Technical Publication

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Rev. 10

CE 0197

Versana Active™ Basic User Manual

R1.1.x / R1.2.x

Operating Documentation

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Regulatory Requirement

This product complies with regulatory requirements of the following European Directive 93/42/EEC concerning medical devices.

$\mathsf{C}\mathsf{E}_{0197}$

First CE Marked in 2019.

This manual is a reference for the Versana Active. It applies to all versions of the R1.1.x / R1.2.x for the Versana Active ultrasound system.

Revision History

Reason for Change

REV	DATE (YYYY/MM/DD)	REASON FOR CHANGE
Rev. 1	2020/01/03	Initial Release
Rev. 2	2020/03/19	Update Indications for Use
Rev. 3	2020/05/10	Update the Table for Icons and the description for Using 4D
Rev. 4	2020/07/01	Add the description for battery status icons; Update "Compatible Chemicals for Cleaning" section; Add "All Third-Party or Open-Source Software" section
Rev. 5	2020/11/09	Add Brazilian registration number and importer information; Update Brazil telephone number
Rev. 6	2021/04/02	Update Body Pattern graphics Update manual for R1.1.4
Rev. 7	2021/09/20	Update cleaning and disinfection information
Rev. 8	2022/05/10	Add India factory site information
Rev. 9	2022/10/30	Add software R1.2.x information
Rev. 10	2023/01/04	Update typo error R1.0.x to R1.1.x

List of Effective Pages

CHAPTER NUMBER	REVISION NUMBER	CHAPTER NUMBER	REVISION NUMBER
Title Page	Rev. 10	Chapter 9	Rev. 10
Revision History	Rev. 10	Chapter 10	Rev. 10
Regulatory Requirements	Rev. 10	Chapter 11	Rev. 10
Chapter 1	Rev. 10	Chapter 12	Rev. 10
Chapter 2	Rev. 10	Chapter 13	Rev. 10
Chapter 3	Rev. 10	Chapter 14	Rev. 10
Chapter 4	Rev. 10	Chapter 15	Rev. 10
Chapter 5	Rev. 10	Chapter 16	Rev. 10
Chapter 6	Rev. 10	Chapter 17	Rev. 10
Chapter 7	Rev. 10	Chapter 18	Rev. 10
Chapter 8	Rev. 10		

Please verify that you are using the latest revision of this document. Information pertaining to this document is maintained on MyWorkshop/ePDM (GE Electronic Product Data Management). If you need to know the latest revision, contact your distributor, local GE Sales Representative or in the USA call the GE Ultrasound Clinical Answer Center at 1 800 682 5327 or 1 262 524 5698.

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Regulatory Requirements

Conformance Standards

- According to 93/42/EEC Medical Device Directive, this is Class IIa Medical Device.
- According to IEC/EN 60601-1,
    - Equipment is Class I, Type BF or CF Applied Part for probes, DEFIBRILLATION-PROOF Type CF Applied Part for ECG.
- According to CISPR 11,
    - Equipment is Group 1, Class A ISM Equipment.
    - Continuous Operation.
- According to IEC 60529,
    - The footswitch rate IPx8 is suitable for use in surgical rooms.
    - Probe head (immersible portion) and cable are IPX7

        Probe connector is not waterproof.

This product complies with the regulatory requirement of the following:

- Council Directive 93/42/EEC concerning medical devices: the CE label affixed to the product testifies compliance to the Directive.

    The location of the CE marking is shown in Chapter 2 of this manual.

Authorized EU Representative

EC	REP

GE Medical Systems SCS

283 rue de la Minière 78530 BUC, France

Conformance Standards (continued)

- International Electrotechnical Commission (IEC).
  - IEC/EN 60601-1 Medical electrical equipment - Part 1: General requirements for basic safety and essential performance.
  - IEC/EN 60601-1-2 Medical electrical equipment - Part 1-2: General requirements for basic safety and essential performance - Collateral Standard: Electromagnetic disturbances- Requirements and tests.
  - IEC/EN 62366(Usability), EN 1041 (Information supplied with medical devices).
  - IEC/EN 60601-2-37 Medical electrical equipment - Part 2-37: Particular requirements for the basic safety and essential performance of ultrasonic medical diagnostic monitoring equipment.
- International Organization of Standards (ISO)
  - ISO 10993-1 Biological evaluation of medical devices.
- ANSI/AAMI ES60601-1 Medical electrical equipment - Part 1: General requirements for basic safety and essential performance.
- Canadian Standards Association (CSA).
  - CAN/CSA-22.2, NO. 60601-1 Medical electrical equipment - Part 1: General requirements for basic safety and essential performance.
- NEMA/AIUM Acoustic Output Display Standard (NEMA UD3).
- Acoustic Output Measurement Standard for Diagnostic Ultrasound Equipment NEMA UD2.
- Medical Device Good Manufacturing Practice Manual issued by the FDA (Food and Drug Administration, Department of Health, USA).

Certifications

- GE Medical Systems (China) Co., Ltd. is ISO 13485 certified.

Original Documentation

- The original document was written in English.

