steno %**
Auto Stenosis	Area	**A1**, **A2 cm^2**
	Circumference	**C1**, **C2 cm**
	Percentage stenosis	**%Steno %**
O-Marker	Distance	**D cm**

M-Mode Measurement Methods

Measurement Method	Measurement Results	Displayed Results
Distance	Distance	**D cm**
4 Point Dist	Distance	**D1**, **D2**, **D3 cm**
5 Point Dist	Distance	**D1**, **D2**, **D3**, **D4 cm**
Slope	Distance	**D cm**
	Slope	**Slope cm/s**
	Time	**T ms**
HR	Heart rate	**HR bpm**
	Time	**T ms**
Time	Time	**T ms**
Dist Ratio	Distance	**D cm**
	Ratio	**A/B**
		B/A
		(A-B)/A
Time Ratio	Time	**T s**
	Ratio	**A/B**
		B/A
		(A-B)/A

Doppler Measurement Methods

Measurement Method	Measurement Results	Displayed Results
PI Auto	Pulsatility index	**PI**
	Resistive index	**RI**
	Systole/diastole	**S/D**
	Peak systole	**PS cm/s**
	End diastole	**ED cm/s**
	Time-averaged maximum	**TAmax**
	Time-averaged mean	**TAmean**
PI Manual	Pulsatility index	**PI**
	Resistive index	**RI**
	Systole/diastole	**S/D**
	Peak systole	**PS cm/s**
	End diastole	**ED cm/s**
	Time-averaged maximum	**TAmax cm/s**
Velocity	Velocity	**V cm/s**
	Frequency	**Freq kHz**
	Pressure gradient	**PG mmHg**
RI	Peak systole	**PS cm/s**
	End diastole	**ED cm/s**
	Systole/diastole	**S/D**
	Resistive index	**RI**
A-Flow	Distance	**D1**, **D2 cm**
	Circumference	**C cm**
	Area	**A cm^2**
	Time-averaged mean	**TAMean cm/s**
	Flow volume	**FV L/min**
D-Flow	Distance	**D1 cm**
	Area	**A cm^2**
	Time-averaged mean	**TAMean cm/s**
	Flow volume	**FV L/min**
Velocity Ratio	Velocity	**V1**, **V2 cm/s**
	Frequency	**Freq1, Freq2 kHz**
	Ratio	**V1/V2**
	Ratio	**V2/V1**
	Ratio	**(V1-V2)/V1**

Measurement Method	Measurement Results	Displayed Results
Acceleration	Slope	**Acceleration m/s^2**
	Time	**T ms**
	Peak velocity	**Vmx cm/s**
Time	Time	**T ms**
VTI	Velocity-time integral	**VTI cm**
	Maximum velocity	**Vmax m/s**
	Mean velocity	**Vmean m/s**
	Maximum pressure gradient	**PGmax mmHg**
	Mean pressure gradient	**PGmean mmHg**
	Actual time	**AT ms**
	Estimated time	**ET ms**
VTI Trace	Velocity-time integral	**VTI cm**
	Maximum velocity	**Vmax m/s**
	Mean velocity	**Vmean m/s**
	Maximum pressure gradient	**PGmax mmHg**
	Mean pressure gradient	**PGmean mmHg**
	Actual time	**AT ms**
	Estimated time	**ET ms**
HR	Heart rate	**HR bpm**
	Time	**T ms**
PHT Guide	Pressure half time	**PHT ms**
	Maximum velocity	**Vmax cm/s**
	Velocity	**V1**, **V2 cm/s**
	Deceleration time	**DT ms**
	Deceleration slope	**DS m/s^2**
PHT	Pressure half time	**PHT ms**
	Maximum velocity	**cm/s**
	Velocity	**V1**, **V2 cm/s**
	Deceleration time	**DT ms**
	Deceleration slope	**DS m/s^2**
dP/dt	Delta time	**dt ms**
	Delta pressure over delta time	**dP/dt mmHg/s**
Time Ratio	Time	**T s**
	Ratio	**A/B**
		B/A
		(A-B)/A
E/A Vel + DT	Pressure half time	**PHT ms**
	Deceleration time	**DT ms**
	Deceleration slope	**DS m/s^2**
	E point	**E Pt cm/s**
	A point	**A Pt cm/s**

Exam-Specific Measurement Methods

2D-Mode Obstetric Measurement Methods

The following measurement methods are available only during the following exam types:
obstetric, early obstetric.

Measurement Method	Measurement Results	Displayed Results
AFI	Distance	**AFI mm** **Q1**, **Q2**, **Q3**, **Q4 mm**
AP Depth	Distance	**D cm**

Measurement Formulas

2D-Mode Measurement Formulas

Measurement Result	Formula	Abbreviation
Area	A = π x D1 / 2 x D2 / 2 / 100 cm²	A = area
	C = π (D1/2 + D2/2) mm	C = circumference
Percentage stenosis, distance	%Steno = (D1 - D2) / D1 x 100	%Steno = percentage stenosis
		D1 = distance of long axis
		D2 = distance of short axis
Percentage stenosis, area	%Steno = (A1 - A2) / A1 x 100	%Steno = percentage stenosis
		A1 = large area
		A2 = small area
Volume, one distance	V = π*D³ / 6 / 1000 cm³	V = volume
		D = distance
Volume, two distances	V = π x D1 x D2² / 6 / 1000 cm³	V = volume
		D1 = length
		D2 = distance
Volume, three distances	V = π x D1 x D2 x D3 / 6 / 1000 cm³	V = volume
		D1 = length
		D2 = depth
		D3 = width
Volume, one ellipse and one distance	C = π (D1/2 + D2/2) mm	V = volume
	A = π x D1½ x D2½ / 100 cm	A = area
	V = π x D1 x D2 x D/6 / 1000 cm³	C = circumference
		D1 = distance
		D2 = distance
Volume, one ellipse	C = π (D1 / 2 + D2 / 2) mm	V = volume
	A = π x D1½ x D2½ / 100 cm	A = area
	V = 8A² / (3 x π (longer value between D1 & D2)) x 10	C = circumference
		D1 = distance
		D2 = distance
		D = distance
Volume, disk	V = π x L / 20*Sigma (Ri² mm) / 1000 mL	V = volume
Average, two distances	Avg = (D1 + D2) / 2	D1 = distance
		D2 = distance
		Avg: average of distances
Average, three distances	Avg = (D1 + D2 + D3) / 3	D1 = distance
		D2 = distance
		D3 = distance
		Avg: average of distances
Angle, cross angle	α+β = 180˚	α = angle
	α<180˚, β<180˚	β = angle

M-Mode Measurement Formulas

Measurement Result	Formula	Abbreviation
Slope	S = D / T	S = slope D = distance T = time

Doppler Measurement Formulas

Measurement Result	Formula	Abbreviation
Resistive index	RI = (PS - ED) / PS	RI = resistive index PS = peak systole ED = end diastole
Pulsatility index	PI = (PS - ED) / TAmx	PI = pulsatility index PS = peak systole ED = end diastole TAmx = time averaged maximum velocity
Acceleration	Accel = (Vmx – Vmn) cm / T ms x 1000 sec / 100 m	V = volume T = time Accel = acceleration
Flow volume	FV = TAmn x A x 60 / 1000 (A = π / 4 x D^2 / 100)	FV = flow volume TAmn = time averaged mean velocity A = area D = distance
Flow volume	FV = TAmn x A x 60 / 1000 (A = π / 4 x D1 x D2 / 100)	FV = flow volume TAmn = time averaged mean velocity A = area D1, D2 = distance
Velocity	P = 4V² m	P = peak gradient V= volume
Velocity time integral	VTI = Velocity x Time	VTI = velocity time integral
Heart rate	{60 sec / 1 heart beat cycle time x 1000 sec}	-

See also: For information about exam specific reports, refer to Appendix C, Appendix D, and Appendix E in this manual.

Appendix C Obstetrical Reference

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Obstetric Measurement and Calculation Labels

2D-Mode Measurement Labels for Estimating Gestational Age

Note: An estimated fetal age can be calculated when you measure both **APTD** and **TTD**.

Measurement Label	Description	Measurement Method
Mean Sac Diam	Mean Gestational Sac Diameter	3 Distance Avg
GSD	Gestational Sac, Maximum Length	Distance
CRL	Crown Rump Length	Distance
BPD	Biparietal Diameter	Distance
HC	Head Circumference. Also performs the following measurements and calculations: ▪ Cephalic Index (**CI**) ▪ Biparietal Diameter (**BPD**), if specified in the configuration settings ▪ Occipital Frontal Diameter (**OFD**), if specified in the configuration settings	Ellipse
AC	Abdominal Circumference. Also performs the following measurements and calculations if specified in the configuration settings: ▪ Antero-posterior Abdominal Diameter (**APAD**) ▪ Transverse Abdominal Diameter (**TAD**) **Note:** When you measure abdominal circumference, the system assigns the larger measurement to transverse abdominal diameter and the smaller measurement to antero-posterior abdominal diameter.	Ellipse
FL	Femur Length	Distance
OFD	Occipital Frontal Diameter	Distance
TAD	Transverse Abdominal Diameter	Distance
APAD	Antero-posterior Abdominal Diameter	Distance
HL	Humerus Length	Distance
Binoc D	Binocular Distance (Outer Orbital Diameter)	Distance
Clavicle	Clavicle Length	Distance
FTA	Fetal Trunk Area	Ellipse
APTD	Antero-posterior Trunk Diameter	Distance
TTD	Transverse Thoracic Diameter	Distance
Tibia	Tibia Length	Distance
Ulna	Ulna Length	Distance
Foot	Foot Length	Distance

2D-Mode Measurement Labels Not Related to Estimating Gestational Age

Measurement Label	Description	Measurement Method
Yolk Sac	Yolk Sac Diameter	Distance
Intra Trans	Intracranial Translucency	Distance
Nuchal Translucency	Nuchal Translucency	Distance
Nuchal Thickness	Nuchal Fold Thickness	Distance
TC	Thoracic Circumference	Ellipse
AFI	Amniotic Fluid Index in up to four quadrants	Distance
HW	Hemispheric Width (Width of Hemisphere)	Distance
LV-A	Anterior Horn Lateral Ventricular Width	Distance
LV-P	Posterior Horn Lateral Ventricular Width	Distance
Lat Vent	Lateral Ventricle Width	Distance
Cist Magna	Cisterna Magna	Distance
Cervix (TA)	Cervix Length, transabdominal	Distance
Cervix (EV)	Cervical Length, endovaginal	Distance
Umb V Diam	Umbilical Vein Diameter	Distance
APTD	Anteroposterior Trunk Diameter	Distance
TTD	Transverse Trunk Diameter	Distance
Facial Angle	Facial Angle	Single Angle
TA	Thoracic Area	Ellipse
MAD	Mean Abdominal Diameter	Distance
Fibula	Fibula Length	Distance
Radius	Radius Length	Distance
Kidney Length	Kidney Length	Distance
Kidney Width	Kidney Width	Distance
Kidney AP	Kidney Anteroposterior	Distance
Ureter	Ureter Length	Distance
PreVoid Bladder Length	Pre-Void Bladder Length	Distance
PreVoid Bladder AP	Pre-Void Bladder Anteroposterior	Distance
PreVoid Bladder Width	Pre-Void Bladder Width	Distance
PostVoid Bladder Length	Post-Void Bladder Length	Distance
PostVoid Bladder AP	Post-Void Bladder Anteroposterior	Distance
PostVoid Bladder Width	Post-Void Bladder Width	Distance
Fibroid 1	Fibroid 1, numbered 1 through 5	Distance
Cyst 1	Cyst 1, numbered 1 through 5	Distance
Mass 1	Mass 1, numbered 1 through 5	Distance

Measurement Label	Description	Measurement Method
CTR Area	Cardiothoracic Area Ratio	Area Ratio
CSP	Cavum Septum Pellucidum	Distance
IOD	Interocular Distance (Inner Ocular Distance)	Distance
Nasal Bone	Nasal Bone	Distance
Cerebellum	Cerebellum (Trans Cerebellar Diameter)	Distance
Aorta	Aorta Diameter	Distance
Umb A	Umbilical Artery	Distance
Cardiac Axis	Cardiac Axis	Cardiac Axis
Amniotic Pocket	Amniotic fluid pocket	Distance
Q1	Amniotic Fluid Index Q1, numbered Q1 through Q4	Distance
Uterus Width (TA)	Uterus Width, transabdominal	Distance
Uterus Length (TA)	Uterus Length, transabdominal	Distance
Uterus AP (TA)	Uterus Anteroposterior Diameter, transabdominal	Distance
Uterus Width (EV)	Uterus Width, endovaginal	Distance
Uterus Length (EV)	Uterus Length, endovaginal	Distance
Uterus AP (EV)	Uterus Anteroposterior Diameter, endovaginal	Distance
Ovary Width (TA)	Ovary Width, transabdominal	Distance
Ovary Length (TA)	Ovary Length, transabdominal	Distance
Ovary AP (TA)	Ovary Anteroposterior Diameter, transabdominal	Distance
Ovary Width (EV)	Ovarian Transverse Diameter (Width), endovaginal	Distance
Ovary Length (EV)	Ovary Length, endovaginal	Distance
Ovary AP (EV)	Ovary Anteroposterior Diameter, endovaginal	Distance
Endo Thick Width (TA)	Endometrium Thickness Width, transabdominal	Distance
Endo Thick Length (TA)	Endometrium Thickness Length, transabdominal	Distance
Endo Thick AP (TA)	Endometrium Thickness Anteroposterior Diameter, transabdominal	Distance
Endo Thick Width (EV)	Endometrium Thickness Width, endovaginal	Distance
Endo Thick Length (EV)	Endometrium Thickness Length, endovaginal	Distance
Endo Thick AP (EV)	Endometrium Thickness Anteroposterior Diameter, endovaginal	Distance

Measurement Label	Description	Measurement Method
AoD Arch	Aortic Arch Diameter	Distance
LVOT diam	Left Ventricular Outflow Tract	Distance
RVOT diam	Right Ventricular Outflow Tract	Distance
Asc AoD	Ascending Aorta Diameter	Distance
Desc AoD	Descending Aorta Diameter	Distance
PA	Pulmonary Artery	Distance
IVS d	Interventricular Septal Thickness in diastole	Distance
IVS s	Interventricular Septal Thickness in systole	Distance
LVID d	Left Ventricle Internal Diameter in diastole	Distance
LVID s	Left Ventricle Internal Diameter in systole	Distance
LVPW d	Left Ventricle Posterior Wall Thickness in diastole	Distance
LVPW s	Left Ventricle Posterior Wall Thickness in systole	Distance
RVD d	Right Ventricle Diameter in diastole	Distance
Total Cardiac Dimension	Total Cardiac Dimension	Distance

2D-Mode Calculation Labels

Calculation Label	Description	Required Measurements
EFW1 **EFW2**	Estimated Fetal Weight	Required measurements vary depending on the selected reference authors
PreVoid Bladder Vol	Pre-Void Bladder Volume	**PreVoid Bladder Length** **PreVoid Bladder AP** **PreVoid Bladder Width**
PostVoid Bladder Vol	Post-Void Bladder Volume	**PostVoid Bladder Length** **PostVoid Bladder AP** **PostVoid Bladder Width**
Micturated Volume	Micturated Volume	**PreVoid Bladder Vol** **PostVoid Bladder Vol**
Ovary Volume (TA)	Ovary, transabdominal (Transabdominal)	**Ovary Length (TA)** **Ovary Width(TA)** **Ovary AP (TA)**
Ovary Volume (EV)	Transvaginal Ovarian Volume (Endovaginal)	**Ovary Length (EV)** **Ovary Width(EV)** **Ovary AP (TA)**
AFI	Amniotic Fluid Index	**Q1** **Q2** **Q3** **Q4**
Uterus Volume (TA)	Uterus Volume (Transabdominal)	**Uterus (TA) Length** **Uterus (TA) Width** **Uterus (TA) AP**
Uterus Volume (EV)	Uterus Volume (Endovaginal)	**Uterus (EV) Length** **Uterus (EV) Width** **Uterus (EV) AP**
Kidney Volume (Fetus)	Kidney Volume (Fetus)	**Kidney Length** **Kidney Width** **Kidney AP**
APTD X TTD	Anteroposterior Trunk Diameter multiplied by Transverse Trunk Diameter	**APTD** **TTD**
BPDa	Biparietal Diameter corrected by a formula to adjust the head shape	**BPD** **OFD**
Cerebellum/ AC	Growth Analysis from Transverse Cerebellar Diameter over Abdominal Circumference	**Cerebellum** **AC**

Calculation Label	Description	Required Measurements
FL/AC	Ratio of Femur Length to Abdominal Circumference	**FL** **AC**
FL/BPD	Ratio of Femur Length to Biparietal Diameter	**FL** **BPD**
HC/AC	Ratio of Head Circumference to Abdominal Circumference	**HC** **AC**
Lat Vent/HW	Ratio of Lateral Ventricular Width to Hemispheric Width	**LVW** **HW**
CI	Cephalic Index short axis / long axis * 100	**BPD** **OFD**
Cubed / Gibson / Teichholz	---	
EDV	Left Ventricular End-Diastolic Volume	**LVID d**
EF	Ejection Fraction is the ratio of the stroke volume to the end-diastolic volume	**SV** **EDV**
ESV	Left Ventricular End-Systolic Volume	**LVID s**
FS	Fractional Shortening is the percentage of shortening of the Left ventricular dimension	**LVID d** **LVID s**

Doppler Calculation Labels

Calculation Label	Description	Required Measurements
Ductus V PLI	Ductus Venous Preload Index	**Ductus V S Vmax** **Ductus V A Vmax**
Ductus V PVIV	Ductus Venous Peak velocity index for veins	**Ductus V S Vmax** **Ductus V A Vmax** **Ductus V D Vmax**
Ductus V S/a	Ductus Venous S point / a point	**Ductus V S Vmax** **Ductus V A Vmax**
LV MPI	Left Ventricle Myocardial Performance Index	**LV ET** **LV C-O dur**
RV MPI	Right Ventricle Myocardial Performance Index	**RV ET** **RV C-O dur**

M-Mode Measurement Labels

Measurement Label	Description	Measurement Method
Fetal HR	Fetal Heart Rate, in beats per minute	HR
LVOT diam	Left Ventricular Outflow Tract	Distance
RVOT diam	Right Ventricular Outflow Tract	Distance
Asc AoD	Ascending Aorta Diameter	Distance
Desc AoD	Descending Aorta Diameter	Distance
AoD Arch	Aortic Arch Diameter	Distance
PA	Pulmonary Artery	Distance
IVS d	Interventricular Septal Thickness in diastole	Distance
IVS s	Interventricular Septal Thickness in systole	Distance
LVID d	Left Ventricle Internal Diameter in diastole	Distance
LVID s	Left Ventricle Internal Diameter in systole	Distance
LVPW d	Left Ventricle Posterior Wall Thickness in diastole	Distance
LVPW s	Left Ventricle Posterior Wall Thickness in systole	Distance
RVD d	Right Ventricle Diameter in diastole	Distance

Doppler Measurement Labels

Measurement Label	Description	Measurement Method
Fetal HR	Fetal Heart Rate in beats per minute	HR
Umb A	Umbilical Artery	PI Auto
Umb V A Vmax	Umbilical Vein A Vmax	Velocity
Umb V D Vmax	Umbilical Vein D Maximum Velocity	Velocity
Umb V S Vmax	Umbilical Vein S Maximum Velocity	Velocity
Uterine A	Uterine Artery	PI Auto
Ductus V All	Ductus Venous All	PI Auto
Ductus V S	Ductus V S Vmax	Velocity
Ductus V A	Ductus V A Vmax	Velocity
Ductus V D	Ductus V D Vmax	Velocity
Aorta	Aorta	PI Auto
IVC PLI	Preload Index	Velocity Ratio V1 = S, V2=a
Ao Desc s	Aortic Descending Systole	Velocity

Measurement Label	Description	Measurement Method
LVOT Vmax	Left Ventricular Outflow Tract Maximum Velocity	Velocity
RVOT Vmax	Right Ventricular Outflow Tract Maximum Velocity	Velocity
LV ET	Left Ventricular Ejection Time	Time
RV ET	Right Ventricular Ejection Time	Time
LV C-O dur	Left Ventricular Close-Open Duration	Time
RV C-O dur	Right Ventricular Close-Open Duration	Time
Asc Ao Vmax	Ascending Aorta Maximum Velocity	Velocity
Desc Ao Vmax	Descending Aorta Maximum Velocity	Velocity
DA Vmax	Ductus Arteriosus Maximum Velocity	Velocity
PA	Pulmonary Artery	Velocity
Ao Arch Vmax	Aortic Arch Velocity Maximum	Velocity
Ovarian A	Ovarian Artery	PI Auto
Uterine A	Uterine Artery	PI Auto
MCA	Middle Cerebral Artery	PI Auto

M-Mode Calculation Labels

Calculation Label	Description	Required Measurements
Cubed / Gibson / Teichholz	---	
EDV	Left Ventricular End-Diastolic Volume	**LVID d**
EF	Ejection Fraction is the ratio of the stroke volume to the end-diastolic volume	**SV** **EDV**
ESV	Left Ventricular End-Systolic Volume	**LVID s**
FS	Fractional Shortening is the percentage of shortening of the left ventricular dimension	**LVID d** **LVID s**
SV	Stroke Volume is the volume of blood ejected from a ventricle during one cardiac cycle or phase of ventricular systole	**EDV** **ESV**

Sections in the Patient Report

Section	Description
Exam Specific Information	Gestational age, date of confinement, and fetal weight estimations
2D Measurements	Measurement labels and results for 2D-mode measurements
2D Ratio	2D-mode measurement ratios specified in the configuration settings.
M Measurements	Measurement labels and results for M-mode measurements
D Measurements	Measurement labels and results for Doppler measurements
OB (2D), **(D)**	(Available only for the obstetric exam type) Measurement labels and result only for the obstetric exam in 2D or Doppler mode.
Fetal Heart (2D), **(M)**, **(D)**	(Available only for the advanced obstetric exam types) Measurement labels and result for fetal heart motion in 2D, M or Doppler mode.
Assessment	Descriptions for exam-related structures. You can select system defined or user-defined descriptions. ▪ **Fetal Heart Motion** ▪ **4Ch heart** ▪ **RVOT** ▪ **LVOT** ▪ **Ao Arch** ▪ **Ductal Arch** ▪ **Fetal Number** ▪ **Fetal Position** ▪ **Placenta Location** ▪ **Previa** ▪ **Placenta Grade** ▪ **AF Volume** ▪ **Placental Cord** ▪ **Facial Profile** ▪ **Lips/Palate** ▪ **Lateral Ventricles** ▪ **Choroid** ▪ **Posterior Fossa** ▪ **Cerebellum** ▪ **Nuchal Fold** ▪ **C-Spine** ▪ **T-Spine** ▪ **L-Spine** ▪ **Sacrum** ▪ **4 Extremities** ▪ **L Ankle/Foot** ▪ **Diaphragm** ▪ **Lungs** ▪ **Stomach** ▪ **Cord Insertion** ▪ **3-V Cord** ▪ **Abdominal Wall** ▪ **R Kidney** ▪ **L Kidney** ▪ **Bladder** ▪ **Bowel Pattern** ▪ **Genitalia** ▪ **Cardiac Rhythm** ▪ **R Ankle/Foot**

Section	Description
Biophysical Profile	Fetal parameters for creating a biophysical profile. ▪ **Fetal Breathing Movements** ▪ **Fetal Tone** ▪ **Fetal Movements** ▪ **Amniotic Fluid Volume** ▪ **Total Score**
Growth Graph	(Available only for the early obstetric and obstetric exam types) Growth analysis graphs indicating predicted fetal growth patterns
Quick Grow Graph	(Available only for the advanced obstetric exam type) Measurement and calculation results and quick growth graphs
USGA Data Graph	(Available only for the advanced obstetric exam type) Graphs with an estimated gestational age
Images	Images included from the thumbnail panel
Comments	Any combination of predefined comments and user-entered comments

Growth Analysis Graph Measurements and Calculations

References for growth analysis often differ from the references for estimated gestational age for the same label.

