



Data sheet

ACUSON SC2000 PRIME Ultrasound System

Release 6.0

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ACUSON SC2000 PRIME ultrasound system – Precision at the speed of life

Unlike any system on the market today, the ACUSON SC2000 PRIME was developed to revolutionize the world of Echocardiography. As a platform pushing the boundaries of power, this ultrasound system provides a new level of image quality and workflow efficiency in 2D and 4D – to drive precision at the speed of life.

As the only system to offer 2D and 4D TTE, TEE, ICE and TrueFusion¹ ACUSON SC2000 PRIME offers the complete Structural Heart Disease solution with a comprehensive suite of AI-powered clinical applications. The full set of ultrasound imaging options enables you to treat more patients with speed and precision at every step of the patient care pathway.

With continuous software and hardware updates and secure software-enabled service the ACUSON SC2000 PRIME is more relevant now than ever before.

Innovative Technologies

Information Rate

The key performance measure of real-time imaging systems is the information rate. It unifies many of the well known image quality measures such as detail resolution, contrast resolution, temporal resolution, field of view and penetration. The information rate of an imaging system defines an upper boundary for achievable image quality and exam efficiency, therefore supporting diagnostic confidence and speed of workflow. With 2.88 GB/s and the power of 64 parallel beams, the ACUSON SC2000 PRIME system is one of the most powerful ultrasound systems in the market.

Its extraordinary performance level translates to increased detail, contrast and temporal resolution improvements in 2D B-mode with InFocus and 2D color Doppler with True Fidelity color Doppler. The instantaneous full-volume imaging architecture and unparalleled information rate allows the ACUSON SC2000 PRIME system to deliver instantaneous full-volume B-mode and volume color Doppler imaging all at clinically relevant volume rates and volume sizes without stitching or gating.

InFocus Coherent technology

InFocus coherent technology is the next generation real-time coherent imaging technology that provides dynamic transmit focus at all depths for excellent 2D and volume imaging without user intervention.

¹ Based on competitive data available April 2020.

TrueFusion represents a workflow consisting of syngo® TrueFusion (syngo X Workplace) and TrueFusion echo-fluoro guidance (ACUSON SC2000 PRIME).



This technique allows each transducer to reach its highest beamforming potential in terms of detail and contrast resolution throughout the field of view.

Unlike conventional ultrasound where transmit waves are focused at a single depth, InFocus Technology achieves dynamic focus by combining information from overlapping transmit events. This is equivalent to hundreds of transmit focal zones from near to far field. Using the power of up to 64 parallel receive beams and the unique coherent imageformer engine, InFocus Technology delivers superior image quality, and improves user workflow by eliminating the focus knob. InFocus Technology is applied to B-mode imaging for adult, pediatric, fetal and transesophageal imaging. It is available on the following transducers:

- 4Z1c for full volume and thin volume imaging
- 4V1c for 2D transthoracic echo
- 8V3 for 2D pediatric and fetal echo
- 10V4 for 2D neonatal and pediatric transthoracic echo
- V5M for 2D transesophageal echo (TEE)
- V7M for 2D neonatal and pediatric transesophageal echo
- 6C1 HD Transducer for Abdominal Aorta, Renal arteries and Fetal heart
- Z6Ms for full volume transesophageal echo (TEE)
- ACUSON AcuNav 8F ultrasound catheter, ACUSON AcuNav 10F ultrasound catheter, SOUNDSTAR® 10F ultrasound catheter, SOUNDSTAR® eco 8F, SOUNDSTAR® eco 10F and ACUSON AcuNav Volume ICE catheter



Real-time Volume Image Enhancement

Volume Image Enhancement is a real-time proprietary post-processing technique designed specifically for cardiology applications to improve the coherence and visualization of anatomic structures and reduce speckle noise.

True Fidelity Color Doppler

Proprietary multi-beam color Doppler technology improves 2D color Doppler detail resolution and border definition while reducing artifact and color flash without sacrificing frame rates. It is designed to give the clinician improved diagnostic confidence with more detailed color resolution without the artifacts.

True Fidelity Color Doppler is applied to color Doppler imaging available on the following transducers:

- Z6Ms
- 6C1 HD
- 4V1c

TrueFusion Echo-Fluoro Guidance¹

Using the Z6Ms True Volume TEE transducer, TrueFusion echo-fluoro guidance¹ uses real-time anatomical data from the ACUSON SC2000 PRIME system to combine static markers and valve model overlays into a Siemens Healthineers Artis system's fluoroscopic X-ray image to guide interventional and surgical procedures. Overlays include the mitral and aortic landmarks using eSie Valves advanced analysis package. This is completed directly from the ACUSON SC2000 PRIME system to the Siemens Healthineers Artis angiography systems with PURE (Artis zee, Artis Q and Artis Q.zen).

Capabilities include eSie Sync automatic registration of the X-ray and ultrasound image via real-time detection of the Z6Ms TEE transducer orientation on an Artis X-ray image, using proprietary knowledge-based algorithm.

Patient co-registration synchronizes patient information between the Artis angiography system and the ultrasound system provides ease of use and a more efficient workflow.

Automated detection of aortic and mitral valve structures is supported with transfer of model overlays on a Siemens Healthineers Artis fluoroscopic X-ray image to indicate the major anatomical aspects and orientation of the valves.

Achieve true fusion with a truly integrated workflow directly from the ACUSON SC2000 PRIME ultrasound system with real-time true volume imaging without stitching or gating.

4Z1c Matrix Array Transducer with Active Cooling

Patented active cooling technology on the 4Z1c volume imaging transducer enables operation at high transmit voltage levels. This allows for deeper penetration than other matrix transducers and the ability to image a wider range of cardiac patients including the technically difficult to image patients.

4V1c Transducer with Hanafy Lens technology

The 4V1c transthoracic transducer utilizes Hanafy lens transducer technology to provide excellent elevation focusing and uniform beam intensity throughout the field of view.

Z6Ms True Volume TEE Transducer

A matrix array transducer with active electronics that enables real-time full volume transesophageal imaging for every heartbeat. Transducer supports all imaging modes along with Bi-Plane+ imaging, high volume rate B-mode and volume color Doppler imaging capabilities for a wide range of patients. Patients with arrhythmia can be imaged real-time without need of ECG gating or suspension of patient respiration which is typically needed during stitched acquisition.

ACUSON AcuNav Volume ICE Catheter

The proprietary array design enables the ACUSON AcuNav Volume ICE catheter to provide real-time full volume ICE imaging for every heartbeat allowing for guidance and monitoring throughout the entire procedure. It offers increased visualization of intracardiac structures and provides visual navigation of catheters and devices within the heart.

¹ TrueFusion represents a workflow consisting of syngo® TrueFusion (syngo X Workplace) and TrueFusion echo-fluoro guidance (ACUSON SC2000 PRIME).



Imaging Engine

With its full volume imaging architecture and unparalleled information rate, the ACUSON SC2000 PRIME system's imaging engine utilizes up to 884,736 receive analytic processing channels, providing instantaneous full volume data acquisition, beam formation, image formation and image processing enabling significant advances in diagnostic confidence and workflow.

Beamformer

- Real-time full volume imaging architecture
- Up to 64 parallel receive beams
- Up to 884,736 receive analytic processing channels
- Fully programmable parallel beam configuration
- High-precision transmit pulse shaping in 2D and receive echo shaping with spectral whitening, amplitude modulation, linear and nonlinear frequency modulation and other coding/decoding capabilities enable transducer- and application-specific axial response optimization
- High-precision beam shaping in 2D and 4D with programmable group delay, phase delay and apodization capabilities enable transducer- and application-specific lateral response optimization
- Analog beamformer steerable in 2D dedicated for spectral Doppler

Imageformer

- Coherent Imageformer
 - Real-time full volume imaging architecture
 - InFocus coherent imaging technology
 - Preserved information density and phase information in B-mode
 - Extremely flexible, fully programmable softwaredefined signal processing infrastructure
- Non-Coherent Imageformer
 - Real-time full volume imaging architecture
 - Preserved information density
 - Extremely flexible, fully programmable softwaredefined
 - image processing infrastructure

- Field Programmable Gate Array (FPGA) based hardware
 - Massive parallel computing
 - Up to 160 Megavoxels/s acoustic data output rate
 - Programmable multi-pass capability
 - Transducer and application specific programmability

Image Processor

- Acoustic Image Processor
 - 1.6 GB cine memory
 - Real-time Volume Image Enhancement – for volume B-mode imaging
 - Real-time Image Enhancement – for 2D B-mode and spectral Doppler imaging
 - Full access to raw (pre-scan conversion) data in cine review and in 4D exam review on and off the system
 - Full access to acoustic image processor capabilities in cine review, 4D exam review, and off-the-system review station (future research option)
- Display Image Processor
 - Advanced full volume renderer
 - D'art volume navigation and visualization tool
 - Full access to volume rendering controls in live, cine and exam review
- Flexible and expandable CPU- and GPU-based hardware
- 4D DICOM open standard and protocol ready

Modes

B-mode

- Employs InFocus coherent imaging technology that provides transmit focusing at all depths through temporal alignment and coherent processing of an array of receive beams. InFocus technology improves detail and contrast resolution, and eliminates the need for the user to manually optimize the focus position, thereby improving workflow. InFocus technology is supported in Volume, Thin Volume and 2D B-mode
- Volume B-mode on the 4Z1c transducer
 - Up to 1353 B-mode volumes/s
 - Instantaneous full volume B-mode
 - Instantaneous volume Native tissue harmonic imaging



- Volume B-mode on the Z6Ms transducer
 - Up to 219 B-mode volumes/s
 - Instantaneous full volume B-mode
 - Instantaneous volume Native tissue harmonic imaging
- Volume B-mode on the ACUSON AcuNav Volume ICE catheter transducer
 - Up to 255 B-mode volumes/s
 - Instantaneous full volume B-mode
 - Instantaneous volume Native tissue harmonic imaging
- Thin volume B-mode on the 4Z1c transducer
 - Derives 2D B-mode images from volume data
 - Supports both fundamental frequency and Native tissue harmonics
 - Maximum 2140 fps
- 2D
 - Maximum 2140 frames/s
 - Supports both fundamental frequency and Native tissue harmonics
- M-mode¹
 - Supports fundamental and Native tissue harmonics operating frequencies
 - Supports color Doppler

Color Doppler

- Up to 201 color Doppler volumes/s on the 4Z1c and the Z6Ms transducers and up to 96 color Doppler volumes/s on the ACUSON AcuNav Volume ICE Catheter.
 - Instantaneous volume Color Doppler Velocity (CDV) capability
 - Instantaneous volume Doppler Tissue Velocity capability (DTV) on the 4Z1c and Z6Ms
 - Instantaneous volume Doppler Tissue Energy capabilities (DTE) on the 4Z1c
 - Thin Volume color Doppler on the 4Z1c derives 2D color Doppler images from volume data
- Supports CDV, and DTV
- Up to 332 frames/s in CDV and DTV
- 2D color Doppler (CDV, DTV, DTE)
- Color M-mode

Spectral Doppler

- Pulsed Wave (PW) spectral Doppler
- Continuous Wave (CW)² spectral Doppler
- Tissue spectral Doppler
- High Pulse Repetition Frequency³ (HPRF)
- Auxiliary CW Doppler transducer

Contrast Agent Imaging⁴

- 4D Volume and 2D Thin Volume LVO on the 4Z1c transducer
- 2D LVO on the 4V1c transducer
- 2D LVO with contrast pulse sequencing (CPS)³ on the 4V1c transducer

Combined Modes

- 2D + color Doppler
- 2D + PW Doppler
- 2D + CW Doppler²
- 2D + M-mode¹
- 2D + M-mode + color Doppler
- 2D + color Doppler + PW Doppler
- 2D + color Doppler + CW Doppler
- Volume + color Doppler Vol
- Thin volume + color Doppler

4D Full Volume Imaging

Unlike traditional 3D ultrasound systems that require two to seven heart cycles to stitch together a full volume, the ACUSON SC2000 PRIME system delivers instantaneous full volume acquisition at 90° x 90° in one cardiac cycle, acquiring up to 40 volumes per second at a depth of 16 cm. No ECG or suspension of patient respiration which are required from patients. It is available in the following imaging modes:

- Instantaneous full volume B-mode imaging
- Instantaneous volume color Doppler imaging

¹ M-mode is available on all transducers except for the 4Z1c, 9L4 and all ultrasound catheters.