Country-Specific Approval

- Japan

  MHLW Certificated Number: 301ACBZX00017000

- Brazil

  Registro ANVISA Nº: 80071260409

Importer Information

Table i-1:   Importer

Turkey	Türkiye İthalatçısı / Turkish Importer GE Medical Systems Türkiye Ltd. Şti. Esentepe Mah. Harman Sok. No: 8 34394 Şişli İstanbul Türkiye
Brazil	INFORMAÇÕES DO IMPORTADOR E DISTRIBUIDOR NO BRASIL GE HEALTHCARE DO BRASIL COMÉRCIO E SERVIÇOS PARA EQUIPAMENTOS MEDICOS-HOSPITALARES LTDA. Av. Magalhães de Castro, 4800 – Andar 10 Conj. 101 e 102, Andar 11 Conj. 111 e 112, Andar 12 Conj. 121 e 122, Torre 3 - Cidade Jardim - CEP: 05676-120 - São Paulo/SP – Brasil CNPJ: 00.029.372/0001-40 RESPONSÁVEL TÉCNICO: Karolina Morangoni Torres Registro CREA/SP nº 5069785521

Authorized Representative in Kazakhstan

Authorized representative in Kazakhstan which is responsible for accepting claims is General Electric Kazakhstan LLP.

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Table of Contents

Monitor Display

Chapter 4 — Preparing for an Exam

Beginning an Exam

Chapter 5 — Optimizing the Image

Optimizing B-Mode

Clinical Calculation Accuracy
Anti-Virus Software Note
System Care and Maintenance

Quality Assurance

Privacy and Security

Index

Chapter 1

Introduction

This chapter consists of information concerning indications for use/contraindications, and how this documentation is organized.

Overview

Attention

This manual is for Versana Active.

This manual contains necessary and sufficient information to operate the system safely. Advanced equipment training may be provided by a factory trained Applications Specialist for the agreed-upon time period.

Read and understand all instructions in all manuals supplied with the system before attempting to use the Versana Active system.

Keep this manual with the equipment at all times. Periodically review the procedures for operation and safety precautions.

NOTE: *The Online Help offers a quick way for the user to access the manual.*

Disregarding information on safety is considered abnormal use.

Not all features, products, probes or peripherals described in this document may be available or cleared for sale in all markets. Please contact your local GE Ultrasound representative to get the latest information.

NOTE: *Please note that orders are based on the individually agreed upon specifications and may not contain all features listed in this manual.*

NOTE: *All references to standards / regulations and their revisions are valid for the time of publication of the user manual.*

⚠ CAUTION Safety instructions must be reviewed before operating the unit.

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

NOTE: *The screen graphics in this manual are only for illustrational purposes. Actual screen output may differ with the different software version.*

Documentation

Versana Active documentation consists of various manuals:

- The Basic User Manual (ENGLISH ONLY), and Online Help (TRANSLATED) provides information needed by the user to operate the system safely. It describes the basic functions of the system, safety features, operating modes, measurements/calculations, probes, user care and maintenance.
- The User Guide (TRANSLATED) is a condensed user instruction guide.
- The Release Notes (TRNASLATED) provide precautions and instructions that supplement the Basic User Manual.
- The Advanced Reference Manual (ENGLISH ONLY) contains data tables, such as OB and Acoustic Output tables.
- The Basic Service Manual (ENGLISH ONLY) supplies block diagrams, lists of spare parts, descriptions, adjustment instructions or similar information which help adequately qualified technical personnel in repairing those parts of the instrument which have been defined repairable by the manufacturer.

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

NOTE: *The Electronic Documentation CD includes English and all translations.*

Principles of Operation

Medical ultrasound images are created by computer and digital memory from the transmission and reception of mechanical high-frequency waves applied through a transducer. The mechanical ultrasound waves spread through the body, producing an echo where density changes occur. For example, in the case of human tissue, an echo is created where a signal passes from an adipose tissue (fat) region to a muscular tissue region. The echoes return to the transducer where they are converted back into electrical signals.

These echo signals are highly amplified and processed by several analog and digital circuits having filters with many frequency and time response options, transforming the high-frequency electrical signals into a series of digital image signals which are stored in memory. Once in memory, the image can be displayed in real-time on the image monitor. All signal transmission, reception and processing characteristics are controlled by the main computer. By selection from the system control panel, the user can alter the characteristics and features of the system, allowing a wide range of uses, from obstetrics to peripheral vascular examinations.

Transducers are accurate, solid-state devices, providing multiple image formats. The digital design and use of solid-state components provides highly stable and consistent imaging performance with minimal required maintenance. Sophisticated design with computer control offers a system with extensive features and functions which is user-friendly and easy to use.

Contraindications

The Versana Active ultrasound system is not intended for ophthalmic use or any use causing the acoustic beam to pass through the eye.

Intended Use

The Versana Active is intended for use by qualified and trained healthcare professionals for ultrasound imaging, measurement, display and analysis of the human body and fluid.

Indications for Use

The Versana Active is a general-purpose diagnostic ultrasound system intended for use by qualified and trained healthcare professionals for ultrasound imaging, measurement, display and analysis of the human body and fluid.

Versana Active clinical applications include: Fetal/Obstetrics, Abdominal, Gynecology, Urology, Pediatric, Small Organ (includes breast, testes, thyroid), Neonatal Cephalic, Adult Cephalic, Cardiac (includes Adult and Pediatric), Vascular/Peripheral Vascular, Musculoskeletal Conventional, Musculoskeletal Superficial, Thoracic/Pleural, Transcranial, Transrectal, Transvaginal, Interventional guidance (includes tissue biopsy, fluid drainage, vascular and non-vascular access).