Note: References for growth curves typically use 5 or 10 percent for the lower limit and 90 or 95 percent for the upper limit.

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.

Graph	Description	References
Mean Sac Diam	Mean Gestational Sac Diameter	Hellman, Rempen
CRL	Crown Rump Length	Hadlock, Robinson, Hansmann, Rempen, ASUM, JSUM, Osaka, Tokyo, INTERGROWTH-21st, Pexters
BPD	Biparietal Diameter	Hadlock, Merz, Lasser, Hansmann, Rempen, ASUM, Chitty (O-I), Chitty (O-O), JSUM, Osaka, Tokyo, Nicolaides, Verburg, CFEF, Grumbach (Twin), INTERGROWTH-21st
OFD	Occipital Frontal Diameter	Hansmann, ASUM, Chitty, Nicolaides, INTERGROWTH-21st
HC	Head Circumference	Hadlock, Merz, Hansmann, ASUM, Chitty, Nicolaides, Verburg, CFEF, Deter, INTERGROWTH-21st
AC	Abdominal Circumference	Hadlock, Merz, Jeanty, ASUM, Chitty, JSUM, Nicolaides, Verburg, CFEF, Deter, Grumbach (Twin), INTERGROWTH-21st

Graph	Description	References
FL	Femur Length	Jeanty, Hadlock, Merz, Hansmann, ASUM, JSUM, Osaka, Tokyo, Nicolaides, Chitty, Verburg, CFEF, INTERGROWTH-21st, Warda
HL	Humerus Length	Jeanty, Merz, Hansmann, ASUM, Osaka, Chitty
Ulna	Ulna Length	Jeanty, Merz, Hansmann, Chitty
Tibia	Tibia Length	Jeanty, Merz, Hansmann, Chitty
Foot	Foot Length	Mercer, Chitty
TC	Thoracic Circumference	Chitkara
Clavicle	Clavicle Length	Yarkoni
FTA	Fetal Trunk Area	Osaka
AFI	Amniotic Fluid Index	Moore
Cerebellum	Cerebellum (Trans Cerebellar Diameter)	CFEF, Nicolaides, Verburg
Cist Magna	Cisterna Magna (Posterior Fossa)	Nicolaides
EFW1, **EFW2**	Estimated Fetal Weight	Hadlock, Hansmann, Jeanty, Yarkoni, Osaka, JSUM, Tokyo, Brenner, Doubilet, Williams
FL/AC	A ratio of Femur Length to Abdominal Circumference	Hadlock
FL/BPD	A ratio of Femur Length to Biparietal Diameter	Hohler
CI	Cephalic Index	Hadlock, Chitty
Cerebellum/ AC	Transcerebellar Diameter to Abdominal Circumference Ratio	Meyer, Nicolaides
GSD	Gestational Sac, Maximum Length	Hellman, Rempen, Tokyo
LV-A	Anterior Horn Lateral ventricular width	Nicolaides
LV-P	Posterior Horn Lateral ventricular width	Nicolaides
APTD x TTD	Anteroposterior Trunk Diameter multiplied by Transverse Trunk Diameter	JSUM, Tokyo
MCA PI	Middle Cerebral Artery PI	JSUM
MCA RI	Middle Cerebral Artery RI	JSUM
Umb A PI	Umbilical Artery PI	JSUM
Umb A RI	Umbilical Artery RI	JSUM
HC/AC	Ratio of Head Circumference to Abdominal Circumference	Nicolaides, Cambell
Kidney AP	Kidney Anteroposterior	Bertagnoli, CFEF, Hansmann
Kidney Length	Kidney Length	Bertagnoli, CFEF, Hansmann
Kidney Width	Kidney Width	CFEF
MAD	Mean Abdominal Diameter	Kurmanavicius
TAD	Transverse Abdominal Diameter	CFEF
Fibula	Fibula	Chitty
Radius	Radius	Chitty
Uterine A	Uterine Artery	Merz, Schaffer

Appendix D Cardiac Reference

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Cardiac Measurement and Calculation Labels

2D-Mode Measurement Labels

Measurement Label	Description	Measurement Method
Mitral Valve	Mitral Valve Function	---
EPSS	E Point to Septal Separation. The distance between the anterior leaflet and the ventricular septum at early diastole.	Distance
MV Area	Mitral Valve Area	Trace
MV Diam	Mitral Valve Diameter	Distance
HR	Heart Rate	HR
HR (Edit)	Heart Rate	(user-entered value)
AO/LA	Aorta/Left Atrium	---
RV Diam	Right Ventricular Diameter	Distance
AOd	Aorta at end-diastole	Distance
AOs	Aorta at end-systole	Distance
ACS	Aortic Cusp Separation	Distance
LAd Diam	Left Atrial Diameter at end-diastole	Distance
LAs Diam	Left Atrial Diameter at end-systole	Distance
Aortic Valve	Aortic Valve Function	---
LVOT Diam	Left Ventricular Outflow Tract Diameter	Distance
AV Area	Aortic Valve Area	Trace
HR	Heart Rate	HR
HR (Edit)	Heart Rate	(user-entered value)
Pulmonary Valve	Pulmonary Valve Function	---
PV Diam	Pulmonary Valve diameter	Distance
HR	Heart Rate	HR
HR Edit	Heart Rate	(user-entered value)
RV	Right Ventricle Function	---
RV Diam	Right Ventricle diameter	Distance
PISA (AR)	Proximal Isovelocity Surface Area (Aortic Regurgitation)	---
AR Radius	Aortic Regurgitation Radius	Distance
AR Aliasing Vel	Aortic Regurgitation Aliasing Velocity	Velocity
PISA (TR)	Proximal Isovelocity Surface Area (Tricuspid Regurgitation)	---
TR Radius	Tricuspid Regurgitation Radius	Distance
TR Aliasing Vel	Tricuspid Regurgitation Aliasing Velocity	Velocity

Measurement Label	Description	Measurement Method
PISA (MR)	Proximal Isovelocity Surface Area (Mitral Regurgitation)	---
MR Radius	Mitral Regurgitation Radius	Distance
MR Aliasing Vel	Mitral Regurgitation Aliasing Velocity	Velocity
PISA (MS)	Proximal Isovelocity Surface Area (Mitral Stenosis)	---
MS Radius	Mitral Stenosis Radius	Distance
MS Aliasing Vel	Mitral Stenosis Aliasing Velocity	Velocity
MS Angle	Mitral Stenosis Angle	Angle
Qp/Qs	Pulmonary-Systemic Flow Ratio	---
Systemic Diam	Systemic diameter	Distance
Pulmonic Diam	Pulmonic diameter	Distance
HR	Heart Rate	HR
HR (Edit)	Heart Rate	(user-entered value)
(LV Dimensions)	Left Ventricular Dimensions	---
RVAWd	Right Ventricular Anterior Wall at end-diastole	Distance
RVDd	Right Ventricular Dimension at end-diastole	Distance
IVSd	Interventricular Septal Dimension at end-diastole	Distance
LVIDd	Left Ventricular Internal Dimension at end-diastole	Distance
LVPWd	Left Ventricular Posterior Wall Dimension at end-diastole	Distance
Systole	Left Ventricular Dimension at end-systole	Distance
Diastole	Left Ventricular Dimension at end-diastole	Distance
IVSs	Interventricular Septal Dimension at end-systole	Distance
LVIDs	Left Ventricular Internal Dimension at end-systole	Distance
LVPWs	Left Ventricular Posterior Wall Dimension at end-systole	Distance
(LV Volume-specific)	Left Ventricular Volume	---
LVAd sxPM	Left Ventricular Area at Papillary Muscle level at end-diastole in short axis view	Spline
LVAd sxMV	Left Ventricular Area at Mitral Valve level at end-diastole in short axis view	Spline
LVLd apical	Left Ventricular Length at end-diastole in apical view	Distance
LVAs sxPM	Left Ventricular Area at Papillary Muscle level at end-systole in short axis view	Spline
LVAs sxMV	Left Ventricular Area at Mitral Valve level at end-systole in short axis view	Spline
LVLs apical	Left Ventricular Length at end-systole in apical view	Distance
LVAd apical	Left Ventricular Long Axis Area at end-diastole in apical view	Spline
LVAs apical	Left Ventricular Long Axis Area at end-systole in apical view	Spline

Measurement Label	Description	Measurement Method
(LV Mass-specific)	Left Ventricular Mass	---
A Sax Epi	Area short axis epicardial	Spline
A Sax Endo	Area short axis endocardial	Spline
a	Semi-major axis from widest minor axis radius to apex	Distance
d	Truncated semi-major axis from widest minor axis radius to mitral annulus plane	Distance
LVL	Left Ventricular Length	Distance
(LA Volume-specific)	Left Atrial Volume	---
A1-A4C	End-Diastolic Volume for 4-chamber	Spline
A2-A2C	Two-chamber or apical long area of left atrium	Spline
L	Length	Distance
4CH	Four-chamber volume	Volume (Disk)
2CH	Two-chamber volume	Volume (Disk)
(RA Volume-specific)	Right Atrial Volume	---
A1-A4C	Four-chamber area of right atrium	Spline
A2-A2C	Two-chamber or apical long area of right atrium	Spline
L	Length	Distance
4CH	Four-chamber volume	Volume (Disk)
2CH	Two-chamber volume	Volume (Disk)
IVC	Inferior Vena Cava	Distance

2D-Mode Calculation Labels

Calculation Label	Description	Required Measurements	Units
CI	Cardiac Index is the cardiac output of the left ventricle per square meter of body surface area (BSA): CI = CO ÷ BSA For height in centimeters and weight in kilograms: BSA = 0.007184 x (Weight$^{0.425}$) x (Height$^{0.725}$) For height in feet/inches and weight in pounds: BSA = 0.007184 x (Weight x 0.454)$^{0.425}$ x (Height x 2.54)$^{0.725}$	**HR** and **BSA** (BSA is determined by height and weight of patient; entered in the patient data form) **EDV (BP)** **ESV (BP)**	L/min/m^2
LA CI	Left Atrium Cardiac Index is the cardiac output of the left atrium per square meter of body surface area (BSA): LA CI = CO ÷ BSA For height in centimeters and weight in kilograms: BSA = 0.007184 x (Weight$^{0.425}$) x (Height$^{0.725}$) For height in feet/inches and weight in pounds: BSA = 0.007184 x (Weight x 0.454)$^{0.425}$ x (Height x 2.54)$^{0.725}$	**HR** and **BSA** (BSA is determined by height and weight of patient; entered in the patient data form) **LA EDV (BP)** **LA ESV (BP)**	L/min/m^2
CI2	Cardiac Index is the cardiac output of the left ventricle per square meter of body surface area (BSA): CI2 = CO2 ÷ BSA For height in centimeters and weight in kilograms: BSA = 0.007184 x (Weight$^{0.425}$) x (Height$^{0.725}$) For height in feet/inches and weight in pounds: BSA = 0.007184 x (Weight x 0.454)$^{0.425}$ x (Height x 2.54)$^{0.725}$	**HR** and **BSA** (BSA is determined by height and weight of patient; entered in the patient data form) **2ch EDV** **2ch ESV**	L/min/m^2
LA CI2	Left Atrium Cardiac Index is the cardiac output of the left atrium per square meter of body surface area (BSA): LA CI2 = LA CO2 ÷ BSA For height in centimeters and weight in kilograms: BSA = 0.007184 x (Weight$^{0.425}$) x (Height$^{0.725}$) For height in feet/inches and weight in pounds: BSA = 0.007184 x (Weight x 0.454)$^{0.425}$ x (Height x 2.54)$^{0.725}$	**HR** and **BSA** (BSA is determined by height and weight of patient; entered in the patient data form) **2ch EDV** **2ch ESV**	L/min/m^2

Calculation Label	Description	Required Measurements	Units
CI4	Cardiac Index is the cardiac output of the left ventricle per square meter of body surface area (BSA): CI4 = CO4 ÷ BSA For height in centimeters and weight in kilograms: BSA = 0.007184 x (Weight$^{0.425}$) x (Height$^{0.725}$) For height in feet/inches and weight in pounds: BSA = 0.007184 x (Weight x 0.454)$^{0.425}$ x (Height x 2.54)$^{0.725}$	**HR** and **BSA** (BSA is determined by height and weight of patient; entered in the patient data form) **4ch EDV** **4ch ESV**	L/min/m^2
LA CI4	Left Atrium Cardiac Index is the cardiac output per of the left atrium per square meter of body surface area (BSA): LA CI4 = LA CO4 ÷ BSA For height in centimeters and weight in kilograms: BSA = 0.007184 x (Weight$^{0.425}$) x (Height$^{0.725}$) For height in feet/inches and weight in pounds: BSA = 0.007184 x (Weight x 0.454)$^{0.425}$ x (Height x 2.54)$^{0.725}$	**HR** and **BSA** (BSA is determined by height and weight of patient; entered in the patient data form) **4ch EDV** **4ch ESV**	L/min/m^2
CO	Cardiac Output is the effective volume of blood ejected from the left ventricle of the heart per unit of time: CO = [(EDV - ESV) ÷ 1000](HR)	**EDV** **ESV** **HR**	L/min
CO2	Cardiac Output is the effective volume of blood ejected from the left ventricle of the heart per unit of time: CO2 = [(2ch EDV - 2ch ESV) ÷ 1000](HR)	**2ch EDV** **2ch ESV** **HR**	L/min
LA CO2	Left Atrium Cardiac Output is the effective volume of blood ejected from the left atrium of the heart per unit of time: LA CO2 = [(2ch EDV - 2ch ESV) ÷ 1000](HR)	**2ch EDV** **2ch ESV** **HR**	L/min
CO4	Cardiac Output is the effective volume of blood ejected from the left ventricle of the heart per unit of time: CO4 = [(4ch EDV - 4ch ESV) ÷ 1000](HR)	**4ch EDV** **4ch ESV** **HR**	L/min
LA CO4	Left Atrium Cardiac Output is the effective volume of blood ejected from the left atrium of the heart per unit of time: LA CO4 = [(4ch EDV - 4ch ESV) ÷ 1000](HR)	**4ch EDV** **4ch ESV** **HR**	L/min

Calculation Label	Description	Required Measurements	Units
diffD(2ch)	Left Ventricle Diastolic differentiation for 2-chamber diffD(2ch) = abs(L(d)2 - L(d)4) / max(L(d)4, L(d)2) * 100	**L(d)4** - (mm) **L(d)2** - (mm)	%
diffS(2ch)	Left Ventricle Systolic differentiation for 2-chamber diffS(2ch) = abs(L(s)2 - L(s)4) / max(L(s)4, L(s)2) * 100	**L(s)4** - (mm) **L(s)2** - (mm)	%
diffD(4ch)	Left Ventricle Diastolic differentiation for 4-chamber diffD(4ch) = abs(L(d)2 - L(d)4) / max(L(d)4, L(d)2) * 100	**L(d)4** - (mm) **L(d)2** - (mm)	%
diffS(4ch)	Left Ventricle Systolic differentiation for 4-chamber diffS(4ch) = abs(L(s)2 - L(s)4) / max(L(s)4, L(s)2) * 100	**L(s)4** - (mm) **L(s)2** - (mm)	%
LA diffD(2ch)	Left Atrium Diastolic differentiation for 2-chamber LA diffD(2ch) = abs(L(d)2 - L(d)4) / max(L(d)4, L(d)2) * 100	**L(d)4** - (mm) **L(d)2** - (mm)	%
LA diffS(2ch)	Left Atrium Systolic differentiation for 2-chamber LA diffS(2ch) = abs(L(s)2 - L(s)4) / max(L(s)4, L(s)2) * 100	**L(s)4** - (mm) **L(s)2** - (mm)	%
LA diffD(4ch)	Left Atrium Diastolic differentiation for 4-chamber LA diffD(4ch) = abs(L(d)2 - L(d)4) / max(L(d)4, L(d)2) * 100	**L(d)4** - (mm) **L(d)2** - (mm)	%
LA diffS(4ch)	Left Atrium Systolic differentiation for 4-chamber LA diffS(4ch) = abs(L(s)2 - L(s)4) / max(L(s)4, L(s)2) * 100	**L(s)4** - (mm) **L(s)2** - (mm)	%
EDV (BP)	Left Ventricular End-Diastolic Volume	Varies with the selected Volume method	mL
ESV (BP)	Left Ventricular End-Systolic Volume	Varies with the selected Volume method	mL
EF (BP)	Ejection Fraction is the ratio of the stroke volume to the end-diastolic volume: EF (BP) = 100[(EDV (BP) - ESV (BP)) ÷ EDV]	**EDV (BP)** **ESV (BP)**	%
LA EDV (BP)	Left Atrium End-Diastolic Volume	Varies with the selected Volume method	mL
LA ESV (BP)	Left Atrium End-Systolic Volume	Varies with the selected Volume method	mL
LA EF (BP)	Left Atrium Ejection Fraction is the ratio of the stroke volume to the end-diastolic volume: LA EF (BP) = 100[(LA EDV (BP) - ESV) ÷ LA EDV (BP)]	**LA EDV (BP)** **LA ESV (BP)**	%

Calculation Label	Description	Required Measurements	Units
EF2	Ejection Fraction is the ratio of the stroke volume to the end-diastolic volume: EF2 = 100[(2ch EDV - 2ch ESV) ÷ 2ch EDV]	**2ch EDV** **2ch ESV**	%
LA EF2	Left Atrium Ejection Fraction is the ratio of the stroke volume for 2-chamber to the end-diastolic volume: LA EF2 = 100[(2ch ESV - 2ch EDV) ÷ 2ch ESV)]	**LA 2ch EDV** **LA 2ch ESV**	%
EF4	Ejection Fraction is the ratio of the stroke volume to the end-diastolic volume: EF4 = 100[(4ch EDV - ESV) ÷ EDV]	**4ch EDV** **4ch ESV**	%
LA EF4	Left Atrium Ejection Fraction is the ratio of the stroke volume for 4-chamber to the end-diastolic volume: LA EF4 = 100[(LA 4ch ESV - LA 4ch EDV) ÷ LA 4ch ESV]	**LA 4ch EDV** **LA 4ch ESV**	%
Flow Rate	Flow Rate Flow Rate = 2 * 3.1415926535 * ((Radius)^2) * Aliasing Vel	**Radius** **Aliasing Vel**	mL/s
FS	Fractional Shortening is the percentage of shortening of the Left Ventricular dimension: FS = 100[(LVIDd - LVIDs) ÷ LVIDd]	**LVIDd** **LVIDs**	%
SI	Stroke Index is a measurement of left ventricle stroke volume normalized to BSA: SI = SV ÷ BSA	**SV** **BSA**	mL/m^2
LA SI	Left Atrium Stroke Index is a measurement of left atrium stroke volume normalized to BSA: LA SI = LA SV ÷ BSA	**LA SV** **BSA**	mL/m^2
SI2	Stroke Index is a measurement of left ventricle stroke volume for 2-chamber normalized to BSA: SI2 = SV2 ÷ BSA	**SV2** **BSA**	mL/m^2
LA SI2	Left Atrium Stroke Index is a measurement of left atrium stroke volume for 2-chamber normalized to BSA: LA SI2 = LA SV2 ÷ BSA	**LA SV2** **BSA**	mL/m^2
SI4	Stroke Index is a measurement of left ventricle stroke volume for 4-chamber normalized to BSA: SI4 = SV4 ÷ BSA	**SV4** **BSA**	mL/m^2
LA SI4	Left Atrium Stroke Index is a measurement of left atrium stroke volume for 4-chamber normalized to BSA: LA SI4 = LA SV4 ÷ BSA	**LA SV4** **BSA**	mL/m^2

