

**SIEMENS**



Datasheet

## ACUSON S2000 Ultrasound System, HELX Evolution with Touch Control

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# ACUSON S2000 Ultrasound System, HELX Evolution with Touch Control

## Premium Performance. Expanded Insight.

The all-purpose member of the ACUSON S Family™ of ultrasound systems, the high-end premium ACUSON S2000™ ultrasound system delivers exceptional performance for General Imaging and Women's Health. Get the most comprehensive information possible from each exam, using innovative technologies like 3D total breast ultrasound and our complete portfolio of strain imaging technologies, to make confident diagnoses even in the most challenging cases.



## General System Information



### Control Panel

- Simple, intuitive user interface with home-base design minimizes repetitive hand motions and enables motor-memory learning
- Floating control panel allows a wide range of adjustment for operator comfort in standing and sitting positions
- Left/Right swivel articulation:  $\pm 38^\circ$
- Vertical articulation: 85-100 cm
- System control panel illumination via tri-color backlighting
- 12-inch touch screen (resolution 1280 x 800)
- Laser-optical trackball for higher sensitivity
- Pull-out keyboard
- Optional integrated gel warmer

### Dual-Option Keyboard

- Pull-out keyboard
- Touch screen keyboard

### Ergonomics

- Laser-optical trackball
- Context sensitive: Dynamic back lighting
- Redesigned: Heads-up display
- Intuitively organized user interface
- 40% fewer tactile keys
- 20% fewer keys in home-base
- Vertical articulation: 85-100 cm
- Left/Right swivel articulation:  $\pm 38^\circ$
- Dedicated key for Delete/Undo
- Repositioned freeze button for improved accessibility
- Ergonomic, tactile button designs
- Smart-adaptive annotations
- Smart-intuitive body markers and pictograms
- Robust selection for protocols
- Dual-option keyboard:
  - Conventional pull-out keyboard
  - Touch screen keyboard
- Supports HELX Evolution with Touch Control software level VD10A and above



### Fully Articulated Flat Panel Display

- 21.5" full HD 1080P, flat panel liquid crystal display (LCD) with LED backlighting and wide-angle IPS (in-plane switching) technology
- High contrast ratio 800 : 1
  - Supports HELX Evolution with Touch Control screen saver
  - Supports HELX Evolution with Touch Control Software Level VD10A and above
- Variable monitor positioning adjustment (height, swivel, tilt)
  - Range of height: (upright FPD) 154-138 cm (60.6-53.3 in)
  - Swivel:  $\pm 80^\circ$
  - Tilt:  $+60^\circ$  forward,  $-10^\circ$  back
- Extended wide-angle viewing angle:  $\pm 178^\circ$
- Folds down for transport
  - Minimum fold-down system height: 125 cm (49.2 in)
- Default brightness: 170 cd/m<sup>2</sup>
- Response time: 7 ms

### Articulating Arm

- Allows monitor transition for optimal ergonomic positioning toward, away and side-to-side
- Articulation independent of system and control panel
- Left/Right swivel articulation:  $\pm 80^\circ$  in either direction
- Horizontal articulation: Up to 30 cm
- Vertical articulation: Up to 15 cm
- Default locking position for safe transport

### Touch Screen

- LCD (12.1" WXGA, 16:10) touch panel
- Screen resolution: 1280 x 800
- Dot pitch: 0.204 mm x 0.204 mm-USB 2.0 interface with host system
- Video over USB connectivity
- 2 USB ports
- 16:10 aspect ratio
- Supports HELX Evolution with Touch Control screen saver
- Supports HELX Evolution with Touch Control software level VD10A and above

## QuikStart Standby Mode

QuikStart standby mode enhances system portability by reducing startup and shutdown times.

- Startup from standby in approximately 30 s
- Shutdown to standby in approximately 10 s

## Language Support

- Image screen, control panel text and operating instructions all available in English, French, German, Italian and Spanish
- Instructions for use available in Chinese, Czech, Danish, Dutch, Finnish, Greek, Hungarian, Japanese, Korean, Latvian, Lithuanian, Norwegian, Polish, Portuguese, Romanian, Russian, Slovak, Swedish and Turkish

## Audio Speakers/Microphone

- High-performance audio speakers integrated with the monitor
- Directional microphone for voice recording on DVR

## Transducer Ports

- 3 universal transducer ports supporting 612 micro-pinless transducer connectors
- Electronic transducer selection
- One-handed transducer connection and disconnection
- Ergonomic access to all transducer ports
- Aux CW port for 2 MHz and 5 MHz CW transducers

## Transducer Storage and Gel Warmer

- 6 transducer cup holders support all transducer designs and gel bottle storage
- Ergonomic cable management for in-exam convenience and secure transport
- Specialty transducer holders for endocavity, intra-operative, Aux CW, and 4D transducers
- Parking port for transducer storage
- Optional integrated gel warmer

## System Upgradeability

Upgradeability is achievable across the ACUSON S Family of ultrasound systems, which includes the ACUSON S1000™, ACUSON S2000™, and the ACUSON S3000™ ultrasound systems. Upgrades from any ACUSON S Family system (Classic, software level VC25 and below) to the higher performance level of the ACUSON S Family system, HELX Evolution (software level VC30, VC31, VD10 and above) is available. For these, all hardware accessories, transducers, and software are forward-compatible (excluding the ACUSON S2000™ Automated Breast Volume Scanner (ABVS)). The availability of serviceable field upgrades depends upon local regulatory guidelines. Based upon the current system configuration and serial number of an upgradable system, additional hardware elements may be required.

## Operating System

Supported with operating system Windows® 7.

## HIPAA Compliance

The ACUSON S2000 ultrasound system provides the necessary tools to address the saving, accessibility and sharing of protocols according to HIPAA privacy safeguards.

## Imaging Modes And Options

### Imaging Modes

- 2D and Native™ tissue harmonic imaging (THI)
- 3D/4D imaging
- Color Doppler velocity
- Color Doppler energy
- M-mode
- M-mode and tissue harmonic imaging (THI)
- M-mode and color Doppler velocity
- Anatomical M-mode
- PW and CW Doppler

## Imaging Options

- 3-Scape™ real-time 3D imaging
- Advanced fourSight™ technology
- Advanced SieClear™ spatial compounding
- Advanced SieClear spatial compounding in color and Power Doppler
- Axius™ direct ultrasound research interface
- Cadence™ contrast harmonic imaging (CHI) technology\*
- Cadence contrast pulse sequencing (CPS) technology\*
- Clarify™ vascular enhancement (VE) technology
- Color SieScape™ panoramic imaging
- Contrast Dynamics™ software\*
- Custom Tissue Imaging
- DTI™ Doppler tissue imaging capability
- Dynamic TCE™ tissue contrast enhancement technology
- eSie Touch™ elasticity imaging
- fourSight™ 4D transducer technology
- SieClear™ multi-view spatial compounding
- SieScape™ panoramic imaging
- Skeletal Rendering
- eSielImage™ multiparametric optimization
- TEQ™ ultrasound technology (2D and PW Doppler)

## Beamforming

Next-generation beamforming features:

- Supports fully digital beamforming technology
- Up to 67,392 processing channels
- 2D-mode line density up to 512 lines
- Total system dynamic range of > 210 dB
- Up to 1,000 acoustic frames per second
- Depth display: 0.5-30 cm
- Volume Rates: 33 vps

## Focusing

- Simultaneous focal zones: 3
- Focal positions: Up to 8 positions
- Adjustable spacing between focal zones
- Continuous dynamic receive focusing

## Image Processing

- Transmit frequency: Up to 7 frequencies
- 2D Gain: -20 to +20 dB in 1 dB increments
- Display dynamic range: 30-90 dB
- Depth gain compensation: 8 controls
- Maps: Up to 12 maps
- Tint maps: Up to 17 B-mode tint maps and 7 Cadence CPS Capture tint maps
- Persistence: 5 levels
- Edge enhancement: 5 levels
- Space/Time: 4 levels
- DTO™ dynamic tissue optimization technology: 4 levels (for cardiac option)
- Image knob presets: Up to 6 customizable factory image presets per exam preset

## Image Display Formats

- Full, dual, live-dual and dual-screen formats
- Image depth maximum up to 30 cm in 0.5-1.0 cm increments
- Vector™ wide-view imaging format: Selectable field-of-view from 15 to 90°
- Trapezoid: Selectable field of view up to 60° on linear transducers
- Steerable linear: Variable steering angles for 2D, color and Doppler modes
  - Maximum steering angle in color and spectral Doppler: 20°
  - Beta angle viewing: Beam steering available on 9EVF4 transducer
- Curved: Selectable field of view from 15°-174°, in 1° increments, depending on transducer
- Zoom with image pan
  - Available on live, frozen, cine, dual screen images
  - Preserves full image resolution within the zoom region of interest (ROI)
  - Up to 10X zoom
- HD Zoom: Region of Interest (ROI) with increased detail resolution and frame rate, compatible with color Doppler and Advanced SieClear spatial compounding
- On-screen timer

\* 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.