² CW Doppler available on all transducers except for the 9L4, 6C1 HD and 4Z1c.

³ HPRF available on 4V1c, 8V3, 9L4, 10V4, AcuNav 8F, AcuNav 10F, V5M, V7M and Z6Ms transducers.

⁴ At the time of publication, the U.S. Food and Drug Administration has cleared ultrasound contrast agents only for use in LVO. Check current regulations for the country in which you are using this system for contrast agent clearance.



- Thin Volume imaging (2D images derived from volume imaging) (available only on the 4Z1c transducer)
- Thin Volume color Doppler imaging (available only on the 4Z1c transducer)
- LVO contrast¹
- Available in TTE using the 4Z1c transducer and TEE using the Z6Ms matrix array transducer

TTE Instantaneous 4D Full-volume B-mode with the 4Z1c Transducer

- MultiHertz multiple frequency imaging settings:
 - Fundamental (InFocus)
 - Native tissue harmonics (InFocus)
 - Left Ventricular Opacification (LVO)³
- Volume Rates
 - Fundamental:
 - At 90° x 90°, 16 cm depth, up to 40 volumes/s
 - At 45° x 45°, 16 cm depth, up to 115 volumes/s
 - Native tissue harmonics: At 90° x 90°, 16 cm depth, up to 18 volumes/s
 - LVO¹: At 90° x 90°, 16 cm depth, up to 20 volumes/s
 - Volume rate is dependent on frequency, SpaceTime resolution control, volume size and depth
 - Continuous 4D B-mode and color Doppler ROI resize
- Maximum depth: 30 cm

TTE Instantaneous Volume Color Doppler (CDV, DTV, DTE) with the 4Z1c Transducer

- Volume rate is dependent on frequency, SpaceTime control, volume size and depth of both the color Doppler and background B-mode image
 - Up to 20 volumes/s for 60° x 60° B-mode (fundamental) and 45° x 45° color Doppler
 - Maximum of 201 color Doppler volumes/s

TEE Instantaneous 4D Full Volume B-mode with the Z6Ms Transducer

- MultiHertz imaging settings:
 - Fundamental (InFocus)
 - 4D RES
 - Native tissue harmonics (InFocus)
 - Left Ventricular Opacification (LVO)¹

- Volume Rates
 - Fundamental
 - At 90° x 90°, 6 cm depth, up to 20 volumes/s (T1)
 - At 90° x 90°, 12 cm depth, up to 20 volumes/s (T1)
 - 60° x 60°, 12 cm, up to 18 volumes/s (S1)
 - 60° x 60°, 12 cm, up to 22 volumes/s (T1)
 - 45° x 45°, 12 cm, up to 26 volumes/s (T1)
 - Volume rate is dependent on frequency, SpaceTime control, volume size and depth
 - Continuous 4D B-mode and color Doppler ROI resize
- Maximum depth: 26 cm
- Volume Native TEQ dynamic ultrasound technology

TEE Instantaneous Volume Color Doppler (CDV, DTV) with the Z6Ms Transducer

- MultiHertz imaging
- Volume rate is dependent on frequency, SpaceTime control, volume size and depth of both the color Doppler and background B-mode image
 - Up to 18 volumes/s for 60° x 60° B-mode (fundamental) and 45° x 45° color Doppler
 - Maximum of 138 color Doppler volumes/s

ICE Instantaneous 4D Full Volume B-mode with the ACUSON AcuNav Volume ICE Catheter

- MultiHertz multiple frequency imaging settings
 - Fundamental (IN Focus)
- Volume Rates
 - Fundamental
 - At 90° x 50°, 16 cm depth, up to 13 volumes/s
 - 50° x 50°, 4 cm, up to 30 volumes/s
 - Volume rate is dependent on frequency, SpaceTime control, volume size and depth
 - Continuous 4D B-mode and color Doppler ROI resize
- Maximum depth: 160 mm
- Volume Native TEQ dynamic ultrasound technology

¹ At the time of publication, the U.S. Food and Drug Administration has cleared ultrasound contrast agents only for use in LVO. Check current regulations for the country in which you are using this system for contrast agent clearance.



ICE Instantaneous Volume Color Doppler (CDV, DTV) with the ACUSON AcuNav Volume ICE Catheter

- MultiHertz imaging
- Volume rate is dependent on frequency, SpaceTime control, volume size and depth of both the color Doppler and background B-mode image
 - Up to 21 volumes/s for 90° x 50° B-mode, 4 cm depth (fundamental) and 32° x 32° color Doppler
 - Maximum of 96 color Doppler volumes/s

Volume Display Tools

SieShell View

Visual display of the entire volume dataset divided into halves so the user can visualize the entire volume. SieShell can be applied to B-mode and color Doppler volumes.

SieSync volume synchronization Tool

A volume adjustment tool that synchronizes the cut plane and viewing direction of the volume to the exact position of the reference plane.

Single V Navigation Tool

An intuitive navigation tool that allows the user to select any view orientation with the added ability to place a cropping box around a target (e.g. PFO/ASD/VSD). It allows for rapid orientation of the display to the anatomical view of interest.

Dual V Navigation Tool (Z6Ms and AcuNav Volume Only)

This volume editing tool allows the user to place a cropping box around a target (e.g. Mitral Valve) and then visualize two simultaneous volume renderings of the target from two opposite viewing directions as defined by the editing box. This allows anatomy like heart valves to be simultaneously viewed in 4D from both ventricular and atrial sides.

eSie Lines

Easily understand where your reference planes are on the volume with color lines specific to each reference plane projected on the volume.

eSie Slice

Intuitively align all 3 reference planes at 90° to one another in 1-click anywhere in the volume for quick and precise volume navigation. eSie Slice works in conjunction with eSie Lines.

Measurements on the volume

Quickly measure on the volume or on thick reference planes.

Surgical view of Mitral Valve (Z6Ms only)

An easy to use control on system user interface (MV button) that allows user to quickly obtain surgical view of Mitral Valve at a press of a button. It allows for 1-click rapid orientation of volume, manipulation of cut-planes to get to the anatomical view of interest.

En Face Button (ACUSON AcuNav Volume ICE only)

An easy-to-use control on the system user interface that allows the user to quickly obtain an en face view of the left atrial appendage at the press of a button when the ACUSON AcuNav Volume ICE catheter is in the right atrium. It allows for one-click rapid orientation of the volume and manipulation of the reference planes to get to an en face view of left atrial appendage in the volume view.

Main Volume Navigation Controls

1. Pivot/Orbit
2. Volume tilt
3. Volume rotation
4. Cut plane scroll and tilt



Variable Volume Reference Planes and Tints

- Slice thickness of the Reference Planes can be modified to improve the reference image quality. Available while imaging live, in cine or in Review (both on the system and workplace)
- Reference Plane tints
 - 13 tints available

Thin Volume Imaging with the 4Z1c Transducer

Thin volume imaging, a technique unique to the ACUSON SC2000 PRIME system, enhances image quality by combining information from an acquisition volume that is a few degrees wide into a 2D image.

- Reduces speckle and improves contrast resolution of the B-mode image
- Reduces noise and improves sensitivity in color Doppler
- Allows rapid transition from full volume imaging to Thin Volume imaging without switching transducers

B-mode

- MultiHertz imaging (4Z1c only):
 - Fundamental (InFocus)
 - Native tissue harmonics (InFocus)
 - Left Ventricular Opacification (LVO)¹
- Frame rate is dependent on frequency, SpaceTime control and depth
 - Fundamental: Up to 82 frames/s for 90° sector, 16 cm depth
 - Native tissue harmonics (InFocus): Up to 100 frames/s for 90° sector, 16 cm depth
 - LVO¹: Up to 79 frames/s for 90° sector, 16 cm depth

Color Doppler (CDV, DTV, DTE)

- MultiHertz imaging
- Frame rate is dependent on frequency, SpaceTime control and ROI size and position
 - CDV: Up to 29 frames/s for 35° sector at 13 cm ROI depth with a 90° sector B-mode background at 16 cm depth
 - DTV and DTE

2D Imaging

The ACUSON SC2000 PRIME system introduces 2D imaging with InFocus technology coherent imaging technology which delivers the full field of view in focus without user intervention. With up to 64 parallel receive beams, InFocus technology provides rapid parallel processing of all data points at all depths, resulting in excellent detail and contrast resolution and better workflow.

2D imaging supports the following modes and features:

- InFocus coherent imaging technology
- Native Tissue Harmonic Imaging
- B-mode
- Color Doppler
- Spectral Doppler (PW and CW)
- PW DTI, HPRF
- M-mode
- Color M-mode
- LVO contrast with CPS technology¹ on the 4V1c transducer only
- RES enhanced resolution imaging
- 2D stress echo

Maximum frame rate and depth:

- Maximum frames per second in 2D B-mode: 952 frames/s
- Maximum depth: 30 cm

B-mode Imaging

B-mode (Brightness mode) is an imaging mode of echo amplitude which is directly proportional to the backscattering or reflection coefficient of tissue.

B-mode is available in:

- Instantaneous full volume B-mode imaging
- Thin Volume B-mode imaging (2D images are derived from volume data)
- 2D imaging on 1D array transducers
- M-mode imaging on 1D array transducer²

¹ At the time of publication, the U.S. Food and Drug Administration has cleared ultrasound contrast agents only for use in LVO. Check current regulations for the country in which you are using this system for contrast agent clearance.

² M-mode is available on all transducers except for the 4Z1c, 9L4 and all ultrasound catheters.



Additionally, B-mode supports the following:

- InFocus technology for improved detail and contrast resolution and reduced multi-beam artifacts
- RES enhanced resolution imaging
 - Provides a more detailed image for increased resolution and higher frame rate
- MultiHertz imaging for optimal choice of detail resolution and penetration
- Multiple SpaceTime control settings to achieve desired spatial and temporal resolution
- Multiple levels of Edge for spatial edge enhancement or smoothing
- Dynamic Tissue Contrast Enhancement (DTCE)
- Real-time Image Enhancement for 2D imaging
- DELTA differential echo amplification
- Multiple grayscale and tint maps to optimize a real-time or frozen volume and 2D B-mode image
- Multiple depth shading maps for improved depth perception of the volume

Native Tissue Harmonic Imaging

Native tissue harmonics, a B-mode MultiHertz imaging option, improves contrast resolution by reducing acoustic noise and clutter thus delivering a higher level of diagnostic information particularly for the technically difficult patient.

Native tissue harmonics is available in:

- Instantaneous volume imaging
- Thin Volume B-mode imaging
- 2D imaging
- M-mode imaging
- On the reference image in mixed modes such as color
- Doppler and spectral Doppler

Native tissue harmonics supports:

- Patented phase inversion technology for wideband harmonics
- Patented alternating line phase inversion technology for wideband high volume/frame rate harmonics
- InFocus technology for increased image quality at high volume/frame rates

TEQ Ultrasound Technology

TEQ ultrasound technology is a unique technology for efficient image optimization which automatically and intuitively responds to patient-specific information and adjusts the overall gain and brightness along with regional gain compensation in both axial and lateral dimensions at a press of a button. Additionally, TEQ technology performs this optimization based on two automated, synergistic processes:

- A real-time monitoring function that checks the image for subtle tissue and interface changes distinguishing between soft tissue, artifacts, noise and specular reflectors
- An overall and depth-related gain optimization function that is activated on a trigger

TEQ technology provides the following functionalities:

- Optimizes system performance by modifying patient-specific data before the image is formed, not a postprocessing technique
- Uses returned echo information to adjust patient-specific gain over the entire image, independent of any region of interest
- Overcomes limitations of the conventional DGC adjustments for non-uniform tissue structures
- Provides consistent, reproducible image quality, independent of the “starting point” for TEQ control, including serial patient studies
- Easy and fast balance of grayscale image while in color Doppler mode
- Assures optimal gain settings under sub-optimal ambient lighting conditions for stored images
- Works with all transducers in 2D B-mode imaging including LVO contrast applications



Dynamic NTEQ Ultrasound Technology

Dynamic Native TEQ (NTEQ) ultrasound technology performs the above optimization in a continuous manner without the need for user input.