Modes of operation include: B, M, PW Doppler, CW Doppler, Color Doppler, Color M Doppler, Power Doppler, Harmonic Imaging, Coded Pulse, 3D, 4D Imaging mode and Combined modes: B/M, B/Color M, B/PWD or CWD, B/Color/PWD or CWD, B/Power/PWD or CWD.

The device is intended for use in an indoor hospital environment, in medical offices/clinics and other Healthcare facilities.

Frequency of Use

Daily (Typically 8 hours)

Operator Profile

- Qualified and trained physicians or sonographers with at least basic ultrasound knowledge.
- The operator must have read and understood the user manual.

NOTE: *Only qualified and trained healthcare professionals should perform ultrasound scanning on human subjects for medical diagnostic reasons. Request training, if needed.*

Clinical Applications

Specific clinical applications and exam types include:

- Fetal/Obstetrics
- Abdominal
- Gynecology
- Urology
- Pediatric
- Small Organ
- Neonatal Cephalic
- Adult Cephalic
- Cardiac
- Vascular/Peripheral Vascular
- Musculoskeletal Conventional
- Musculoskeletal Superficial
- Thoracic/Pleural
- Transcranial
- Transrectal
- Transvaginal
- Interventional guidance

Image Acquisition is for diagnostic purposes including measurements on acquired image.

⚠ CAUTION   This machine should be used in compliance with law. Some jurisdictions restrict certain uses, such as gender determination.

Prescription Device

℞ ONLY U.S.   CAUTION: Federal law restricts this device to sale by or on the order of a physician.

Contact Information

Contacting GE Ultrasound

For additional information or assistance, please contact your local distributor or the appropriate support resource listed on the following pages:

INTERNET

http://www.gehealthcare.com

http://www3.gehealthcare.com/en/Products/Categories/Ultrasound/Ultrasound_Probes

Clinical Questions

For information in the United States, Canada, Mexico and parts of the Caribbean, call the Customer Answer Center.
TEL: (1) 800-682-5327 or (1) 262-524-5698

In other locations, contact your local Applications, Sales, or Service Representative.

Service Questions

For service in the United States, call GE CARES.

TEL: (1) 800-437-1171

In other locations, contact your local Service Representative.

Information Requests

To request technical product information in the United States, call GE.

TEL: (1) 800-643-6439

In other locations, contact your local Applications, Sales, or Service Representative.

Placing an Order

To order accessories, supplies, or service parts in the United States, call the GE Technologies Contact Center.

TEL: (1) 800-558-5102

In other locations, contact your local Applications, Sales, or Service Representative.

Contacting GE Ultrasound (continued)

Table 1-1:   Americas

ARGENTINA	GE Healthcare Argentina Nicolas de Vedia 3616 piso 5 Buenos Aires - 1307	TEL: (+54) 11-5298-2200
BRAZIL	**GE HEALTHCARE DO BRASIL COMÉRCIO E SERVIÇOS PARA EQUIPAMENTOS MEDICOS-HOSPITALARES LTDA.** Av. Magalhães de Castro, 4800 – Andar 10 Conj. 101 e 102, Andar 11 Conj. 111 e 112, Andar 12 Conj. 121 e 122, Torre 3 - Cidade Jardim - CEP: 05676-120 - São Paulo/SP – Brasil **CNPJ:** 00.029.372/0001-40 **RESPONSÁVEL TÉCNICO:** Karolina Morangoni Torres Registro CREA/SP nº 5069785521	TEL: 3004 2525 (Capitals and Metropolitan Regions) 08000 165 799 (Other Locations)
CANADA	GE Ultrasound 9900 Innovation Drive Wauwatosa, WI 53226	TEL: (1) 800-668-0732 Customer Answer Center TEL: (1) 262-524-5698
LATIN & SOUTH AMERICA	GE Ultrasound 9900 Innovation Drive Wauwatosa, WI 53226	TEL: (1) 262-524-5300 Customer Answer Center TEL: (1) 262-524-5698
MEXICO	GE Sistemas Medicos de Mexico S.A. de C.V. Rio Lerma #302, 1º y 2º Pisos Colonia Cuauhtemoc 06500-Mexico, D.F.	TEL: (5) 228-9600 FAX: (5) 211-4631
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Table 1-2:   Asia

ASIA PACIFIC JAPAN	GE Healthcare Asia Pacific 4-7-127, Asahigaoka Hinoshi, Tokyo 191-8503, Japan	TEL: +81 42 585 5111
AUSTRALIA	32 Phillip Street Parramatta 2150 Sydney, Australia	TEL: 1300 722 229
CHINA	GE Healthcare - Asia No. 1, Yongchang North Road Beijing Economic & Technology Development Area Beijing 100176, China	TEL: (8610) 5806 8888 FAX: (8610) 6787 1162 Service: 4008128188 (24h)
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Table 1-3:   Europe (Continued)

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LUXEMBORG	See Belgium.	
NETHERLANDS	GE Healthcare De Wel 18 B, 3871 MV Hoevelaken PO Box 22, 3870 CA Hoevelaken	TEL: (+31) 33 254 1290 FAX: (+31) 33 254 1292
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PORTUGAL	General Electric Portuguesa SA Avenida do Forte 6 - 6A Edifício Ramazzotti 2790-072 CARNAXIDE	TEL: (+351) 21 425 1300 FAX: (+351) 21 425 1343
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Table 1-3:   Europe (Continued)