Calculation Label	Description	Required Measurements	Units
SV	Stroke Volume is the volume of blood ejected from a ventricle during one cardiac cycle or phase of ventricular systole: SV = EDV - ESV	**EDV (BP)** **ESV (BP)**	mL
LA SV	Left Atrium Stroke Volume is the volume of blood ejected from an atrium during one cardiac cycle or phase of atrial systole: LA SV = EDV (BP) - ESV (BP)	**LA EDV (BP)** **LA ESV (BP)**	mL
SV2	Stroke Volume is the volume of blood ejected from a ventricle during one cardiac cycle or phase of ventricular systole: SV = 2ch EDV - 2ch ESV	**2ch EDV** **2ch ESV**	mL
LA SV2	Left Atrium Stroke Volume is the volume of blood for 2-chamber ejected from an atrium during one cardiac cycle or phase of atrial systole: LA SV2 = LA 2ch EDV - LA 2ch ESV	**LA 2ch EDV** **LA 2ch ESV**	mL
SV4	Stroke Volume is the volume of blood ejected from a ventricle during one cardiac cycle or phase of ventricular systole: SV = 4ch EDV - 4ch ESV	**4ch EDV** **4ch ESV**	mL
LA SV4	Left Atrium Stroke Volume is the volume of blood for 4-chamber ejected from an atrium during one cardiac cycle or phase of atrial systole: LA SV4 = LA 4ch EDV - LA 4ch ESV	**LA 4ch EDV** **LA 4ch ESV**	mL
t	Thickness of the myocardium t(mm) = SQRT (A Sax Epi(cm^2) * 100 / 3.14) - SQRT (A Sax Endo(cm^2) * 100 / 3.14)	**A Sax Epi** **A Sax Endo**	mm
b	Short axis radius b(mm) = SQRT (A Sax Endo(cm^2) * 100 / 3.14)	**A Sax Endo**	mm
TR Flow Rate	Tricuspid regurgitation flow rate TR Flow Rate = 2 * 3.1415926535 * ((TR Radius)^2) * TR Aliasing Vel	**TR Radius** **TR Aliasing Vel**	mL/s
TS Flow Rate	Tricuspid stenosis flow rate TS Flow Rate = 2 * 3.1415926535 * ((TS Radius)^2) * TS Aliasing Vel	**TS Radius** **TS Aliasing Vel**	mL/s

Calculation Label	Description	Required Measurements	Units
LV Mass	Left Ventricular Mass LV Mass(g) = 1.05 * π * (((b + t)^2) * (2 / 3 * (a + t) + d - (((d)^3) / (3 * (a + t)^2))) - ((b)^2) * (2 / 3 * a + d - (((d)^3) / (3 * (a)^2))))	**a** **d** **b** **t**	g
LV Mass-I	LV Mass Index describes the proportion of left ventricular mass to the body surface area: LV Mass-I(g / m^2) = LV Mass(g) / BSA(m^2)	**LV Mass** **BSA**	g/m^2
LV Mass T-E	LV Mass T-E estimates left ventricular mass using a Truncated Ellipse: LV Mass(g) = 1.05 * π * ((b(cm) + t(cm))^2 * (2 / 3 * (a(cm) + t(cm)) + d(cm) - ((d(cm))^3 / (3 * (a(cm) + t(cm))^2))) - (b(cm))^2 * (2 / 3 * a(cm) + d(cm) - ((d(cm))^3 / (3 * (a(cm))^2))))	**a** **d** **b** **t**	g
LV Mass A-L	LV Mass A-L estimates left ventricular volume using Area and Length: LV Mass(g) = 1.05 * (((5 / 6) * A Sax Epi(cm^2) * (LVL(cm) + t(cm))) - (5 / 6) * A Sax Endo(cm^2) * LVL(cm))	**A Sax Epi** **A Sax Endo** **LVL**	g
LA Vol-I	LA Vol-I describes the proportion of left atrial volume to the body surface area: LA Vol-I(mL / m^2) = LA Vol(mL) / BSA(m^2)	**LA Vol (A-L)** or **LA Vol (Simp)** **BSA**	mL/m^2
LA Vol (A-L)	LA Vol (A-L) estimates left atrial volume using Area and Length: LA Vol (A-L)(mL) = (8 / 3 / π) * A1-A4C(cm^2) * A2-A2C(cm^2) / L(mm) * 10	**A1-A4C** **A2-A2C** **L**	mL
LA Vol (Simp)	LA Vol (Simp) uses Simpson's formula to estimate left atrial volume using the 4CH and 2CH measurements: LA Vol (Simp)(mL) = (4CH(mL) + 2CH(mL)) / 2	**4CH** **2CH**	mL
LAs/AOd	Left Atrium Systole to Aorta Diastole ratio LAs / AOd = LAs Diam / AOd	**LAs Diam** **AOd**	---
AR Flow Rate	Aortic Regurgitation Flow Rate AR Flow Rate(mL/s) = 2 * π * ((AR Radius(cm))^2) * AR Aliasing Vel(cm/s)	**AR Radius** **AR Aliasing Vel**	mL/s
MR Flow Rate	Mitral Regurgitation flow rate MR Flow Rate = 2 * 3.1415926535 * ((MR Radius)^2) * MR Aliasing Vel	**MR Radius** **MR Aliasing Vel**	mL/s
MS Flow Rate	Mitral Stenosis flow rate MS Flow Rate = 2 * 3.1415926535 * ((MS Radius)^2) * MS Aliasing Vel	**MS Radius** **MS Aliasing Vel**	mL/s

Calculation Label	Description	Required Measurements	Units
RA Vol-I	RA Vol-I describes the proportion of right atrial volume to the body surface area: RA Vol-I(mL / m^2) = RA Vol(mL) / BSA(m^2)	**RA Vol (A-L)** or **RA Vol (Simp)** **BSA**	mL/m^2
RA Vol (A-L)	RA Vol (A-L) estimates right atrial volume: using Area and Length RA Vol (A-L)(mL) = (8 / 3 / π) * A1-A4C(cm^2) * A2-A2C(cm^2) / L(mm) * 10	**A1-A4C** **A2-A2C** **L**	mL
RA Vol (Simp)	RA Vol (Simp) uses Simpson's formula to estimate right atrial volume using the 4CH and 2CH measurements: RA Vol (Simp)(mL) = (4CH(mL) + 2CH(mL)) / 2	**4CH** **2CH**	mL
RA Vol-I (Simp)	Right Atrium Volume Index (Simpson) RA Vol-1 (Simp) = RA Vol (Simp) / BSA	**RA Vol (Simp)** **BSA**	mL/m^2
RA Vol-I (A-L)	Right Atrium Volume Index using area and length RA Vol-1 (A-L) = RA Vol (A-L) / BSA	**RA Vol (A-L)** **BSA**	mL/m^2
RWT	Relative Wall Thickness RWT = 2 * LVPWd / LVIDd	**LVIDd** **LVPWd**	mm
AOd/LAs	Aorta Diastole to Left Atrium Systole ratio	**LAs** **AOd**	---
LAs/AOd	Left Atrium Systole to Aorta Diastole ratio	**LAs** **AOd**	---
mVcfc*	Mean Velocity of Circumferential Fiber Shortening $\frac{(LVIDd(mm) - LVIDs(mm))}{LVIDd(mm) \times LVETc}$ $LVETc = \frac{(LVET(ms)/1000)}{\sqrt{RR}}$ $RR(sec) = \frac{60}{HR}$	**LVIDd** **LVIDs** **LVET** **HR**	circ/s
ESWS*	End-Systolic Wall Stress 0.334 * sysBP(mmHg) * LVIDs(mm) / (LVPWs(mm) * (1 + LVPWs(mm) / LVIDs(mm)))	**LVIDs** **LVPWs** **sysBP**	g/cm^2

* Applies only to Ped Echo exam types.

Left Ventricular Function Assessment Measurement and Calculation Labels

Volume Method	Menu Label	Description	Calculated Results	
Simpson Single Plane	**Simpson SP**	Estimates Volume using the Disk measurement at end-diastole and at end-systole for the apical two-chamber or four-chamber view.	EDV	mL
			ESV	mL
			SV	mL
			CO	L/min
			EF	%
			SI	mL/m^2
			CI	$mL/min/m^2$
Simpson Bi-Plane	**Simpson BP**	Estimates Volume using the Disk measurement at end-diastole and at end-systole for the apical four-chamber view: $EDV(mL) = \pi * LVLd(mm) / 20 * \sum(r_{2i}(mm) * r_{4i}(mm)) / 1000$ $ESV(mL) = \pi * LVLs(mm) / 20 * \sum(r_{2i}(mm) * r_{4i}(mm)) / 1000$	EDV	mL
			ESV	mL
			SV	mL
			CO	L/min
			EF	%
			SI	mL/m^2
			CI	$mL/min/m^2$
Modified Simpson Formula	**Mod. Simpson**	Estimates Volume using the trace measurement in two different views at end-diastole and at end-systole for sax MV and for sax PM. Also requires a distance measurement of the long axis dimension in an apical four-chamber view at end-diastole and at end-systole: EDV (mL) = LVLd apical(mm) / 9 * (4 * LVAd sax $MV(cm^2)$ + 2 * LVAd sax $PM(cm^2)$ + SQRT (LVAd sax $MV(cm^2)$ * LVAd sax $PM(cm^2)$) / 10) ESV (mL) = LVLs apical(mm) / 9 * (4 * LVAs sax $MV(cm^2)$ + 2 * LVAs sax $PM(cm^2)$ + SQRT (LVAs sax $MV(cm^2)$ * LVAs sax $PM(cm^2)$) / 10)	EDV	mL
			ESV	mL
			SV	mL
			CO	L/min
			EF	%
			SI	mL/m^2
			CI	$mL/min/m^2$
Single Plane Formula	**Single Plane**	Estimates Volume using the trace measurement in a single plane at end-diastole and at end-systole for apical two- or four-chamber view. Also requires a distance measurement of the long axis dimension in an apical view at end-diastole end-systole: $EDV = (8 \div (3\pi)) * (LVAd\ apical(cm^2))^2$ / LVLd apical(mm) * 10 $ESV = (8 \div (3\pi)) * (LVAs\ apical(cm^2))^2$ / LVLs apical(mm) * 10	EDV	mL
			ESV	mL
			SV	mL
			CO	L/min
			EF	%
			SI	mL/m^2
			CI	$mL/min/m^2$

Volume Method	Menu Label	Description	Calculated Results	
Bi-plane Formula	**Bi-Plane**	Estimates Volume using the trace measurement in two planes at end-diastole and at end-systole for apical and for sax MV. Also requires a distance measurement of the LVIDd and the LVIDs: EDV = (8 ÷ (3π)) * LVAd apical(cm^2) * LVAd sax MV(cm^2) / LVIDd(mm) * 10 ESV = (8 ÷ (3π)) * LVAs apical(cm^2) * LVAs sax MV(cm^2) / LVIDs(mm) * 10	EDV ESV SV CO EF SI CI	mL mL mL L/min % mL/m^2 mL/min/m^2
Bullet Formula	**Bullet**	Estimates Volume using the trace measurement in one view at end-diastole and at end-systole for sax MV. Also requires a distance measurement of the long axis dimension in an apical view at end-diastole end-systole. This formula assumes that the left ventricle is shaped like a bullet; the base being cylindrical and the apex cone-like: EDV = (5 ÷ 6) * LVLd apical(mm) * LVAd sax MV(cm^2) / 10 ESV = (5 ÷ 6) * LVLs apical(mm) * LVAs sax MV(cm^2) / 10	EDV ESV SV CO EF SI CI	mL mL mL L/min % mL/m^2 mL/min/m^2
Cubed Formula	**Cubed**	Estimates Volume from the Left Ventricular Internal Diameter (LVID) using the distance measurement: EDV = LVIDd$(mm)^3$ / 1000 ESV = LVIDs$(mm)^3$ / 1000	EDV ESV SV CO EF SI CI	mL mL mL L/min % mL/m^2 mL/min/m^2
Teichholz Formula	**Teichholz**	Estimates Volume from the Left Ventricular Internal Diameter (LVID) using the distance measurement: EDV(mL) = 7 * (LVIDd(mm) * LVIDd(mm) * LVIDd(mm) / 1000) / (2.4 + LVIDd(mm) / 10) ESV(mL) = (7 * LVIDs(mm) * LVIDs(mm) * LVIDs(mm) / 1000) / (2.4 + LVIDs(mm) / 10)	EDV ESV SV CO EF SI CI	mL mL mL L/min % mL/m^2 mL/min/m^2
Gibson Formula	**Gibson**	Estimates Volume from the Left Ventricular Internal Diameter (LVID) using the distance measurement: EDV(mL) = π / 6 * (0.98 * LVIDd(mm) / 10 + 5.90) * LVIDd(mm) / 10 * LVIDd(mm) / 10 ESV(mL) = π / 6 * (1.14 * LVIDs(mm) / 10 + 4.18) * LVIDs(mm) / 10 * LVIDs(mm) / 10	EDV ESV SV CO EF SI CI	mL mL mL L/min % mL/m^2 mL/min/m^2

M-Mode Measurement Labels

Measurement Label	Description	Measurement Method
AO/LA	Aortic Valve/Left Atrium function	---
AV/LA(M)	Aortic Valve/Left Atrium function	Distance
RV Diam	Right Ventricular Diameter	Distance
AOd	Aorta at end-diastole	Distance
AOs	Aorta at end-systole	Distance
ACS	Aortic Cusp Separation	Distance
LAd Diam	Left Atrial Diameter at end-diastole	Distance
LAs Diam	Left Atrial Diameter at end-systole	Distance
LV ET	Left Ventricular Ejection Time	Time
LV PEP	Left Ventricular Pre-Ejection Period	Time
Mitral Valve	Mitral Valve function	---
CE amp	Amplitude of the E wave	Distance
CA amp	Amplitude of the A wave	Distance
DE excursion	Anterior excursion of the mitral leaflet at early diastole	Slope
DE amp	Amplitude of the DE wave	Distance
EPSS	E Point to Septal Separation. The distance between the anterior leaflet and the ventricular septum at early diastole.	Distance
EF Slope	Deceleration slope of the mitral leaflet’s closure at early diastole	Slope
MAPSE	Mitral Annular Plane Systolic Excursion	Distance
RV	Right Ventricular Dimensions	---
RV Diam	Right Ventricular Diameter	Distance
TAPSE	Tricuspid Annular Plane Systolic Excursion	Distance

Measurement Label	Description	Measurement Method
(LV Dimensions)	Left Ventricle Dimensions	---
Diastole	Left Ventricular Dimension at end-diastole	3Distance
Systole	Left Ventricular Dimension at end-systole	3Distance
RVDd	Right Ventricular Dimension at end-diastole	Distance
IVSd	Interventricular Septal dimension at end-diastole	Distance
LVIDd	Left Ventricular Internal dimension at end-diastole	Distance
LVPWd	Left Ventricular Posterior wall dimension at end-diastole	Distance
IVSs	Interventricular Septal dimension at end-systole	Distance
LVIDs	Left Ventricular Internal Dimension at end-systole	Distance
LVPWs	Left Ventricular Posterior Wall dimension at end-systole	Distance
(LV Function)	Left Ventricular Function	---
LV ET	Left Ventricular Ejection time	Time
LV ET (Edit)	Left Ventricular Ejection time	(user-entered value)
HR	Heart Rate	HR
HR (Edit)	Heart Rate	(user-entered value)

M-Mode Calculation Labels

Calculation Label	Description	Required Measurements	Units
CI	Cardiac Index is the cardiac output of the left ventricle per square meter of body surface area (BSA): CI = CO ÷ BSA For height in centimeters and weight in kilograms: BSA = 0.007184 x ($Weight^{0.425}$) x ($Height^{0.725}$) For height in feet/inches and weight in pounds: BSA = 0.007184 x $(Weight \times 0.454)^{0.425}$ x $(Height \times 2.54)^{0.725}$	**BSA** entry in the patient data form (determined by height and weight of patient)	L/min/m^2
LA CI	Left Atrium Cardiac Index is the cardiac output of the left atrium per square meter of body surface area (BSA): LA CI = LA CO ÷ BSA For height in centimeters and weight in kilograms: BSA = 0.007184 x ($Weight^{0.425}$) x ($Height^{0.725}$) For height in feet/inches and weight in pounds: BSA = 0.007184 x $(Weight \times 0.454)^{0.425}$ x $(Height \times 2.54)^{0.725}$	**BSA** entry in the patient data form (determined by height and weight of patient)	L/min/m^2
CO	Cardiac Output is the effective volume of blood ejected by either ventricle of the heart per unit of time: CO = [(EDV - ESV) ÷ 1000](HR)	**EDV** **ESV** **HR**	L/min
LA CO	Left Atrium Cardiac Output is the effective volume of blood ejected by either atrium of the heart per unit of time: LA CO = [(LA ESV (BP) - LA EDV (BP)) ÷ 1000](HR)	**LA EDV (BP)** **LA ESV (BP)** **HR**	L/min
EDV and **ESV**	Left Ventricular End-Systolic Volume and Left Ventricular End-Diastolic Volume estimates volume from the left ventricular internal diameter (LVID) using the distance measurement. Cubed Volume Method: EDV = $LVIDd^3$ ESV = $LVIDs^3$ Teichholz Volume Method: EDV = $7(LVIDd^3 / 1000) / (2.4 + LVIDd/10)$ ESV = $7(LVIDs^3 / 1000) / (2.4 + LVIDs/10)$ Gibson Volume Method: EDV = $\pi / 6 * (0.98 * LVIDd/10 + 5.90) * LVIDd/10 * LVIDd/10$ ESV = $\pi / 6 * (1.14 * LVIDs/10 + 4.18) * LVIDs/10 * LVIDs/10$	**LVIDd** **LVIDs**	mL
EF	Ejection Fraction is the ratio of the stroke volume to the end-diastolic volume: EF = 100[(EDV - ESV) ÷ EDV]	**EDV** **ESV**	%

Calculation Label	Description	Required Measurements	Units
AOd/LAs	Aorta Diastole to Left Atrium Systole ratio	**LAs** **AOd**	---
LAs/AOd	Left Atrium Systole to Aorta Diastole ratio	**LAs** **AOd**	---
LV STI	Left Ventricular Systolic Time Intervals LV STI = LV PEP ÷ LV ET	**LV PEP** **LV ET**	---
RWT	Relative Wall Thickness	**LVID** **LVPWd**	mm
HR	Heart Rate: HR = 60 ÷ (R-R interval)	**HR** a cardiac cycle	bpm
SI	Stroke Index is a measurement of left ventricle stroke volume normalized to BSA: SI = SV ÷ BSA	**SV** **BSA**	mL/m^2
LA SI	Left Atrium Stroke Index is a measurement of left atrium stroke volume normalized to BSA: LA SI = LA SV ÷ BSA	**LA SV** **BSA**	mL/m^2
SV	Stroke Volume is the volume of blood ejected from a ventricle during one cardiac cycle: SV = EDV - ESV	**EDV** **ESV**	mL
LA SV	Left Atrium Stroke Volume is the volume of blood ejected from an atrium during one cardiac cycle: LA SV = LA EDV (BP) - LA ESV (BP)	**LA EDV (BP)** **LA ESV (BP)**	mL
CA/CE	Mitral Valve ratio of the CA amplitude to the CE amplitude CA amp / CE amp	**CA amp** **CE amp**	---

Calculation Label	Description	Required Measurements	Units
LV Mass	Left Ventricular Mass LV Mass(g) = 1.04 * ((IVSd(mm) / 10 + LVIDd(mm) / 10 + LVPWd(mm) / 10)^3 - (LVIDd(mm) / 10)^3)	**IVSd** **LVIDd** **LVPWd**	g
LV Mass-c	LV Mass-corrected LV Mass-c(g) = 0.8 * LV Mass(g) + 0.6	**LV Mass**	g
LV Mass-I	LV Mass-Index describes the proportion of left ventricular mass to the body surface area LV Mass-I(g/m^2) = LV Mass-c(g) / BSA(m^2)	**LV Mass-c** **BSA**	g/m^2
mVcf	M-mode Velocity of Circumferential Fiber Shortening (LVIDd(mm) - LVIDs(mm)) / (LVIDd(mm) * LVET(ms) / 1000)	**LVIDd** **LVIDs** **LV ET**	circ/s
mVcfc*	Mean Velocity of Circumferential Fiber Shortening $\frac{(\text{LVIDd(mm)} - \text{LVIDs(mm)})}{\text{LVIDd(mm)} \times \text{LVETc}}$ $\text{LVETc} = \frac{(\text{LVET(ms)}/1000)}{\sqrt{\text{RR}}}$ $\text{RR(sec)} = \frac{60}{\text{HR}}$	**LVIDd** **LVIDs** **LV ET** **HR**	circ/s
ESWS*	End-Systolic Wall Stress 0.334 * sysBP(mmHg) * LVIDs(mm) / (LVPWs(mm) * (1 + LVPWs(mm) / LVIDs(mm)))	**LVIDs** **LVPWs** **sysBP**	g/cm^2

*Applies only to Ped Echo exam.