- In Dynamic mode, TEQ optimization is performed continuously and is triggered instantaneously when a change in either image plane or system state is detected. In semi-Dynamic mode, TEQ optimization is triggered instantaneously only when change in system state including changes to MultiHertz, SpaceTime control, Depth, RES, Unfreeze, and B-mode update is detected.
- Allows the user to concentrate on the clinical question without the need to press a button
- Provides ease of use by dramatically reducing hand movements and keystrokes
- Reduces the effort required in optimization of images
- Accelerates workflow and shortens study time

The standard TEQ option also includes TEQ technology capability for instant 2D image optimization at the push of the TEQ button. Additionally, the Dynamic NTEQ technology provides the same optimization capability in a continuous manner. Dynamic NTEQ is also available in 4D volume imaging using the Z6Ms true volume TEE transducer.

Left Ventricular Opacification (LVO)

LVO¹ is a low-MI contrast agent imaging mode that improves detectability of contrast agents by increasing the brightness of the contrast agent relative to the tissue brightness.

LVO incorporates patented phase inversion technology and patented alternating line phase inversion technology for wideband high volume/frame rate harmonics. InFocus technology is also available for increased image quality at high volume/frame rates.

Contrast pulse sequencing technology (CPS) is available for LVO on the 4V1c transducer to improve image quality with high specificity and high sensitivity.

LVO is available in:

- Instantaneous volume imaging
- Thin Volume B-mode imaging
- 2D imaging

Contrast Pulse Sequencing (CPS) Technology for LVO

CPS technology¹ is a patented imaging technique that employs signal coding to provide excellent tissue suppression and contrast sensitivity. CPS technology builds the foundation for future contrast imaging application. CPS technology is optimized for LVO by providing the following benefits:

- High Specificity (tissue suppression)
- High Sensitivity (less contrast required, longer lasting enhancement)

Color Doppler Modes

Color Doppler Velocity (CDV)

CDV imaging mode detects and displays mean flow velocity. It uses Siemens Healthineers proprietary color Doppler detection, True Fidelity Color Doppler, and processing techniques for high spatial and temporal resolution and flash artifact suppression.

CDV is available in:

- Instantaneous volume color Doppler imaging
- Thin volume color Doppler imaging (2D images are derived from volume data)
- 2D color Doppler imaging -Max frame rate:
- 332 fps
- M-mode

¹ At the time of publication, the U.S. Food and Drug Administration has cleared ultrasound contrast agents only for use in LVO. Check current regulations for the country in which you are using this system for contrast agent clearance.



Additionally, CDV supports the following:

- MultiHertz imaging settings for optimal choice of detail resolution and penetration
- Multiple SpaceTime control settings to achieve desired spatial and temporal resolution
- Multiple wall Filter settings to achieve desired sensitivity to low velocity flow vs. tissue motion induced artifacts
- Multiple velocity Scale settings
- Multiple levels of Edge, for sharpening or smoothing flow information in spatial dimensions
- Multiple levels of Persistence, for temporal averaging, allowing smoothing of flow velocity information over time
- Independent CDV gain adjustment
- Multiple velocity maps and variance maps to optimize a real-time or frozen CDV image
- Adaptive rendering for improved depth perception of color volumes

Color Doppler Energy Capability (CDE)

CDE capability displays the intensity of the Doppler signal providing:

- Independence from velocity and angle to flow
- Higher sensitivity to low velocity and low intensity flow
- Ability to display flows that are perpendicular to the color Doppler beam

Color Doppler Energy is declared equivalent to Power Doppler. Color Doppler Energy used in vascular exams is declared equivalent to Power Doppler for high resolution vascular examinations.

Doppler Tissue Imaging Capabilities (DTI)

DTI Doppler tissue imaging capability mode detects Doppler frequency shift information from moving tissue (e.g., myocardium, heart valves, etc.) and displays mean velocity or backscattering strength of moving tissues in several imaging and strip display capabilities. It provides additional clinical and investigational information on myocardial function during transthoracic and trans-esophageal studies. DTI capability uses Siemens Healthineers proprietary multi-parameter motion discrimination technology.

DTI capability options are:

- Doppler Tissue Velocity (DTV)
 - Provides real-time imaging of tissue mean velocities
 - Maximum frame rate: 349 fps
- Doppler Tissue Energy (DTE)
 - Provides real-time imaging of the intensity of Doppler signals returning from tissue
 - Maximum frame rate: 349 fps

All DTI capability options are available in:

- Instantaneous volume color Doppler imaging
- Thin volume color Doppler imaging
- Native tissue harmonic imaging
- 2D color Doppler imaging

Additionally, the following are supported:

- MultiHertz imaging settings for optimal choice of detail resolution and penetration
- Multiple SpaceTime control settings to achieve desired spatial and temporal resolution
- Multiple wall Filter settings to achieve desired sensitivity to low velocity flow vs. tissue motion induced artifacts
- Multiple levels of Edge for sharpening or smoothing tissue motion information in spatial dimensions
- Multiple levels of Persistence for temporal averaging, allowing smoothing of tissue motion information over time
- Independent DTI capability gain adjustment
- Multiple maps to optimize a real-time or frozen DTI capability image

Spectral Doppler Modes

Spectral Doppler detects Doppler frequency shift information from moving blood cells or tissue and displays the information in a strip display. It uses Siemens Healthineers proprietary spectral Doppler detection and processing techniques for superb velocity sensitivity and resolution.



Spectral Doppler options are:

- Pulsed Wave (PW) Doppler
 - Provides real-time quantitative flow velocity information at the range gate location
- Continuous Wave (CW) Doppler
 - Provides real-time quantitative flow velocity information without aliasing
- PW Doppler Tissue Imaging (DTI capability)
 - Provides real-time quantitative tissue velocity information at the range gate location
- Range of Doppler sample volume sizes and depth capability
 - Gate Size can be adjusted from 1 mm to 20 mm. The PW Doppler sample volume can be positioned from 2 mm to 300 mm.
- Velocity range: 0.001–22 m/s

PW:

- Max: 25 kHz, 11 m/s (baseline shifted)
- Min: 12.5 kHz, 5.8 m/s (baseline shifted)

CW:

- Max: 50 kHz, 22 m/s (baseline shifted)
- Min: 50 kHz, 9.6 m/s (baseline shifted)

Additionally, the following are supported:

- Multiple wall Filter settings to achieve desired sensitivity to low velocity flow vs. tissue motion induced artifacts
- Spectral Doppler Dynamic Tissue Contrast Enhancement (DTCE) uses Siemens Healthineers proprietary algorithms to reduce background noise and enhance the Doppler waveform envelope in real-time or on a frozen strip
- Multiple levels of Edge, for sharpening or smoothing velocity information
- Multiple levels of Persistence for temporal averaging, allowing smoothing of spectral information over time
- A wide range of gain and dynamic range settings to optimize a real-time or frozen strip
- A wide range of sweep speed settings to optimize a real-time or frozen strip
- Multiple grayscale and tint maps to optimize a real-time or frozen strip
- A wide range of display size settings to optimize a real-time or frozen strip

- Angle correction to optimize a real-time or frozen strip
- Trace assist function provides an automated trace for the PW Doppler waveform and provides routine measurements and associated calculations. The feature is available during vascular examinations with the 6C1 HD or the 9L4 transducers. Depending on the selected measurements results for Max Vel (PS), Min Vel (ED), TAMx (Time-Average Maximum Velocity), PI (Pulsatility Index), RI (Resistive Index) and S/D (Systolic to Diastolic Ratio) are computed.

RES Enhanced Resolution Imaging

When a more detailed view is needed, the computer re-optimizes and re-scans the selected region to actually increase the acoustic information content of the image. RES enhanced resolution imaging areas can be defined on a full size display in 2D and color Doppler mode, or on the images combined with a strip mode. Image improvements and beneficial features include:

- Increased temporal resolution and enhanced visualization
- More efficient use of the space available on screen display
- Instant access to RES enhanced resolution imaging function at a push of a button
- Complete flexibility of position and size of the RES enhanced resolution imaging box

RES (aka acoustic Zoom, write Zoom) is available in live and live dual imaging.

Zoom (aka read Zoom) is available in Freeze, Cine, and Review.

RES enhanced resolution imaging is supported by all transducers on the ACUSON SC2000 PRIME system except for the Aux CW transducer. It is available in the following modes:

- 2D
- Thin volume imaging
- M-mode
- Color M-mode
- Spectral Doppler
- Bi-Plane+ imaging



Vascular Imaging

Advanced SieClear Spatial Compounding with Real-time Image Enhancement Technology

- Advanced SieClear spatial compounding offers image quality with unrivaled detail and contrast resolution via a real-time compounding technique that applies multiple lines of sight at greater steering angles.
 - Spatial compounding one (ASC3): 3 lines
 - Spatial compounding two (ASC5): 5 lines
 - Spatial compounding three (ASC7): 7 lines
- Includes real-time image enhancement technology – a real-time speckle reduction technique that enhances contrast resolution, border detection, and image presentation
- This combination of image optimization methods offers the user enhanced specular targets within the image, increased contrast resolution, and speckle smoothing via spatially compounding multiple images acquired with different ultrasound line steering angles, without losing acoustic enhancement or shadows
 - Available on the 9L4 transducer
 - Supports the following modes and their respective frequencies
 - B-mode
 - Color Doppler (CDV, CDE)
 - Spectral Doppler (PW, PW DTI)

Clarify Vascular Enhancement (VE) Technology

A patented, real-time, adaptive technology that uniquely uses Doppler flow information to reduce noise within macro and microvascular structures, provide clearer vessel wall definition with improved tissue boundary detection, and enhances tissue contrast resolution without compromising spatial resolution.

- Factory presets optimized for each exam type
- 7 user-selectable levels
- Compatible with THI and TEQ ultrasound technology

Dual Imaging

Dual image display for simultaneous visualization of two images of interest on separate sides.

- Accessed via the Dual control on the control panel
- Ability to display color and B-mode on separate sides
- Separate Cine control for both sides
- Split ED/ES control for easy access to these frames for analysis
- User can enable Dual during acquisition or after image is frozen
- Zoom and Pan Zoom available
- 2D Labeled and Generic measurements available – Active and inactive port, cine and Review

2D and 4D Live Imaging Guidance Tools

Septal Guide (available only when the Z6Ms is connected) is an easy-to-use guidance tool that allows the user to move a circle overlay with lines at 90° from each other of a user-defined diameter during 2D live imaging. Septal Guide may be used, for example, during the inter-atrial septal puncture to ensure a proper distance and location of the puncture from the MV annulus.

Circle Tool (available only when the ACUSON AcuNav Volume ICE catheter is connected via the SwiftLink catheter connector) is an easy-to-use guidance tool that allows the user to assess and quantify anatomical structures on 2D and MPR images using a circle of varying diameters during 4D live imaging. The Circle Tool may be used, for example, during electrophysiology and structural heart disease cases to measure the left atrial appendage ostium to ensure a proper sizing and placement of a left atrial appendage occlusion device.



4D Volume Intracardiac Imaging

The ACUSON SC2000 PRIME was the first ultrasound system offering volume intracardiac imaging with the ACUSON AcuNav V ICE catheter, now delivering its second generation with the ACUSON AcuNav Volume ICE catheter. For more than a decade, the ACUSON AcuNav technology has provided electrophysiologists and interventional cardiologists with high-quality, real-time diagnostic information about the structure of the heart, hemodynamic information and device guidance. Adding the benefits of volume imaging improves and simplifies the visualization of valve anatomy, blood flow, and structural heart devices.