## Acoustic Output Management

- On-screen acoustic power indicator (AIUM/NEMA output display standard)
  - Display of power output: %, MI, TIC, TIS/TIB, TIF

## MultiHertz Multiple Frequency Imaging

Siemens' unique MultiHertz™ multiple frequency imaging capability provides the resolution and penetration of several transducers in one. 2D or THI, color and spectral Doppler frequencies can be used independently for optimal choice of image resolution, penetration and sensitivity. Specifics include:

- 2D and M-mode: 3 frequencies
- THI: Up to 5 frequencies
- Harmonic compounding frequency (available on selected transducers)
- Color Doppler modes: Up to 4 frequencies
- Independent frequency selection in 2D or THI, color and Doppler modes
- Pulsed Wave (PW) Doppler: Up to 4 frequencies
  - High Pulse Repetition Frequency (HPRF)
- Steerable Continuous Wave (CW) Doppler: Up to 3 frequencies

## Native Tissue Harmonic Imaging (THI)

Native THI delivers a higher level of diagnostic information for the difficult-to-image patient. It dramatically improves contrast and spatial resolution by reducing noise and clutter in the image.

- Wideband harmonic imaging
- Harmonic compounding technique for additional penetration
- Available for most transducers
- Available in M-mode and color M-mode
- Compatible with advanced standard and configurable options including Advanced SieClear compounding, SieScape imaging, real-time 3D imaging, TEQ technology, Cadence contrast pulse sequencing technology\*, Clarify VE technology, and fourSight 4D technology
- All 2D optimization parameters compatible with THI

## Color Doppler Velocity and Color Doppler Energy Display Details

- 2D/C mode, dual 2D/C mode, live dual 2D/C
- 2D/C/D mode (simultaneous triplex), 2D/C/D mode (update)
- 2D/C/CW mode (for cardiac option)
- 2D/DTI (for cardiac option)
- 2D/DTI/PW DTI (for cardiac option)
- 2D/DTI/Color Doppler M-mode (for cardiac option)
- 2D/CDV/Color Doppler M-mode

## Color Doppler Velocity (CDV) Imaging

- Available on all imaging transducers
- Advanced adaptive processing resulting in excellent spatial resolution and superior flash suppression
- Transmit frequencies: Up to 4 frequencies
- Color velocity maps: Up to 6 maps
- Maximum color frame rate: 215 fps
- PRF range: 100-19,500 Hz
- Gain: -20 to +20 dB in 1 dB increments
- Wall filter: Up to 4 selections
- Velocity range: 0.004-450 cm/s
- Up to 512 2D-mode lines plus 256 color flow lines
- Tissue/Color priority: Up to 5 selections
- Color smoothing: Up to 4 levels
- Flow states: Low, General, High for all applications
- Color persistence: Up to 5 levels
- Space/Time: 6 levels
- Color invert
- Color display: On/Off

## Color Doppler Energy (CDE) Imaging

- Available on all imaging transducers
- Transmit Frequencies: Up to 4 frequencies
- PRF range: 100 – 19,500 Hz
- Gain: -20 to +20 dB in 1 dB increments
- Wall Filter: Up to 4 selections
- Background CDE Doppler on and off
- Tissue/Color priority: Up to 5 selections
- CDE smoothing: Up to 4 levels
- Color power maps (A – H): Up to 8 maps
- Space/Time: 6 levels
- Flow states: Low, General and High for all applications
- Power CDE persistence: Up to 5 levels

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### Pulsed Wave Doppler

- Available on all transducers
- Transmit frequencies: Up to 4 frequencies
- Spectral TEQ technology
- Angle correct for all exams
- FFT processing: 32-256 points
- FFT speed: Up to 1,920 FFT's per second at the highest sweep speed
- PW sweep speed: Up to 5 selections (25, 50, 100, 150, 200)
- PW maps: Up to 8 maps
- PW tint maps: Up to 12 maps
- Display dynamic range: 30-60 dB in 5 dB increments
- Gain: 0-90 dB in 1 dB increments
- PRF range: 100-52,000 Hz
- Angle correction 0-89° in 1° increments; Auto angle correction 60/0/60 degrees
- Gate size: 0.1-4.0 cm, transducer dependent
- Filter selections: Up to 8 selections
- Velocity range: 0.12-2,000 cm/s (with High PRF) at angle correction
- T/F res: Time/Frequency resolution feature
- Baseline shift levels: Up to 16 levels
- Spectral invert
- Derived waveform Doppler trace function analyzes frozen spectra for mean and maximum velocity information. Waveform may be set to trace above baseline, below baseline or both.
- Auto Doppler trace and calculations performed in real-time and cine provide auto-calculation and display of PS, ED, TAMx, TAMn, PI, RI and S/D

### Pulsed Wave Doppler Display Details

- Full screen trace or 2D, 2D/D mode, simultaneous 2D/C/Doppler and update
- 2D/CW, simultaneous or update (for cardiac option)
- CW (for cardiac option)
- 4 display formats: 1/3-2/3, 2/3-1/3, 1/2-1/2, side-by-side

### Continuous Wave Doppler

- Maximum velocity: 20 m/s
- Repetition frequency: 1.6-60 kHz

### M-mode

M-mode is compatible with B-mode, THI and CDV on all imaging transducers. Color M-mode is also available on all imaging transducers.

- Anatomical M-mode (for cardiac option)
- Transmit frequencies: Up to 5 frequencies
- Edge enhancement: 4 levels
- Display dynamic range: 30-70 dB in 5 dB increments
- Gain: -20 to +20 dB in 1 dB increments
- M-mode maps: Up to 6 user-selectable maps
- M-mode tint maps: Up to 6 user-selectable maps
- Sweep speed: Up to 5 selections (25, 50, 100, 150, 200)
- M-mode zoom feature live and frozen

### M-mode Display Details

- Full screen 2D, 2D/M-mode, full screen M-mode
- 4 display formats (2D/trace): 1/3-2/3, 2/3-1/3, 1/2-1/2, side-by-side

### ECG and Physiologic Module

- Built-in ECG and physiologic signal module providing:
  - On-screen ECG trace in B-, M- and Doppler imaging modes
  - ECG sync with PW, CW or M-mode
  - ECG signal for triggering
  - Auxiliary trace of the conditioned signal from any compatible accessory or monitors
- Detected and displayed heart rate, averaged over 5 second intervals, updated at 1 second intervals
- Standard range: 30-300 beats per minute

## DTI Doppler Tissue Imaging (for Cardiac Option)

DTI capability uses Siemens' proprietary multivariate motion discrimination technology for processing Doppler frequency shift information from moving tissue (e.g., myocardium, heart valves, etc.) and displays physiologic data on velocity, acceleration and scattering capabilities of moving tissues in several imaging and strip display capabilities. It provides additional clinical and investigational information on myocardial function during transthoracic studies.

- DTI Doppler tissue imaging option includes the following:
  - DTI Velocity (DTV) capability
  - DTI Acceleration (DTA) capability
  - DTI Energy (DTE) capability
- DTI capability in color Doppler M-mode

### DTI Velocity (DTV) Capability

Provides real-time imaging display of tissue mean velocities in the sampling area within the user-selected region of interest using various user-selectable color coding maps.

- Available in Cardiology imaging
- Level: Independent signal gain adjustment
- Tissue/Color priority: Up to 5 selections
- Wall filter: Up to 4 selections
- Space/Time control: 6 levels to achieve desired spatial and temporal resolution
- Persistence: 5 levels, for color frame temporal averaging, allowing smoothing of tissue motion information over time
- Smooth: 4 levels, for smoothing tissue motion information in two spatial dimensions
- Maps: 6 velocity maps to optimize a real-time or frozen DTV image

### DTI Acceleration (DTA) Capability

Provides real-time imaging display of the rate of change of tissue velocity in the sampling area (tissue velocity difference between consecutive ultrasound frames) within the user-selected region of interest using various user-selectable color coding maps.