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UNITED ARAB EMIRATES (UAE)	GE Healthcare Dubai Internet City, Building No. 18 First Floor, Dubai - UAE	TEL: (+971) 4 429 6101 or 4 429 6161 FAX: (+971) 4 429 6201
UNITED KINGDOM	GE Medical Systems Ultrasound Pollards Wood Nightingales Lane Chalfont St Giles Buckinghamshire HP8 4SP	TEL: (+44) 1494 544000 FAX: (+44) 1707 289742
For all other European countries not listed, please contact your local GE distributor or the appropriate support resource listed on www.gehealthcare.com.		

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214028 Jiangsu China

Wipro GE Medical Device Manufacturing Private Limited
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Sadarmangala, Whitefield,
Bangalore, Karnataka, India 560067

Chapter 2

Safety

*Describes the safety and regulatory information
pertinent for operating this ultrasound system.*

Owner Responsibility

Owner requirements

It is the responsibility of the owner to ensure that anyone operating the system reads and understands this section of the manual. However, there is no representation that the act of reading this manual renders the reader qualified to operate, inspect, test, align, calibrate, troubleshoot, repair or modify the system. The owner should make certain that only properly trained, fully-qualified service personnel undertake the installation, maintenance, troubleshooting, calibration and repair of the equipment.

The owner of the ultrasound unit should ensure that only properly trained, fully qualified personnel are authorized to operate the system. Before authorizing anyone to operate the system, it should be verified that the person has read, and fully understands, the operating instructions contained in this manual. It is advisable to maintain a list of authorized operators.

Should the system fail to operate correctly, or if the unit does not respond to the commands described in this manual, the operator should contact the nearest field GE Ultrasound Service Office.

For information about specific requirements and regulations applicable to the use of electronic medical equipment, consult the local, state and federal agencies.

Notice against user modification

Never modify this product, including system components, software, cables, and so on. User modification may cause safety hazards and degradation in system performance. All modification must be done by a GE qualified person.

Bioeffect Disclosure

Bioeffect disclosure

Following are potential risks inherent to technology:

1. During a diagnostic ultrasound examination, high frequency sound penetrates and interacts with tissue in and around the area of anatomy to be imaged. Only a small portion of this sound energy is reflected back to the transducer for use in constructing the image while the remainder is dissipated within the tissue. The interaction of sound energy with tissue at sufficiently high levels can produce biological effects (aka bioeffects) of either a mechanical or thermal nature. Although the generation of bioeffect is intentional with therapeutic ultrasound, it is generally undesired in diagnostic application and may be harmful in some conditions.

2. Cavitation may occur by Ultrasound technology during a diagnostic ultrasound examination. Mechanical Index (MI) is an attempt to indicate the probability that cavitation might occur within the tissue. Always observe the Acoustic Output display for possible effects.

Safety Precautions

Precaution Levels

Icon description

Various levels of safety precautions may be found on the equipment and different levels of concern are identified by one of the following flag words and icons which precede the precautionary statement.

⚠ DANGER — Indicates that a specific hazard is known to exist which through inappropriate conditions or actions will cause:

- Severe or fatal personal injury
- Substantial property damage.

⚠ WARNING — Indicates that a specific hazard is known to exist which through inappropriate conditions or actions may cause:

- Severe personal injury
- Substantial property damage.

⚠ CAUTION — Indicates that a potential hazard may exist which through inappropriate conditions or actions will or can cause:

- Minor injury
- Property damage.

NOTE: *Indicates precautions or recommendations that should be used in the operation of the ultrasound system, specifically:*

- *Maintaining an optimum system environment*
- *Using this Manual*
- *Notes to emphasize or clarify a point.*

Hazard Symbols

Icon Description

Potential hazards are indicated by the following icons:

Table 2-1: Potential Hazards

Icon	Potential Hazard	Usage	Source
	Biological Hazard Describes precautions necessary to prevent the risk of disease transmission or infections. • Patient/user infection due to contaminated equipment.	• Cleaning and care instructions • Sheath and glove guidelines	ISO 7000 No. 0659
	Electrical Hazard Describes precautions necessary to prevent the risk of injury through electric hazards. • Electrical micro-shock to patient, e.g., ventricular	• Probes • ECG,if applicable • Connections to back panel	
	Moving Hazard Describes precautions necessary to prevent the risk of injury through moving or tipping hazard! • Console, accessories or optional storage devices that can fall on patient, user, or others. • Collision with persons or objects may result in injury while maneuvering or during system transport. • Injury to user from moving the console.	• Moving • Using brakes • Transporting	
	Acoustic Output Hazard • Patient injury or tissue damage from ultrasound radiation.	• ALARA, the use of Power Output following the 'as low as reasonably achievable' principle	
	Explosion Hazard Describes precautions necessary to prevent the risk of injury through explosion hazard! • Risk of explosion if used in the presence of flammable anesthetics.	• Flammable anesthetic	
	Fire and Smoke Hazard • Patient/user injury or adverse reaction from fire or smoke. • Patient/user injury from explosion and fire.	• Replacing fuses • Outlet guidelines	

Important Safety Considerations

The following topic headings (Patient Safety, and Equipment and Personnel Safety) are intended to make the equipment user aware of particular hazards associated with the use of this equipment and the extent to which injury can occur if precautions are not observed. Additional precautions may be provided throughout the manual.