ACUSON AcuNav Volume ICE catheter enables easier and more accurate device navigation. This technology allows physicians to make more informed decisions about the use of local or general anesthesia for SHD and ablation procedures and to monitor procedural outcomes with minimal effort right at the table side.

Transducer Technology

The ACUSON SC2000 PRIME system imaging transducers use patented micro-pinless transducer connectors. This technology provides preserved signal integrity and improvement in signal to noise ratio.

The ACUSON SC2000 PRIME system supports the Siemens Healthineers state-of-the-art 4D matrix array transducer for instantaneous full volume imaging. It also supports 1D and 1.25D array transducers for advanced real-time 2D imaging. It supports convex transducers, phased array transducers, linear transducers, TEE, volumetric transducers and a comprehensive suite of intracardiac echocardiography catheters.

4Z1c Transducer

- Matrix array transducer with active electronics for instantaneous full volume transthoracic echocardiography
 - Patented active cooling
 - Ergonomic palmar grip with an elastomeric gripping surface to facilitate scanning – even on the most technically difficult-to-image patients
 - Number of elements: 1728 elements

Modes

- Instantaneous full volume B-mode
 - MultiHertz imaging
 - Fundamental (InFocus)
 - Native tissue harmonics (InFocus)
 - Left Ventricular Opacification (LVO)¹
 - Volume rate is frequency, SpaceTime control, volume size and depth dependent
 - Fundamental: Up to 40 volumes/s for 90° x 90° volume, 16 cm depth
 - Native tissue harmonics (InFocus): Up to 18 volumes/s for 90° x 90° volume, 16 cm depth
 - LVO¹: Up to 20 volumes/s for 90° x 90° volume, 16 cm depth
 - Maximum depth is 30 cm
- Thin Volume B-mode
 - MultiHertz imaging
 - Fundamental (InFocus)
 - Native tissue harmonics (InFocus)
 - Left Ventricular Opacification (LVO)¹
 - Frame rate is dependent on frequency, SpaceTime control and depth
 - Fundamental: up to 82 frames/s for 90° sector, 16 cm depth
 - Native tissue harmonics (InFocus): Up to 100 frames/s for 90° sector, 16 cm depth
 - LVO¹: Up to 79 frames/s for 90° sector, 16 cm depth
- Instantaneous Volume Color Doppler (CDV, DTV, DTE)
 - MultiHertz imaging
 - Volume rate is dependent on frequency, SpaceTime control, volume size and depth of both color Doppler and the background B-mode
 - Up to 18 volumes/s for 60° x 60° B-mode (fundamental) and 45° x 45° color Doppler
 - Maximum of 138 color Doppler volumes/s
- Thin Volume Color Doppler
 - Accessed through 2D button
 - MultiHertz imaging
 - CDV: Up to 29 frames/s for 35° sector at 13 cm ROI depth with a 90° sector B-mode background at 16 cm depth
 - DTV and DTE
- Spectral Doppler
 - PW Doppler
 - PW Doppler Tissue Imaging (DTI)
- RES enhanced resolution imaging
 - Also available in 4D imaging

¹ At the time of publication, the U.S. Food and Drug Administration has cleared ultrasound contrast agents only for use in LVO. Check current regulations for the country in which you are using this system for contrast agent clearance.



Z6Ms Transducer

- Matrix array transducer with active electronics for instantaneous full volume transesophageal echocardiography
 - Ergonomic, customizable buttons provide numerous controls of systems at your fingertips right on the probe handle
 - Number of elements: 2304 elements
- Endoscope
 - 100 cm long, 15.5 mm wide at tip, 12 mm high at tip
 - Tip articulation range – Anterior: 120°, Posterior: 60°, Left/Right: 45°
- Shielded for RF noise suppression

Modes

- Instantaneous full volume B-mode
 - MultiHertz imaging
 - Volume rate is frequency, SpaceTime control, volume size and depth dependent
 - Fundamental: Up to 20 volumes/s for 90° x 90° volume, 120 cm depth
 - Maximum depth is 26 cm
 - Frame rate is dependent on frequency, SpaceTime control and depth
- B-mode Imaging
 - Fundamental (InFocus)
 - Native tissue harmonics (InFocus)
- Instantaneous Volume Color Doppler (CDV, DTV)
 - MultiHertz imaging
 - Volume rate is dependent on frequency, SpaceTime control, volume size and depth of both color Doppler and the background
- B-mode
 - Up to 22 volumes/s for 60° x 60° B-mode, 12 cm depth (fundamental)
- Color Doppler
 - 4D: 14 volumes/s for 45° x 45° color Doppler at 12 cm depth
 - 2D: True Fidelity Color Doppler
- Spectral Doppler

4V1c Transducer

A Vector wide-view imaging format, 1D array transducer for transthoracic 2D adult echocardiography

- B-mode Imaging
 - Frame rate is frequency, SpaceTime control and depth dependent
 - Maximum depth is 30 cm
- Color Doppler Imaging
 - Color Doppler Velocity (CDV)
 - Max velocity 1.28 m/s and Min velocity 0.1 m/s
 - True Fidelity Color Doppler
 - Color Doppler Energy (CDE)
 - Doppler Tissue Velocity (DTV) and Doppler Tissue Energy (DTE)
- LVO Contrast¹
 - Two frequencies, both optimized for low transmit power (low MI)
 - LVO II: Alternative frequency with ALP (Alternate Line Phase)
 - CPS technology
- Spectral Doppler
 - CW Spectral Doppler
 - PW Spectral Doppler
 - PW Doppler Tissue Imaging (DTI)
- M-mode
 - Color M-mode
- Resolution
- RES enhanced resolution imaging
- Transducer is also compatible with:
 - ACUSON S2000 ultrasound system
 - ACUSON Sequoia legacy ultrasound system
- Presets: Cardiac, Ao-Iliac, Ao-Renal

Aux CW

2.0 MHz non-imaging CW spectral Doppler transducer for adult and pediatric transthoracic echocardiography.

¹ At the time of publication, the U.S. Food and Drug Administration has cleared ultrasound contrast agents only for use in LVO. Check current regulations for the country in which you are using this system for contrast agent clearance.



8V3 Transducer

A Vector imaging format, multiplane 2D transthoracic transducer used for pediatric and fetal echo.

- B-mode Imaging
 - InFocus technology
 - Maximum depth: 240 mm
- Color Doppler Imaging
 - Color Doppler Velocity (CDV)
 - Doppler Tissue Velocity (DTV) and Doppler Tissue Energy (DTE)
- Spectral Doppler
 - CW Spectral Doppler
 - PW Spectral Doppler
 - HPRF
 - PW Doppler Tissue Imaging (DTI)
- M-mode
 - Color M-mode (CDV, DTV, DTE)
- RES enhanced resolution imaging
- Transducer is also compatible with:
 - ACUSON S2000 system
 - ACUSON Sequoia legacy system

10V4 Transducer

A Vector imaging format, 2D pediatric transthoracic transducer used for pediatric and fetal echo.

- B-mode Imaging
 - InFocus technology
 - Maximum depth: 180 mm
- Color Doppler Imaging
 - Color Doppler Velocity (CDV)
 - Doppler Tissue Velocity (DTV) and Doppler Tissue Energy (DTE)
- Spectral Doppler
 - CW Spectral Doppler
 - PW Spectral Doppler
 - HPRF
 - PW Doppler Tissue Imaging (DTI)
- M-mode
 - Color M-mode (CDV, DTV, DTE)
- RES enhanced resolution imaging
- Transducer is also compatible with:
 - ACUSON S2000 system
 - ACUSON Sequoia legacy system

V5Ms Transducer

A Vector imaging format, multiplane transesophageal transducer.

- Transesophageal multiplane
 - One-hand control, ergonomically designed form factor
 - Range of rotation: 0°–180°
 - Motor rotation speed: variable up to 90° per second
- Endoscope
 - 110 cm long, 14.5 mm wide at tip, 11.5 mm high at tip
 - Tip articulation range – Anterior: 120°, Posterior: 90°, Left/Right: 45°
- Shielded for RF noise suppression
- B-mode Imaging
 - InFocus technology
 - Maximum depth: 180 mm
- Color Doppler Imaging
 - Color Doppler Velocity (CDV)
 - Doppler Tissue Velocity (DTV) and Doppler Tissue Energy (DTE)
 - Color M-mode (CDV, DTV, DTE)
- Spectral Doppler
 - CW Spectral Doppler
 - PW Spectral Doppler
 - HPRF
 - PW Doppler Tissue Imaging (DTI)
- M-mode
- Color M-mode
 - RES enhanced resolution imaging
- Transducer is also compatible with:
 - ACUSON S2000 system
 - ACUSON Sequoia legacy ultrasound system



V7M Transducer

A Vector imaging format, multiplane pediatric transesophageal transducer.

- Transesophageal multiplane
 - One-hand control, ergonomically designed form factor
 - Range of rotation: -10°–190°
- Endoscope
 - 70 cm long, 10.9 mm wide at tip, 8 mm high at tip
 - Tip articulation range – Anterior: 120°, Posterior: 90°
- Shielded for RF noise suppression
- B-mode Imaging
 - InFocus technology
 - Maximum depth: 180 mm
- Color Doppler Imaging
 - Color Doppler Velocity (CDV)
 - Doppler Tissue Velocity (DTV) and Doppler Tissue Energy (DTE)
 - Color M-mode (CDV, DTV, DTE)
- Spectral Doppler
 - CW Spectral Doppler
 - PW Spectral Doppler
 - HPRF
 - PW Doppler Tissue Imaging (DTI)
- M-mode
- Color M-mode
 - RES enhanced resolution imaging pediatric

9L4 Transducer

Multi-D matrix array transducer technology for precise beam elevation control and exceptional spatial resolution throughout the field of view.

- 1.25D array transducer
 - Allows elevation aperture control
- Elevation aperture is variable
 - Allows focusing at different depths
 - Better detail and contrast resolution
- Three rows of 192 elements
- B-mode Imaging
- Color Doppler Imaging:
 - Color Doppler Velocity (CDV)
 - Color Doppler Energy (CDE)

- Spectral Doppler
 - PW Spectral Doppler
 - HPRF
 - PW Doppler Tissue Imaging (DTI)
- Transducer is also compatible with:
 - ACUSON S2000 system
 - ACUSON Sequoia legacy system
- Presets: Carotid, PV Arterial, PV Venous

6C1 HD Transducer

Utilizes Hanafy lens transducer technology to provide excellent elevation focusing and uniform beam intensity throughout the field of view.

- Curved vector imaging format
- 192 elements
- B-mode supports InFocus technology
- Color Doppler Imaging
 - Color Doppler velocity (CDV)
 - Color Doppler Energy (CDE)
 - True Fidelity Color Doppler
- Spectral Doppler
 - PW Spectral Doppler
 - PW Doppler Tissue Imaging (DTI)
- Transducer is also compatible with:
 - ACUSON S2000 Ultrasound System
 - ACUSON S3000 Ultrasound System

ACUSON AcuNav Volume ICE Catheter

- Supports 90° x 50° degree real-time volume imaging
- B-mode Imaging
 - IN Focus technology for B-mode
- Color Doppler Imaging
 - Color Doppler Velocity (CDV)
- Spectral Doppler
 - PW Doppler
 - CW Doppler

Note: PW DTI is not supported on ACUSON AcuNav Volume ICE Catheters. ACUSON AcuNav Volume ICE catheters are sold separately.