- Available on all probes which support cardiac application
- Level: Independent signal gain adjustment
- Priority: 5 selections, 0-4
- Filter: 4 selections, 0-3
- Space/Time control: 6 levels to achieve desired spatial and temporal resolution
- Smooth: 4 levels, for smoothing tissue motion information in two spatial dimensions
- Maps: 6 acceleration maps to optimize a real-time or frozen DTA image

### DTI Energy (DTE) Capability

Provides real-time imaging display of the intensity of Doppler signals returning from tissue within the user-selected region of interest using various user-selectable color-coding maps.

- Available on all probes which support cardiac application
- Level: independent signal gain adjustment

- Tissue/Color priority: Up to 5 levels
- Wall filter: Up to 4 selections
- Space/Time control: 6 levels to achieve desired spatial and temporal resolution
- Persistence: 5 levels, for color frame temporal averaging, allowing smoothing of tissue motion information over time
- Smooth: 4 levels, for smoothing tissue motion information in two spatial dimensions
- Maps: 6 energy maps to optimize a real-time or frozen image

## Applications

### Axius Direct Ultrasound Research Interface (Option)

The Axius ultra research interface allows the capture of beamformed acoustic RF data. The Axius research interface is intended for biomedical engineering research users with knowledge of offline RF signal processing.

- Stores beamformed acoustic RF data
- Data accessible through CD/DVD, USB, or shared WinFS folder

### eSieScan Workflow Protocols

eSieScan workflow protocols allow the operator to focus on patient care, rather than system interaction. eSieScan protocols anticipate and execute an based on customizable programs. Major modes such as 2D, color, PW Doppler or M-mode can be automatically activated along with sub-modes like eSie Touch elasticity imaging or Virtual Touch imaging. Even Cadence contrast pulse sequencing technology\* (CPS) for contrast studies can be controlled by eSieScan protocols. In tandem with syngo Auto OB measurements, eSieScan workflow protocols greatly decrease keystrokes, enabling shorter exams times, better throughput and reduced intra-operator variability. eSieScan protocols are available for OB, vascular, breast and cardiac exams. An unlimited amount of user-defined protocols can be added to the system.

eSieScan workflow protocols include:

- Skipping view: Option to capture image when skipping views during protocols to improve scanning efficiency
- Paused view: Option to chronologically insert paused images before, during or after scanning

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### Fetal Heart STIC (Option)

Fetal Heart STIC provides the ability to acquire a 3D volume fetal heart through Spatio Temporal Image Correlation (STIC).

- Compatible with *fourSight* technology manipulation capabilities
- Available on the 7CF1 transducer
- Provides real-time fetal heart rate estimator that serves as a quality indicator during acquisition
- Compatible with *syngo* VVI technology

### *syngo* Arterial Health Package (Option)

*syngo* Arterial Health Package (AHP) provides the clinician with the capability to measure intima-media thickness and the option to reference normative tables that have been validated and published in peer-reviewed studies. The information is intended to provide a straightforward tool for communicating with patients the relative state of their cardiovascular system.

*The syngo Arterial Health Package application should be utilized according to the American Society of Echocardiography Consensus Statement, "Use of Carotid Ultrasound to Identify Subclinical Vascular Disease and Evaluate Cardiovascular Disease Risk: A Consensus Statement from the American Association of Echocardiography; Carotid Intima-Media Thickness Task Force, Endorsed by the Society for Vascular Medicine".*

### *syngo* Auto OB Measurements (Option)

Siemens' innovative *syngo* Auto OB measurements algorithm provides automated biometry measurements.

- Measures CRL, BPD, OFD, HC, AC, HL and FL
- Utilizes trained, pattern recognition algorithms
- Once accepted, measurements are automatically saved to the report
- Set-up option for outer-to-outer caliper placement

### *syngo* eSieCalcs Native Tracing Software (Option)

*syngo* eSieCalcs native tracing software performs automated trace measurements with area, maximum diameter and volume results. *syngo* eSieCalcs software segments any given lesion in 2D or 3D and 4D.

- Utilizes proprietary border detection technology for automatic segmenting of lesions and anatomical structures
- Works with 2D images or 3D volumes
- User accepts automated measurements, such as area, maximum diameter, etc.

### Data Transfer to Nuance PowerScribe 360 | Reporting (Option)

The ACUSON S2000 system's compatibility with the Nuance PowerScribe® 360 | Reporting system eliminates all of the manual transcription and dictation – for any exam type – often required between the ultrasound exam and final patient reporting. At the end of the exam, measurement data is sent directly to the Nuance PowerScribe 360 | Reporting system using the PowerScribe's Web Services API. The customer is responsible for initial system set up – creating custom fields in the PowerScribe database and modifying patient reports to include those custom fields. Once the system is configured, custom fields in the patient reports are auto-populated by the documented measurement fields sent from the ACUSON S2000 system for every exam.

### Multi-modality Review (Option)

Multi-modality Review brings images from other modalities like Computed Tomography (CT), Magnetic Resonance Imaging (MRI), and Mammography into the ultrasound system for simultaneous viewing alongside the real-time ultrasound image. This provides fast and easy comparison of organs and previously identified pathology combined with the advantages of real-time ultrasound.

- Available on all transducers and exams
- Compatible with DICOM-formatted mammograms, CT, MRI or ultrasound image files
- Split-screen view
- Import static images and ultrasound clips
- Import via external media (USB, CD) or via network

### Skeletal Rendering (Option)

A unique, 3D/4D rendering method optimized for spine and limbs. This rendering mode enhances visualization of the fetal skeleton to better enable the evaluation of spinal anomalies.

- Bone enhancement level: 0-100%
- Post-processing function
- Works with 3D or 4D volumes
- Variety of rendering modes
  - Opacity
  - Gradient light
  - Amniotic rendering

### Bracco VueBox Data Transfer (Option)

This feature transfers Bracco-specified private DICOM attributes from DICOM contrast clips to support the quantitative assessment of tissue perfusion by the Bracco VueBox™.

## Advanced OB/Gyn Visualization Package

The ACUSON S2000 ultrasound system offers many common applications for OB/GYN:

- 3-Scape real-time 3D imaging
- Advanced *fourSight* 4D technology
- Amnioscopic rendering method

### 3-Scape Real-time 3D Imaging

3-Scape imaging enables volume imaging through real-time capture and display of B-mode data using traditional and *fourSight* 4D imaging transducers.

- Available on all transducers
- Real-time reconstruction during freehand acquisition with traditional transducers
- Real-time display of multiple views with *fourSight* 4D transducers
- Multiplanar rendering (MPR) displays imaging planes not traditionally accessible
- Editing tools such as parallel cut, polygon, trace, niche, large and small eraser, undo last, undo all
- Zoom available
- Provides a volume-to-clip conversion of all three orthogonal planes ensuring ability to display volume data as DICOM multi-frames for viewing on DICOM workstations
- 4 display modes: full screen (1:1), side-by-side (2:1), 4:1 and 4:1 asymmetric
- Variety of rendering modes
  - Opacity
  - Gradient light
  - Minimum intensity projection (min IP)
  - Maximum intensity projection (max IP)
  - Mean intensity projection (mean IP)
- 2D linear measurements on MPRs with *fourSight* 4D transducers:
  - Distance
  - Volume (D1 X D2 X D3)
  - Trace
- Simultaneous acquisition of 2D volumes can be independently reviewed in surface rendering
- 4D volume cine including clip functions available with *fourSight* 4D transducers
- Stores 3D and 4D volumes in DICOM format
- Features “bookmark” image that references volume data in a different file to reduce storage space

- Advanced *fourSight* 4D transducers include raw data capabilities which allow the post-processing of Gain, Maps, Tint, Dynamic Range and re-processing of the volume
- Compatible with other advanced imaging options including THI, Advanced SieClear compounding, TEQ technology, Clarify VE technology and Dynamic TCE technology
- 3-Scape imaging utilizes *fourSight* 4D technology transducers to automatically acquire a real-time volume
- Annotation function on MPR/VR

### Advanced *fourSight* 4D Imaging – Rendering Modes and Calculations

- Specific anatomy imaging sub-states
- MultiSlice format obtains and displays a matrix of 2D images from any plane in a volume
  - Slice increments 0.1 mm with slice spacing 0.2-1.0 mm
  - 0.5 mm with slice spacing 1.5 mm or greater.
- Thick Slice Imaging (TSI)
- Curved Top Volume of Interest (VOI) allows curvilinear view plane
- Curved MPR allows curvilinear reformatting of a cross section into a flat line or plane
- Inversion mode reverses the appearance of anechoic and echogenic structures, thereby enhancing the visualization of internal surfaces

### Amnioscopic Rendering

Unique rendering mode that incorporates several technologies to create a more accurate, realistic representation of the fetus. This rendering mode utilizes lighting modes, such as gradient light, as well as a diffusion technique that creates a realistic view.