Doppler Measurement Labels

Measurement Label	Description	Measurement Method
Aortic Valve	Aortic Valve Function	---
Ao Arch VTI	Aortic Arch Velocity-Time Integral	VTI
Ao Arch Vmax	Aortic Arch Maximum Velocity	Velocity
AV VTI	Aortic Valve Velocity-Time Integral	VTI
LVOT VTI	Left Ventricular Outflow Tract Velocity-Time Integral	VTI
IVRT	Isovolumic Relaxation Time	Time
HR	Heart Rate	HR
HR (Edit)	Heart Rate	(user-entered value)
AV VTI	Aortic Valve Velocity-Time Integral	VTI
AV Vmax	Aortic Valve Maximum Velocity	Velocity
AV Accel Time	Aortic Valve Acceleration Time	Acceleration
LVOT Vmax	Left Ventricular Outflow Tract Maximum Velocity	Velocity
VSD Vmax	Ventricular Septal Defect Maximum Velocity	Velocity
LV ET	Left Ventricular Ejection Time	Time
LV PEP	Left Ventricular Pre-Ejection Period	Time
Mitral Valve	Mitral Valve Function	---
E Dur	E-wave Duration	Time
A Dur	A-wave Duration	Time
IVRT	Isovolumic Relaxation Time	Time
MV Decel Time	Mitral Valve Deceleration Time	Acceleration
MV E/A Vel	Mitral Valve E point/A point Velocity	Velocity
MV Peak A vel	Mitral Valve A point Velocity	Velocity
MV Peak E vel	Mitral Valve E point Velocity	Velocity
MV VTI	Mitral Valve Velocity-Time Integral	VTI
MV Vmax	Mitral Valve Maximum Velocity	Velocity
HR	Heart Rate	HR
HR (Edit)	Heart Rate	(user-entered value)
IVCT	Isovolumic Contraction Time	Time
Tricuspid Valve	Tricuspid Valve Function	---
TV Vmean	Tricuspid Valve Velocity mean	VTI
TV Vmax	Tricuspid Valve Velocity maximum	Velocity
TV E pt	Tricuspid Valve E point	Velocity
TV A pt	Tricuspid Valve A point	Velocity

Measurement Label	Description	Measurement Method
Pulmonary Valve	Pulmonary Valve Function	---
PV Vmax	Pulmonary Valve Velocity maximum	Velocity
PV Accel Time	Pulmonary Valve Acceleration Time	Acceleration
RV ET	Right Ventricular Ejection Time	Time
RV Accel Time	Right Ventricular Acceleration Time	Time
RV PEP	Right Ventricular Pre-ejection Period	Time
PV VTI	Pulmonary Valve-Time Integral	VTI
HR	Heart Rate	HR
HR (Edit)	Heart Rate	(user-entered value)
Pulmonary Vein	Pulmonary Vein Function	---
PVs1 Vel	Pulmonary Vein systole1 Velocity	Velocity
PVs2 Vel	Pulmonary Vein systole2 Velocity	Velocity
PVd Vel	Pulmonary Vein diastolic Velocity	Velocity
PVa Vel	Pulmonary Vein late diastolic Velocity	Velocity
PVa dur	Pulmonary Vein late diastolic duration	Time
PVs VTI	Pulmonary Vein systolic Velocity-Time Integral	VTI
PVd VTI	Pulmonary Vein diastolic Velocity-Time Integral	VTI
PVd Decel	Pulmonary Vein diastolic Deceleration Time	Acceleration
AR	Aortic Regurgitation	---
AR Decel Time	Deceleration Time	Acceleration
AR PHT	Aortic Insufficiency Pressure Half-Time	PHT
AR Vmax	Aortic Regurgitation Maximum Velocity	Velocity
TR	Tricuspid Regurgitation	---
TR Vmean	Tricuspid Regurgitation Velocity mean	VTI
TR VTI	Tricuspid Regurgitant Velocity Time Integral	VTI
TR Vmax	Tricuspid Regurgitation Velocity maximum	Velocity
RAP select	Right Atrial Pressure selection	ComboType
RAP(edit)	Right Atrial Pressure selection	(user-entered value)
PR	Pulmonary Regurgitation	---
PR Vmean	Pulmonary Regurgitation Velocity mean	VTI
PR Vmax	Pulmonary Regurgitation Velocity maximum	Velocity
PR Ved	Pulmonary Regurgitation Velocity end diastole	Velocity
PR VTI	Pulmonary Regurgitation Velocity Time Integral	VTI
RAP select	Right Atrial Pressure selection	ComboType

Measurement Label	Description	Measurement Method
MR	Mitral Regurgitation	---
MR Vmax	Mitral Regurgitation Velocity maximum	Velocity
dP/dt	Rate of change of pressure over time dP / dt = 32 / dt x 1000	dP/dt
LV dP/dt	Rate of change of pressure over time	dP/dt
PISA (AR)	Proximal Isovelocity Surface Area (Aortic Regurgitation)	---
AR VTI	Aortic Regurgitation Velocity-Time Integral	VTI
PISA (TR)	Proximal Isovelocity Surface Area (Tricuspid Regurgitation)	---
TR VTI	Tricuspid Regurgitation Velocity-Time Integral	VTI
PISA (MR)	Proximal Isovelocity Surface Area (Mitral Regurgitation)	---
MR VTI	Mitral Regurgitation Velocity-Time Integral	VTI
PISA (MS)	Proximal Isovelocity Surface Area (Mitral Stenosis)	---
MS VTI	Mitral Stenosis Velocity-Time Integral	VTI
MS Vmax	Mitral Stenosis Velocity maximum	Velocity
DTI (MV)	Doppler Tissue Imaging (Mitral Valve)	---
Med E' Vel	Early diastolic motion	Velocity
Med A' Vel	Late diastolic motion	Velocity
Med S Vel	Systolic motion	Velocity
Med Accel Time	Med Acceleration Time	Acceleration
Med Decel Time	Med Deceleration Time	Acceleration
Med Accel Rate	Med Acceleration Rate	Acceleration
Med Decel Rate	Med Deceleration Time	Acceleration
Lat E' Vel	Early diastolic motion	Velocity
Lat A' Vel	Late diastolic motion	Velocity
Lat S Vel	Systolic motion	Velocity
Lat Accel Time	Lateral Acceleration Time	Acceleration
Lat Decel Time	Lateral Deceleration Time	Acceleration
Lat Accel Rate	Lateral Acceleration Rate	Acceleration
Lat Decel Rate	Lateral Deceleration Rate	Acceleration
DTI (RV)	Doppler Tissue Imaging (Right Ventricle)	---
RV E' Vel	Early diastolic motion	Velocity
RV A' Vel	Late diastolic motion	Velocity
RV S' Vel	Systolic motion	Velocity

Measurement Label	Description	Measurement Method
Tei-Index	Tei-Index	---
LV ET	Left Ventricle Ejection Time	Time
MV C-O Time	Mitral Valve Close Open duration	Time
RV ET	Right Ventricular Ejection Time	Time
TV C-O Time	Tricuspid Valve Close-Open duration	Time
Qp/Qs	Pulmonary Valve / Aortic Valve	---
Systemic VTI	Systemic Velocity-Time Integral	VTI
Pulmonic VTI	Pulmonic Velocity-Time Integral	VTI
HR	Heart Rate	HR
HR (Edit)	Heart Rate	(user-entered value)
IVC	Inferior Vena Cava	Velocity

Doppler Calculation Labels

Calculation Label	Description	Required Measurements	Units
A/E	Mitral Valve ratio of the A point to the E point A/E = MV Peak A vel (m/s) / MV Peak E vel (m/s)	**MV Peak A vel** **MV Peak E vel**	---
E/A	Mitral Valve ratio of the E point to the A point E/A = MV Peak E vel (m/s) / MV Peak A vel (m/s)	**MV Peak E vel** **MV Peak A vel**	---
E/A	Tricuspid Valve ratio of the E point to the A point E/A = TV E pt (m/s) / TV A pt (m/s)	**TV E pt** **TV A pt**	---
MVA (PHT)	Mitral Valve Area (Pressure Half-Time) MVA (PHT) = 220 / MV PHT	**MV Peak E vel** **MV Peak A vel**	cm^2
SV	Stroke Volume SV(mL) = 0.785 * (MV diam(mm))^2 * MV VTI(cm) / 100	**MV VTI** **MV diam**	mL
SI	Stroke Index SI(mL/m2) = SV (mL) / BSA (m^2)	**SV** **BSA**	mL/m^2
CO	Cardiac Output (Doppler-derived) CO(L/min) = SV(mL) * HR(bpm)	**SV** Heart Rate	L/min
CI	Cardiac Index CI = CO(L/min) / BSA(m^2)	**CO** **BSA**	$L/min/m^2$
LV dP/dt	Rate of change of pressure over time LV dP/dt = 32000 / dt (ms)	---	mmHg/s
AR EO Area	Aortic Regurgitation Effective Regurgitant Orifice Area AR EO Area(mm^2) = AR Flow Rate(mL/s) / AR Vmax(m/s)	**AR Flow Rate** **AR Vmax**	mm^2
AR Flow Rate	Aortic Regurgitation Flow Rate AR Flow Rate(mL/s) = 2 * π * ((AR Radius(cm))^2) * AR Aliasing Vel(cm/s)	**AR Radius** **AR Aliasing Vel**	mL/s
AR Flow Vol	Aortic Regurgitation Flow Volume AR Flow Vol(mL) = AR EO Area(cm^2) * AR VTI(cm)	**AR EO Area** **AR VTI**	mL

Calculation Label	Description	Required Measurements	Units
MR Flow Vol	Mitral Regurgitation Flow Volume MR Flow Vol(mL) = MR EO Area(cm^2) * MR VTI(cm)	**MR EO Area** **MR VTI**	mL
MR Flow Rate	Mitral Regurgitation Flow Rate MR Flow Rate(mL/s) = 2 * π * ((MR Radius(mm))^2) * MR Aliasing Vel(m/s)	**MR Radius** **MR Aliasing Vel**	mL/s
MR EO Area	Mitral Regurgitation EO Area MR EO Area(mm^2) = MR Flow Rate(mL/s) / MR Vmax(m/s)	**MR Flow Rate** **MR Vmax**	mm^2
MS MVA	Mitral Stenosis Mitral Valve Area MS MVA(cm^2) = 2 * π * ((MS Radius(cm)^2) * MS Aliasing Vel(m/s) / MS Vmax(m/s) * MS Angle(°) / 180	**MS Radius** **MS Aliasing Vel** **MS Vmax** **MS Angle**	cm^2
MS Flow Rate	Mitral Stenosis Flow Rate MS Flow Rate(mL/s) = 2 * π * ((MS Radius(mm))^2) * MS Aliasing Vel(m/s)	**MS Radius** **MS Aliasing Vel**	mL/s
MS Flow Vol	Mitral Stenosis Flow Volume MS Flow Vol(mL) = MS MVA(cm^2) * MS VTI(cm)	**MS MVA** **MS VTI**	mL
LV STI	Left Ventricular Systolic Time Intervals LV STI = LV PEP(ms) / LV ET(ms)	**LV PEP** **LV ET**	---
PAEDP	Pulmonary Artery End Diastolic Pressure PAEDP(mmHg) = RAP(mmHg) + (PR Ved(m/s))^2 * 4	**RAP** **PR Ved**	mmHg
PVs2/PVd	Pulmonary Vein systole2 Velocity / Pulmonary Vein diastolic Velocity PVs2/PVd = PVs2 Vel (m/s) / PVd Vel (m/s)	**PVs2 Vel** **PVd Vel**	---
Sys Fraction	Systolic Filling Fraction Sys Fraction = (PVs VTI(cm) / (PVs VTI(cm) + PVd VTI(cm)))	**PVs VTI** **PVd VTI**	---
RVSP	Right Ventricular Systolic Pressure is determined from the tricuspid regurgitation velocity converted to a pressure gradient: RVSP(mmHg) = (TR Vmax(m/s))^2 * 4 + RAP(mmHg)	**TR Vmax** **RAP**	mmHg
LVOT/AV VTI	Left Ventricular Outflow Tract Aortic Valve Velocity-Time Integral LVOT/AV VTI = LVOT VTI (cm) / AV VTI(cm)	**LVOT VTI** **AV VTI**	---
LV MPI	Left Ventricular Index of Myocardial Performance LV MPI = (MV C-O Time (ms) - LVET(ms)) / LVET(ms)	**MV C-O Time** **LV ET**	---
RV MPI	Right Ventricular Index of Myocardial Performance RV MPI = (TV C-O Time (ms) - RVET(ms)) / RVET(ms)	**TV C-O Time** **RV ET**	---

Calculation Label	Description	Required Measurements	Units
HR	Heart Rate: HR = 60 / R-R interval.	Measure across one heart cycle	bpm
E'/A' (Med)	Doppler Tissue Imaging ratio of the lateral or medial E' and A' measurements E'/A'(Med) = Med E' Vel(m/s) / Med A' Vel (m/s)	**Med E' Vel** **Med A' Vel**	---
E'/A' (Lat)	Doppler Tissue Imaging ratio of the lateral E' and A' measurements E'/A'(Lat) = Lat E' Vel (m/s) / Lat A' Vel (m/s)	**Lat E' Vel** **Lat A' Vel**	---
E/E' (Lat)	Doppler Tissue Imaging ratio of the lateral E and E' measurements E/E' (Lat) = MV Peak E vel (m/s) / Lat E' Vel (m/s)	**MV Peak E vel** **Lat E' Vel**	---
E/E' (Med)	Doppler Tissue Imaging ratio of the medial E and E' measurements E/E' (Med) = MV Peak E vel(m/s) / Med E' Vel (m/s)	**MV Peak E vel** **Med E' Vel**	---
MVA (VTI)	Mitral Valve Area (Velocity-Time Integral) MVA(VTI)(cm^2) = π * (LVOT Diam(mm)/2/10)^2 * (LVOT VTI(cm) / MV VTI(cm))	**LVOT Diam** **LVOT VTI** **MV VTI**	cm^2
AVA (VTI)	Aortic Valve Area (Velocity-Time Integral) AVA (VTI)(cm^2) = π * (LVOT Diam(cm)/2)^2 * (LVOT VTI(cm) / AV VTI(cm))	**LVOT Diam** **LVOT VTI** **AV VTI**	cm^2
AVA (Vmax)	Aortic Valve Area Maximum Velocity AVA (Vmax) = π * (LVOT Diam(cm)/2)^2 * (LVOT Vmax(m/s) / AV Vmax(m/s))	**LVOT Diam** **LVOT Vmax** **AV Vmax**	cm^2
RV Acc T/ET	RV Acc T/ET = RV Accel Time(ms) / RV ET(ms)	**RV ET** **RV Accel Time**	---
RV STI	Right Ventricular Systolic Time Intervals RV STI = RV PEP(m/s) / RV ET(m/s)	**RV PEP** **RV ET**	---
Qp/Qs	Qp/Qs = CO(L/min)(Pulmonary Valve) / CO(L/min)(Aortic Valve)	**CO Pulmonary Valve** **CO Aortic Valve**	---
SVs	SV(mL)(Aortic Valve)	**SV Aortic Valve**	mL
COs	CO(L/min)(Aortic Valve)	**CO Aortic Valve**	L/min
SVp	SV(mL)(Pulmonary Valve)	**SV Pulmonary Valve**	mL
COp	CO(L/min)(Pulmonary Valve)	**CO Pulmonary Valve**	L/min
Qp-Qs	Qp-Qs(L/min) = CO(L/min)(Pulmonary Valve) - CO(L/min)(Aortic Valve)	**CO Pulmonary Valve** **CO Aortic Valve**	L/min

Calculation Label	Description	Required Measurements	Units
MR PGmax	Mitral Regurgitation Maximum Pressure Gradient 4 * ((MR Vmax)^2)	**MR Vmax**	mmHg
MS PGmax	Mitral Stenosis Maximum Pressure Gradient 4 * ((MS Vmax)^2)	**MS Vmax**	mmHg
TR PGmax	Tricuspid Regurgitation Maximum Pressure Gradient 4 * ((TR Vmax)^2)	**TR Vmax**	mmHg
TR EO Area	Tricuspid Regurgitation EO Area TR Flow Rate / TR Vmax	**TR Flow Rate** **TR Vmax**	mm^2
MV PGmax	Mitral Valve Maximum Pressure Gradient 4 * ((MV Vmax)^2)	**MV Vmax**	mmHg
TR Flow Vol	Tricuspid Regurgitation Flow Volume TR EO Area * TR VTI	**TR EO Area** **TR VTI**	mL
TR Flow Rate	Tricuspid Regurgitation Flow Rate TR Flow Rate(mL/s) = 2 * π * ((TR Radius(cm))^2) * TR Aliasing Vel(cm/s)g	**TR Radius** **TR Aliasing Vel**	mL/s
AV PGmax	Aortic Valve Maximum Pressure Gradient 4 * ((AV Vmax)^2)	**AV Vmax**	mmHg
Ao Arch PGmax	Aortic Arch Maximum Pressure Gradient 4 * ((Ao Arch Vmax)^2)	**Ao Arch Vmax**	mmHg
LVOT PGmax	Left Ventricular Outflow Tract Maximum Pressure Gradient 4 * ((LVOT Vmax)^2)	**LVOT Vmax**	mmHg
VSD PGmax	Ventricular Septal Defect maximum Pressure Gradient 4 * ((VSD Vmax)^2)	**VSD Vmax**	mmHg
AV PGmax	Aortic Valve maximum Pressure Gradient 4 * ((AV Vmax)^2)	**AV Vmax**	mmHg
AR PGmax	Aortic Regurgitation maximum Pressure Gradient 4 * ((AR Vmax)^2)	**AR Vmax**	mmHg
PV PGmax	Pulmonary Valve Maximum Pressure Gradient 4 * ((PV Vmax)^2)	**PV Vmax**	mmHg
PR PGmax	Pulmonary Regurgitation Maximum Pressure Gradient 4 * ((PR Vmax)^2)	**PR Vmax**	mmHg
TV PGmax	Tricuspid Valve Maximum Pressure Gradient 4 * ((TV Vmax)^2)	**TV Vmax**	mmHg

Doppler Tissue Imaging Measurement and Calculation Labels

All DTI (Doppler Tissue Imaging) values in the patient report include prefix labels, **m** for medial or **l** for lateral, to indicate the specific mitral valve.

Measurement Label	Description
Med E' Vel	Early diastolic motion
AR/DR(m)	Begins the workflow for completing the following measurements: ▪ **Med Accel Time** - Acceleration Time of **Med E' Vel** ▪ **Med Accel Rate** - Acceleration Rate of **Med E' Vel** ▪ **Med Decel Time** - Deceleration Time of **Med E' Vel** ▪ **Med Decel Rate** - Deceleration Rate of **Med E' Vel**
Med A' Vel	Late diastolic motion
Med S Vel	Systolic motion
Med Accel Time	Med Acceleration Time
Med Decel Time	Med Deceleration Time
Lat E' Vel	Early diastolic motion
AR/DR(l)	Begins the workflow for completing the following measurements: ▪ **Lat Accel Time** - Acceleration Time of **Lat E' Vel** ▪ **Lat Accel Rate** - Acceleration Rate of **Lat E' Vel** ▪ **Lat Decel Time** - Deceleration Time of **Lat E' Vel** ▪ **Lat Decel Rate** - Deceleration Rate of **Lat E' Vel**
Lat A' Vel	Late diastolic motion
Lat S Vel	Systolic motion

Note: The system generates the calculation for E'/A'(Med) or E'/A'(Lat) when both Med E' Vel and Med A' Vel measurements are completed.