AI-powered, Knowledge-based Clinical Applications

Siemens Healthineers innovative Artificial Intelligence (AI)-powered, knowledge-based workflow technology is designed to improve clinical productivity while also lowering measurement variability in basic echo exams as well as pre-, peri-, and post-procedural echo guidance for electrophysiology and structural heart disease interventions. Unique to the ACUSON SC2000 PRIME system are the following AI-powered, knowledge-based applications:

- eSie Measure workflow acceleration package (2D, M-mode, spectral Doppler)
- eSie Left Heart measurement package for automated measurements on 2D images of left heart
- eSie LVA volume LV analysis, an automated quantification application for the left ventricle
- eSie Valves package
- With TrueFusion guidance¹, AI-powered eSie Sync registration improves workflow with automatic co-registration of the Z6Ms TEE transducer using a knowledge-based image algorithm.

eSie Measure Workflow Acceleration Package

The eSie Measure package is an innovative AI-powered application that provides semi-automated measurements for routine echo exams, improving efficiency and consistency for end users. Based on a knowledge base of over a thousand expert-traced datasets, the eSie Measure package improves accuracy and reproducibility. Manual measurement accounts for a large portion of an echo exam time and requires repetitive key strokes which can lead to long term stress injury. With a push of a button, the eSie Measure package semi-automatically generates reliable measurement data for 2D, M-mode and spectral Doppler, increasing consistency, reproducibility and accuracy of each exam, while reducing key strokes.

eSie Measure package for spectral Doppler measurements is also available on TEE datasets to accelerate workflow for TEE exams and interventional procedures. On TEE exams, eSie Measure allows for 1-click spectral Doppler measurements from mid-esophageal and transgastric views.

eSie Left Heart Measurement Package

eSie Left Heart utilizes AI-powered knowledge-based technologies specifically designed to identify and measure contours on a typical transthoracic exam of left ventricle and atrium in an automated manner. The algorithms are trained on a large image database of apical 4CH and 2CH adult transthoracic 2D echo views annotated by clinical experts and provide a quick and easy measurements of EF, EDV and ESV for both LV and LA. The application is available both on and off the system and is trained on apical 4CH and 2CH transthoracic 2D echo views. eSie Left Heart enables improvement in efficiency and workflow in a routine clinical setting.

eSie LVA Volume LV Analysis

eSie LVA analysis is an automated volume quantitative analysis package based on AI-powered knowledge-base algorithms and designed specifically for the left ventricle. It includes Ejection Fraction (EF), volumes (end Diastolic/end Systolic) and mechanical dyssynchrony tools and calculations for up to 5 consecutive beats. Multiple consecutive beat analysis provides averaged calculations for irregular heart rhythms. The algorithms are based on a large database of expert-traced datasets improving reproducibility and workflow efficiency. eSie LVA analysis is available on both TTE and TEE volume datasets. On the 4Z1c and the Z6Ms, eSie LVA analysis provides faster workflow to both TTE and TEE exams and interventional procedures.

eSie LVA is configurable and can quantify up to 5 consecutive heart beats.

Features include the following:

- Automated Reference Plane Extraction
The system automatically generates and displays images that are aligned to standard 2D views from a volume dataset in the LVA application and Rapid Stress volume stress echo application. From an apical volume dataset, the extracted reference planes correspond to the short axis, apical 4, apical 3 and apical 2 chamber views.

¹ TrueFusion represents a workflow consisting of syngo® TrueFusion (syngo X Workplace) and TrueFusion echo-fluoro guidance (ACUSON SC2000 PRIME).



- **Automated Volume Contouring Ejection Fraction and Volume Data**
From the volume dataset, the system automatically traces the endocardial surface from the entire volume and displays the contours on the multiple reference planes from which calculations such as Ejection Fraction (EF) and volume data are calculated.
- **Parametric Static Maps of Minimum Volume and Maximum Volume**
Using the 16 or 17 segment map options, the mechanical contraction time pattern within the myocardium is displayed. On a static bulls-eye, the color indicates when that region reaches its minimum or maximum volume.
- **Dynamic Time to Minimum Volume and Dynamic Time to Maximum Volume**
This application analyzes and displays delayed contractility on a segment-by-segment basis using a parametric display. The volume curve provides a visual indication of global dyssynchrony. The user can isolate the segments to determine regional dyssynchrony. On a dynamic bulls-eye display, the color indicates when the region reaches its minimum and maximum value.

eSie Valves Package

The eSie Valves application is a state-of-the-art AI-powered valve modeling application. It provides accelerated workflow tools to visualize and quantify valvular anatomy. Valve specific reference planes for the aortic and mitral valve are automatically created from B-mode or Color Doppler volume TEE data. The volume rendered image can then, with one single click, be aligned to the reference planes. The valve-specific views provide the ability to review standard valvular anatomy. Valvular anatomy can then be detected in an automated manner for any 4D volume data. The automated modeling is performed utilizing Siemens Healthineers knowledge-based technologies.

The valve models can be detected on individual volumes or tracked for all volumes in a heart cycle.

Single frame tracking in as little as 4 seconds. Dynamic cycle tracked in as little as 60 seconds.

Anatomy labelling and color-coded rendering options are provided. Generic tool options make selecting multiple display options seamless and intuitive.

Valve editing can be performed on multiple slices and layout options. Corrections can be performed quickly and intuitively as needed.

Analysis step provides the ability to review static or dynamic models with accompanying geometric measurements for aortic and the mitral valve. The patientspecific models include aortic root, annulus and leaflets as well as the mitral valve annulus and leaflets presented in a color encoded anatomy. Measurements are displayed in graphical and textual format for each instance. Measurements are also displayed on the valve models for easy review.

Results can then be saved as static or dynamic files, private data in the Adult Echocardiography Structured Report, or exported to USB for statistical analysis.

eSie Sync Automatic Registration on TrueFusion Echo-Fluoro Guidance

TrueFusion echo-fluoro guidance uses real-time anatomical data from the ACUSON SC2000 PRIME system to combine static markers and valve model overlays into a Siemens Healthineers Artis system's fluoroscopic X-ray image to guide interventional and surgical procedures.

Using proprietary knowledge-based algorithms, eSie Sync registration enables automatic registration of the X-ray and ultrasound image via real-time detection of the Z6Ms TEE transducer orientation on an Artis X-ray image.

Innovative Clinical Applications

In addition to the AI-Powered knowledge-based applications, the ACUSON SC2000 PRIME system offers additional innovative technologies to quickly and easily quantify form, flow, and function in both 2D and 4D. This comprehensive suite of innovative 2D & 4D clinical applications not only accelerates your workflow but also provides quantification not previously possible. The ACUSON SC2000 PRIME system pioneers advanced applications to perform volume stress echo and to assess the right ventricle, which has proven to be challenging under traditional 2D or 4D imaging technique.



For valve analysis and assessment, the ACUSON SC2000 PRIME system provides a number of pioneering clinical applications: in addition to eSie Valves package for accelerated modeling and comprehensive quantification of the mitral and aortic valves, eSie PISA volume analysis quantifies regurgitation based on the flow convergence principle without geometric assumptions.

eSieScan Workflow Protocols

eSieScan protocols guide the operator through the clinical workflow steps required to complete an exam. Using protocol-driven workflow ensures a consistent, repeatable process with reduced keystrokes, thus leading to more accurate outcomes. With the ability to customize the protocol, a user can structure the protocol to meet the lab's needs.

Workflow protocols include automated features for:

- Automatic mode and measurement activation (4D, color Doppler, spectral Doppler, Thin Volume or 2D, M-mode)
- Transducer switching (necessary to go from 2D imaging to 4D imaging)
- Available for Adult and Pediatric Echo

Pre-defined protocols:

- Complete Adult Echo (to include volume imaging, color Doppler, Thin Volume (2D), PW and CW Doppler and measurements)
- Limited Adult Echo
- Pediatric Echo
- Volume Adult Echo
- Cardiac (free form)
- 4D Pharm Stress 4-Stage
- 2D Exercise Stress 2-Stage
- 2D Pharm Stress 4-Stage

eSie VVI Velocity Vector Imaging Technology

eSie VVI velocity vector imaging technology is an advanced 2D quantitative tool for assessment of global and regional myocardial mechanics applicable to the left and right ventricle as well as both atria. It provides Global Longitudinal Strain (GLS), strain, strain rate, velocity

and displacement deformation parameters with related dyssynchrony analysis. Independent of Doppler angle, eSie VVI technology provides reliable tracking of B-mode images on the majority of patients, for all supported transducers, from 2D images of the heart. It supports clinical analysis of adult, pediatric and fetal heart. Detailed analysis results are visualized as vectors and graphical display. Summarized results are also displayed in an easy to read graphical bulls-eye display and text display for all parameters. All results can be exported via export media for further analysis.

Volume Right Ventricular Analysis (RVA)

Volume Right Ventricular Analysis is an innovative quantitative analysis package designed specifically for the complex anatomy of the right ventricle. Results from the analysis include Global Volume Curve and Ejection Fraction, which can be performed on or off the system using *syngo* SC2000 Workplace.

2D Stress Echo Application

The Stress Echo application provides tools for ECG-triggered acquisition, display, selection, comparison, evaluation and archiving of multiple cardiac loops during various stages of a Stress Echo examination.

- Standard customizable acquisition protocols for treadmill and pharmacological stress include:
 - 2D Exercise Stress Echo 2-Stage
 - 2D Pharm Stress Echo 4-Stage (Dobutamine)
- Full screen or ROI (Region Of Interest) acquisition
- Resizable capture ROI
- On/Off capture ROI during exam
- View stage with capture ROI
- Complete R-R capture with clip editing
- Systole only capture
- R-wave delay, R-offset
- Easy workflow throughout the exam protocol
- User-Defined Stage and View names
- Ability to Add Stage (user-defined name or from list) on-the-fly during an exam
- Status Grid displays number of acquired and selected clips for each stage and view



- Spectral Doppler captures can be performed inside the protocol, with stage and view labels, for hemodynamic studies
- Configuration option for only single clip selection per view, improving compatibility with 3rd party DICOM workstations
- Ability to restart an Exercise study as a Pharm study, retaining the baseline clip captures
- Perspective capture, continuous capture, retrospective capture or capture on demand
- Clips per capture 1 to 10
- Capture length: limited to 1 beat
- Ability to store 750 clips, continuous capture with reference memory gauge
- Immediate review of acquired loops via Stress Echo Selection and Review
- Adjustable Layouts: 1 x 1 up to 4 x 3
- Flexibility to skip views or stages
- Flexibility to re-acquire and overwrite already acquired images
- Baseline stage parameters are saved per view then applied in subsequent stages
- Playback selectable for Full R-R, Systole only, or Diastole only
- Dogear control to view and compare multiple clips selected per view per stage
- Measurements may be performed in Stress Review
- Measurements automatically placed into reports
- Undefined view for capture of color Doppler and spectral Doppler
- Option for systolic only Capture
- Option for ECG display within Region of Interest (ROI)

Rapid Stress Volume Stress Echo Application

Rapid Stress volume stress echo application is the first non-stitched, full volume stress echo application that enables full volume acquisition per stage and automatically extracted 2D views for rapid analysis. It can lead to potential time savings and improved accuracy compared to 3D stitched imaging or 2D stress echo. It is the first full volume stress echo solution for patients with arrhythmia and dyssynchrony.

Available protocol includes:

- 4D Pharm Stress 4-Stage (Dobutamine only)

Features include:

- Rapid extraction of conventional reference planes for analysis of stress echo volumes using auto reference plane extraction
- Various display formats to compare multiple views across multiple stages
- Displays of reference planes and volumes for comparison
- Clip capture – Retrospective and Prospective
- Clips per capture – 1 to 4
- Capture length – limited to one beat
- Stress echo selection in parasternal long axis or short axis view with dynamic view adjustment to review all LV wall segments
- Dual volume display in review to access Stress LV analysis package to generate EF and volume data for up to five separate stages
- Results export to report with appropriate stage name
- Reference planes may be easily exported as individual DICOM clips
- 9-up SAX display format

eSie PISA Volume Analysis

Siemens Healthineers exclusive advanced software provides semiautomatic quantification of proximal isovelocity surface area (PISA) from volume color Doppler data to assess the severity of valvular disease. eSie PISA analysis computes the status of PISA and effective regurgitant orifice area (EROA), free of any geometric assumptions.