- Moveable light source

## General Imaging Technology Package

The General Imaging technology package offers a number of advanced image quality and innovative workflow applications including:

- Advanced SieClear spatial compounding
- Advanced SieClear spatial compounding in Color & Power Doppler\*
- Dynamic TCE tissue contrast enhancement technology
- Clarify VE technology
- SieScape imaging and Color SieScape imaging
- TEQ technology

## Advanced SieClear Spatial Compounding

Advanced SieClear spatial compounding provides exceptional improvements in border definition.

- Available on all linear and curved array transducers
- Provides up to 13 steering angles available on linear and curves array transducers
- Supports all primary and secondary exam types
- Compatible with other advanced imaging modes including Dynamic TCE technology, THI and TEQ technology

## Advanced SieClear Spatial Compounding in Color and Power Doppler

This feature enables Advanced SieClear spatial compounding when either color or Power Doppler is active, bringing the Advanced SieClear spatial compounding image quality advantages to Doppler imaging.

## SieClear Multi-view Spatial Compounding

- Available on all transducers
- Supports all primary and secondary exam types
- SieClear compounding is compatible with all standard imaging modes such as 2D, Dynamic TCE, CDV, CDE, DTI, PW Doppler and M-mode, THI, SieScape imaging, Color SieScape imaging, 3-Scape imaging, TEQ technology and Clarify VE technology

## Dynamic TCE Tissue Contrast Enhancement Technology

- Dynamic TCE technology is a proprietary, advanced post-processing method for speckle reduction
- Compatible with other advanced imaging modes including Advanced SieClear compounding, THI and TEQ technology
- Available on all imaging transducers
- Supports all primary and secondary exam types
- 3 levels available: Low, Medium and High

## Clarify Vascular Enhancement (VE) Technology

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

- Factory presets optimized for each exam type
- 7 user-selectable levels
- Compatible with other advanced imaging options including THI, Dynamic TCE technology, SieClear compounding, SieScape imaging, 3-Scape imaging and TEQ technology
- Available on all transducers

## SieScape Imaging

Large field of view images are acquired with real-time high-resolution grayscale imaging. These images present ultrasound information in anatomical context providing gross anatomical orientation for referring physicians, teaching and surgical consultation.

- Available on all linear and curved imaging transducers
- Displays up to 240 cm in length or 180 degrees
- Pause and reverse during acquisition
- On-screen reference and speed indicators simplify scanning technique
- Zoom and Pan capabilities
- Unique cine display provides review capability of individual data frames composing the SieScape image
- 2D standard measurements and reports are available

## Color SieScape Imaging

Color SieScape imaging is a combination of real-time SieScape imaging and real-time power mode acquisition. All power information is preserved during image acquisition and the peak of the signal is saved for the Color SieScape image.

- Available on all linear and curved imaging transducers
- Displays up to 240 cm in length or 180°
- On-screen reference and speed indicators enhance technique
- Pause and reverse during acquisition
- Optimization features including all power, color capture, flow and acquisition fraction
- Zoom and Pan capabilities
- Unique cine display provides review capability of the individual data frames composing the color SieScape image

## eSiImage Multiparametric Optimization

eSiImage multiparametric optimization enhances workflow by delivering a uniform image, removing unnecessary keystrokes and potentially reducing examination time.

\* Available with VC30 and newer releases

eSiImage innovatively optimizes key imaging parameters real time across different body structures.

- Enabled with TEQ technology on the ACUSON S2000 ultrasound system, HELX Evolution (VC30B software and above)
- Requires eSiImage optimization license
- Adaptively maintains B-mode image uniformity for varying tissue attenuation characteristics
- Leverages computational processing power of SieStream™ HD Architecture for real-time adaptive adjustments
- Optimizes both front end and back end gain independently therefore eliminating artifacts and image saturation
- Smoothly adjusts gain frame by frame to avoid large jumps and flashes in image quality
- Continuously identifies and suppresses noise and enhances tissue to compensate gain according to patients' unique anatomy and operator preference
- Enabled with TEQ technology
- Extends flexible gain compensation to the cine mode after image acquisition allowing adjustments in post processing for gain and TEQ technology

eSiImage supports the following transducers

- 6C1 HD (VC30B software and above) for all exams
- MC9-4 (VC30B software and above) for all exams
- 8C3 HD (VC30C software and above) for all exams
- 18L6 HD (VC31A software and above) for all exams
- 12L4 (VC31A software and above) for all exams

### TEQ Ultrasound Technology

TEQ technology reduces time spent optimizing imaging performance, while improving the consistency and quality of diagnostic exams. TEQ technology offers a sophisticated solution for 2D and spectral Doppler imaging optimization with a push of a button.

- Available on all transducers
- Available as a purchasable option on ACUSON S2000 ultrasound system and ACUSON S1000 ultrasound system
- Pre-processing to RF echo data before image is formed
- Optimizes gain and brightness in two dimensions for 2D-mode imaging
- Optimizes gain, baseline, scale and dynamic range for spectral Doppler
- Default image brightness and target spectral Doppler gain
- Auto-refresh on mode transitions (2D/THI), freeze/unfreeze
- Preset option for auto-refresh upon unfreeze events

## Cardiac Imaging and Quantification Package

The Cardiac Imaging and Quantification package provides the functionality necessary for performing standard cardiac and stress echo exams.

### Stress Echo

The Stress Echo package 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 acquisition protocols for treadmill, ErgoMetric, and pharmacological stress with
  - Dobutamine Stress Echo
  - ErgoMetric Continuous R-R
  - ErgoMetric Continuous
  - ErgoMetric Stress Echo
  - Treadmill Continuous R-R
  - Treadmill Continuous
  - Treadmill
- Full screen or ROI (Region of Interest) acquisition
  - Complete R-R capture with clip editing
- Easy workflow throughout the exam protocol
- Baseline Save enables storing parameters for gain, depth and ROI position when each view is captured
- Prospective continuous capture (up to 120 seconds) or retrospective labeled capture
- Immediate review of acquired loops
- Multi-view compare
- Programmable stage timers
- Flexibility to skip views or stages
- Flexibility to re-acquire and overwrite already acquired images
- Indication of current view, acquired views and skipped views in the workflow diagram
- Wall motion scoring, 17-segment and 16-segment models with graphical display and report printing
- LV volume measurements with report printing
- Factory default or user-defined diagnostic text selection for stress echo and LV volume report generation
- Customized studies through Protocol Editor, with up to 12 stages, 6 views per stage, 20 loops per view or 120 second prospective clip capture

## Advanced Cardiac Analysis Package

The Advanced Cardiac Analysis package provides the advanced functionality of syngo VVI technology and syngo Auto LH.

### **syngo Velocity Vector Imaging (VVI) Technology**

A dynamic 2D method to visualize, measure and display global and regional myocardial motion and mechanics.

- Uses grayscale images and a sophisticated tracking algorithm to determine the velocity and direction of myocardial tissue motion and displays it in a dynamic vector presentation as an overlay on the 2D clip
- Base of vectors labels tissue motion
- Length of vector indicates movement velocity of tissue at the base of the vector
- Direction of vectors point in the direction of tissue motion
- Algorithm allows for processing ultrasound clips obtained in all views of the heart, as well as for generic moving tissue (e.g. vessel wall)
- Not limited by color Doppler (CDV) dependencies on frame rate, angle or mean velocities
- Tracking algorithm incorporates multiple sources of information, including speckle tracking:
  - Manual tracing of the myocardial border on any single frame of a clip
  - Mitral plane motion tracking
  - Tracking of the inward and outward motion of the tissue border
  - Tissue motion along the border trace using sophisticated speckle tracking
  - Periodic motion of the heart
  - Spatial coherence of tissue motion
- Parameters and parametric displays supported include:
  - Visual assessment of wall motion
  - Visual assessment of vector dynamics
  - Display of time curves of the selected velocity vector components
  - ECG display
  - Analysis of an individual heart beat or an average of multiple heart beats
  - Parametric color M-mode display of a selected component of tissue velocity along the dynamic tissue border trace over time