Sections in the Patient Report

Section Name	Description
Exam Specific Information	Indications and additional information for specific exam types
Assessment	Descriptions for exam-related structures. You can select system defined or user-defined descriptions
Stress Echo LV Results	(Available only for the adult echo exam type) Descriptions for stress echo measurement results for the left ventricle
WMS Results	(Available only for the adult echo exam type) Descriptions for wall motion scoring (WMS)
WMS Summary	(Available only for the adult echo exam type) Summary for wall motion scoring (WMS)
Images	Images included from the thumbnail panel
Comments	Any combination of predefined comments and user-entered comments
Measurement result by package	▪ **Teichholz** ▪ **Cubed** ▪ **Gibson** ▪ **Simpson BP** ▪ **Simpson SP** ▪ **Mod. Simpson** ▪ **Single Plane** ▪ **Bi-Plane** ▪ **Bullet** ▪ **Mitral Valve** ▪ **DTI (MV)** ▪ **DTI (RV)** ▪ **MR** ▪ **PISA (AR)** ▪ **PISA (TR)** ▪ **PISA (MR)** ▪ **PISA (MS)** ▪ **AO/LA** ▪ **Aortic Valve** ▪ **AR** ▪ **Pulmonary Valve** ▪ **Pulmonary Vein** ▪ **LV Mass A-L** ▪ **LV Mass T-E** ▪ **LA Vol (A-L)** ▪ **LA Vol (Simp)** ▪ **RA Vol (A-L)** ▪ **RA Vol (Simp)** ▪ **RV** ▪ **Teichholz (M)** ▪ **Cubed (M)** ▪ **Gibson (M)** ▪ **AO/LA (M)** ▪ **Mitral Valve (M)** ▪ **RV (M)** ▪ **PR** ▪ **Tricuspid Valve** ▪ **TR** ▪ **Tei-index** ▪ **Qp/Qs**

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Abdominal Measurements and Calculations

2D-Mode Measurement Labels

Measurement Label	Description	Measurement Method
Kidney Length	Kidney Length	Distance
Kidney Width	Kidney Width	Distance
Kidney AP	Kidney Anteroposterior	Distance
Cortical Thickness	Kidney Cortical Thickness	Distance
Liver Length	Liver Length	Distance
Liver AP	Liver Anteroposterior	Distance
Liver Width	Liver Width	Distance
Liver Mass 1	Liver Mass, numbered 1 through 10	3 Dist
CHD	Common Hepatic Duct	Distance
CBD	Common Bile Duct	Distance
Stent Portal End	Stent-Portal End (Proximal)	Distance
Stent Mid	Stent-Mid (Mid)	Distance
Stent Hepatic End	Stent-Hepatic End (Distal)	Distance
Donor A	Donor Artery	Distance
Portal V Pre Anast	Portal Vein Pre-anastomosis	Distance
Portal V Anast	Portal Vein Anastomosis	Distance
Transplant Kidney AP	Transplant Kidney Anteroposterior	Distance
Transplant Kidney Length	Transplant Kidney Length	Distance
Transplant Kidney Width	Transplant Kidney Width	Distance
GB AP	Gallbladder Anteroposterior	Distance
GB Length	Gallbladder Length	Distance
GB Width	Gallbladder Width	Distance
GB Wall Thickness	Gallbladder Wall Thickness	Distance
Pancreas Duct	Pancreas Duct	Distance
Pancreas Body	Pancreas Body	Distance
Pancreas Head	Pancreas Head	Distance
Pancreas Tail	Pancreas Tail	Distance
Spleen Length	Spleen Length	Distance
Spleen AP	Spleen Anteroposterior	Distance
Spleen Width	Spleen Width	Distance
Splenic A	Splenic Artery	Distance

Measurement Label	Description	Measurement Method
CIA	Common Iliac Artery	Distance
CIA AP	Common Iliac Artery Anteroposterior Diameter	Distance
CIA Trans	Common Iliac Artery Transverse Diameter	Distance
EIA	External -Iliac Artery	Distance
Inflow Vessel 1	Inflow Vessel, numbered 1 through 2	Distance
Anast 1	Anastomosis, numbered 1 through 2	Distance
Graft 1	Graft, numbered 1 through 2	Distance
Outflow Vessel 1	Outflow Vessel, numbered 1 through 2	Distance
Art Anast	Art Anastomosis	Distance
EIV	External Iliac Vein	Distance
IIA	Internal Iliac Artery	Distance
IIA Trans	Internal Iliac Artery Transverse	Distance
IIV	Internal Iliac Vein	Distance
Aorta	Aorta	Distance
Aorta AP	Aorta Anteroposterior	Distance
Aorta Trans	Aorta Transverse	Distance
Suprarenal Ao	Suprarenal Aorta	Distance
Suprarenal Ao AP	Suprarenal Aorta Anteroposterior	Distance
Suprarenal Ao Diam	Suprarenal Aorta Diam	Distance
AAA	Abdominal Aortic Aneurysm	Distance
AAA AP	Abdominal Aortic Aneurysm Anteroposterior	Distance
AAA Trans	Abdominal Aortic Aneurysm Transverse	Distance
AAA dist from SMA	Abdominal Aortic Aneurysm distance from superior mesenteric artery	Distance
Neck Length	Infra-renal Neck Length	Distance
Neck Diam	Infra-renal Neck Diam	Distance
AAA Sac Length	Abdominal Aortic Aneurysm Sac Length	Distance
Ao Bif	Aorta at Bifurcation	Distance
Ao Bif AP	Aorta at Bifurcation Anteroposterior	Distance
Ao Bif Trans	Aorta at Bifurcation Transverse	Distance
CIA Stent	Common Iliac Artery Stent	Distance
CIA Stent AP	Common Iliac Artery Stent Anteroposterior	Distance
CIA Stent Trans	Common Iliac Artery Stent Transverse	Distance
CIA Aneurysm	Common Iliac Artery Aneurysm	Distance
CIA Aneurysm AP	Common Iliac Artery Aneurysm Anteroposterior	Distance
CIA Aneurysm Trans	Common Iliac Artery Aneurysm Transverse	Distance

Measurement Label	Description	Measurement Method
EIA Stent	External Iliac Artery Stent	Distance
EIA Stent AP	External Iliac Artery Stent Anteroposterior	Distance
EIA Stent Trans	External Iliac Artery Stent Transverse	Distance
IIA Stent	Internal Iliac Artery Stent	Distance
IIA Stent AP	Internal Iliac Artery Stent Anteroposterior	Distance
IIA Stent Trans	Internal Iliac Artery Stent Transverse	Distance
Prox Landing Site	Proximal (Stent Graft) Landing Site	Distance
Prox Landing Site AP	Proximal (Stent Graft) Landing Site Anteroposterior Diameter	Distance
Prox Landing Site Trans	Proximal (Stent Graft) Landing Site Transverse Diameter	Distance
Ao Stent Graft	Aortic Stent Graft	Distance
Ao Stent Graft AP	Aortic Stent Graft Anteroposterior Diameter	Distance
Ao Stent Graft Trans	Aortic Stent Graft Trans Diameter	Distance
Dist Landing Site	Distal (Stent Graft) Landing Site	Distance
Dist Landing Site AP	Distal (Stent Graft) Landing Site Anteroposterior Diameter	Distance
Dist Landing Site Trans	Distal (Stent Graft) Landing Site Transverse Diameter	Distance
Main RA Origin	Main Renal Artery Origin	Distance
IVC	Inferior Vena Cava	Distance
CIV	Common Iliac Vein	Distance
Celiac A Origin	Celiac Artery	Distance
SMA Origin	Superior Mesenteric Artery	Distance
SMA	Superior Mesenteric Artery	Distance
IMA Origin	Inferior Mesenteric Artery	Distance
IMA	Inferior Mesenteric Artery	Distance
Celiac A Origin, Postprandial	Celiac Artery-Postprandial	Distance
SMA Origin, Postprandial	Superior Mesenteric Artery-Postprandial	Distance
SMA Postprandial	Superior Mesenteric Artery-Postprandial	Distance
MPV	Main Portal Vein	Distance
LPV	Left Main Branch of Portal Vein	Distance
RPV	Right Main Branch of Portal Vein	Distance
SMV	Superior Mesenteric Vein	Distance
Splenic V	Splenic Vein	Distance

Measurement Label	Description	Measurement Method
CHA	Common Hepatic Artery	Distance
LHA	Left Branch of Hepatic Artery	Distance
RHA	Right Branch of Hepatic Artery	Distance
LHV	Left Hepatic Vein	Distance
MHV	Middle Hepatic Vein	Distance
RHV	Right Hepatic Vein	Distance
SVC	Superior Vena Cava	Distance
RA Stent	Renal Artery Stent	Distance
Main RA	Main Renal Artery	Distance
ARA Origin	Accessory Renal Artery Origin	Distance
ARA	Accessory Renal Artery	Distance
Renal V	Renal Vein	Distance
Transplant RA	Transplant Renal Artery	Distance
Transplant Renal V	Transplant Renal Vein	Distance
Renal V Anast	Renal Vein Anastomosis	Distance
Ureter	Ureter Length	Distance
Urethra	Urethra	Distance
PreVoid Bladder Length	Pre-Void Bladder Length	Distance
PreVoid Bladder AP	Pre-Void Bladder Anteroposterior	Distance
PreVoid Bladder Width	Pre-Void Bladder Width	Distance
PostVoid Bladder Length	Post-Void Bladder Length	Distance
PostVoid Bladder AP	Post-Void Bladder Anteroposterior	Distance
PostVoid Bladder Width	Post-Void Bladder Width	Distance
Bladder Length	Bladder Length	Distance
Bladder Width	Bladder Width	Distance
Bladder AP	Bladder Anteroposterior	Distance
BPD	Biparietal Diameter	Distance
CRL	Crown Rump Length	Distance
Mean Sac Diam	Mean Gestational Sac Diameter	3 Distance Avg
GSD	Gestational Sac. Maximum Length	Distance
EDV (Simpson SP)	End-Diastole Volume	Disk
ESV (Simpson SP)	End-Systole Volume	Disk
HR (Simpson SP)	Heart Rate	(user-entered value)

2D-Mode Calculation Labels

Calculation Label	Description	Required Measurements	Units
Kidney Volume	Kidney Volume 3.1415926535 / 6 * Kidney Length * Kidney Width * Kidney AP	**Kidney Length** **Kidney Width** **Kidney AP**	mL
Liver	Liver 3.1415926535 / 6 * Liver Length * Liver Width * Liver AP	**Liver Length** **Liver AP** **Liver Width**	mL
Transplant Kidney Vol	Transplant Kidney Volume 3.1415926535 / 6 * Transplant Kidney Length * Transplant Kidney Width * Transplant Kidney AP	**Transplant Kidney Length** **Transplant Kidney AP** **Transplant Kidney Width**	mL
GB	Gallbladder 3.1415926535 / 6 * GB Length * GB Width * GB AP	**GB Length** **GB Width** **GB AP**	mL
Spleen Volume	Spleen Volume 3.1415926535 / 6 * Spleen Length * Spleen AP * Spleen Width	**Spleen Length** **Spleen AP** **Spleen Width**	mL
EF	Ejection Fraction Stroke Volume / EDV * 100	**EDV(Simpson SP)** **ESV(Simpson SP)**	%
PreVoid Bladder Vol	PreVoid Bladder Volume 3.1415926535 / 6 * PreVoid Bladder Length * PreVoid Bladder AP * PreVoid Bladder Width	**PreVoid Bladder Length** **PreVoid Bladder AP** **PreVoid Bladder Width**	mL
PostVoid Bladder Vol	PostVoid Bladder Volume 3.1415926535 / 6 * PostVoid Bladder Length * PostVoid Bladder AP * PostVoid Bladder Width	**PostVoid Bladder Length** **PostVoid Bladder AP** **PostVoid Bladder Width**	mL
Micturated Volume	Micturated Volume PreVoid Bladder - PostVoid Bladder	**PreVoid Bladder** **PostVoid Bladder**	mL
Residual Urine (Haylen)	Residual Urine(Haylen) Bladder Width * Bladder AP * 5.9 - 14.9	**Bladder Width** **Bladder AP**	mL
Residual Urine (Dietz)	Residual Urine(Dietz) Bladder Length * Bladder AP * 5.6	**Bladder Length** **Bladder AP**	mL
Residual Urine (Dicuio)	Residual Urine(Dicuio) Bladder Length * Bladder AP * Bladder Width * 0.5	**Bladder Length** **Bladder Width** **Bladder AP**	mL

Spleen Volume Reference

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Residual Urine Reference

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Dietz HP, Velez D, Shek KL, Martin A. "Determination of postvoid residual by translabial ultrasound." Int Urogyn J 2012;23:1749-1752.

Dicuio M, Pomara G, Menchini Fabris F, Ales V, Dahlstrand C, Morelli G. "Measurements of urinary bladder volume: comparison of five ultrasound calculation methods in volunteers." Arch Ital Urol Androl 2005;77:60-62.

M-Mode Measurement Labels

Measurement Label	Description	Measurement Method
Fetal HR	Fetal Heart Rate, in beats per minute	HR

Doppler Measurement Labels

Measurement Label	Description	Measurement Method
CIA	Common Iliac Artery	PI Auto
EIA	External Iliac Artery	PI Auto
Inflow Vessel 1	Inflow Vessel, numbered 1 through 2	Velocity
Anast 1	Anastomosis, numbered 1 through 2	Velocity
Graft 1	Graft, numbered 1 through 2	Velocity
Outflow Vessel 1	Outflow Vessel, numbered 1 through 2	Velocity
Art Anast	Arterial Anastomosis	Velocity
EIV	External Iliac Vein	Velocity
IIA	Internal Iliac Artery	PI Auto
IIV	Internal Iliac Vein	Velocity
Aorta	Aorta	PI Auto
Suprarenal Ao	Suprarenal Aorta	PI Auto
AAA	Abdominal Aortic Aneurysm	RI
Ao Bif	Aorta at Bifurcation	PI Auto
CIA Stent	Common Iliac Artery Stent	PI Auto
CIA Aneurysm	Common Iliac Artery Aneurysm	RI
EIA Stent	External Iliac Artery Stent	RI
IIA Stent	Internal Iliac Artery Stent	RI

Measurement Label	Description	Measurement Method
Prox Landing Site	Proximal (Stent Graft) Landing Site	RI
Ao Stent Graft	Aortic Stent Graft	RI
Dist Landing Site	Distal (Stent Graft) Landing Site	RI
IVC	Inferior Vena Cava	Velocity
CIV	Common Iliac Vein	Velocity
Celiac A Origin	Celiac Artery Origin	PI Auto
SMA Origin	Superior Mesenteric Artery Origin	RI
SMA	Superior Mesenteric Artery	PI Auto
IMA Origin	Inferior Mesenteric Artery Origin	RI
IMA	Inferior Mesenteric Artery	PI Auto
Celiac A Origin, Postprandial	Celiac Artery-Postprandial	RI
SMA Origin, Postprandial	Superior Mesenteric Artery-Postprandial	RI
SMA Postprandial	Superior Mesenteric Artery-Postprandial	RI
MPV	Main Portal Vein	Velocity
LPV	Left Main Branch of Portal Vein	Velocity
RPV	Right Main Branch of Portal Vein	Velocity
SMV	Superior Mesenteric Vein	Velocity
Splenic V	Splenic Vein	Velocity
CHA	Common Hepatic Artery	RI
LHA	Left Branch of Hepatic Artery	RI
RHA	Right Branch of Hepatic Artery	RI
LHV	Left Hepatic Vein	Velocity
MHV	Middle Hepatic Vein	Velocity
RHV	Right Hepatic Vein	Velocity
Stent Portal End	Stent-Portal End (Proximal)	Velocity
Stent Mid	Stent-Mid (Mid)	Velocity
Stent Hepatic End	Stent-Hepatic End (Distal)	Velocity
Donor A	Donor Artery	RI
Portal V Pre Anast	Portal Vein Pre-anastomosis	Velocity
Portal V Anast	Portal Vein Anastomosis	Velocity
SVC	Superior Vena Cava	Velocity
RA Stent	Renal Artery Stent	RI
Main RA	Main Renal Artery	PI Auto
Main RA Origin	Main Renal Artery Origin	PI Auto
ARA Origin	Accessory Renal Artery Origin	RI
ARA	Accessory Renal Artery	RI

Measurement Label	Description	Measurement Method
Segmental A Sup	Superior Segmental Artery	RI
Segmental A Mid	Medial Segmental Artery	RI
Segmental A Inf	Inferior Segmental Artery	RI
Arcuate A Sup	Superior Arcuate Artery	RI
Arcuate A Mid	Medial Arcuate Artery	RI
Arcuate A Inf	Inferior Arcuate Artery	RI
Interlobar A Sup	Superior Interlobar Artery	RI
Interlobar A Mid	Medial Interlobar Artery	RI
Interlobar A Inf	Inferior Interlobar Artery	RI
Renal V	Renal Vein	Velocity
Transplant RA	Transplant Renal Artery	RI
Transplant Renal V	Transplant Renal Vein	Velocity
Renal V Anast	Renal Vein Anastomosis	Velocity
Splenic A	Splenic Artery	PI Auto
Fetal HR	Fetal Heart Rate, in beats per minute	HR

Doppler Calculation Labels

Calculation Label	Description	Required Measurements
Portal V Anast/Pre Anast Vel	Portal Vein Anastomosis / Portal Vein Anastomosis Velocity Ratio	**Portal V Anast** **Pre Anast Vel**
Main RA / Suprarenal Ao	Main Renal Artery / Suprarenal Aorta Ratio max(Main RA PS,Main RA PS Prox,Main RA PS Mid,Main RA PS Dist) / Suprarenal Aorta PS	**Main RA PS** **Suprarenal Ao PS**
Main RA Origin / Suprarenal Ao	Main Renal Artery Origin / Suprarenal Aorta Ratio max(Main RA PS,Main RA PS Prox,Main RA PS Mid,Main RA PS Dist) / Suprarenal Aorta PS	**Main RA Origin** **Suprarenal Ao PS**
ARA / Suprarenal Ao	Accessory Renal Artery / Suprarenal Aorta Ratio max(ARA PS,ARA PS Prox,ARA PS Mid,ARA PS Dist) / Suprarenal Aorta PS	**ARA PS** **Suprarenal Ao PS**
ARA Origin / Suprarenal Ao	Accessory Renal Artery Origin / Suprarenal Aorta Ratio max(ARA PS,ARA PS Prox,ARA PS Mid,ARA PS Dist) / Suprarenal Aorta PS	**Suprarenal Ao PS** **ARA Origin**

Sections in the Patient Report

Section Name	Description
Exam Specific Information	Indications and additional information for specific exam types
2D Measurements	Measurement labels and results for 2D-mode measurements
2D Mode Side by Side	Measurement labels and results for 2D-mode measurements for both right and left sides
M Measurements	Measurement labels and results for M-mode measurements
D Measurements	Measurement labels and results for Doppler measurements
D Mode Side by Side	Measurement labels and results for Doppler measurements for both right and left sides
Assessment	Descriptions for exam-related structures. You can select system defined or user-defined descriptions
Images	Images included from the thumbnail panel
Comments	Any combination of predefined comments and user-entered comments

Gynecology Measurements and Calculations

Gynecology 2D-Mode Measurement Labels

Measurement Label	Description	Measurement Method
Cervix (TA)	Cervix Length, transabdominal	Distance
Cervix (EV)	Cervix Length, endovaginal	Distance
Kidney Length	Kidney Length	Distance
Kidney Width	Kidney Width	Distance
Kidney AP	Kidney AP	Distance
Ureter	Ureter Length	Distance
PreVoid Bladder Length	Pre-Void Bladder Length	Distance
PreVoid Bladder AP	Pre-Void Bladder Anteroposterior	Distance
PreVoid Bladder Width	Pre-Void Bladder Width	Distance
PostVoid Bladder Length	Post-Void Bladder Length	Distance
PostVoid Bladder AP	Post-Void Bladder Anteroposterior	Distance
PostVoid Bladder Width	Post-Void Bladder Width	Distance
Fibroid 1	Fibroid, numbered 1 through 5	Distance
Mass 1	Mass, numbered 1 through 5	Distance
Ovary Width (TA)	Ovary Width, transabdominal	Distance
Ovary Length (TA)	Ovary Length, transabdominal	Distance
Ovary AP (TA)	Ovary AP, transabdominal	Distance
Ovary Width (EV)	Ovarian Transverse Diameter (Width), endovaginal	Distance
Ovary Length (EV)	Ovarian Length, endovaginal	Distance
Ovary AP (EV)	Ovary Anteroposterior Diameter, endovaginal	Distance

Measurement Label	Description	Measurement Method
Endometrium	Endometrium	Distance
Endo Thick Width (TA)	Endometrium Thickness Width, transabdominal	Distance
Endo Thick Length (TA)	Endometrium Thickness Length, transabdominal	Distance
Endo Thick AP (TA)	Endometrium Thickness Anteroposterior Diameter, transabdominal	Distance
Endo Thick Width (EV)	Endometrium Thickness Width, endovaginal	Distance
Endo Thick Length (EV)	Endometrium Thickness Length, endovaginal	Distance
Endo Thick AP (EV)	Endometrium Thickness Anteroposterior Diameter, endovaginal	Distance
Uterus Width (TA)	Uterus Width, transabdominal	Distance
Uterus Length (TA)	Uterus Length, transabdominal	Distance
Uterus AP (TA)	Uterus Anteroposterior Diameter, transabdominal	Distance
Uterus Width (EV)	Uterus Width, endovaginal	Distance
Uterus Length (EV)	Uterus Length, endovaginal	Distance
Uterus AP (EV)	Uterus Anteroposterior Diameter, endovaginal	Distance
Uterine Width	Uterine Width	Distance
Uterine Length	Uterine Length	Distance
Uterine AP	Uterine Anteroposterior Diameter	Distance
Follicle 1	Follicle, numbered 1 through 15	2 Distance Avg
Cyst 1	Cyst, numbered 1 through 5	Distance
Bladder neck-Symphysis	Bladder neck-Symphysis Distance	Distance
Cervix descent	Cervix descent	Distance
Rectal Ampulla descent	Rectal Ampulla descent	Distance
Levator Hiatus AP	Levator Hiatus Anteroposterior	Distance
Levator Hiatus Lateral	Levator Hiatus Lateral	Distance
Levator Hiatus Area	Levator Hiatus Area	Ellipse
Rectovesical Angle (Rest)	Rectovesical Angle at Rest	Cross Angle
Rectovesical Angle (Valsalva)	Rectovesical Angle at Valsalva	Cross Angle
Detrusor wall thick.	Detrusor wall thickness	Distance
Urethral Rotation	Urethral Rotation	Cross Angle
RVA	Retrovesical Angle	Cross Angle
PUV	Posterior Urethrovesical Angle	Cross Angle

Measurement Label	Description	Measurement Method
Uterine Desc max	Maximum distance from the inferior margin of pubis symphysis to the cervix	Distance
Re.amp.desc.max	Maximum distance from the inferior margin of pubis symphysis to the rectal ampulla	Distance
Rectocele Depth	Rectocele is measured as the maximal Depth of the protrusion beyond the expected margin of the normal anterior rectal wall.	Distance
BND Rest	The bladder neck descent is the difference between the horizontal measurement of the bladder neck position at rest and at maximum valsalva	Distance
BND Stress	The bladder neck descent is the difference between the horizontal measurement of the bladder neck position at rest and at maximum valsalva	Distance
Bladder desc.max	Maximum distance from the inferior margin of pubis symphysis to the bladder	Distance
Levator Hiatus Stress	Quantification of pelvic floor muscle activity. Reduction of the mid-sagittal diameter of the levator hiatus is measured at the level of minimal hiatal dimensions	Distance
Bladder Length	Bladder Length	Distance
Bladder Width	Bladder Width	Distance
Bladder AP	Bladder Anterior Posterior	Distance
Hiatus AP	Hiatus AP length	Distance
Hiatus Lateral	Hiatus Lateral Diameter	Distance
PRM inner perimeter	Puborectalis muscle inner perimeter	Spline
Hiatus inner area	Pelvic floor hiatus inner area	Spline
Hiatus outer area	Pelvic floor hiatus outer area	Spline
Levator ani Angle	Levator ani angle	Cross Angle
IAS diameter	Internal Anal Sphincter Diameter	Distance
EAS diameter	External Anal Sphincter Diameter	Distance
Cervix Len	Cervical Length	Distance
CRL	Crown Rump Length	Distance
Yolk Sac	Yolk Sac Diameter	Distance
Mean Sac Diam	Mean Gestational Sac Diameter	3 Distance Avg
GSD	Gestational Sac Maximum Length	Distance