Unlike traditional 2D PISA that is truly applicable only for a limited number of valvular pathologies, eSie PISA analysis can be used on almost all patients with valvular diseases. The simple workflow of eSie PISA analysis delivers measurement of the EROA within seconds.



Intracardiac Echocardiography (ICE) Imaging

2D ICE Bundle

Intracardiac imaging visualizes cardiac and great vessel anatomy, blood flow, and other devices located within the heart. 2D ICE has been prevalently used in guiding electrophysiology (EP) and interventional procedures.

This bundle enables the use of the ACUSON AcuNav ultrasound catheters (8F and 10F) and SOUNDSTAR® catheter for intracardiac echo (ICE) procedures via the SwiftLink catheter connector and the CARTOSOUND® communication package.

The bundle includes:

- 2D SwiftLink connector
- CARTOSOUND® communication package
- Box of sterile, single-use covers for the SwiftLink connector

Note: ACUSON AcuNav and SOUNDSTAR® ultrasound catheters are sold separately.

Volume ICE Bundle

The ACUSON AcuNav Volume ICE catheter delivers real-time volume imaging at 90° x 50° angle volume color Doppler, pulse and continuous wave Doppler to enhance the visualization and guidance of EP and structural heart disease procedures. Volume ICE visualizes valve and cardiac anatomy, blood flow, and other devices located within the heart. Volume ICE can potentially improve visualization of the anatomy and tools during EP and Structural Heart Disease (SHD) procedures.

This bundle enables the use of the ACUSON AcuNav Volume ICE ultrasound catheter via the SwiftLink Volume catheter connector.

The bundle includes:

- SwiftLink Volume catheter connector
- Box of sterile, single-use covers for the SwiftLink volume catheter connector

Note: ACUSON AcuNav Volume ICE catheters are sold separately.

ICE Probe Saver

As catheters are designed for passive cooling while imaging in the blood stream, ICE Probe Saver will automatically reduce the transmit power when it detects that the catheter is imaging in air to prevent ICE catheters from overheating. The transmit power will go back to its previous level automatically when the catheter is not imaging in air.

General System Information

System Dimensions

- Width (control panel in home position): 64 cm (25.2 in)
- Depth (control panel in home position): 109 cm (42.9 in)
- Height – maximum: 177–183 cm (69.7–72 in)
 - The maximum height is based on the highest position for the monitor arm and control panel
- Height – minimum: 141–147 cm (55.5–57.9 in)
 - The minimum height is based on the lowest position for the monitor arm and control panel
- Height – transport position: 108–120 cm (42.5–47.2 in)
 - The monitor folds down for transport or portable exams
- Weight: Not to exceed 136 kg (299 lbs)
 - The weight of the system is based on the system unpacked and ready for operation

Note: All values are approximate. The system height depends on the height of the column installed on the system.

Operating System

- Windows 10

ErgoDynamic Imaging System Design

- Portable: small, four-caster design with foot-operated wheel/caster lock
- Four wheel pivot mode
- Front wheels caster lock with rear wheels pivot mode
- Front wheels lock mode
- System supports up to two on-board OEM devices



- HDMI, S-Video, and VGA video output for remote display monitor
- Four casters with high-end bearings for easier turning and manipulation in tight places
- The wheel castor size is 125 mm and has lock control of the castors from the front of the system.
- Rear handle for easier maneuverability
- Control Panel lock for easier control and ergonomic mobility from the front of the system and ability to reposition the control panel without a power source.

Control Panel (CP)

- Simple, intuitive user interface with Home Base design minimizes repetitive hand motions
- Enables motor-memory learning
- Floating control panel allows infinite adjustment for operator comfort in standing and sitting positions
- Left/right swivel articulation: $\pm 90^\circ$, locks in any position
- Slide extension (in/out) articulation: 18 cm (7.1 in), locks in any position
- Vertical adjustment range: 23 cm (9.1 in)
- Max left/right travel, CP facing forward: ± 17.7 cm (7 in)
- Home position safety lock feature for transport; locks control panel to system and disables articulation trigger
- The control panel has an alphanumeric keyboard and the ability to control peripherals.

Flat Panel Display (FPD)

- 21.5 in (54.5 cm) diagonal; 16:9 widescreen format
- Screen resolution: 1680 x 1050, progressive scan, flicker-free monitor
- 256 shades of gray
- 8 bit (16.7 million colors)
- Recordable image area of 1024 x 768 pixels (clips)
- Recordable image area of 1024 x 768 pixels (static image)
- The ratio between the maximum image diagonal and the monitor dimension is 0.5564

- IPS (in-plane switching) technology
- Folds down for transport or portable exams
- Fully articulating arm, independent of the system and the control panel, allows transition of monitor for optimal ergonomic positioning
- Variable positioning adjustments
 - Range of height: Adjustment of 36 cm from minimum to maximum
 - Left and right swivel: $\pm 180^\circ$
 - Extended wide-angle viewing angle (rotation at the base of the monitor): $\pm 178^\circ$
 - Tilt front ($+90^\circ$) and back (-10°)
- Articulating arm adjustments (independent of control panel)
 - Left and right swivel: $\pm 180^\circ$
 - Vertical: up to 12.7 cm
- Brightness controls
- Built-in microphones
- Energy savings compliant per VESA Display Power Management Signaling standard
- Reduced glare in all working environments

Language Support

- On-screen user interface in English, German, French, Italian and Spanish
- Alphanumeric keyboards for English, French, Italian, German, Spanish, Swedish, Norwegian, Danish and Chinese
- User Manual languages include Bulgarian, Chinese, Czech, Danish, Dutch, English, Finnish, French, German, Greek, Hungarian, Italian, Japanese, Norwegian, Polish, Portuguese, Romanian, Russian, Slovakia, Spanish, Swedish and Turkish
- Allows for secondary display

Audio Speakers/Microphone

- High-performance audio speakers integrated into the control panel
- Two speakers available



Transducer Ports and Storage

- Three universal transducer ports supporting micropinless connectors are centrally located for easy access whether scanning from the right or left side
- Electronic transducer selection
- One-handed transducer connection and disconnection
- Aux CW port
- Six holders for transducers or gel bottles
- Ergonomic cable management for exam convenience and secure transport
- Dual parking ports for transducer connector storage

Gel Warmer

- Used for keeping the gel warm for patient comfort. Power supply included.

DVR

TEAC UR50BD-S 50 GB Blu-ray Recorder.

High-quality medical grade TEAC UR50BD-S 50 GB Blu-ray Recorder, which allows digital recording of video from the ultrasound system to 25–50 GB Blu-ray Discs.

Supports the following capabilities and features:

- Recording of clinical workflow in high definition
- Recording of the entire display area – not just the image area
- Auto creation of Titles and Chapters via Record/Pause and Stop
- Support for Blu-ray media (BD-RE and BD-R)
- On screen controls for DVR

Transthoracic Impedance Respirometer

Displays the timing of inspiration and expiration.

- Transthoracic Impedance Respirometer (TIR) calculates breathing by sensing impedance changes in the patient's chest through the ECG leads
- The display of respirometer signal is configurable, repositionable and scalable on the monitor
- Provides the ability to have different color for waveforms
- Provides the ability to preset the lead position and the ability to display selected lead on the screen
- Available on ACUSON SC2000 PRIME 5.0 systems and above

Nasal Respirometer

- Available on ACUSON SC2000 release 4.0 and earlier revisions. Also available on 5.0 systems that have software only upgrades.

Utilized to display the timing of inspiration and expiration events.

- Uses a nasal thermistor
- Thermistor plugs into the Pulse input of the Physio Module
- Probe kit contains one nasal thermistor and five disposable nose clips
- Temperature sensed by the nasal thermistor is displayed as a physio trace
- Auto-scaling algorithm normalizes the amplitude within 30 seconds or less
- Lower sweep speeds available for use with nasal respirometer

Acoustic Output Management

- User-adjustable, transducer mode dependent
- System monitor display of output acoustic power level, thermal and mechanical indices:
 - PWR – Output Power level
 - MI – Mechanical Index
 - MIF – Mechanical Index at Focus
 - TIB – Thermal Index, Bone at Focus
 - TIS – Thermal Index, Soft Tissue
 - The parameters displayed are mode-dependent

Presets

Exam and image presets function with ease. Intuitive user interface provides the user with customizable sets of image optimization parameters for instant image adjustments tailored to various applications.

- Exam Presets
 - Transducer-specific presets for customizing settings such as display remotes, measurements and reports
 - Create and save in control area via drop down menu
- Image Presets
 - Exam/mode specific for customizing image optimization settings
 - Create and save via Image knob



Joysticks

The ACUSON SC2000 joystick allows selected control panel and cursor events to be triggered via joystick and buttons from tableside or bedside via USB 2.0 connection to the system. The ACUSON SC2000 system supports two joysticks: SC2000 Joystick and the SC2000 6.0 Joystick, depending on the release version of the ACUSON SC2000 system. The latest software version will be backwards compatible with older versions of the Joystick.

The ACUSON SC2000 Joysticks allow the operator to control the following:

- Enable/disable major modes (B-mode, Color, PW/CW, 2D/4D)
- Increase/decrease imaging depth
- Manipulate the system cursor and the ROI (Region of Interest) controls

The ACUSON SC2000 Joysticks can aid in procedures involving Intracardiac Echocardiography (ICE) catheters and TrueFusion Echo-Fluoro Guidance or whenever remote control of selected controls are needed.

The ACUSON SC2000 Joystick supports the following functions:

- Enter/exit 4D Mode
- Enter/exit Color Mode
- Cycles through the 4D screen layout options between all layouts available under the layout icon in the control area
- Enter/exit RES (same functionality as pressing RES button on control panel)
- Clip Capture
- Increase/Decrease Depth
- Enter/exit CW Mode
- Enter/exit PW Mode
- Left/right mouse click

The ACUSON SC2000 6.0 Joystick supports the following functions:

- Enter/exit 4D Mode
- Enter/exit Color Mode
- Freeze/unfreeze
- Make measurements
- Static Capture
- Clip Capture
- Increase/Decrease Depth
- Enter/exit CW Mode
- Left/right mouse click

The joystick is an extension of the keyboard. It works everywhere where these functions are available and with all transducers.

Footswitch

The three-pedal programmable USB footswitch allows the following functions to be programmed to each individual foot-pedal.

- Clip Capture
- Static Capture
- Freeze
- End Continuous Capture
- Defer Select
- TEQ on/Update
- Disable TEQ
- Color On/Off
- M-mode On/Off
- CW On/Off
- PW On/Off
- Live Dual On/Off
- Review
- None



Patient De-Identification

Provides the ability to export selected clips and images to a connected USB thumb drive or external drive.

- Images are exported as AVI and JPG
- Selecting “anonymous” will black out pertinent patient data from images

Teaching Files

Teaching File edit and compile capability. Ability to generate an exam file with customizable collection of images from different patient studies.

- DICOM de-identification of study
- Deidentifies on-screen and DICOM header information
- Create separate teaching files and append individual images
- Can be exported and imported

Measurements and Reports

Customizable, anatomy-based measurements and calculations with enhanced report capabilities for both adult and pediatric calculations.

- Displays measurements and calculations in a *syngo*® Dynamics report format
 - Supports DICOM structured reporting to PACS
 - Measurement results are available in the worksheet layout in the following tabs:
 - Left Ventricle
 - Left Atrium
 - Volume
 - Right Ventricle
 - Right Atrium
 - Mitral Valve
 - Ao/Aortic Valve
 - Tricuspid Valve
 - Pulmonary Valve
 - Pulmonary Veins
 - Diastology
 - PISA
 - LVA/RVA
 - Stress Echo LVA
 - Arteries
 - Shunts
 - M-mode

- Both adult and pediatric measurements contain the same list and can be configured differently and independently
- 2D measurements can be performed on the reference planes, Thin Volume and 2D images
- All measurements can be performed on stored images
- Measurement menu display is mode-dependent

Vascular Calculations Package

A single key access to calculation packages with flexible report contents.