- Parametric color M-mode display of tissue strain along the dynamic tissue border trace over time
- Up to 20 different points can be selected on the 2D image along the trace for graphic displays of velocity, strain and strain rate
- Combined display or full-screen magnification
- 3D representations of parametric color M-mode displays along the trace over time for:
  - Selected components of tissue velocity
  - Tissue strain
  - Tissue strain rate
  - Pan, Zoom, Rotate of the 3D parametric display
- Time curves of global and segmental (6-segment model) LV volumes automatically calculated by Simpson method
- Parametric color display of automatically calculated global and segmental ejection fraction
- Time curves and measurements of  $D_{\min}$  (transverse diameter) and  $D_{\max}$  (longitudinal diameter)
- Simultaneous display of volume time curves and measurements for current and previous cases
- Synchrony analysis
  - 6-segment chamber model
  - Time curve display and measurements for segmental tissue motion parameters: Velocity (Tangential or Radial), Strain (Tangential), Strain Rate (Tangential) and Displacement (Tangential or Radial)
  - Automatic time-to-peak and phase analysis of all motion parameter curves
  - Parameter color 6-segment model display of time-to-peak and phase information for Velocity (Tangential or Radial), Strain (Tangential), Strain Rate (Tangential) and Displacement (Tangential or Radial)
- Arbitrary, multi-segment M-line can be selected on a 2D clip display to obtain virtual M-mode information derived from a 2D clip. Virtual M-mode can be used as a background for time curves providing reference on cardiac cycle phase
- Compatible with standard acquisition frame rate clips, and acoustic clip capture (e.g. isovolumetric contraction and relaxation events)
- Compatible with all transducers

### **syngo Auto Left Heart**

syngo Auto Left Heart (Auto LH) automatically detects left ventricular and atrial borders, generating measurements with no user interaction on typical adult transthoracic images. Using routine apical 2 chamber and apical 4 chamber views, end-systolic and diastolic segments, standard measurements of end-diastolic volume, end-systolic volume, ejection fraction, and volume-time curves for the cardiac cycle are calculated.

- Utilizes trained, pattern-recognition algorithms
- User accepts automated measurements
- Measurements automatically entered into report

### **Advanced Breast Imaging Package**

The Advanced Breast Imaging package includes eSie Touch elasticity imaging and Custom Tissue Imaging. Virtual Touch™ IQ is a separate configurable option indicated for breast and thyroid.

#### **eSie Touch Elasticity Imaging**

eSie Touch elasticity imaging is a real-time qualitative strain imaging application that calculates and displays the relative stiffness of tissue within a ROI.

- Proprietary technology uses minimal transducer compression. Works with normal respiration and cardiac motion
- Transducers supported: 18L6 HD, 14L5, 12L4, MC9-4, 9L4, EC9-4 (Prostate), 6C2 (Abdomen) and 4C1 (Abdomen)
- Image display of elastogram and standard 2D-mode image
- Unique mapping options in grayscale and color facilitate interpretation of the elastogram
- Area and distance ratio measurement capability
- Strain ratio measurement
  - Provides relative strain value between two user-selectable regions on the elastogram

#### **Custom Tissue Imaging**

Custom Tissue Imaging improves both lateral and contrast resolution by modifying the speed of sound for fatty breasts and adipose tissue. Custom tissue imaging is standard on VC31A software or above.

- Levels: 0-4

### **Virtual Touch IQ**

Virtual Touch IQ is a real-time imaging mode that utilizes Acoustic Radiation Force Impulse (ARFI) imaging technology to gently displace tissue, giving both a qualitative and quantitative evaluation of relative tissue stiffness of focal changes in breast or thyroid tissue.

Virtual Touch IQ is Siemens' third-generation, recognized strain imaging solution, providing a single image presentation of both qualitative and quantitative assessment of tissue stiffness.

- Color-coded stiffness map
- 4 color display modes
- Measures shear wave velocity
- Maximum ROI height: 2.5 cm
- Maximum ROI width: Full image width
- Maximum ROI depth: 4.0 cm
- Maximum shear wave velocity: 10 m/s

Virtual Touch IQ is for breast and thyroid exam types, using the 9L4 transducer. Output range is 0.5-10.0 m/s (shear wave velocity) with a maximum depth of 6 cm.

### **Liver Tissue Analysis Package**

The Liver Tissue Analysis package combines the two ARFI technology-based applications (Virtual Touch imaging and Virtual Touch quantification) to provide qualitative and quantitative stiffness analysis capabilities.

#### **Virtual Touch Imaging**

Virtual Touch imaging is a real-time dual display imaging mode that utilizes ARFI imaging technology to gently displace tissue and for qualitative evaluation of relative tissue stiffness of focal changes in liver tissue compared to surrounding liver tissue. Virtual Touch technology enhancements for the ACUSON S2000 ultrasound system, HELX Evolution with Touch Control include imaging with dual-screen color maps, support for dual display with color maps for VTI and support for dual display with color map for VTIQ.

- Available with the 4V1, 4C1, 6C1 and 9L4 transducers
- The system automatically generates the tissue displacement without manual tissue compression. This allows easy visibility of relative stiffness

## Virtual Touch Quantification

Virtual Touch quantification is a real-time measurement technique that utilizes ARFI imaging to gently displace tissue for quantitative evaluation of tissue stiffness properties.

- Available with the 4V1, 4C1, 6C1 and 9L4 transducers
- The system automatically generates the tissue displacement without manual tissue compression, so that tissue stiffness properties can be quickly and easily measured within a small region of interest
- Measurements can be more reliably correlated to anatomic location through simultaneous display of the movable measurement cursor in the 2B-mode image
- Liver assessment report package
- Labeled measurement capabilities

## Contrast Imaging and Quantification Package

The Contrast Imaging and Quantification package combines Cadence contrast pulse sequencing (CPS) technology\* and Cadence contrast harmonic imaging (CHI) technology\* with Contrast Dynamics software\*, a quantification application used with Cadence contrast agent imaging technology\*.

### Cadence CPS Technology\*

- Utilizes precise control of phase and amplitude modulation on both transmit and receive
- Processes the strong nonlinear fundamental signals that are generated by ultrasound contrast agents
- Cadence CPS technology\* is a low-MI contrast agent imaging technique which provides highly sensitive agent detection with outstanding enhancement uniformity
- MultiHertz imaging provides specific optimized waveforms for improved fine tuning for low-MI contrast investigations
- Selectable live-dual image display for simultaneous display of contrast and tissue and contrast agent image
- Selectable image display of tissue-only or contrast agent-only displays (Balance mode)
- Mix mode displays overlay of the contrast "perfusion" image on the anatomical "tissue" image. May be used in real-time or cine

- Cadence CPS\* Capture mode, in which the system persists contrast-specific pixels creating a "vascular roadmap" showing contrast agent wash-in and wash-out
- MBD (Micro-bubble Destruction) allows destruction of contrast bubbles with a continuous burst by applying the maximum allowable MI. Can also be user-definable as an automated workflow protocol for contrast agent destruction and re-perfusion sequences
- Optimized for the 4C1, 6C1 HD, 9L4, MC9-4 and EC9-4 (prostate) transducers
- Start Burst – Integrated burst/reflow control for destruction-reperfusion investigations
- On-screen stopwatch feature
- DIMAQ-IP integrated workstation protocols specific for Cadence contrast imaging technology\*
- Cadence agent detection imaging (ADI) technology\*
  - Available on the 4C1 transducer
  - Specifically designed for high-MI imaging. High-intensity transmit pulses detect bubbles for loss of correlation (LOC) imaging
- User-selectable Tint maps allow for enhanced visual conspicuity of contrast agent

### Cadence Contrast Harmonic Imaging (CHI) technology\*

Cadence CHI technology uses Phase Inversion technology to isolate second harmonic data and allow enhanced visualization of small vascularities and volumes when imaging with contrast agents. Cadence CHI technology enhances resolution, delineation and detection of lesions and areas of low flow and small vasculature.

### Contrast Dynamics Software\*\*

Contrast Dynamics software is a quantification application used with Cadence contrast imaging technology. Contrast Dynamics software technology\* illustrates contrast agent enhancement by displaying graphs indicating changes of intensity over time within defined ROI. Contrast quantification technology offers quantitative assessment Time Intensity Curves displays with parametric analysis.

\* 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.

\*\* Not commercially available in the United States.

## Transducers

The ACUSON S2000 ultrasound system supports all transducers within the ACUSON S Family. These transducers are interchangeable across the ACUSON S1000 and ACUSON S2000 ultrasound systems.