⚠ CAUTION   Improper use can result in serious injury. The use of the system outside the described conditions or intended use, and disregarding safety related information is considered abnormal use. The user must be thoroughly familiar with the instructions and potential hazards involving ultrasound examination before attempting to use the device. Training assistance is available from GE if needed.

Disregarding information on safety is considered abnormal use.

⚠ CAUTION   The use of the system outside the described conditions or intended use, and disregarding safety related information is considered as abnormal use. The manufacturer is not liable for damage caused by abnormal use of the device.

Patient Safety

Related Hazards

WARNING   The concerns listed in this section can seriously affect the
safety of patients undergoing a diagnostic ultrasound
examination.

Patient identification

Always include proper identification with all patient data and
verify the accuracy of the patient's name and ID numbers when
entering such data. Make sure correct patient ID is provided on
all recorded data and hard copy prints. Identification errors could
result in an incorrect diagnosis.

The ultrasound system is not meant to be long term storage for
patient data or images. The customers are responsible for the
data on the system and a regular backup is highly
recommended.

It is advisable to back up system data prior to any service
repairs to the hard drive. It is always possible during system
failure and repair to lose patient data. GE will not be held
responsible for the loss of this data.

Diagnostic information

The images and calculations provided by the system are intended for use by competent operators, as a diagnostic tool. They are explicitly not to be regarded as the sole, irrefutable basis for clinical diagnosis. Operators are encouraged to study the literature and reach their own professional conclusions regarding the clinical utility of the system.

The operator should be aware of the product specifications and of the system accuracy and stability limitations. These limitations must be considered before making any decision based on quantitative values. If in doubt, the nearest GE Ultrasound Service Office should be consulted.

Equipment malfunction or incorrect settings can result in measurement errors or failure to detect details within the image. The equipment user must become thoroughly familiar with the equipment operation in order to optimize its performance and recognize possible malfunctions. Applications training is available through the local GE representative. Added confidence in the equipment operation can be gained by establishing a quality assurance program.

⚠️ CAUTION	The system provides calculations (e.g estimated fetal weight) and charts based on published scientific literature. The selection of the appropriate chart and clinical interpretation of calculations and charts is the sole responsibility of the operator. The operator must consider contraindications for the use of a calculation or chart as described in the scientific literature. The diagnosis, decision for further examinations and medical treatment must be performed by qualified personnel following good clinical practice.
⚠️ CAUTION	Be certain to ensure privacy data of patient information.

Mechanical hazards

The use of damaged probes or improper use and manipulation of intracavity probes can result in injury or increased risk of infection. Inspect probes often for sharp, pointed, or rough surface damage that could cause injury or tear protective barriers. Become familiar with all instructions and precautions provided with special purpose probes.

Electrical Hazard

A damaged probe can also increase the risk of electric shock if conductive solutions come in contact with internal live parts. Inspect probes often for cracks or openings in the housing and holes in and around the acoustic lens or other damage that could allow liquid entry. Become familiar with the probe's use and care precautions outlined in *Probes and Biopsy*.

CAUTION

Ultrasound transducers are sensitive instruments which can easily be damaged by rough handling. Take extra care not to drop transducers and avoid contact with sharp or abrasive surfaces. A damaged housing, lens or cable can result in patient injury or serious impairment or operation.

WARNING

Observe probe immersion levels (see Figure 17-13 *on page 17-24*).

Inspect probes for sharp edges or rough surfaces that could injure sensitive tissue.

DO NOT bend or pull the cable forcefully, to avoid mechanical shock or impact to the probe.

Scanner and electrosurgical units

⚠ CAUTION — This equipment provides no special means of protection from high frequency (HF) burns that may result from using an electrosurgical unit (ESU). To reduce the risk of HF burns, avoid contact between the patient and ultrasound transducer or ECG electrodes while operating the ESU. Where contact cannot be avoided, make sure the transducer or ECG electrodes are not located between the ESU active and dispersive electrodes and keep the ESU cables away from the transducer or ECG cables.

ALARA

⚠ CAUTION — Ultrasound can produce harmful effects in tissue and potentially result in patient injury. Always minimize exposure time and keep ultrasound levels low when there is no medical benefit. Use the principle of ALARA (As Low As Reasonably Achievable), increasing output only when needed to obtain diagnostic image quality. Observe the acoustic output display and be familiar with all controls affecting the output level. See the *Bioeffects section* of the *Acoustic Output chapter* in the *Advanced Reference Manual* for more information.

⚠ CAUTION — The operator of the device must sufficiently understand the acoustic output and be able to obtain the related thermal index values. The probe with self-heating in the air cannot be used in transvaginal scanning. Always minimize exposure time to the irradiation and keep ultrasound acoustic output level low for embryos or fetuses.

Training

During each ultrasound examination the user is expected to weigh the medical benefit of the diagnostic information that would be obtained against the risk of potentially harmful effects. Once an optimal image is achieved, the need for increasing acoustic output or prolonging the exposure cannot be justified. It is recommended that all users receive proper training in applications before performing them in a clinical setting. Contact the GE sales representative for training assistance.