- Available measurements and calculations:
 - Resistive Indices
 - Vmax (m/s)
 - Vmin (m/s)
 - TAMX (m/s)
 - TAMn (m/s)
 - Peak Systolic Velocity
 - End Diastolic Velocity
 - Angle (degrees)
 - Pulsatility Index (PI)
 - Resistive Index (RI)
 - S/D ratio
 - Acceleration time
 - Ratio
 - % stenosis, Diameter
 - % stenosis, Area
- Easy access to calculation Worksheet and Report with summary areas and comment Page

Carotid Study (Left and Right)

Upper Extremity Arterial Study (Left and Right)

- PSV, EDV for:
 - Subclavian
 - Axillary
 - Brachial
 - Radial
 - Ulnar
 - Innominate
 - Deep Brachial ported



Lower Extremity Arterial Study (Left and Right)

- PSV, EDV for:
 - EIA
 - CFA
 - PFA
 - SFA proximal
 - SFA mid
 - SFA distal
 - Popliteal
 - TpT
 - PTA proximal
 - PTA mid
 - PTA distal
 - ATA proximal
 - ATA mid
 - ATA distal
 - Peroneal proximal
 - Peroneal mid
 - Peroneal distal
- PSV, EDV for:
 - EIA
 - CFA
 - PFA
 - TpT

Vascular study patient reports include:

- Ao-Iliac, Carotid, Abdomen, Renal, PV Art-Lower, PV Art-Upper, PV Ven-Lower, PV Ven Upper

Abdominal Vascular Release 3.5 Measurements

Abdominal Graft:

- 2D Mode Measurements
 - Anastomosis, graft: inner diameter, outer diameter
- Doppler Measurements
 - Anastomosis: PS, ED, AT, graft: AT, TAMx, ED and AT
- Calculations: S/D, PI, RI

Hepatoportal System:

- 2D Mode Measurements
 - Main portal vein, portal vein, CHA, hepatic artery, SMV, splenic vein, hepatic vein, IVC: diameter, inner diameter, outer diameter
- Doppler Measurements
 - Main portal vein, portal vein, CHA, hepatic artery, SMV, splenic vein, hepatic vein, IVC: Vmax, Vmin, PS, ED
- Calculations: S/D, PI, RI

Liver Transplant:

- 2D Mode Measurements
 - CHA, hepatic artery, hepatic vein, portal vein preanastomosis, portal vein anastomosis, main portal vein, portal vein, IVC, SVC, common bile duct: diameter, inner diameter, outer diameter, extrahepatic diameter, intrahepatic diameter
- Doppler Measurements
 - CHA, hepatic artery, hepatic vein, portal vein preanastomosis, portal vein anastomosis, main portal vein, portal vein, IVC, SVC: Vmax, Vmin, PS, ED, AT
- Calculations: S/D, Vel Ratio, PI, RI

Renal Transplant:

- 2D Mode Measurements
 - Transplant kidney, EIA, IIA, arterial anastomosis, transplant renal artery, superior segmental artery, medial segmental artery, inferior segmental artery, transplant renal vein, renal vein anastomosis, EIV: length, inner diameter, outer diameter, diameter
- Doppler Measurements
 - EIA, IIA, arterial anastomosis, transplant renal artery, superior segmental artery, medial segmental artery, inferior segmental artery, transplant renal vein, renal vein anastomosis, EIV: TAMx, PS, ED, AT, Vmax
- Calculations: S/D, PI, RI

Transjugular Intrahepatic Portosystemic Shunt (TIPS):

- 2D Mode Measurements
 - Main portal vein, portal vein, stent-portal end, stent-mid, stent-hepatic end, hepatic vein: diameter
- Doppler Measurements
 - Main portal vein, portal vein, stent-portal end, stent-mid, stent-hepatic end, hepatic vein: Vmax

Aorta-mesenteric:

- 2D Mode Measurements
 - Aorta, aortic bifurcation, celiac artery origin, splenic artery, CHA, SMA origin, SMA, IMA origin, IMA: inner area, inner diameter, outer area, outer diameter, transverse diameter
- Doppler Measurements
 - Aorta, aortic bifurcation, celiac artery origin, splenic artery, CHA, SMA origin, SMA, IMA origin, IMA: ED, PS
- Calculations: S/D



Aorta-Renal:

- 2D Mode Measurements
 - Kidney, aorta, suprarenal aorta, renal artery origin, renal artery, renal vein, IVC: length, width, A/P, inner area, inner diameter, outer diameter, outer area, transverse diameter, diameter
- Doppler Measurements
 - Aorta, suprarenal aorta, renal artery origin, renal artery, renal vein, superior arcuate artery, medial arcuate artery, inferior arcuate artery, superior segmental artery, medial segmental artery, inferior segmental artery, interlobar artery: TAMx, PS, ED, AT, Vmax
- Calculations: S/D, PI, RI, RA/Ao

Fetal Echo Calculations Package

The Fetal Echo calculations package includes fetal echo measurements and a subset of OB biometry measurements for up to four fetuses. The Fetal Echo calculations package has optimized imaging presets for the 4V1c, 8V3, and 6C1HD transducers, and provides the following features:

- Support for up to four fetuses
- Fetal Echo measurements and calculations and a subset of OB biometry measurements
- Contains OB measurement labels for calculating GA, EFW and US age
- Pregnancy information: Gravida, Aborta, Para, Ectopics fields in patient registration field
- EDC based on IVF or LMP
- Ability to select Author for each calculation supported from configuration page and report page
- Fetal Echo calculations also provides OB Biometry Measurements/Ratios.

Fetal Echo Calculations: OB Biometry Measurements/Ratios

- BPD (Bi-Parietal Diameter)
- HC (Head Circumference)
- FL (Femur Length)
- AC (Abdominal Circumference)
- FL/AC
- FL/BPD

- HC/AC
- HL (Humeral Length)
- TCD (Trans-Cerebellar Diameter)
- Heart Circumference
- Thoracic Circumference
- CTR CardioThoracic Ratio (Circ)
- Heart Area
- Thoracic Area
- CTR (Area)

Left Ventricular Mass Measurement

- 2D Mode Measurements LV Mass measurement

Freeze, Cine and Post-Processing Functions

Cine Review

- Cine feature offers post-acquisition optimization of certain imaging parameters
- Frame-by-frame and continuous cine review, including control of playback speed and direction
- 1.6 GB cine memory
- 16 seconds of cine
- Editable loop margins

Post Processing Features in Freeze Frame or Cine

- Volume imaging
 - Zoom/Pan
 - Dynamic Range and Gain
 - The user controlled Dynamic Range can be adjusted from 10 dB to 90 dB
 - Gray map
 - Tint/Depth shading
 - Dynamic Tissue Contrast Enhancement for volume imaging
- 2D-mode
 - Zoom/Pan
 - Dynamic Range and Gain
 - Gray map and Tint map
 - Manual and auto measurements
 - 2D trace erase



- Color Doppler Velocity
 - Zoom/Pan
 - Color Doppler map and invert
 - Color Doppler baseline shift
 - Color Doppler display on/off
 - Color Doppler priority
 - Manual measurement (distance only)
- Spectral Doppler
 - Gain adjustable while frozen
 - Dynamic Tissue Contrast Enhancement for volume imaging
 - Angle correct
 - Baseline shift
 - Dynamic range
 - Gray map and Tint map
 - Spectral invert
 - Manual and auto measurements
 - Strip display size and sweep speed
 - Support up to 180 dB in dynamic range specific to CW on the 4V1c transducer
- M-mode
 - Dynamic Range
 - Gray map and Tint map
 - Manual and auto measurements
 - Strip display size and sweep speed

ECG and Physiologic Module

- Built-in ECG and physiologic signal module providing:
 - ECG signal
 - Auxiliary trace of the conditioned signal from any compatible accessories or monitors
 - Ability for the user to specify EKG lead.
 - Physio can be triggered by R waves on EKG.
 - System notification when lead is off.
 - Enables Lead select: the ability to select Lead I, II or III for optimal ECG performance and display
- Transthoracic impedance respirometer (TIR) calculates breathing by sensing changes in the patient's impedance in the chest. It uses the attached ECG leads on the patient to get the chest impedance information, for computing the respiration signal.
- Physio auto gain
- Detected and displayed heart rate, averaged over three R-R intervals, updated every R-R interval. Standard range: 30 to 300 beats per minute

- Position and gain adjustment for a selected trace
- Nasal respirometer
- Selectable QRS source

Digital Storage and Image Archiving

Clip Capture

2D and volume clips as follows:

- Prospective and retrospective live or cine captures
- Capture on demand
- Capture length:
 - Cine: (max. 300 frames) between cine margins
 - 2D:
 - Prospective Capture 30 beats or 30 seconds
 - Retrospective Capture 10 beats or 10 seconds
 - 4D:
 - Prospective and Retrospective Capture 10 beats or 10 seconds
 - All captures will be limited to a maximum of 30 Hz by default
 - User-adjustable control for clip storage up to 60 Hz
 - Cine capture for acoustic rate

2D Stress Echo

- Continuous Capture
- Capture up to 256 individual one beat clips
- Undefined view available for the following benefits:
 - Provides the ability for the user to capture any type of image
 - Clips and Images, including in Continuous Capture
 - Color Doppler, spectral Doppler, M-mode
 - User may move the Color ROI while capturing – will not interrupt capture
 - User may capture as many clips as desired for the Undefined view
- In-progress store during Stress Echo studies for nonstress images
- Systole-only capture for 2D Stress Echo clips
 - Reduces study size
 - Allows for systole-only playback on PACs
- ECG/Physio displayed within the capture region of interest



Image Store

- 2D single frame images are stored as primary DICOM static
- 2D clips are stored as primary DICOM multi-frame (MF)
- Volumes are stored as DICOM Raw Data objects (DICOM compliant with proprietary acoustic data storage) and a reference clip for each volume is created and stored as a multi-frame object
- “Bookmarks” to volumes are stored as:
 - A 2D primary DICOM MF (2D reference clip of VR)
- An application state object
- Reference planes are stored as 2D primary DICOM MF objects

Image Management

- DICOM format for all images and clips
- PC-compatible files (AVI, JPG) are available
 - Static image, dynamic clip, strip mode, and 4D dataset and bookmark captures
 - Selectable lossy (JPG) and lossless compression for clips and lossless compression for static images

Hard Drive

- 2 TB SATA HD = 2 Terabyte (2000 GB)
- Image storage capacity greater than 35,000 images; color or black/white
- Automatic disk management (first in, first out)

Read/write CD-R/DVD-R

- Slim DATA DVD drive which supports DVD +R/W, DVD -R/W, DVD +R, DVD -R, CD R/W, CD -R etc.
- 650 MB; read/write CD media
- Storage capacity dependent upon writing session format
- DVD drive can support single layer DVD disk (4.7 GB) and dual layer media (8.4 GB)
- Allows storage of images, clips and volumes across systems in DICOM format
- Supports system software and option upgrades

USB

- Two user-accessible USB 2.0 ports on control panel
- Three USB ports on the back of system, one port on the lower right side of the system
- Supports export of images and clips in DICOM or PC format (AVI and JPG)

Documentation Devices

- Up to three documentation devices are supported.
- Up to two on-board document devices can include color printer, black/white thermal printer or DVR.