- The following transducers are supported on the system: 9L4, 14L5, 4C1, 6C1 HD, 6C2, 8C3 HD, 4P1, 4V1, 10V4, 7CF1, 7CF2, EC9-4, 9EVF4, MC9-4, EV8C4, 8V3, CW2, CW5, V5Ms, V7m, 4V1c, 14L5 SP, 18L6 HD, 12L4, ACUSON AcuNav 8F and 10F ultrasound catheters
- 9L4, 14L5 and 4P1 transducers utilize Multi-D™ matrix array transducer technology for precise beam elevation control and exceptional spatial resolution throughout the field of view
- 4C1, 6C1 HD, 6C2, 8V3, 4V1, 4V1c, 18L6 HD and 8C3 HD transducers utilize Hanafy lens transducer technology to provide excellent elevation focusing and uniform beam intensity throughout the field of view
- 9EVF4 and 7CF1 transducers with *fourSight* 4D transducer technology provide superior image quality, contrast and detail resolution in 2D, 3D and 4D imaging modes
- Adult intracardiac echocardiography (ICE) using the ACUSON AcuNav ultrasound catheter family. Complete echocardiography exam capabilities during intracardiac minimally invasive procedures, such as atrial fibrillation ablation, transcatheter septal closure device placement, pacemaker lead placement, trans-septal catheterization, and balloon valvuloplasty or septostomy
- microCase™ transducer miniaturization technology combined with SuppleFlex™ transducer cables provide lightweight, comfortable transducer designs that can reduce operator fatigue during prolonged scanning sessions
- HD transducers feature innovative, ergonomic designs. The 18L6 HD and 8C3 HD transducers features a palmar grip, designed to decrease the "pinch" grip which causes repetitive stress injury. The lightweight, flexible cord is offset to decrease wrist stress. The 6C1 HD transducer features a ridged handle for improved control. All HD transducers have an elastomeric surface coating which ensures a secure grip.
- Advanced hybrid and disposable biopsy guides for specified transducers
- Reusable and sterilizable stainless steel biopsy guides for 9EVF4, EC9-4 and MC9-4
- Micro-pinless connectors for improved signal to noise ratio
- Frequency range: 1.0-18.0 MHz

## Freeze, Cine and Post-Processing

### Cine Review

Cine feature offers post-acquisition optimization of all real-time post-processing functions.

- Frame-by-frame and continuous cine review, including control of playback rate for both forward and reverse directions
- In mixed mode (2D/M, 2D/D, 2D/C/D), individual modes can be played back independently
- Cine memory: 30 seconds, 201 MB and 400 frames (dependent on frame rate and other parameters)
- Up to 30 seconds Doppler cine, or up to 25 seconds M-mode cine
- Available in full-screen and dual-screen display
- Editable loop margins

### Post-Processing Features in Freeze Frame or Cine

- Auto Gain Optimization
  - TEQ
  - eSiElImage optimization
- 2D-mode
  - Zoom/Pan
  - Dynamic range
  - Gray map
  - 2D-mode tint map
  - Measurements/annotations/pictograms
- Color Doppler Velocity
  - Zoom/Pan
  - Color map
  - Color invert
  - Color baseline shift
  - Color display On/Off
  - Color priority
  - Measurements/annotations/pictograms
- Spectral Doppler
  - Baseline shift
  - Spectral dynamic range
  - Gray map
  - Doppler tint map
  - Angle correct
  - Spectral invert
  - Measurements/annotations/pictograms
  - Sweep speed

### Post-Processing Features in Freeze Frame or Cine

- M-mode
  - Dynamic range
  - Gray map
  - Tint map
  - Measurements/annotations/pictograms
  - Sweep speed
- Report Printing
  - Measurement reports and OB graphs to laser printer
- Basic Physio Option
  - ECG option for on-screen ECG trace in B-, M- and Doppler modes

## Applications and Measurements

The ACUSON S2000 system, VD10A software release and above supports up to 100 user-defined customizable measurement labels. Factory-defined imaging presets have been clinically optimized for each exam and transducer to provide consistency, reliability, and increased productivity. Up to 10 user-programmable presets are available for each application/transducer combination to customize the system for specific clinical needs. Selected applications include pictograms (user-defined library), customizable text and measurement labels, and editable/customizable reports.

### Applications

- Abdominal
- Renal
- Obstetrics
- Fetal Echo
- Gynecology
- Neonatal
- Pediatric
- Cerebrovascular
- Peripheral Vascular (arterial, venous)
- Transcranial
- Cardiac (adult, pediatric and neonatal)
- Musculoskeletal
- Small Parts (breast, testicle, thyroid, digital)
- Urology (pelvis, penile, prostate)

### 2D Calipers – Generic Measurements and Calculations

- Unlimited cursor sets on frozen, live, dual-screen and cine images
- Distance, depth from skin line
- Area and circumference: Ellipse and trace
- Angle: In degrees
- Compound measurements:
  - Volume: User-selectable preset by 3 distances; 1 distance and 1 ellipse
  - Flow volume: 1 velocity and 1 distance, or 1 velocity and 1 ellipse
  - Stenosis: User-selectable preset calculated by Trace, 2 ellipse, or 2 distance measurements

### Doppler Calipers – Generic Measurements and Calculations

- Unlimited cursor sets
- Velocity/frequency; heart rate; trace; resistive index (RI); systolic/diastolic ratio (S/D); slope (acceleration/deceleration); time averaged max velocity (TAMx); time averaged mean velocity (TAMn); heart rate tool; flow volume using 1 velocity and 1 distance, or 1 velocity and 1 ellipse; velocity ratio tool; time
- Automatic waveform trace to simplify Doppler measurements
- Auto-Doppler statistics for real-time and cine display of Doppler spectral measurements and calculations including PS, ED, TAMx, TAMn, PI, RI and S/D

### M-mode Calipers – Generic Measurements and Calculations

- Multiple cursor sets
- Distance tool
- Heart rate tool
- Slope tool
- Time tool

### Abdominal

- 2D-mode measurement labels
  - Liver, CHD, CBD, GB wall, pancreatic duct, spleen, kidney, pre-void bladder, post-void bladder
- PW Doppler measurement labels
  - Aorta, celiac A, splenic A, gastric A, hepatic A, SMA, renal A, IMA, bifurcation, iliac A, anastomosis
- Pictograms and annotations
- Editable report with up to 16 images

**Renal**

- 2D-mode measurement labels
  - Kidney, ureter, pre-void bladder, post-void bladder
- PW Doppler measurement labels
  - Aorta, inferior vena cava, renal artery, renal vein, segmental artery, interlobar artery, arcuate artery, anastomosis artery, anastomosis vein
- Pictograms and annotations
- Editable report with up to 16 images

**Obstetrics**

- Gestational age and estimated date of confinement (EDC) by LMP or IVF
- Gestational age by single parameter: Biparietal Diameter (BPD), Head Circumference (HC), Abdominal Circumference (AC), Femur Length (FL), Crown Rump Length (CRL), Binocular Distance, Gestational Sac Diameter (GSD), Humerus Length (HL), Tibia Length, Ulna Length, Clavicle Length, Foot Length and Facial Angle
- Automatic assignment of BPD/OFD with HC measurement
- Automatic assignment of ASD/ATD with AC measurement
- Gestational age by multiple parameters
- Interval growth rate
- Estimated date of confinement by ultrasound age
- Estimated fetal weight (EFW)
- Singleton, twin, triplet or quadruplets
- User-defined gestational age OB tables
- User-defined growth analysis charts
- User-defined fetal and maternal assessment checklist
- Serial (historical) growth trending – import up to 20 previous exams
- Export of data with serial cable, to Windows file share location or DICOM SCP
- Growth evaluation
- Ratios: Cephalic Index (CI), HC/AC, FL/AC, FL/HC, FL/BPD, LVW/HW, TCD/AC
- Curves: AC, APAD, TAD, BPD, CRL, EFW, FL, FTA, GSD, HC/AC, HC, HL, OFD, TAD
- Percentile display on report

**• 2D-mode measurement labels**

- Amniotic fluid index (supports two sets of index measurements), Anterior-posterior Abdominal Diameter (APAD), Lateral Ventricular Width (LVW), Transabdominal Diameter (TAD), Thoracic Circumference (TC), Transcerebellar Diameter (TCD), Hemispheric Width (HW), radius, yolk sac, Cisterna Magna, nuchal thickness, cervix length, maternal kidney, fetal Aorta, Middle Cerebral Artery (MCA), umbilical artery, ovarian artery, uterine artery, fetal kidney, Fetal Trunk Area (FTA)

**• PW Doppler measurement labels**

- Fetal heart rate, fetal aorta, middle cerebral artery, umbilical artery, ovarian artery, uterine artery

**• M-mode measurement labels**

- Fetal heart rate
- Biophysical profile
- Optional cm versus mm unit
- Pictograms and annotations
- Editable report with up to 16 images