Equipment and Personnel Safety

The concerns listed below can seriously affect the safety of equipment and personnel during a diagnostic ultrasound examination.

Related Hazards

⚠️ WARNING	This equipment contains dangerous voltages that are capable of serious injury or death.

If any defects are observed or malfunctions occur, stop operating the equipment and perform the proper action for the patient. Inform a qualified service person and contact a Service Representative for information.

There are no user replaceable or serviceable components inside the console. Refer all servicing to GE qualified service personnel only.

Ensure that unauthorized personnel do not tamper with the unit.

Electrical Hazard

To avoid injury:

- Do not remove protective covers. No user serviceable parts are inside. Refer servicing to qualified service personnel.
- To assure adequate grounding, connect the attachment plug to a reliable (hospital grade) grounding outlet (having equalization conductor ⏚).
- Never use any adaptor or converter of a three-prong-to-two-prong type to connect with a mains power plug. The protective earth connection will loosen.
- Do not place liquids on or above the console. Spilled liquid may contact live parts and increase the risk of shock.

Related Hazards (continued)

⚠	CAUTION	Servicing must be performed by GE qualified service personnel.
⚠	WARNING	The internal circuits of the unit use high voltages, capable of causing serious injury or death by electrical shock.
⚠	WARNING	To avoid risk of electric shock, this equipment must only be connected to a supply mains with protective earth.
🔥	Smoke & Fire Hazard	The system must be supplied from an adequately rated electrical circuit. The capacity of the supply circuit must be as specified.
⚠	WARNING	Only approved and recommended peripherals and accessories should be used. All peripherals and accessories must be securely mounted to the Versana Active.

Related Hazards (continued)

⚠️ WARNING   The Versana Active is not intended to be used as a data storage device; backup of the Patient and Image Database is your institution's responsibility. GE is NOT responsible for any lost patient information or for lost images.

⚠️ Explosion Hazard   Risk of explosion if used in the presence of flammable anesthetics.

⚠️ Explosion Hazard   Never operate the equipment in the presence of flammable or explosive liquids, vapors or gases. Malfunctions in the unit, or sparks generated by fan motors, can electrically ignite these substances. Operators should be aware of the following points to prevent such explosion hazards.

- If flammable substances are detected in the environment, do not plug in or turn on the system.
- If flammable substances are detected after the system has been turned on, do not attempt to turn off the unit, or to unplug it.
- If flammable substances are detected, evacuate and ventilate the area before turning off the unit.

⚠️ CAUTION   Do not use this equipment if a safety problem is known to exist. Have the unit repaired and performance verified by qualified service personnel before returning to use.

Related Hazards (continued)

Biological Hazard

For patient and personnel safety, be aware of biological hazards while performing invasive procedures. To avoid the risk of disease transmission:

- Use protective barriers (gloves and probe sheaths) whenever possible. Follow sterile procedures when appropriate.
- Thoroughly clean probes and reusable accessories after each patient examination and disinfect as required. Refer to *Probes and Biopsy* for probe use and care instructions.
- Follow all infection control policies established by your office, department or institution as they apply to personnel and equipment.

CAUTION

Contact with natural rubber latex may cause a severe anaphylactic reaction in persons sensitive to the natural latex protein. Sensitive users and patients must avoid contact with these items. Refer to package labeling to determine latex content and FDA's March 29, 1991 Medical Alert on latex products.

CAUTION

To avoid injury or system damage, NEVER place any object or liquid on the operator panel.

CAUTION

Archived data is managed at the individual sites. Performing data backup (to any device) is recommended.

CAUTION

- Make sure to verify the media after writing of data, such as EZBackup, SaveAs or Export.
- Before deleting a patient or image from the patient screen, make sure you have saved the data by EZBackup/Backup or Export and verify that the media transfer of data was successful.

Related Hazards (continued)

⚠ CAUTION
Do not unpack the Versana Active. This must be performed by qualified service personnel only.

⚠ CAUTION
To avoid skin burns in surgical use, do not place ECG electrodes in the current path between the Electrosurgical Unit (ESU) active and dispersive electrodes. Keep ESU cables away from ECG leads.

⚠ CAUTION
DO NOT touch the patient and any of the connectors on the ultrasound unit simultaneously, including ultrasound probe connectors.

DO NOT touch the conducting parts of the USB, Ethernet, Video, Audio cables when connecting equipment to the unit.

⚠ CAUTION
To minimize accidental loss of data, perform EZBackup and Backup on a regular basis.

1. First, perform EZBackup to save the images.
2. Next, perform Backup at Utility -> System ->Backup/ Restore. Enable the following checkboxes under Backup:

   • Patient Archive
   • Report Archive
   • User defined configuration
   • Service

⚠ CAUTION
DO NOT load non-system software on the system computer.

Related Hazards (Monitor)

CAUTION

- **DO NOT** place a finger, hand or any object on the joint of the monitor to avoid injury when moving the monitor.
- To avoid result of injury or system damage, **NEVER** place any object or liquid on the monitor, whether in the home or flip down/transport position.
- **DO NOT** scratch or press on the panel with any sharp objects, such as a pencil or pen, as this may result in damage to the panel.
- The monitor screen may have defective pixels. These pixels may appear as a slightly light or dark area on the screen. This is due to the characteristics of the panel itself, and not the product.
- The backlight of the monitor panel has a fixed life span. When the screen becomes dark or begins to flicker, contact a qualified Service Representative for information.
- There is a pinch point on the monitor. Take care to avoid injuring hands or fingers when flipping down the monitor.
- Avoid injuring hands or fingers when adjusting the LCD monitor.