System Connections Supported

- Peripherals
 - USB 2.0
- Local Area Network (LAN)
 - 10-base T Ethernet (RJ-45 Connector)
 - 100-base T Ethernet
 - 1000-base T Ethernet
- Wireless Network (WLAN)
 - Network Standards: IEEE 802.11a, IEEE 802.11b, IEEE 802.11g, IEEE 802.11n, IEEE 802.11ac
 - Security: 64-bit WEP, 128-bit WEP, WPA2-PSK, WPAPSK, WPA-Enterprise, WPA2-Enterprise (Radius server), EAP-PEAPv0 (i.e. EAP-PEAP-MSCHAPv2), EAP-TLS
 - Encryption types: AES, TKIP, PSK
 - Frequency Band: Dual Band, 2.4 GHz and 5 GHz
 - Wireless Adapter: Integrated inside the system (No external bridges)

syngo SC2000 Workplace

syngo SC2000 Workplace is a dedicated offline applications launcher and image review station for use with the ACUSON SC2000 system's datasets. Supporting the same clinical applications that are available on the ACUSON SC2000 system, syngo SC2000 Workplace provides for a seamless workflow. syngo SC2000 Workplace is the first system with fully open, non-proprietary, real-time 4D review and processing capabilities, based on the new 4D DICOM standard.¹

¹ The 4D DICOM enhanced image object will be implemented in a future release.



Supported workflows include the following:

1. Direct data storage from the ACUSON SC2000 system to *syngo* SC2000 Workplace for PACS that do not yet support volumes. Currently 2D primary DICOM multiframe of the volume clips can be stored to a PACS.
2. Direct data storage from the ACUSON SC2000 system to PACS when the PACS can support the DICOM Raw Data Object.¹
3. Direct data storage from the ACUSON SC2000 system to PACS and *syngo* SC2000 Workplace (when the PACS can store volume data after approval of 4D DICOM standard).

syngo SC2000 Workplace is not to be used as an archiving device. The institution is responsible for archiving its patient data.

***syngo* SC2000 Workplace Hardware**

The *syngo* SC2000 Workplace hardware is PC-based and supports *syngo* SC2000 Workplace applications such as the analysis and calculation packages. *syngo* SC2000 Workplace utilizes state-of-the art 64 bit system architecture and applications.

Hardware specs are as follows:

- CPU: Intel Xeon CPU E5-1620 v3 @ 3.50 GHz
- RAM: 32 GB (4 x 8 GB) DDR4-2400 Registered RAM
- Video: NVIDIA Quadro K2200
- Hard drive: 1000 GB SATA 7200 1st HDD
- Monitor: 24 in LED S-IPS Monitor US
- Optical drive: HP 16X DVD±RW SuperMulti SATA 1st Drive
- Keyboard: USB Keyboard
- Mouse: USB Optical Scroll Mouse
- OS: Windows 10
- Windows server 2008 compatible

DICOM Connectivity and IHE Compliance

Integrating the Healthcare Enterprise (IHE) compliance is an initiative by the healthcare industry and professionals to improve the way computer systems in healthcare share information. IHE promotes the coordinated use of established standards such as DICOM and HL7 to address specific clinical needs in support of optimal patient care. Systems developed in accordance with IHE communicate with one another better, are easier to implement and enable care providers to use information more effectively.

The ACUSON SC2000 PRIME system complies with the following IHE profiles:

- Echocardiography Workflow (ECHO) integrates ordering, scheduling, imaging acquisition, storage and viewing for digital echocardiography
- Evidence Documents (ED) adds Cardiology-specific options to the Radiology ED profile (specifies how data objects such as digital measurements are created, exchanged, and used)

The ACUSON SC2000 system supports the following DICOM service classes:

- Verification service class as the SCU and SCP
- Basic worklist management service class (Modality worklist) in the role of the SCU
- Study management service class (Modality performed procedure step) in the role of the SCU
- Storage service class as a SCU and SCP
- Storage Commitment service class as the SCU
- Query/Retrieve service class as the SCU
- Print management service class as the SCU

Verification Service Class

- As the SCU for the Verification SOP class, the system allows the user to test the availability of remote DICOM nodes from the DICOM configuration pages
- As the SCP for the Verification SOP class, the system answers to verification requests coming in from remote DICOM nodes

¹ The ACUSON SC2000 system utilizes the DICOM Raw Data Object for the volume image. PACS servers must support DICOM storage and retrieval of the DICOM Raw Data Object SOP Class UID for storing and retrieval of the ACUSON SC2000 system volume images.



Basic Worklist Management Service Class

As the SCU for the Modality worklist SOP class, the system allows for querying the Cardiology Information System. Modality Worklist Server in the background obtains information about scheduled patients and patient demographics.

Modality Performed Procedure Step (MPPS)

As the SCU for the Modality Performed Procedure Step SOP class, the system automatically updates systems involved in the echocardiography workflow (CIS, PACS) about the status of the study.

Storage Service Class

As the SCU for the Storage service class, the system supports transferring objects of the following SOP classes to one or more remote DICOM nodes (PACS or *syngo* SC2000 Workplace) simultaneously:

- DICOM ultrasound image storage SOP class for transfer of 2D single frame images either uncompressed or using lossless image compression
- DICOM ultrasound multi-frame image
- Storage SOP class for the transfer of 2D clips and derived views from the volumes either uncompressed or using lossy image compression
- DICOM raw data storage SOP class to transfer volume data of the ACUSON SC2000 PRIME system in acoustic data format either uncompressed or using lossless image compression
- DICOM comprehensive structured report storage SOP class using the Vascular Ultrasound Procedure Report template (TID 5100) and the Adult Echocardiography Procedure Report template (TID 5200) for the transfer of measurement information
- The system allows for the following storage modes:
 - "In progress", the system automatically stores images in the background as soon as they are captured, measurement data is stored at the end of the exam
 - "End of exam", the system automatically stores all image and measurement data automatically in the background once the study has been closed
 - "Manual", the system transfers multiple exams or parts of an exam as selected by the user in the background
- As the SCP for the DICOM Storage service class, the system supports receiving objects of the mentioned SOP classes from remote DICOM nodes like a PACS Storage Commitment Service Class
- As the SCU of the Storage Commitment service class, the system automatically requests the archive to take responsibility for the safekeeping of data that were stored using the above mentioned storage classes

Query/Retrieve Service Class

- As an SCU of the Study Root Query/Retrieve Information Model – FIND SOP class the system
- Allows querying remote DICOM nodes (PACS) and retrieving selected exams from that node
- Allows patient based worklist query

For more details on all the provided DICOM services, please refer to the IHE integration statement and the DICOM conformance statement of the ACUSON SC2000 PRIME system.

DICOM Grey scale standard display function (GSDF)

Allows customers to seamlessly maintain the same image presentation from the ACUSON SC2000 system to their GSDF supported PACs workstation.

4D DICOM Connectivity

Ability to store all standard DICOM 2D images (clips, statics and extracted 2D views) and measurement data directly to a DICOM PACS.

Volume datasets, in addition to the standard DICOM 2D images and data, can be sent to *syngo* SC2000 Workplace. *syngo* SC2000 Workplace can then store to the PACS server in any extracted 2D views and data.



Service Options

Connect Platforms

- **Smart Remote Services (SRS)**
Real-time remote service that connects your ultrasound system with Siemens Healthineers global team of technical and application experts. Delivered through a secure, high-speed network, SRS supports your system by resolving issues as they arise, to prevent unscheduled service visits.
- **eSieLink remote assistance technology**
 - Remote Assist: Real-time interaction between clinical staff and clinical application experts whenever a clinical support need arises
 - Remote Technical Support: Remote error identification, diagnosis and repair using specialized diagnostic tools
 - Requires using the phone number provided by your Siemens Healthineers representative to initiate remote assistance
 - Headset, camera, and camera attachment are optional
- **teampay Fleet**
Online portal that allows you to manage the performance and maintenance of your Siemens Healthineers equipment, 24/7, from any device.
- **PEPconnect/PEPconnections**
Personalized education and performance experience for healthcare professionals to increase staff competency, efficiency, and productivity.
 - Engaging learning activities including e-learning, webinars, job aids, videos, virtual instructor led events, and more
 - Create own learning experience with an individual profile, plan and transcript to record education
 - Connect, communicate and be part of social learning groups
- **teampay**
Make fast, well-informed decisions and optimize workflow by connecting to teampay to compare your performance data to benchmarks and to collaborate with healthcare professional worldwide.

Ultrasound System Security

The ACUSON SC2000 PRIME system uses the McAfee Application Control solution to protect the system against Advanced Persistent Threats, viruses, malware and other executing software. The small footprint, low-overhead software combines industry-leading application control and change control technology to ensure that only trusted applications run on the system.

Unauthorized software, malware, scripts and Dynamic-Link-Libraries (DLLs) are blocked to maintain system integrity. The McAfee Application Control helps protect against unwanted, or unauthorized system configuration changes. No signature upgrades or file scanning are necessary to provide optimal protection.

The Ultrasound System Security solution works online and offline and requires only minimal system resources (less than 25 MB RAM) and does not impact system performance.

eSieCrypt Hard Disk Encryption

eSieCrypt hard disk encryption software provides encryption of the ultrasound system hard disk, including patient information and system configuration for improved protection using AES-128 bit encryption.

This feature protects information that is stored in the system, such as Protected Health Information (PHI) and system settings.

eSieCrypt encryption software also includes a USB storage device with recovery key for recovering encrypted data.

Anytime Software Updates

The ACUSON SC2000 PRIME system allows for selfinstallable hotfixes, security patches, and software updates. Self-install increases the availability and timeliness of software updates at the users' convenience. It can dramatically lower the time to install important software updates and security features in a simple intuitive workflow.



User Accounts

Allows for increased security with user-defined password protected access to the ultrasound system. Using administrator and user accounts password protection secures patient data from non-authorized users.

Hotfix support

Allows for quick and easy hotfix updates by USB or remote update handling.

WiFi Authentication Protocol: EAP-TLS

- Extensible Authentication Protocol-Transport Layer Security (EAP-TLS)
- Certification-based Wi-Fi authentication protocol

Electrical/Environmental Specifications

- Voltage: 100 V, 115 V, 230 V (50/60 Hz)
- Integrated A/C line conditioner
- Built-in AC isolation transformer
- Power connections
 - 100 V version: 90–110 VAC
 - 115 V version: 98–132 VAC
 - 230 V version: 196–264 VAC
- Power consumption: maximum 1500 Watts (may vary with configuration)
- Atmospheric pressure range: 700 hPa to 1060 hPa (525 mm Hg to 795 mm Hg) or up to 3050 m (10,000 ft)
- Ambient temperature range (without OEM's): +10°C to +33°C (50°F to 91.4°F)
- Humidity: 10–80%, non-condensing
- Maximum heat output: 5100 BTU/hr
- Vibration and shock: specified in EN IEC 60601-1
- Fan noise: 50 dBA at 22°C (80°F)
- Ethernet 10/100/1000 Base T
- USB-7
- HDMI
- S-Video
- VGA

Standards Compliance

Quality Standards

- FDA QSR 21 CFR Part 820
- ISO 9001
- ISO 13485

Design Standards

- UL 60601-1
- CSA C22.2 No. 601.1
- EN 60601-1 and IEC 60601-1
- EN 60601-1-1 and IEC 60601-1-1
- EN 60601-1-2 and IEC 60601-1-2
- EN 60601-2-37 and IEC 60601-2-37

Acoustic Output Standards

- IEC 61157 (Declaration of Acoustic Power)
- AIUM/NEMA UD-2, Acoustic Output Measurement Standard for Diagnostic Ultrasound
- AIUM/NEMA UD-3, Standard for Real-time Display of Thermal and Mechanical Acoustic Output Indices on Diagnostic Ultrasound Equipment

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At Siemens Healthineers, our mission is to enable healthcare providers to increase value by empowering them on their journey towards expanding precision medicine, transforming care delivery, and improving patient experience, all enabled by digitalizing healthcare.

An estimated five million patients worldwide everyday benefit from our innovative technologies and services in the areas of diagnostic and therapeutic imaging, laboratory diagnostics and molecular medicine as well as digital health and enterprise services.

We're a leading medical technology company with over 120 years of experience and 18,500 patents globally. With over 50,000 employees in more than 70 countries, we'll continue to innovate and shape the future of healthcare.

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