**Fetal Echo****• 2D-mode measurements ILabels**

- Left heart: LA width, LA length, LVPW, LV length, LVID, LVOT, IVSd

**• Right heart: RA width, RA length, RVAW, RV length, RVID, RVOT****• CTA ratio: HA, TA****• Arteries: aortic arch, AoD, Ascend Ao, Descend Ao, Trans Ao, ductal arch, Ductus Arteriosus (DA), isthmus, PA, MPA, Umb A****• Valves: AV****• Veins: SVC, IVC, L Pulmon V, R Pulmon V, Umb V****• PW Doppler measurement labels**

- Valves: MV E peak, MV A peak, AV, PV, FO
- Ventricles: LVICT, LVET, LVIRT, RVET, fetal heart rate
- Arteries: Ascend Ao, Descend Ao, Trans Ao, DA, MPA, Umb A
- Veins: SVC, IVC, L Pulm V, R Pulm V, Umb V

**• M-mode measurement labels**

- LA, MV, LVPW, LVID, IVSd, AV, AoD, LVET, fetal heart rate, RA, TV, RVAW, RVID, PV, PA, RVET

**• Pictograms and annotations****• Editable report with up to 16 images**

## Gynecology

- 2D-mode measurement labels
  - Kidney, uterus, ovary, endometrium, pre-void bladder, post-void bladder, cyst 1-6, follicle 1-20
- PW Doppler measurement labels
  - Arcuate artery, ovarian artery, uterine artery
- Pictograms and annotations
- Editable report with up to 16 images

## Neonatal

- Editable report with up to 16 images

## Pediatric

- 2D-mode measurement labels
  - Pediatric hip
  - Pediatric sonometer or % coverage
- Editable report with up to 16 images

## Cerebrovascular

- 2D-mode and Doppler measurement labels
- Common carotid artery, external carotid artery, internal carotid artery, vertebral artery, subclavian artery, innominate artery, aorta
- Pictograms and annotations
- Editable report with up to 16 images

## Peripheral Vascular

- 2D-mode and Doppler measurement labels
  - Lower extremities: abdominal aorta, common iliac artery, internal iliac artery, external iliac artery, common femoral artery, superficial femoral artery, profunda femoral artery, popliteal artery, tibial-peroneal trunk, posterior tibial artery, anterior tibial artery, peroneal artery, dorsalis pedis artery
  - Upper extremities: innominate artery, common carotid artery, vertebral artery, subclavian artery, axillary artery, deep brachial artery, radial artery, ulnar artery
- Pictograms and annotations
- Editable report (arterial only) with up to 16 images

## Transcranial

- 2D-mode and Doppler measurement labels
  - Middle cerebral artery, internal carotid-siphon, anterior cerebral artery (A1 & A2), anterior communicating artery, posterior cerebral artery (P1 & P2), posterior communicating artery, basilar artery, vertebral artery
  - Ratio: MCA/ICA
- Editable report with up to 16 images

## Cardiac

- 2D measurement labels
  - Mitral valve function including: EPSS, MVA (PHT), MVA (VTI), LVOT diameter, MVA (Trace), MV area, CO, LVIMP, HR (edit) AV/LA, RV diameter, AoRoot diameter, ACS, LA diameter
  - Aortic valve function including: AVA (VTI), AVA(Vmax), AVA (trace), VSD, LVSTI, HR
  - Pulmonary valve function including: CO, RVOT diameter, VD
  - PISA (MR) including: Radius, aliasing velocity
  - PISA (MS) including: Radius, aliasing velocity, angle
  - LV dimensions including: RVAWd, RVDd, diastole, IVSd, LVIDd, LVPWd, systole, IVSs, LVIDs, LVPWs
  - LV mass (Truncated Ellipse) including: A Sax Epi, A Sax Endo, A, D
  - LV mass (Area and Length) including: A Sax Epi, A Sax Endo, LVL
  - CO: LVOT VTI, LVOT Diam, HR
  - 2D-mode calculation labels including: CI, CP, EDV and ESV, EF, FS, SI, SV, t, b, AO/LA, LV Mass-I, LV Mass T-E, LV Mass A-L
  - Left ventricular function Assessment including: Simpson Single Plane, Simpson Bi-Plane, Cubed formula, Teichholz Formula
  - Left and right atrial volume measurements
- PW Doppler measurement labels
  - Aortic valve function including: AV VTI, LVO VTI, IVRT
  - Aortic valve area velocity time integral including: AV VTI, LVOT VTI
  - Aortic valve area including: AV Vmax, LVOT Vmax
  - AVA (Trace)
  - Ventricular septal defect including: VSD Vmax
  - Left ventricular systolic time interval including: LVET, LVPEP, HR
  - Mitral valve function including: E Dur, A Dur, IRVT, MV E pt, MV A pt
  - MVA (PHT)
  - Mitral valve area velocity time integral including: MV VTI, LVOT VTI
  - MVA (Trace)
  - Cardiac output including: MV VTI, HR
  - Left ventricular index of myocardial performance (LVIMP) including: LVET, MV C-Odur
  - Tricuspid valve function including: TV Vmean, TV Vmax, TV E pt, TV A pt
  - Right ventricular index of myocardial performance (RVIMP) including: RVET, TV C-Odur

- Pulmonary valve function including: PV Vmax, RVET, RV Act, RVPEP, PA Act
- Cardiac output including: PV VTI, HR
- Pulmonary vein function including: PVs1 Vel, PVs2 Vel, PVd Vel, PVa Vel, PVa dur, PVs VTI, PVd VTI, PVd Dect
- Aortic regurgitation including: Decel time, AI PHT
- Tricuspid regurgitation including: TR Vmean, TR Vmax
- Pulmonary regurgitation including: PR Vmean, PR Vmax, PR Ved
- Mitral regurgitation including: MR Vmax, dP/dt
- PISA (MR) including: Aliasing Vel, MR VTI
- PISA (MS) including: Aliasing Vel, MS VTI, Angle
- Doppler tissue imaging including: MV medial, Ez, AR/DR, Aa, Sa, MV lateral, Ea, AR/DR, Aa, Sa
- Doppler calculation labels including: A/E, E/A, CA/CE, MV PGmax, MV PGmean, CO, MR PGmax, AR PGmax, AV PGmean, PV PGmax, PV PGmean, PR PGmax, PR PGmean, PAEDP, TR PGmax, TR PGmean, RVSP, LVOT PGmax, LVOT PGmean, VSD PGmax, TV PGmax, TV PGmean, AR PGmax, MS PGmax, LVIMP, RVIMP, HR, Ea/Aa, E/Ea, MVA(VTI), AVA(VTI), Qp/Qs, Qp-Qs
- M-mode measurement labels
  - AV/LV (M) including: RV diam, Ao Root Diam, ACS, LA diam, LVET, LVPEP
  - Mitral valve including: CE amp, CA amp, DE excursion, DE amp, EPSS, EF Slope
  - Right ventricular dimensions including: RV diameter
  - Left ventricular dimensions including: RVDd, Diastole, IVSd, LVIDd, LVPWd, Systole IVSs, LVIDs, LVPWs, LVET, HR
  - M-mode calculation labels including: CI, CO, EDV and ESV, EF, AO/LA, HR, SI, SV, LV Mass, LV Mass-c, LV Mass-l, mVcf
  - Worksheet and report
  - Musculoskeletal/superficial
  - Musculoskeletal
  - Pictograms and annotations
  - Editable report with up to 16 images

## Breast

- 2D-mode measurement labels
  - Mass 1, 2, 3
- Pictograms and annotations
- Editable report with up to 16 images

## Testis

- 2D-mode measurement labels
  - Testicle, epididymis, scrotal wall, mass 1, 2, 3
  - PW Doppler measurements
  - Testicular artery, epididymal artery, intratesticular artery, epididymal artery, epididymal vein, intra-testicular vein
- Pictograms and annotations
- Editable report with up to 16 images

## Thyroid

- 2D-mode measurement labels
  - Thyroid lobe, isthmus, parathyroid, mass
- Worksheet and report
- Pictograms and annotations
- Editable report with up to 16 images

## Pelvis

- 2D-mode measurement labels
  - Prostate, pre-void bladder, post-void bladder, seminal vesicle, urethra, ureter, kidney
- Pictograms and annotations
- Editable report with up to 16 images

## Penile

- 2D-mode measurement labels
  - Corp cavernosum, corp spong, cav art, pre-injection cav, post-Injection cav, urethra
- PW Doppler measurement labels
  - Iliac a, dorsal a, urethral A, bulbar a, brach a, cavernosal a, pre-injection cav, post-injection cav, sup dorsal v, deep penile v
- Editable report with up to 16 images