Material Safe Data

Rubber part

Material: Silicon

Where Used: Handle Screw Cap/Monitor Rubber

Allergic reactions to latex-containing medical devices

⚠ CAUTION   Due to reports of severe allergic reactions to medical devices containing latex (natural rubber), the FDA advises health-care professionals to identify latex-sensitive patients, and be prepared to treat allergic reactions promptly. Latex is a component of many medical devices, including surgical and examination gloves, catheters, incubation tubes, anesthesia masks and dental dams. Patient reaction to latex has ranged from contact urticaria, to systemic anaphylaxis.

For more details regarding allergic reaction to latex, refer to FDA Medical Alert MDA91-1, March 29.

Use of ECG

⚠ CAUTION   Do not use the Versana Active Ultrasound system ECG wave for diagnostic and monitoring.

Electrical safety

Device classifications

The ultrasound unit is a Class I device, type BF, type CF, according to IEC 60601-1.

Internally connected peripheral devices

The system, together with peripheral devices, such as video printer, meets IEC 60601-1 standards for electrical isolation and safety. These standards are applicable only when the specified peripheral devices are plugged into the AC outlets provided on the unit.

External Connection of other peripheral devices

⚠ CAUTION

External devices can be used only if CE marked and in compliance with related standards (EN 60601-1 or EN 60950). Conformance to EN 60601-1 must be verified.

Accessory equipment connected to the analog and digital interfaces must be certified according to the respective IEC standards (e.g. IEC 60950 for data processing equipment and IEC 60601-1 for medical equipment). Furthermore all complete configurations shall comply with the valid version of the system standard IEC 60601-1. Anybody connecting additional equipment to the signal input part or signal output part of the ultrasound unit configures a medical system, and is therefore responsible that the system complies with the requirements of the valid version of IEC 60601-1. If in doubt consult the technical service department or your local GE representative.

Other external devices, such as printers, and external monitors, usually exceed allowable leakage limits and, when plugged into separate AC outlets that are then connected to the unit, are in violation of patient safety standards. Suitable electrical isolation of such external AC outlets may be required in order to meet UL60601-1 and IEC 60601-1 standards for electrical leakage.

EMC (Electromagnetic Compatibility)

> *NOTE:* *This equipment generates, uses and can radiate radio frequency energy. The equipment may cause radio frequency interference to other medical and non-medical devices and radio communications.This product complies with emissions limits for a Group 1, Class A Medical Devices Directive as stated in EN 60601-1-2. However, there is no guarantee that interference will not occur in a particular installation.*

> *NOTE:* *If this equipment is found to cause interference (which may be determined by turning the equipment on and off), the user (or qualified service personnel) should attempt to correct the problem by one or more of the following measure(s):*

> - *reorient or relocate the affected device(s)*
> - *increase the separation between the equipment and the affected device*
> - *power the equipment from a source different from that of the affected device*
> - *consult the point of purchase or service representative for further suggestions.*

> *NOTE:* *The manufacturer is not responsible for any interference caused by using other than recommended interconnect cables or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the users' authority to operate the equipment.*

> *NOTE:* *To comply with the regulations on electromagnetic interference for a Class A FCC Device, all interconnect cables to peripheral devices must be shielded and properly grounded. Use of cables not properly shielded and grounded may result in the equipment causing radio frequency interference in violation of the FCC regulations.*

EMC (Electromagnetic Compatibility) (continued)

NOTE: *Do not use devices which intentionally transmit RF Signals (cellular phones, transceivers, or radio controlled products) other than those supplied by GE (wireless microphone, broadband over power lines, for example) in the vicinity of the equipment as it may cause performance outside the published specifications. Keep the power to these type devices turned off when near this equipment.*

The medical staff in charge of this equipment is required to instruct technicians, patients, and other people who maybe around this equipment to fully comply with the above requirement.

All types of electronic equipment may characteristically cause electromagnetic interference with other equipment, either transmitted through air or connecting cables. The term EMC (Electromagnetic Compatibility) indicates the capability of equipment to curb electromagnetic influence from other equipment and at the same time not affect other equipment with similar electromagnetic radiation from itself.

Proper installation following the service manual is required in order to achieve the full EMC performance of the product.

The product must be installed as stipulated in 'Notice upon Installation of Product' on *page 2-23*.

In case of issues related to EMC, please call your service personnel.

The manufacturer is not responsible for any interference caused by using other than recommended interconnect cables or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the users' authority to operate the equipment.

⚠ WARNING   Portable RF communications equipment (including peripherals such as antenna cables and external antennas) should be used no closer than 30 cm (12 inches) to any part of the Versana Active, including cables specified by the manufacturer. Otherwise, degradation of the performance of this equipment could result.