2D-Mode Calculation Labels

Calculation Label	Description	Required Measurements	Units
Kidney Volume	Kidney Volume 3.1415926535 / 6 * Kidney Length * Kidney Width * Kidney AP	**Kidney Length** **Kidney Width** **Kidney AP**	mL
PreVoid Bladder Vol	PreVoid Bladder Volume 3.1415926535 / 6 * PreVoid Bladder Length * PreVoid Bladder AP * PreVoid Bladder Width	**PreVoid Bladder Length** **PreVoid Bladder AP** **PreVoid Bladder Width**	mL
PostVoid Bladder Vol	PostVoid Bladder Volume 3.1415926535 / 6 * PostVoid Bladder Length * PostVoid Bladder AP * PostVoid Bladder Width	**PostVoid Bladder Length** **PostVoid Bladder AP** **PostVoid Bladder Width**	mL
Micturated Volume	Micturated Volume PreVoid Bladder - PostVoid Bladder	**PreVoid Bladder** **PostVoid Bladder**	mL
Residual Urine (Haylen)	Residual Urine (Haylen) Bladder Width * Bladder AP * 5.9 - 14.9	**Bladder Width** **Bladder AP**	mL
Residual Urine (Dietz)	Residual Urine (Dietz) Bladder Length * Bladder AP * 5.6	**Bladder Length** **Bladder AP**	mL
Residual Urine (Dicuio)	Residual Urine (Dicuio) Bladder Length * Bladder AP * Bladder Width * 0.5	**Bladder Length** **Bladder Width** **Bladder AP**	mL
Ovary Volume (TA)	Ovary Volume (Transabdominal) 3.1415926535 / 6 * Ovary Length (TA) * Ovary Width (TA) * Ovary AP (TA)	**Ovary Length (TA)** **Ovary Width(TA)** **Ovary AP (TA)**	mL
Ovary Volume (EV)	Ovary Volume (Endovaginal) 3.1415926535 / 6 * Ovary Length (EV) * Ovary Width (EV) * Ovary AP (EV)	**Ovary Length (EV)** **Ovary Width(EV)** **Ovary AP (EV)**	mL
Uterine Volume	Uterine Volume 3.1415926535 / 6 * Uterus Length * Uterus Width * Uterus AP	**Uterine Length** **Uterine Width** **Uterine AP**	mL
Uterus Volume (TA)	Uterus Volume (Transabdominal) 3.1415926535 / 6 * Uterus Length(TA) * Uterus Width(TA) * Uterus AP(TA)	**Uterus (TA) Length** **Uterus (TA) Width** **Uterus (TA) AP**	mL
Uterus Volume (EV)	Uterus Volume (Endovaginal) 3.1415926535 / 6 * Uterus Length(EV) * Uterus Width(EV) * Uterus AP(EV)	**Uterus (EV) Length** **Uterus (EV) Width** **Uterus (EV) AP**	mL
Endo Thick (TA)	Endometrium Thickness (Transabdominal) 3.1415926535 / 6 * Endo Thick AP (TA) * Endo Thick Length (TA) * Endo Thick Width (TA)	**Endo Thick AP (TA)** **Endo Thick Length (TA)** **Endo Thick Width (TA)**	mL
Endo Thick (EV)	Endometrium Thickness (Endovaginal) 3.1415926535 / 6 * Endo Thick AP (EV) * Endo Thick Length (EV) * Endo Thick Width (EV)	**Endo Thick AP (EV)** **Endo Thick Length (EV)** **Endo Thick Width (EV)**	mL

M-Mode Measurement Labels

Measurement Label	Description	Measurement Method
Fetal HR	Fetal Heart Rate, in beats per minute	HR

Doppler Measurement Labels

Measurement Label	Description	Measurement Method
Uterine A	Uterine Artery	PI Auto
Ovarian A	Ovarian Artery	PI Auto
Fetal HR	Fetal Heart Rate, in beats per minute	HR
Ovarian V	Ovarian Vein	Velocity

Sections in the Patient Report

Section Name	Description
Exam Specific Information	Indications and additional information for specific exam types
2D Measurements	Measurement labels and results for 2D-mode measurements
2D Mode Side by Side	Measurement labels and results for 2D-mode measurements for both right and left sides
D Measurements	Measurement labels and results for Doppler measurements
D Mode Side by Side	Measurement labels and results for Doppler measurements for both right and left sides
Assessment	Use the configuration settings to create user-defined anatomy structures and descriptions.
Images	Images included from the thumbnail panel
Comments	Any combination of predefined comments and user-entered comments

Pediatric Measurements and Calculations

2D-Mode Measurement Labels

Measurement Label	Description	Measurement Method
Kidney Length	Kidney Length	Distance
Kidney Width	Kidney Width	Distance
Kidney AP	Kidney AP	Distance
Cortical Thickness	Kidney Cortical Thickness	Distance
CIA	Common Iliac Artery	Distance
EIA	External Iliac Artery	Distance
Inflow Vessel 1	Inflow Vessel, numbered 1 through 2	Distance
Anast 1	Anastomosis, numbered 1 through 2	Distance
Graft 1	Graft, numbered 1 through 2	Distance
Outflow Vessel 1	Outflow Vessel, numbered 1 through 2	Distance

Measurement Label	Description	Measurement Method
Art Anast	Art Anastomosis	Distance
EIV	External Iliac Vein	Distance
IIA	Internal Iliac Artery	Distance
IIV	Internal Iliac Vein	Distance
Aorta	Aorta Diameter	Distance
Suprarenal Ao	Suprarenal Aorta	Distance
Suprarenal Ao AP	Suprarenal Aorta AP	Distance
Suprarenal Ao Diam	Suprarenal Aorta Diam	Distance
AAA	Abdominal Aortic Aneurysm	Distance
AAA AP	Abdominal Aortic Aneurysm AP	Distance
AAA Trans	Abdominal Aortic Aneurysm Trans	Distance
AAA dist from SMA	Abdominal Aortic Aneurysm distance from SMA	Distance
Neck Length	Infra-renal Neck Length	Distance
Neck Diam	Infra-renal Neck Diam	Distance
AAA Sac Length	Abdominal Aortic Aneurysm Sac Length	Distance
Ao Bif	Aorta at Bifurcation	Distance
Ao Bif AP	Aorta at Bifurcation	Distance
Ao Bif Trans	Aorta at Bifurcation	Distance
CIA Stent	Common Iliac Artery Stent	Distance
CIA Stent AP	Common Iliac Artery Stent AP	Distance
CIA Stent Trans	Common Iliac Artery Stent Trans	Distance
CIA Aneurysm	Common Iliac Artery Aneurysm	Distance
CIA Aneurysm AP	Common Iliac Artery Aneurysm AP	Distance
CIA Aneurysm Trans	Common Iliac Artery Aneurysm Trans	Distance
EIA Stent	External Iliac Artery Stent	Distance
EIA Stent AP	External Iliac Artery Stent	Distance
EIA Stent Trans	External Iliac Artery Stent	Distance
IIA Stent	Internal Iliac Artery Stent	Distance
IIA Stent AP	Internal Iliac Artery Stent AP	Distance
IIA Stent Trans	Internal Iliac Artery Stent Trans	Distance
Prox Landing Site	Proximal (Stent Graft) Landing Site	Distance
Prox Landing Site AP	Proximal (Stent Graft) Landing Site AP Diameter	Distance
Prox Landing Site Trans	Proximal (Stent Graft) Landing Site Trans Diameter	Distance
Ao Stent Graft	Aortic Stent Graft	Distance
Ao Stent Graft AP	Aortic Stent Graft AP Diameter	Distance
Ao Stent Graft Trans	Aortic Stent Graft Trans Diameter	Distance

Measurement Label	Description	Measurement Method
Dist Landing Site	Distal (Stent Graft) Landing Site	Distance
Dist Landing Site AP	Distal (Stent Graft) Landing Site AP Diameter	Distance
Dist Landing Site Trans	Distal (Stent Graft) Landing Site Trans Diameter	Distance
Main RA Origin	Main Renal Artery Origin	Distance
IVC	Inferior Vena Cava	Distance
CIV	Common Iliac Vein	Distance
Celiac A Origin	Celiac Artery	Distance
SMA Origin	Superior Mesenteric Artery	Distance
SMA	Superior Mesenteric Artery	Distance
IMA Origin	Inferior Mesenteric Artery	Distance
IMA	Inferior Mesenteric Artery	Distance
Celiac A Origin, Postprandial	Celiac Artery-Postprandial	Distance
SMA Origin, Postprandial	Superior Mesenteric Artery-Postprandial	Distance
SMA Postprandial	Superior Mesenteric Artery-Postprandial	Distance
MPV	Main Portal Vein	Distance
LPV	Left Main Branch of Portal Vein	Distance
RPV	Right Main Branch of Portal Vein	Distance
SMV	Superior Mesenteric Vein	Distance
Splenic V	Splenic Vein	Distance
CHA	Common Hepatic Artery	Distance
LHA	Left Branch of Hepatic Artery	Distance
RHA	Right Branch of Hepatic Artery	Distance
LHV	Left Hepatic Vein	Distance
MHV	Middle Hepatic Vein	Distance
RHV	Right Hepatic Vein	Distance
Liver Length	Liver Length	Distance
Liver AP	Liver AP	Distance
Liver Width	Liver Width	Distance
Liver Mass 1	Liver Mass, numbered 1 through 10	3 Dist
CHD	Common Hepatic Duct	Distance
CBD	Common Bile Duct	Distance
Stent Portal End	Stent-Portal End (Proximal)	Distance
Stent Mid	Stent-Mid (Mid)	Distance
Stent Hepatic End	Stent-Hepatic End (Distal)	Distance

Measurement Label	Description	Measurement Method
Donor A	Donor Artery	Distance
Portal V Pre Anast	Portal Vein Pre-anastomosis	Distance
Portal V Anast	Portal Vein Anastomosis	Distance
SVC	Superior Vena Cava	Distance
RA Stent	Renal Artery Stent	Distance
Main RA	Main Renal Artery	Distance
ARA Origin	Accessory Renal Artery Origin	Distance
ARA	Accessory Renal Artery	Distance
Renal V	Renal Vein	Distance
Art Anast	Arterial Anastomosis	Distance
Transplant RA	Transplant Renal Artery	Distance
Transplant Renal V	Transplant Renal Vein	Distance
Renal V Anast	Renal Vein Anastomosis	Distance
Transplant Kidney AP	Transplant Kidney AP	Distance
Transplant Kidney Length	Transplant Kidney Length	Distance
Transplant Kidney Width	Transplant Kidney Width	Distance
GB AP	Gallbladder AP	Distance
GB Length	Gallbladder Length	Distance
GB Width	Gallbladder Width	Distance
GB Wall Thickness	Gallbladder Wall Thickness	Distance
Pancreas Duct	Pancreas Duct	Distance
Pancreas Body	Pancreas Body	Distance
Pancreas Head	Pancreas Head	Distance
Pancreas Tail	Pancreas Tail	Distance
Spleen Length	Spleen Length	Distance
Spleen AP	Spleen AP	Distance
Spleen Width	Spleen Width	Distance
Splenic A	Splenic Artery	Distance
Ureter	Ureter Length	Distance
Hip Angle	Hip angle	Angle
Lt Hip Angle	Left hip angle	Angle
Rt Hip Angle	Right hip angle	Angle
Flexed FHC	Flexed percentage of femoral head coverage	Ratio
Lt Flexed FHC	Left flexed percentage of femoral head coverage	Ratio
Rt Flexed FHC	Right flexed percentage of femoral head coverage	Ratio
Stressed FHC	Stressed percentage of femoral head coverage	Ratio
Lt Stressed FHC	Left stressed percentage of femoral head coverage	Ratio
Rt Stressed FHC	Right stressed percentage of femoral head coverage	Ratio

2D-Mode Calculation Labels

Calculation Label	Description	Required Measurements	Units
Kidney Volume	Kidney Volume	**Kidney Length** **Kidney Width** **Kidney AP**	mL
Liver	Liver	**Liver Length** **Liver AP** **Liver Width**	mL
GB	Gallbladder	**GB Length** **GB Width** **GB AP**	mL

Doppler Measurement Labels

Measurement Label	Description	Measurement Method
CIA	Common Iliac Artery	PI Auto
EIA	External Iliac Artery	PI Auto
Inflow Vessel 1	Inflow Vessel, numbered 1 through 2	Velocity
Anast 1	Anastomosis, numbered 1 through 2	Velocity
Graft 1	Graft, numbered 1 through 2	Velocity
Outflow Vessel 1	Outflow Vessel, numbered 1 through 2	Velocity
Art Anast	Art Anastomosis	Velocity
EIV	External Iliac Vein	Velocity
IIA	Internal Iliac Artery	PI Auto
IIV	Internal Iliac Vein	Velocity
Aorta	Intimal Diameter	PI Auto
Suprarenal Ao	Suprarenal Aorta	PI Auto
AAA	Abdominal Aortic Aneurysm	RI
Ao Bif	Aorta at Bifurcation	PI Auto
CIA Stent	Common Iliac Artery Stent	PI Auto
CIA Aneurysm	Common Iliac Artery Aneurysm	RI
EIA Stent	External Iliac Artery Stent	RI
IIA Stent	Internal Iliac Artery Stent	RI
Prox Landing Site	Proximal (Stent Graft) Landing Site	RI
Ao Stent Graft	Aortic Stent Graft	RI
Dist Landing Site	Distal (Stent Graft) Landing Site	RI

Measurement Label	Description	Measurement Method
IVC	Inferior Vena Cava	Velocity
CIV	Common Iliac Vein	Velocity
Celiac A Origin	Celiac Artery	PI Auto
SMA Origin	Superior Mesenteric Artery	RI
SMA	Superior Mesenteric Artery	PI Auto
IMA Origin	Inferior Mesenteric Artery	RI
IMA	Inferior Mesenteric Artery	PI Auto
Celiac A Origin, Postprandial	Celiac Artery-Postprandial	RI
SMA Origin, Postprandial	Superior Mesenteric Artery-Postprandial	RI
SMA Postprandial	Superior Mesenteric Artery-Postprandial	RI
MPV	Main Portal Vein	Velocity
LPV	Left Main Branch of Portal Vein	Velocity
RPV	Right Main Branch of Portal Vein	Velocity
SMV	Superior Mesenteric Vein	Velocity
Splenic V	Splenic Vein	Velocity
CHA	Common Hepatic Artery	RI
LHA	Left Branch of Hepatic Artery	RI
RHA	Right Branch of Hepatic Artery	RI
LHV	Left Hepatic Vein	Velocity
MHV	Middle Hepatic Vein	Velocity
RHV	Right Hepatic Vein	Velocity
Stent Portal End	Stent-Portal End (Proximal)	Velocity
Stent Mid	Stent-Mid (Mid)	Velocity
Stent Hepatic End	Stent-Hepatic End (Distal)	Velocity
Donor A	Donor Artery	RI
Portal V Pre Anast	Portal Vein Pre-anastomosis	Velocity
Portal V Anast	Portal Vein Anastomosis	Velocity
SVC	Superior Vena Cava	Velocity
RA Stent	Renal Artery Stent	RI
Main RA	Main Renal Artery	PI Auto
ARA Origin	Accessory Renal Artery Origin	RI
ARA	Accessory Renal Artery	RI

Measurement Label	Description	Measurement Method
Segmental A Sup	Superior Segmental Artery	RI
Segmental A Mid	Medial Segmental Artery	RI
Segmental A Inf	Inferior Segmental Artery	RI
Arcuate A Sup	Superior Arcuate Artery	RI
Arcuate A Mid	Medial Arcuate Artery	RI
Arcuate A Inf	Inferior Arcuate Artery	RI
Renal V	Renal Vein	Velocity
Art Anast	Arterial Anastomosis	Velocity
Transplant RA	Transplant Renal Artery	RI
Transplant Renal V	Transplant Renal Vein	Velocity
Renal V Anast	Renal Vein Anastomosis	Velocity
Splenic A	Splenic Artery	PI Auto

Hip Angle Reference

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Sections in the Patient Report

Section Name	Description
Exam Specific Information	Indications and additional information for specific exam types
2D Measurements	Measurement labels and results for 2D-mode measurements
2D Mode Side by Side	Measurement labels and results for 2D-mode measurements for both right and left sides
M Measurements	Measurement labels and results for M-mode measurements
D Measurements	Measurement labels and results for Doppler measurements
D Mode Side by Side	Measurement labels and results for Doppler measurements for both right and left sides
Assessment	Descriptions for exam-related structures. You can select system defined or user-defined descriptions
Images	Images included from the thumbnail panel
Comments	Any combination of predefined comments and user-entered comments

Neonatal Measurements and Calculations

The neonatal exam type has only general measurements and no measurement labels.

Sections in the Patient Report

Section Name	Description
Exam Specific Information	Includes systole and diastole for both left and right sides and the blood pressure for each side
2D Measurements	Measurement labels and results for 2D-mode measurements
2D Mode Side by Side	Measurement labels and results for 2D-mode measurements for both right and left sides
M Measurements	Measurement labels and results for M-mode measurements
D Measurements	Measurement labels and results for Doppler measurements
D Mode Side by Side	Measurement labels and results for Doppler measurements for both right and left sides
Assessment	Use the system configuration settings to create user-defined anatomy structures and descriptions.
Images	Images included from the thumbnail panel
Comments	Any combination of predefined comments and user-entered comments

Vascular Measurements and Calculations

2D-Mode Measurement Labels

Measurement Label	Description	Measurement Method
EIV	External Iliac Vein	Distance
IIV	Internal Iliac Vein	Distance
CIV	Common Iliac Vein	Distance
Axillary Vein	Axillary Vein	Distance
Brachial Vein	Brachial Vein	Distance
CCA	Common Carotid Artery, first sample	ET-%Stenosis
ICA	Internal Carotid Artery, first sample	ET-%Stenosis
ECA	External Carotid Artery	ET-%Stenosis
Vert A	Vertebral Artery	ET-%Stenosis
Bulb	Carotid Bulb	Distance
Subclav A	Subclavian Artery	Distance
Innom A	Innominate Artery	Distance
HR	Heart Rate	(user-entered value)
CFV	Common Femoral Vein	Distance
Deep Fem V	Deep Femoral Vein	Distance
Fem V	Femoral Vein	Distance
Pop V	Popliteal Vein	Distance
Med Gastroc V 1	Medial Gastrocnemius Vein, numbered 1 through 2	Distance
Lat Gastroc V 1	Lateral Gastrocnemius Vein, numbered 1 through 2	Distance
Soleus V	Soleus Vein	Distance
PTV 1	Posterior Tibial Vein, numbered 1 through 2	Distance
Peroneal V 1	Peroneal Vein, numbered 1 through 2	Distance
ATV 1	Anterior Tibial Vein, numbered 1 through 2	Distance
SFJ	Saphenofemoral Junction	Distance
GSV Upper Thigh	Great Saphenous Vein: Upper Thigh	Distance
GSV Mid Thigh	Great Saphenous Vein: Mid Thigh	Distance
GSV Lower Thigh	Great Saphenous Vein: Lower Thigh	Distance
GSV Knee	Great Saphenous Vein: Knee	Distance
GSV Upper Calf	Great Saphenous Vein: Upper Calf	Distance
GSV Mid Calf	Great Saphenous Vein: Mid Calf	Distance
GSV Lower Calf	Great Saphenous Vein: Lower Calf	Distance
GSV Ankle	Great Saphenous Vein: Ankle	Distance

Measurement Label	Description	Measurement Method
SPJ	Saphenopopliteal Junction	Distance
SSV Upper Calf	Small Saphenous Vein: Upper Calf	Distance
SSV Mid Calf	Small Saphenous Vein: Mid Calf	Distance
SSV Lower Calf	Small Saphenous Vein: Lower Calf	Distance
SSV Ankle	Small Saphenous Vein: Ankle	Distance
Cockett's Perf 1	Cockett's Perforator, numbered 1 through 3	Distance
Boyd's Perf	Boyd's Perforator	Distance
Dodd Perf	Dodd Perforator	Distance
Hunterian Perf	Hunterian Perforator	Distance
Innom V	Innominate Vein	Distance
IJV	Internal Jugular Vein	Distance
SCL V	Subclavian Vein	Distance
Brachial V1	Brachial Vein, numbered 1 through 2	Distance
Cephalic V	Cephalic Vein	Distance
Basilic V	Basilic Vein	Distance
Mcub V	Median Cubital Vein	Distance
Radial V	Radial Vein	Distance
Radial V1	Radial Vein, numbered 1 through 2	Distance
Ulnar V	Ulnar Vein	Distance
Ulnar V1	Ulnar Vein, numbered 1 through 2	Distance
MCA	Middle Cerebral Artery	Distance
ICA-Siphon	Internal Carotid Artery-Siphon	Distance
ACA A1	The A-1 section of the Anterior Cerebral Artery	Distance
ACA A2	The A-2 section of the Anterior Cerebral Artery	Distance
ACoA	Anterior Communicating Artery	Distance
PCA-P1	The P1 section of the Posterior Cerebral Artery	Distance
PCA-P2	The P2 section of the Posterior Cerebral Artery	Distance
PCoA	Posterior Communicating Artery	Distance
PCA	Posterior Cerebral Artery	Distance
Basilar A	Basilar Artery	Distance
Opthalmic A	Opthalmic Artery	Distance
CIA	Common Iliac Artery	Distance
EIA	External Iliac Artery	Distance