## Prostate

- 2D-mode measurement labels
  - Prostate, rectal wall, seminal vesicle, urethra, mass 1, 2, 3, kidney
  - Prostate specific gravity: User preset using 1.0 or 1.05
- Editable report with up to 16 images

## Digital Storage and Image Archiving

### Image Capture

- DICOM or PC compatible file (AVI, JPG) formats for all images and clips
- Static image, dynamic clip, strip mode clip, 3D/4D dataset, and bookmark capture
- Selectable lossy (JPG) and lossless compression for static images or clips
- Acoustic clip storage live and from cine
- Anonymization during and after exams

### Hard Drive

- 2.0 TB hard drive
- Image storage capacity greater than 606,350 images; color or black/white
- Automatic disk management (first in – first out) with capability to auto delete based on archived, archived and committed, archived and verified, sent, sent and committed, printed

### Read/Write DVD-R

- 25 GB; read Blu-ray™, 50 GB or 100 GB Blu-ray (BD-R and BD-RE)
- 4.7 GB read/write DVD±R media
- 650 MB read/write CD-R media
- Storage capacity dependent upon writing session format and type and format of images, e.g., entire DVD written in one session with compressed color images stores approximately 2,000 images
- Allows storage of images, clips, volumes and transfer of presets across systems in DICOM or PC format (AVI and JPG)
- Supports system software and option upgrades
- Supports industry standard NTSC/PAL format, plus high-definition Blu-ray video/audio
- Performs real-time direct recording from the ultrasound system using Blu-ray (BD and BD-RE; Panasonic) or regular DVD (DVD-R, TDK) media
- Qualified for Panasonic and TDK and DVD media

### USB

- Two user-accessible USB 2.0 ports on left side of Touch Control screen
- Four user-accessible USB port on back of system
- Supports export of images and clips in DICOM, AVI and JPEG format, volumes, presets, and service log files

### Display Out

- Supports one HDMI out
- Supports one HDMI in
- Supports one DVI

### Exam Restart

Recall or restart an exam and allow for additional images to be appended to an already closed exam. A new series is created. No time limit as to when a study can be restarted.

### Exam Review

Display of digitally stored images in user selectable screen formats (e.g., 1:1, 2:1, 4:1, 9:1, 16:1 etc.). Clip playback in 16:1 format. Exam review allows the selection of images for printing and deletion, review of the current exam in progress and archived exams retrieved from the patient browser on either the hard drive or optical drive, CD-DVD. Exam sorting/search can be done by name, ID, exam type and date/time. Compare function available for selected images.

## DICOM Connectivity

### DICOM Storage Service Class

- Allows connectivity to PACS
- Allows “in-progress” or “batch” storage of digital black/white and color images and clips with patient demographic data

### DICOM Printers

- Allows “in-progress” or “batch” printing to DICOM print devices

### DICOM Query Retrieve (Q/R)

- Allows retrieval of studies on compatible PACS workstations

### DICOM Worklist

- Allows the user to download patient demographic data from a Hospital or Radiology Information System’s (HIS/RIS) DICOM worklist server

### DICOM Modality Performed Procedure Step

- Provides performed procedure information from the ACUSON S2000 system to a HIS/RIS system
- Provides procedure status: In progress, complete, or discontinued

### DICOM Storage Commitment

- Provides commitment from a storage device that images and related information have been stored reliably

## DICOM Wireless Reporting

- Allows organized transfer of calculation data to PACS systems in either supported public elements, or in private elements for measurements not supported by DICOM S/R
- Available for OB/GYN, Cardiac and Vascular calculation data
- Structured reporting data may be transferred to DICOM Storage Devices or Network File Share

*The DICOM conformance statement for the ACUSON S2000 ultrasound system is available on the Siemens Healthcare website at: <http://www.siemens.com/DICOM>*

## Documentation Devices

- Up to three documentation devices are supported. Up to two on-board document devices can include color printer, B/W thermal printer, or Blu-ray DVR
  - Refer to the following table for supported devices

Devices Supported	VC30X	VC31	VD10A
TEAC Blu-ray (DVR)	•	•	•
Mitsubishi CP30DW color	•	•	•
Mitsubishi P95 B/W	•	•	
Sony UPD55 A5 format color (DVR and Blu-ray)	•	•	•
Sony UPD25 color (DVR and Blu-ray)	•	•	•
Printer, BW, UPD898MD, Sony			•
Printer, BW, UPD897MD, Sony	•	•	•
HP M451nw color printer	•	•	•
HP M276nw color printer	•	•	•
HP P2035 color printer	•	•	•
Lexmark C544N color printer	•	•	•
Lexmark CS310dn color printer	•	•	•
Lexmark C734DN color printer	•	•	•
HP Universal Printer driver			•

## System Connections Supported

- Network
  - 10-base T Ethernet (RJ-45 Connector)
  - 100-base T Ethernet
  - 1000-base T Ethernet
- Peripherals
  - USB 2.0
  - Please check wireless pre-qualifications for compatibility
- Wireless Network (WLAN 802.11)
  - Supports standard wireless Network: IEEE 802.11 a/b/g/n standards and 802.11X Extensible Authentication Protocol
  - Security: Wireless network security standards: WEP, WPA, WPA2, and wireless encryptions TKIP, AES and PSK
  - Encryption types: 64 and 128 bit
  - Frequency Band: Dual Band, 2.4 GHz and 5 GHz
  - Wireless Adapter: Integrated inside the system (No external bridges)
  - Supports network bandwidth up to 300 Mbps

*Note: Beginning with ACUSON S2000 systems at RM300, the RS232 port is disabled. Legacy functionality that was supported by the RS232 for RM300 systems is now provided by the J5A USB port and adapter cable.*

*ACUSON S2000 system, 1.6 software is only supported on RM200 systems and therefore the RS232 port functionality is enabled for these systems.*

## Siemens Remote Service (SRS) Support

SRS connects your ultrasound system with Siemens' global team of technical and applications experts to provide faster response time and greater system availability. SRS is provided through a secure high-speed network.

## Ultrasound System Security

The ACUSON S2000 system uses the McAfee® Embedded Security solution to protect the system against advanced persistent threats (APT), 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 devices.

Unauthorized software, malware, scripts and Dynamic-Link-Libraries (DLLs) are blocked to maintain system integrity. The system configuration cannot be changed without service authorization. No signature upgrades or file scanning are necessary to provide optimal protection.

The McAfee Embedded Security solution works on- and offline and requires only minimal system resources (less than 25 MB RAM) and does not impact system performance.

## System Dimensions



### System Dimensions

- System height: (upright FPD) 127.5-258.5 cm (50.2-101.5 in)
- Width: 62.3 cm (24.5 in)
- Depth: 110.3 cm (43.4 in)
- Weight: 160 kg (353 lbs); 187 kg (412 lbs) fully configured
- User-select control panel/monitor height adjustment
  - Control panel lowest position: 77.5 cm (30.5 in) from handle
  - Control panel highest position: 93 cm (36.5 in) from handle
  - Monitor lowest position: 130 cm (51.2 in) measured to top of monitor
  - Monitor highest position: 156.7 cm (61.7 in) measured from top of monitor

## 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 1.2 kVA (may vary with configuration)
- Atmospheric pressure range: 700-1060 hPa (525-795 mm Hg) or up to 3050 m (10,000 ft)
- Ambient temperature range (without OEM's): +10 to +40°C (50° to 104°F)
- Humidity: 10-80%, non-condensing
- Maximum heat output: 2400 BTU/hr
- Vibration and shock: Specified in EN IEC 60601-1 and IEC 68-2
- Maximum fan noise: 48-50 dBA
- Input/Output: ethernet RJ45 (10/100/1000 Mbs)
- Output: J5B, J5A, (USB-A); 1 DVI-I Digital Analog (1920x1080P), 2 HDMI O/P (1920x1080P)
- Input: HDMI 1920x1080P
- Input: ECG trigger (BNC-out)
- Video standard
  - HDMI 1.3a, 1920x1080P, Full HD

## Environmental Standards

- Recyclability: ACUSON S Family systems are 99% recyclable. 96% of the mass of the system can be recycled at the end of product life. 3% is recyclable for energy recovery.
- RoHS compliance: The system is fully EU-RoHS compliant, has no lead-containing solder and no materials containing hazardous substances.

## Standards Compliance

The ACUSON S2000 ultrasound system is in compliance with the following standards, including all applicable amendments at the time of product release.

### Quality Standards

FDA QSR 21 CFR Part 820

ISO 13485:2003

### 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 (Class B)
- EN 60601-1-4 and IEC 60601-1-4
- EN 60601-1-6 and IEC 60601-1-6
- 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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