Measurement Label	Description	Measurement Method
Inflow Vessel 1	Inflow Vessel, numbered 1 through 2	Distance
Anast 1	Anastomosis, numbered 1 through 2	Distance
Graft 1	Graft, numbered 1 through 2	Distance
Outflow Vessel 1	Outflow Vessel, numbered 1 through 2	Distance
Art Anast	Arterial Anastomosis	Distance
Axillary A	Axillary Artery	Distance
Brachial A	Brachial Artery	Distance
CFA	Common Femoral Artery	Distance
CFA Pseudo	Common Femoral Artery Pseudoaneurysm	Distance
CFA Stent	Common Femoral Artery Stent	Distance
DFA	Deep Femoral Artery	Distance
DFA Stent	Deep Femoral Artery Stent	Distance
SFA	Superficial Femoral Artery	Distance
SFA Stent	Superficial Femoral Artery Stent	Distance
Pop A	Popliteal Artery	Distance
Pop A Aneurysm	Popliteal Artery Aneurysm	Distance
Pop A Aneurysm AP	Popliteal Artery Aneurysm	Distance
Pop A Aneurysm Trans	Popliteal Artery Aneurysm	Distance
Pop A Stent	Popliteal Artery Stent	Distance
T-P Trunk	Tibioperoneal Trunk	Distance
ATA	Anterior Tibial Artery	Distance
PTA	Posterior Tibial Artery	Distance
Peroneal A	Peroneal Artery	Distance
DPA	Dorsalis Pedis Artery	Distance
UE stent	Upper Extremity Stent	Distance
Deep Brachial A	Deep Brachial Artery	Distance
Radial A	Radial Artery	Distance
Ulnar A	Ulnar Artery	Distance
Inflo A	Inflow Artery	Distance
AVF	Arteriovenous Fistula	Distance
Venous Anast	Venous Anastomosis	Distance
Outflow V	Outflow Vein	Distance
Inflow Vessel	Inflow Vessel	Distance
Anast	Anastomosis	Distance
Graft	Graft	Distance
Outflow Vessel	Outflow Vessel	Distance

M-Mode Measurement Labels

Measurement Label	Description	Measurement Method
HR	Heart Rate	HR

Doppler Measurement Labels

Measurement Label	Description	Measurement Method
IIV	Internal Iliac Vein	Velocity
CIV	Common Iliac Vein	Velocity
Axillary Vein	Axillary Vein	Velocity
Brachial Vein	Brachial Vein	Velocity
CCA	Common Carotid Artery	RI
ICA	Internal Carotid Artery	RI
ECA	External Carotid Artery	RI
Vert A	Vertebral Artery	RI
Bulb	Carotid Bulb	RI
Subclav A	Subclavian Artery	RI
Innom A	Innominate Artery	RI
HR	Heart Rate	HR
CFV	Common Femoral Vein	Velocity
Deep Fem V	Deep Femoral Vein	Velocity
Fem V	Femoral Vein	Velocity
Pop V	Popliteal Vein	Velocity
Med Gastroc V 1	Medial Gastrocnemius Vein, numbered 1 through 2	Velocity
Lat Gastroc V 1	Lateral Gastrocnemius Vein, numbered 1 through 2	Velocity
Soleus V	Soleus Vein	Velocity
PTV 1	Posterior Tibial Vein, numbered 1 through 2	Velocity
Peroneal V 1	Peroneal Vein, numbered 1 through 2	Velocity
ATV 1	Anterior Tibial Vein, numbered 1 through 2	Velocity
SFJ	Saphenofemoral Junction	Velocity
GSV Upper Thigh	Great Saphenous Vein: Upper Thigh	Velocity
GSV Mid Thigh	Great Saphenous Vein: Mid Thigh	Velocity
GSV Lower Thigh	Great Saphenous Vein: Lower Thigh	Velocity
GSV Knee	Great Saphenous Vein: Knee	Velocity
GSV Upper Calf	Great Saphenous Vein: Upper Calf	Velocity
GSV Mid Calf	Great Saphenous Vein: Mid Calf	Velocity
GSV Lower Calf	Great Saphenous Vein: Lower Calf	Velocity
GSV Ankle	Great Saphenous Vein: Ankle	Velocity

Measurement Label	Description	Measurement Method
SPJ	Saphenopopliteal Junction	Velocity
SSV Upper Calf	Small Saphenous Vein: Upper Calf	Velocity
SSV Mid Calf	Small Saphenous Vein: Mid Calf	Velocity
SSV Lower Calf	Small Saphenous Vein: Lower Calf	Velocity
SSV Ankle	Small Saphenous Vein: Ankle	Velocity
Cockett's Perf 1	Cockett's Perforator, numbered 1 through 3	Velocity
Boyd's Perf	Boyd's Perforator	Velocity
Dodd Perf	Dodd Perforator	Velocity
Hunterian Perf	Hunterian Perforator	Velocity
Innom V	Innominate Vein	Velocity
IJV	Internal Jugular Vein	Velocity
SCL V	Subclavian Vein	Velocity
Brachial V1	Brachial Vein, numbered 1 through 2	Velocity
Cephalic V	Cephalic Vein	Velocity
Basilic V	Basilic Vein	Velocity
Mcub. V	Median Cubital Vein	Velocity
Radial V	Radial Vein	Velocity
Radial V1	Radial Vein, numbered 1 through 2	Velocity
Ulnar V	Ulnar Vein	Velocity
Ulnar V1	Ulnar Vein, numbered 1 through 2	Velocity
Dist ICA skull entrance	Distal Internal Carotid Artery at entrance to skull	RI
Terminal ICA	Terminal Internal Carotid Artery	RI
Terminal Vert A	Terminal Vertebral Artery	RI
MCA	Middle Cerebral Artery	Velocity
ICA-Siphon	Internal Carotid Artery-Siphon	Velocity
ACA A1	The A-1 section of the Anterior Cerebral Artery	Velocity
ACA A2	The A-2 section of the Anterior Cerebral Artery	Velocity
ACoA	Anterior Communicating Artery	Velocity
PCA P1	The P1 section of the Posterior Cerebral Artery	Velocity
PCA P2	The P2 section of the Posterior Cerebral Artery	Velocity
PCoA	Posterior Communicating Artery	Velocity
PCA	Posterior Cerebral Artery	Velocity
Basilar A	Basilar Artery	Velocity
M1 MCA	Middle Cerebral Artery M1 Segment	Velocity
M2 MCA	Middle Cerebral Artery M2 Segment	Velocity
ACA	Anterior Cerebral Artery	Velocity

Measurement Label	Description	Measurement Method
EIV	External lilac Vein	Velocity
CIA	Common Iliac Artery	PI Auto
EIA	External Iliac Artery	PI Auto
Inflow Vessel 1	Inflow Vessel, numbered 1 through 2	Velocity
Anast 1	Anastomosis, numbered 1 through 2	Velocity
Graft 1	Graft, numbered 1 through 2	Velocity
Outflow Vessel 1	Outflow Vessel, numbered 1 through 2	Velocity
Art Anast	Arterial Anastomosis	RI
Axillary A	Axillary Artery	PI Auto
Brachial A	Brachial Artery	PI Auto
Subclav A	Subclavian Artery	RI
Innom A	Innominate Artery	RI
CFA	Common Femoral Artery	Velocity
CFA Pseudo	Common Femoral Artery Pseudoaneurysm	Velocity
CFA Stent	Common Femoral Artery Stent	Velocity
DFA	Deep Femoral Artery	Velocity
DFA Stent	Deep Femoral Artery Stent	Velocity
SFA	Superficial Femoral Artery	Velocity
SFA Stent	Superficial Femoral Artery Stent	Velocity
Pop A	Popliteal Artery	Velocity
Pop A Aneurysm	Popliteal Artery Aneurysm	Velocity
Pop A Stent	Popliteal Artery Stent	Velocity
T-P Trunk	Tibioperoneal Trunk	Velocity
ATA	Anterior Tibial Artery	Velocity
PTA	Posterior Tibial Artery	Velocity
Peroneal A	Peroneal Artery	Velocity
DPA	Dorsalis Pedis Artery	Velocity
UE Stent	Upper Extremity Stent	Velocity

Measurement Label	Description	Measurement Method
Deep Brachial A	Deep Brachial Artery	Velocity
Radial A	Radial Artery	Velocity
Ulnar A	Ulnar Artery	Velocity
Inflow A	Inflow Artery	Velocity
AVF	Arteriovenous Fistula	Velocity
Venous Anast	Venous Anastomosis	Velocity
Outflow V	Outflow Vein	Velocity
Inflow Vessel	Inflow Vessel	Velocity
Anast	Anastomosis	Velocity
Outflow Vessel	Outflow Vessel	Velocity

Doppler Calculation Labels

Calculation Label	Description	Required Measurements
ICA / CCA (d)	Internal Carotid Artery / Common Carotid Artery (diastole)	**ICA ED** **CCA ED**
ICA / CCA (s)	Internal Carotid Artery / Common Carotid Artery (systole)	**ICA PS** **CCA PS**
MCA/ICA-Siphon	Middle Cerebral Artery / Internal Carotid Artery-Siphon	**MCA** **ICA-Siphon**

Sections in the Patient Report

Section Name	Description
Exam Specific Information	Indications and additional information for specific exam types
2D Measurements	Measurement labels and results for 2D-mode measurements
2D Mode Side by Side	Measurement labels and results for 2D-mode measurements for both right and left sides
M Measurements	Measurement labels and results for M-mode measurements
D Measurements	Measurement labels and results for Doppler measurements
D Mode Side by Side	Measurement labels and results for Doppler measurements for both right and left sides
Assessment	Descriptions for exam-related structures. You can select system defined or user-defined descriptions
Venous Assessment	Includes system-defined descriptions and observations for venous structures.
Carotid Assessment	Includes system-defined descriptions and observations for carotid structures.
Arterial Ratios	Includes arterial ratios
Images	Images included from the thumbnail panel
Comments	Any combination of predefined comments and user-entered comments

Urology Measurements and Calculations

2D-Mode Measurement Labels

Measurement Label	Description	Measurement Method
IIA	Internal Iliac Artery	Distance
IIV	Internal Iliac Vein	Distance
Ureter	Ureter Length	Distance
Urethra	Urethra	Distance
PreVoid Bladder Length	Pre-Void Bladder Length	Distance
PreVoid Bladder AP	Pre-Void Bladder Anteroposterior	Distance
PreVoid Bladder Width	Pre-Void Bladder Width	Distance
PostVoid Bladder Length	Post-Void Bladder Length	Distance
PostVoid Bladder AP	Post-Void Bladder Anteroposterior	Distance
PostVoid Bladder Width	Post-Void Bladder Width	Distance
Prostate V1	Prostate V1, numbered 1 through 2	3Dist Volume
Prostate V1 Trans	Prostate V1 Transverse, numbered 1 through 2	Distance
Prostate V1 Length	Prostate V1 Length, numbered 1 through 2	Distance
Prostate V1 AP	Prostate V1 Depth, numbered 1 through 2	Distance
Seminal Ves	Seminal Vesicle	Distance
Vas Deferens	Vas Deferens	Distance
Prostatic Urethra	Prostatic Urethra	Distance
Ejaculatory Duct	Ejaculatory Duct	Distance
Int Pudendal A	Internal Pudendal Artery	Distance
Pudendal V	Pudendal Vein	Distance
Mass 1	Urology Mass, numbered 1 through 3	Distance

2D-Mode Calculation Labels

Calculation Label	Description	Required Measurements	Units
PreVoid Bladder Vol	PreVoid Bladder Volume 3.1415926535 / 6 * PreVoid Bladder Length * PreVoid Bladder AP * PreVoid Bladder Width	**PreVoid Bladder Length** **PreVoid Bladder AP** **PreVoid Bladder Width**	mL
PostVoid Bladder Vol	PostVoid Bladder Volume 3.1415926535 / 6 * PostVoid Bladder Length * PostVoid Bladder AP * PostVoid Bladder Width	**PostVoid Bladder Length** **PostVoid Bladder AP** **PostVoid Bladder Width**	mL
Micturated Volume	Micturated Volume PreVoid Bladder - PostVoid Bladder	**PreVoid Bladder** **PostVoid Bladder**	mL
Prostate V1	Prostate Volume1	**Prostate V1 Length** **Prostate V1 Width** **Prostate V1 AP**	mL
Prostate V2	Prostate Volume2	**Prostate V2 Length** **Prostate V2 Width** **Prostate V2 AP**	mL
PSAD 1	Prostate Specific Antigen Density 1	**Prostate V1** **PSA**	-
PSAD 2	Prostate Specific Antigen Density 2	**Prostate V2** **PSA**	-

Doppler Measurement Labels

Measurement Label	Description	Measurement Method
IIA	Internal Iliac Artery	PI Auto
IIV	Internal Iliac Vein	Velocity
Int Pudendal A	Internal Pudendal Artery	Velocity
Pudendal V	Pudendal Vein	Velocity

Prostate Volume Reference

Rifkin, Matthew D., M.D "Prostrate and Seminal Vesicle Measurements." Chapter 16 in Atlas of Ultrasound Measurements. B.B. Goldburg and A.B. Kurtz Chicago: Year Book Medical Publisher. 1990.

Prostate Specific Antigen Density Reference

Benson, M.C., et al. "The Use of Prostate Specific Antigen Density to Enhance the Predictive Value of Intermediate Levels of Serum Prostate Antigen." Journal of Urology, 147:187, 1992.

Sections in the Patient Report

Section Name	Description
Exam Specific Information	Indications and additional information for specific exam types
2D Measurements	Measurement labels and results for 2D-mode measurements
M Measurements	Measurement labels and results for M-mode measurements
D Measurements	Measurement labels and results for Doppler measurements
Assessment	Descriptions for exam-related structures. You can select system defined or user-defined descriptions
Prostate Assessment	Includes system-defined descriptions and observations for prostate structures.
Images	Images included from the thumbnail panel
Comments	Any combination of predefined comments and user-entered comments

Musculoskeletal Measurements and Calculations

The musculoskeletal exam type has only general measurements and no measurement labels.

Sections in the Patient Report

Section Name	Description
Exam Specific Information	Indications and additional information for specific exam types including systole and diastole for both left and right sides and the blood pressure for each side
2D Measurements	Measurement labels and results for 2D-mode measurements
2D Mode Side by Side	Measurement labels and results for 2D-mode measurements for both right and left sides
M Measurements	Measurement labels and results for M-mode measurements
D Measurements	Measurement labels and results for Doppler measurements
D Mode Side by Side	Measurement labels and results for Doppler measurements for both right and left sides
Assessment	Descriptions for exam-related structures. You can select system defined or user-defined descriptions
Images	Images included from the thumbnail panel
Comments	Any combination of predefined comments and user-entered comments

Intraoperative Measurements and Calculations

The intraoperative exam type has only general measurements and no measurement labels.

Sections in the Patient Report

Section Name	Description
Exam Specific Information	Indications and additional information for specific exam types
2D Measurements	Measurement labels and results for 2D-mode measurements
2D Mode Side by Side	Measurement labels and results for 2D-mode measurements for both right and left sides
M Measurements	Measurement labels and results for M-mode measurements
D Measurements	Measurement labels and results for Doppler measurements
D Mode Side by Side	Measurement labels and results for Doppler measurements for both right and left sides
Assessment	Descriptions for exam-related structures. You can select system defined or user-defined descriptions
Images	Images included from the thumbnail panel
Comments	Any combination of predefined comments and user-entered comments

Small Parts Measurements and Calculations

2D-Mode Measurement Labels

Measurement Label	Description	Measurement Method
Urethra	Urethra	Distance
Brachial A	Brachial Artery	Distance
Testicle Length	Testicle Length	Distance
Testicle AP	Testicle AP	Distance
Testicle Width	Testicle Width	Distance
Epididymis Length	Epididymis Length	Distance
Epididymis AP	Epididymis AP	Distance
Epididymis Width	Epididymis Width	Distance
Mass 1	Testicle Mass, numbered 1 through 5	3 Dist
Testicular A	Testicular Artery	Distance
Pampiniform Plexus	Pampiniform Plexus	Distance
Scrotal Wall	Scrotal Wall	Distance
Corp Cav	Corpus Cavernosom	Distance
Corp Spong	Corpus Spongiosum	Distance
Cav A	Cavernosal Artery	Distance
Pre-Inj Cav A	Pre-Injection Cavernosal Artery	Distance
Post-Inj Cav A	Post-Injection Cavernosal Artery	Distance
Dorsal A	Dorsal Artery	Distance
Pre-Inj Dorsal A	Pre-Injection Dorsal Artery	Distance
Post-Inj Dorsal A	Post-Injection Dorsal Artery	Distance

Measurement Label	Description	Measurement Method
Urethral A	Urethral Artery	Distance
Bulbar A	Bulbar Artery	Distance
Sup Dorsal V	Superficial Dorsal Vein	Distance
Dp Penile V	Deep Penile Vein	Distance
Penile V	Penile Vein	Distance
Isthmus AP	Anteroposterior diameter of thyroid isthmus	Distance
Thyroid Lobe TRV	Transverse diameter of thyroid lobe	Distance
Thyroid Lobe AP	Anteroposterior diameter of thyroid lobe	Distance
Thyroid Lobe SAG	Sagittal diameter of thyroid lobe	Distance
NOD 1	Thyroid nodule, numbered 1 through 15	3 Dist
Parathyroid	Parathyroid Length	Distance
Mass 1	Thyroid Mass, numbered 1 through 5	Distance
Isthmus Mass 1	Isthmus Mass, numbered 1 through 5	Distance
Neck Mass 1	Neck Mass, numbered 1 through 5	Distance
Superior Thyroid A	Superior Thyroid Artery	Distance
Inferior Thyroid A	Inferior Thyroid Artery	Distance

2D-Mode Calculation Labels

Calculation Label	Description	Required Measurements	Units
Thyroid Lobe Volume	Thyroid Lobe Volume 0.479 * Thyroid Lobe SAG * Thyroid Lobe AP * Thyroid Lobe TRV	**Thyroid Lobe SAG** **Thyroid Lobe TRV** **Thyroid Lobe AP**	mL
Testicle Volume	Testicle Volume 3.1415926535 / 6 * Testicle Length * Testicle Width * Testicle AP	**Testicle Length** **Testicle Width** **Testicle AP**	mL
Epididymis Volume	Epididymis Volume	**Epididymis Length** **Epididymis Width** **Epididymis AP**	mL

Thyroid Lobe Volume Reference

J. Brunn, U. Block, G. Ruf, et al, "Volumetrie der Schilddruesenlappn mittels Realtime-sonographie" *Dtsch. Med. Wschr.* 06:1338-1340, 1981.

Doppler Measurement Labels

Measurement Label	Description	Measurement Method
Testicular V	Testicular Vein	Velocity
Brachial A	Brachial Artery	PI Auto
Testicular A	Testicular Artery	Velocity
Epididymal V	Epididymal Vein	Velocity
Intratesticular V	Intratesticular Vein	Velocity
Epididymal A	Epididymal Artery	RI
Intratesticular A	Intratesticular Artery	Velocity
Cav A	Cavernosal Artery	Velocity
Pre-Inj Cav A	Pre-Injection Cavernosal Artery	Velocity
Post-Inj Cav A	Post-Injection Cavernosal Artery	Velocity
Dorsal A	Dorsal Artery	Velocity
Pre-Inj Dorsal A	Pre-Injection Dorsal Artery	Velocity
Post-Inj Dorsal A	Post-Injection Dorsal Artery	Velocity
Urethral A	Urethral Artery	Velocity
Bulbar A	Bulbar Artery	Velocity
Sup Dorsal V	Superficial Dorsal Vein	Velocity
Dp Penile V	Deep Penile Vein	Velocity
Penile V	Penile Vein	Velocity
Cav A Vel	Cavernosal Artery Velocity	Velocity
Superior Thyroid A	Superior Thyroid Artery	PI Auto
Inferior Thyroid A	Inferior Thyroid Artery	PI Auto
Superior Thyroid V	Superior Thyroid Vein	Velocity
Middle Thyroid V	Middle Thyroid Vein	Velocity
Inferior Thyroid V	Inferior Thyroid Vein	Velocity

M-Mode Calculation Labels

Calculation Label	Description	Required Measurements	Units
LC / LBI	Ratio of the Left Cavernosal Artery to the Left Brachial Artery Cav A Vel / Brach A Vel	**Cav A Vel** **Brach A Vel**	n/a
RC / LBI	Ratio of the Right Cavernosal Artery to the Left Brachial Artery Cav A Vel / Brach A Vel	**Cav A Vel** **Brach A Vel**	n/a
LC / RBI	Ratio of the Left Cavernosal Artery to the Right Brachial Artery Cav A Vel / Brach A Vel	**Cav A Vel** **Brach A Vel**	n/a
RC / RBI	Ratio of the Right Cavernosal Artery to the Right Brachial Artery Cav A Vel / Brach A Vel	**Cav A Vel** **Brach A Vel**	n/a

Sections in the Patient Report

Section Name	Description
Exam Specific Information	Indications and additional information for specific exam types
2D Measurements	Measurement labels and results for 2D-mode measurements
2D Mode Side by Side	Measurement labels and results for 2D-mode measurements for both right and left sides
Assessment	Descriptions for exam-related structures. You can select system defined or user-defined descriptions
Images	Images included from the thumbnail panel
Comments	Any combination of predefined comments and user-entered comments
M Measurements	Measurement labels and results for M-mode measurements
D Measurements	Measurement labels and results for Doppler measurements
D Mode Side by Side	Measurement labels and results for Doppler measurements for both right and left sides

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Obstetrical References

Mean Gestational Sac Diameter

Hellman LM, Kobayashi M, Fillisti L, Lavenhar M, Cromb E. "Growth and Development of the Human Fetus Prior to the Twentieth Week of Gestation." *American Journal of Obstetrics and Gynecology* 103(6):789, 1969.

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Aoki M, Yamada M. "Examining Fetal Growth." *Obstetrics and Gynecology* 47:547-556, 1983.

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Masuda H, Shinozuka N, Okai T, Mizuno M. "Diagnosis of the Week of Pregnancy and Prognosis." *Perinatal Care* 8:719-726.

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Hadlock FP, Shah YP, Kanon DJ, Lindsey JV. "Fetal Crown-Rump Length: Reevaluation of Relation to Menstrual Age (5-18 weeks) with High-Resolution Real-Time US." *Radiology* 182(2):501, 1992.

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Japan Society of Ultrasonics in Medicine. "Standardization of Fetometry and Official Announcement of Diagnostic Guidelines." *J. Med. Ultrasonics* 30:415-440, 2003.

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Aoki M, Yamada M. "Examining Fetal Growth." *Obstetrics and Gynecology* 47:547-556, 1983.

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Occipital Frontal Diameter

ASUM

Westerway SC. "Ultrasonic Fetal Measurements: New Australian Standards for the New Millennium." *Aust NZ J Obstet Gynaecol* 40:3:297-302, 2000.

Transverse Abdominal Diameter

Merz E, Wellek S. "Normal Fetal Growth Profile – A Uniform Model for Calculating Normal Current Head and Abdomen Parameters and Long Limb Bones." *Ultraschall in der Medizin* 17(4):153-162, 1996.

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Fractional Shortening

Cyr DR, Guntheroth WG, Mack LA. "Fetal Echocardiography." In: Berman MC (ed.) Diagnostic Medical Sonography, Vol I: *Obstetrics and Gynecology*, 249-271, 1991.

Fetal Weight Estimation

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Head Circumference

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Hadlock FP, Deter RL, Harrist RB, Park SK. "Estimating Fetal Age: Computer-Assisted Analysis of Multiple Fetal Growth Parameters." *Radiology* 152:497, 1984.

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Japan Society of Ultrasonics in Medicine. "Standardization of Fetometry and Official Announcement of Diagnostic Guidelines." *J. Med. Ultrasonics* 30:415-440, 2003.

Anterior-Posterior Trunk Diameter x Transverse Trunk Diameter

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Fetal Trunk Area

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Masuda H, Shinozuka N, Okai T, Mizuno M. "Diagnosis of the Week of Pregnancy and Prognosis." *Perinatal Care* 8:719-726.

Humerus Length

Jeanty P, Rodesch F, Delbeke D, Dumont JE. "Estimation of Gestational Age from Measurements of Fetal Long Bones." *Journal of Ultrasound in Medicine* 3:75, 1984.

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Aoki M, Yamada M. "Examining Fetal Growth." *Obstetrics and Gynecology* 47:547-556, 1983.

Ulna Length

Jeanty P, Rodesch F, Delbeke D, Dumont JE. "Estimation of Gestational Age from Measurements of Fetal Long Bones." *Journal of Ultrasound in Medicine* 3:75, 1984.

Binocular Distance

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Tongsong T, Wanapirak C, Jesadapornchai S, Tathayathikom E. "Fetal binocular distance as a predictor of menstrual age." *International Journal of Gynecology and Obstetrics* 38:87, 1992.

Tibia Length

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Foot Length

Mercer BM, Sklar S, Shariatmadar A, Gillieson MS, Dalton ME. "Fetal foot length as a predictor of gestational age." *American Journal of Obstetrics and Gynecology* 156(2):350, 1987.

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Uterine Artery: Pulsatility Index, Resistive Index

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Cephalic Index

Chitty, LS, Altman, DG. "Charts of Fetal Size: 2. Head Measurements." *British Journal of Obstetrics & Gynaecology* 101:35-43, 1994.

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Fetal Weight Estimation

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Femur Length/Biparietal Diameter Ratio

Hohler CW, Quetel TA. "Comparison of ultrasound femur length and biparietal diameter in late pregnancy." *American Journal of Obstetrics and Gynecology* 141(7):759, 1981.

Head Circumference/Abdominal Circumference Ratio

Campbell S, Thoms A. "Ultrasound measurement of the fetal head to abdomen circumference ratio in the assessment of growth retardation." *British Journal of Obstetrics and Gynaecology*, 84:165, 1977.

Snijders RJ, Nicolaides KH. "Fetal biometry at 14-40 weeks' gestation." *Ultrasound in Obstetrics and Gynecology* 4:34-48, 1994.

Gestational Age by Ultrasound and Estimated Date of Confinement

Abdominal Circumference

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Verburg (Outer to Outer):

Verburg BO, Steegers EA, De Ridder M, Snijders RJ, Smith E, Hofman A, Moll HA, Jaddoe VW, Witteman JC. "New Charts for Ultrasound Dating of Pregnancy and Assessment of Fetal Growth: Longitudinal Data From a Population-based Cohort Study." *Ultrasound in Obstetrics and Gynecology* 31(4):388–396, 2008.

Estimated Date of Confinement by Last Menstrual Period

280 days added to date of last menstrual period.

Clinical Gestational Age

Source data for Clinical GA is determined by the user during the Patient ID operation calculated weeks and days since last menstrual period.

Crown Rump Length

Rempen A, Chaoui R, Kozlowski P, Häusler M, Terinde R, Wisser J. "Standards zur Ultraschalluntersuchung in der Frühschwangerschaft." *Der Frauenarzt* 42:327–331, 2001.

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INTERGROWTH-21st:

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Gestational Sac

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Head Circumference

Chitty, LS, Altman, DG. "Charts of Fetal Size: 2. Head Measurements." *British Journal of Obstetrics & Gynaecology* 101:35-43, 1994.

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Humerus Length

ASUM 2003:

Westerway SC. "Ultrasonic Fetal Measurements for an Australian Population." 2003. Adapted from Westerway SC, Davison A, Cowell S. "Ultrasonic Fetal Measurements: New Australian Standards for the New Millennium." *Australian and New Zealand Journal of Obstetrics and Gynaecology* 40(3):297–302, 2000.

Occipital Frontal Diameter

Chitty LS, Altman DG. "Charts of Fetal Size: 2. Head Measurements." *British Journal of Obstetrics and Gynaecology* 101(1):35–43, 1994.

Cerebellum, Transverse Cerebellar Diameter

Hill LM, Guzick D, Fries J, Hixson J, Rivello D. "The Transverse Cerebellar Diameter in Estimating Gestational Age in the Large for Gestational Age-Fetus." *Obstetrics and Gynecology* 75(6):981-985, 1990.

Composite Gestational Age Estimation by Ultrasound

Simple Average - Ultrasound Gestational Age (average)

The sum of all gestational ages determined by single parameter tables/formulas, divided by the number of parameters summed.

Regression Equations, Hadlock

Hadlock FP, Deter RL, Harrist RB, Park SK. "Estimating Fetal Age: Computer-Assisted Analysis of Multiple Fetal Growth Parameters." *Radiology* 152:497, 1984.

Estimated Date of Confinement by Ultrasound

280 days - today's ultrasound gestational age (in days), add to today's date = estimated date of confinement by ultrasound

Parameters for Growth Analysis Graphs

The references in this section are used to analyze fetal growth by plotting a measured parameter against clinical gestational age. The plotted points are displayed on a graph that indicates the 5%, 50%, and 95% for an expected parameter measurement determined by a function using gestational age.

Mean Gestational Sac Diameter

Hellman LM, Kobayashi M, Fillisti L, Lavenhar M, Cromb E. "Growth and Development of the Human Fetus Prior to the Twentieth Week of Gestation." *American Journal of Obstetrics and Gynecology* 103(6):789, 1969.

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Anterior-Posterior Trunk Diameter x Transverse Trunk Diameter

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Anterior Cerebral Ventricle Diameter

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Posterior Cerebral Ventricle Diameter

Snijders RJ, Nicolaides KH. "Fetal biometry at 14-40 weeks' gestation." *Ultrasound in Obstetrics and Gynecology* 4:34-48, 1994.

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Radius

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Appendix G Cardiac Bibliography

Body Surface Area **3**

2D-Mode Measurements and Calculations **3**

Cardiac Index 3
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syngo Velocity Vector Imaging

See also: For information about *syngo* Velocity Vector Imaging, refer to Chapter D4 in the Clinical Applications Guide.

Bullseye Summary Results

The displayed results depend on the selected view, parameter, layer, and direction of analysis.

Time to Peak Summary Results

Label	Description
Maximum Opposing Wall Delay	Maximum opposing wall delay (MOWD)
Maximum Wall Delay	(Available only in SAX views) Maximum opposing wall delay (MOWD)
Average	Average of all segments

Velocity Results

Result Label	Description	Units
Pk cm/s	Peak systolic velocity	**cm/s**
Pk deg/s	(Available only in SAX views) Peak systolic velocity	**deg/s**
ES	End systolic velocity	**%**
TTP ms	Time-to-peak systolic velocity	**ms**
es-gcs endo	(Available only in Apical views or SAX views) End systolic global circumferential strain endocardium	**%**
es-gcs-myo	(Available only in Apical views or SAX views when the **Endo+Epi** selection is enabled) End systolic global circumferential strain myocardium	**%**
es-rot endo	(Available only in SAX views) End systolic rotational endocardium	**deg**
es-rot-myo	(Available only in SAX views when the **Endo+Epi** selection is enabled) End systolic rotational myocardium	**deg**
es-gls	(Available only in atrium) End systolic global longitudinal strain	**%**
es-gls endo	(Available only in Apical views or right ventricle) End systolic global longitudinal endocardium	**%**
es-gls myo	(Available only in Apical views or right ventricle when the **Endo+Epi** selection is enabled) End systolic global longitudinal myocardium	**%**

Displacement Results

Result Label	Description	Units
Pk mm	Peak displacement	**mm**
Pk deg	(Available only in SAX views) Peak displacement	**deg**
ES	End systolic displacement	**%**
TTP ms	Time-to-peak displacement	**ms**
es-gcs endo	(Available only in Apical views or SAX views) End systolic global circumferential strain endocardium	**%**
es-gcs-myo	(Available only in Apical views or SAX views when the **Endo+Epi** selection is enabled) End systolic global circumferential strain myocardium	**%**
es-rot endo	(Available only in SAX views) End systolic rotational endocardium	**deg**
es-rot-myo	(Available only in SAX views when the **Endo+Epi** selection is enabled) End systolic rotational myocardium	**deg**
es-gls	(Available only in atrium) End systolic global longitudinal strain	**%**
es-gls endo	(Available only in Apical views or right ventricle) End systolic global longitudinal endocardium	**%**
es-gls myo	(Available only in Apical views or right ventricle when the **Endo+Epi** selection is enabled) End systolic global longitudinal myocardium	**%**

Strain Results

Result Label	Description	Units
Pk %	Peak systolic strain	**%**
ES	End systolic strain	**%**
TTP ms	Time-to-peak strain	**ms**
es-gls	(Available only in atrium) End systolic global longitudinal strain	**%**
es-gls endo	(Available only in Apical views or right ventricle) End systolic global longitudinal strain endocardium	**%**
es-gls myo	(Available only in Apical views or right ventricle when the **Endo+Epi** selection is enabled) End systolic global longitudinal strain myocardium	**%**
es-gcs endo	(Available only in Apical views or SAX views) End systolic global circumferential strain endocardium	**%**
es-gcs-myo	(Available only in Apical views or SAX views when the **Endo+Epi** selection is enabled) End systolic global circumferential strain myocardium	**%**
es-rot endo	(Available only in SAX views) End systolic rotational endocardium	**deg**
es-rot-myo	(Available only in SAX views when the **Endo+Epi** selection is enabled) End systolic rotational myocardium	**deg**

Strain Rate Results

Result Label	Description	Units
Pk 1/s	Peak strain rate	**1/s**
ES	End systolic strain rate	**%**
TTP ms	Time-to-peak systolic strain rate	**ms**
es-gcs endo	(Available only in Apical views or SAX views) End systolic global circumferential strain endocardium	**%**
es-gcs-myo	(Available only Apical views or SAX views when the **Endo+Epi** selection is enabled) End systolic global circumferential strain myocardium	**%**
es-rot endo	(Available only in SAX views) End systolic rotational endocardium	**deg**
es-rot-myo	(Available only in SAX views when the **Endo+Epi** selection is enabled) End systolic rotational myocardium	**deg**
es-gls	(Available only in atrium) End systolic global longitudinal strain	**%**
es-gls endo	(Available only in Apical views or right ventricle) End systolic global longitudinal endocardium	**%**
es-gls myo	(Available only in Apical views or right ventricle when the **Endo+Epi** selection is enabled) End systolic global longitudinal myocardium	**%**

Volume and Area Results

Result Label	Description	Units
EF	Ejection fraction	**%**
EDV	End-diastolic volume	**ml**
ESV	End-systolic volume	**ml**
FAC	Fractional area change	**%**
MyoGCS	Myocardium global circumferential strain	**%**
MyoGLS	Myocardium global longitudinal strain	**%**
EndoGCS	Endocardium global circumferential strain	**%**
EndoGLS	Endocardium global longitudinal strain	**%**
EDA	End diastolic area	**cm^2**
ESA	End systolic area	**cm^2**
EndoRot	Endocardial rotation	**deg**
MyoRot	Myocardium rotation	**deg**
GRS	Global radial strain	**%**
SD-RS-Peak	Standard deviation of peak radial strain	**%**
SD-RS-Syst.	Standard deviation of radial strain at systole	**%**
SD-CS-Peak	Standard deviation of peak circumferential strain	**%**
SD-CS-Syst.	Standard deviation of circumferential strain at systole	**%**
SD-Ph%-RS	Standard deviation of phase of radial strain	**%**
SD-Ph%-CS	Standard deviation of phase of circumferential strain	**%**
SD-Ph%-TS	Standard deviation of phase of transverse strain	**%**
SD-Ph%-LS	Standard deviation of phase of longitudinal strain	**%**
SD-TS-Peak	Standard deviation of peak transverse strain	**%**
SD-TS-Syst.	Standard deviation of transverse strain at systole	**%**
SD-LS-Peak	Standard deviation of peak longitudinal strain	**%**
SD-LS-Syst.	Standard deviation of longitudinal strain at systole	**%**
SD-Ttp%-TS	Standard deviation of time to peak of transverse strain	**%**
SD-Ttp%-LS	Standard deviation of time to peak of longitudinal strain	**%**
SD-Ttp%-RS	Standard deviation of time to peak of radial strain	**%**
SD-Ttp%-CS	Standard deviation of time to peak of circumferential strain	**%**
Delta-ROT	Delta of rotational strain	**deg**
FreeWallSt	Free wall strain	**%**
EDL	End-diastolic length	**cm**
ESL	End-systolic length	**cm**
EDDbas	End-diastolic diameter basal	**cm**
ESDbas	End-systolic diameter basal	**cm**

Descriptions for Exported Data Files

The program stores exported files in an external USB-compatible storage device.

Selection	Processing Algorithm(s)	Description
Axis	All	Axis for the selected processing algorithm, for example, Long or Short.
View	All	Selected view, for example, right ventricle.
segments model	All	Segment information, for example, apical segment.
eD	All	End diastole.
eS	All	End systole.
Bpm	All	Heart rate, in beats per minute.
PixelDimension	All	Millimeters per pixel.
TracePointsEpiXY (pixel)	Apical for Endo/Epi, Short Axis for Endo/Epi	(x1,y1,x2,y2,x3,y3,…) pixel coordinates of the endo and epi user-defined points to be tracked.
TracePointsEpiXY (mm)	Apical for Endo/Epi, Short Axis for Endo/Epi	(x1,y1,x2,y2,x3,y3,…) coordinates of the endo and epi user-defined points to be tracked, converted to millimeters.
TracePointsEndoXY (pixel)	Apical for Endo/Epi, Short Axis for Endo/Epi	(x1,y1,x2,y2,x3,y3,…) pixel coordinates of the endo and epi user-defined points to be tracked.
TracePointsEndoXY (mm)	Apical for Endo/Epi, Short Axis for Endo/Epi	(x1,y1,x2,y2,x3,y3,…) coordinates of the endo and epi user-defined points to be tracked, converted to millimeters.
EcgPoints	All	Amplitude of the electrocardiogram, sampled every two milliseconds.
RWaves	All	Amplitude of the R peak from QRS complex.
FrameTime (msec)	All	Time between adjacent frames.
TimeProgression (msec)	All	Time since the first frame.
Time (msec)	All	Time for the selected location.
Velocity (cm/sec)	All	Velocity towards (positive) or away from (negative) the velocity reference point.

Selection	Processing Algorithm(s)	Description
Strain (%)	All	Strain (percentage) for all points along the trace, for every frame.
StrainRate (1/s)	All	Strain rate (per second) for all points along the trace, for every frame.
EndoX (pixel coord)	All	x-coordinates of all endo points along the trace, for every frame.
EndoY (pixel coord)	All	y-coordinates of all endo points along the trace, for every frame.
EndoVelX (cm/sec)	All	x component of the velocity for every endo point along the trace, for every frame.
EndoVelY (cm/sec)	All	y component of the velocity for every endo point along the trace, for every frame.
EpiX (pixel coord)	Apical for Endo/Epi, Short Axis for Endo/Epi	x-coordinates of the epi points along the trace, for every frame.
EpiY (pixel coord)	Apical for Endo/Epi, Short Axis for Endo/Epi	y-coordinates of the epi points along the trace, for every frame.
EpiVelX (cm/sec)	Apical for Endo/Epi, Short Axis for Endo/Epi	x component of the velocity for epi points along the trace, for every frame.
EpiVelY (cm/sec)	Apical for Endo/Epi, Short Axis for Endo/Epi	y component of the velocity for epi points along the trace, for every frame.
RadialVelocity (cm/s)	Short Axis, Short Axis for Endo/Epi	Radial velocity along the trace, for every frame.
RotationVelocity (deg/s)	Short Axis, Short Axis for Endo/Epi	Rotation velocity along the trace, for every frame.
RadialDisplacement (mm)	Short Axis, Short Axis for Endo/Epi	Radial displacement along the trace, for every frame.
RotationDisplacement (deg)	Short Axis, Short Axis for Endo/Epi	Rotation displacement along the trace, for every frame.
RadialStrain (%)	Short Axis for Endo/Epi	Radial strain (percentage) along the trace, for every frame.
CircumferentialStrain (%)	Short Axis, Short Axis for Endo/Epi	Circumferential strain (percentage) along the trace, for every frame.
RadialStrainRate (1/s)	Short Axis for Endo/Epi	Radial strain rate (per second) along the trace, for every frame.
CircumferentialStrainRate (1/s)	Short Axis, Short Axis for Endo/Epi	Circumferential strain rate (per second) along the trace, for every frame.

Selection	Processing Algorithm(s)	Description
Shear (%)	Apical for Endo/Epi, Short Axis for Endo/Epi, Right Ventricle for Endo/Epi	The difference in the tangential displacement of the endo and epi points (percentage), divided by the endo-epi distance.
ShearRate (1/s)	Apical for Endo/Epi, Short Axis for Endo/Epi, Right Ventricle for Endo/Epi	The difference in the tangential velocity of the endo and epi points (per second), divided by the endo-epi distance.
Vol (ml)	Apical, Apical for Endo/Epi	Modified method of disk volume for every frame, converted to milliliters.
Area (cm^2)	Short Axis, Short Axis for Endo/Epi, Right Ventricle for Endo/Epi	Area for every frame, in squared centimeters.
dV/dt (ml/s)	Apical, Apical for Endo/Epi	The rate of change in the volume.
EndoEpiDistance (mm)	Apical for Endo/Epi, Short Axis for Endo/Epi, Right Ventricle for Endo/Epi	Distance between corresponding endo and epi points. Not the perpendicular distance between the point and the other trace.
EndoGLS (%)	Apical, Apical for Endo/Epi, Right Ventricle for Endo/Epi, Atrium	Endocardium global longitudinal strain (percentage) for the endo points along the trace, for every frame.
EndoGCS (%)	Apical, Apical for Endo/Epi, Short Axis, Short Axis for Endo/Epi	Endocardium global circumferential strain (percentage) for the endo points along the trace, for every frame.
MyoGLS (%)	Apical for Endo/Epi, Right Ventricle for Endo/Epi	Myocardium global longitudinal strain (percentage) for the endo and epi points along the trace, for every frame.
MyoGCS (%)	Apical for Endo/Epi, Short Axis for Endo/Epi	Myocardium global circumferential strain (percentage) for the endo and epi points along the trace, for every frame.
GRS (%)	Apical for Endo/Epi, Short Axis for Endo/Epi, Right Ventricle for Endo/Epi	Global radial strain (percentage) for the endo and epi points along the trace, for every frame.
TransverseVelocity (cm/s)	Apical, Apical for Endo/Epi, Atrium, Right Ventricle for Endo/Epi	Transverse velocity for the endo and epi points along the trace, for every frame.

Selection	Processing Algorithm(s)	Description
LongitudinalVelocity (cm/s)	Apical, Apical for Endo/Epi, Atrium, Right Ventricle for Endo/Epi	Longitudinal velocity for the endo and epi points along the trace, for every frame.
TransverseDisplacement (mm)	Apical, Apical for Endo/Epi, Atrium, Right Ventricle for Endo/Epi	Transverse displacement for the endo and epi points along the trace, for every frame.
LongitudinalDisplacement (mm)	Apical, Apical for Endo/Epi, Atrium, Right Ventricle for Endo/Epi	Longitudinal displacement for the endo and epi points along the trace, for every frame.
TransverseStrain (%)	Apical for Endo/Epi, Right Ventricle for Endo/Epi	Transverse strain (percentage) for the endo and epi points along the trace, for every frame.
LongitudinalStrain (%)	Apical, Apical for Endo/Epi, Atrium, Right Ventricle for Endo/Epi	Longitudinal strain (percentage) for the endo and epi points along the trace, for every frame.
TransverseStrainRate (1/s)	Apical for Endo/Epi, Right Ventricle for Endo/Epi	Transverse strain rate (per second) for the endo and epi points along the trace, for every frame.
LongitudinalStrainRate (1/s)	Apical, Apical for Endo/Epi, Atrium, Right Ventricle for Endo/Epi	Longitudinal strain rate (per second) for the endo and epi points along the trace, for every frame.
EndoRot (deg)	Short Axis, Short Axis for Endo/Epi	Endo rotational degree.
MyoRot (deg)	Short Axis for Endo/Epi	Myocardium rotational degree.