Cable Specification

Table 2-2:   Cable specification list

Number	Name	Cable Length	Cable Shielded
1	Power supply cord for adapter/CART/EMI filter	<3m	Unshielded
2	EMI filter output cord	<3m	Unshielded
3	4C-RS probe	<3m	Shielded
4	L6-12-RS probe	<3m	Shielded
5	3Sc-RS probe	<3m	Shielded
6	E8C-RS probe	<3m	Shielded
7	8C-RS probe	<3m	Shielded
8	6S-RS probe	<3m	Shielded
9	L8-18i-RS probe	< 3m	Shielded
10	E8Cs-RS probe	< 3m	Shielded
11	12S-RS probe	< 3m	Shielded
12	12L-RS probe	< 3m	Shielded
13	9L-RS probe	< 3m	Shielded
14	LK760-RS probe	< 3m	Shielded
15	RAB2-6-RS probe	< 3m	Shielded
16	HDMI cable	<3m	Shielded
17	Ethernet cable	<3m	Shielded/Unshielded
18	ECG USB cable & ECG patient cable	>3m	Shielded
19	Footswitch MKF 2-MED USB GP26 transmission cable	<3m	Shielded
20	Footswitch FSU-1000 transmission cable	<3m	Shielded
21	Western Digital 1TB mobile HDD 4317B, transmission cable	<3m	Shielded
22	Transcend TS8XDVDS-K DVDRW kit transmission cable	<3m	Shielded
23	Netgear wireless adapter A6210 transmission cable	<3m	Shielded
24	SONY UPD25 Color Printer transmission line	<3m	Shielded
25	SONY UP-D898MD Printer transmission line	<3m	Shielded
26	SONY UP-D898DC Printer transmission line	<3m	Shielded

Table 2-2:   Cable specification list

Number	Name	Cable Length	Cable Shielded
27	OfficeJet 200 Mobile Printer transmission line	<3m	Shielded
28	Printer USB isolator transmission line	<3m	Shielded
29	Video adapter HDMI input transmission line	<3m	Shielded
30	Video adapter S-video output transmission line	3m	Shielded
31	Video adapter CVBS output transmission line	3m	Shielded
32	Battery Charger DC input cord	<3m	Shielded
33	Battery Charger DC output cord	<3m	Shielded

Notice upon Installation of Product

Separation distance and effect from fixed radio communications equipment: field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast, and TV broadcast transmitter cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the ultrasound system is used exceeds the applicable RF compliance level as stated in the immunity declaration, the ultrasound system should be observed to verify normal operation. If abnormal operation is observed, additional measures may be necessary, such as re-orienting or relocating the ultrasound system or using an RF shielded examination room may be necessary.

1. Use either power supply cords provided by GE or ones designated by GE. Products equipped with a power source plug should be plugged into the fixed power socket which has the protective grounding conductor. Never use any adaptor or converter to connect with a power source plug (e.g. three-prong-to-two-prong converter).

2. Locate the equipment as far away as possible from other electronic equipment.

3. Be sure to use only the cables provided by or designated by GE. Connect these cables following the installation procedures (e.g. wire power cables separately from signal cables).

4. Lay out the main equipment and other peripherals following the installation procedures described in the service manuals and peripherals manufacture's manuals.

General Notice

1. Designation of Peripheral Equipment Connectable to This Product.

   The equipment indicated in the Supplies/Accessories section can be hooked up to the product without compromising its EMC performance.

   Avoid using equipment not designated in the list. Failure to comply with this instruction may result in poor EMC performance of the product.

2. Notice against User Modification

   The user should never modify this product. User modifications may cause degradation in EMC performance.

   Modification of the product includes changes in:

   a. Cables (length, material, wiring, etc.)

   b. System installation/layout

   c. System configuration/components

   d. Securing system parts (cover open/close, cover screwing)

3. Operate the system with all covers closed. If a cover is opened for some reason, be sure to shut it before starting/resuming operation.

4. Operating the system with any cover open may affect EMC performance.

Peripheral Update for EC countries

The following is intended to provide the users in EC countries with updated information concerning the connection of the Versana Active to image recording and other devices or communication networks.

Peripherals used in the patient environment

The Versana Active has been verified for overall safety, compatibility and compliance with the image recording devices listed in Supplies/Accessories section.

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

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

Accessory equipment connected to the analog and digital interfaces must be certified according to the respective IEC standards (i.e., IEC60950 for data processing equipment and IEC60601-1 for medical equipment). Furthermore, all complete configurations shall comply with the valid version of the system standard IEC60601-1. Everyone who connects additional equipment to the signal input part or signal output part of the Versana Active system configures a medical system, and is therefore responsible to ensure that the system complies with the requirement of the valid version of IEC60601-1. If in doubt, consult the technical service department or your local GE representative.

Peripherals used in the patient environment (continued)

General precautions for installing an alternate on-board device would include:

1. The added device(s) must have appropriate safety standard conformance and CE Marking.

2. The total power consumption of the added devices, which connect to the Versana Active and are used simultaneously, must be less than or equal to the rated supply of the Versana Active.

3. There must be adequate heat dissipation and ventilation to prevent overheating of the device.

4. There must be adequate mechanical mounting of the device and stability of the combination.

5. Risk and leakage current of the combination must comply with IEC/EN 60601-1.

6. Electromagnetic emissions and immunity of the combination must conform to IEC/EN 60601-1-2.

General precautions for installing an alternate on-board device would include:

1. The added device(s) must have appropriate safety standard conformance and CE Marking.

2. The added device(s) must be used for their intended purpose having a compatible interface.

3. Signal or mains isolation devices and additional protective earth may be needed to assure compliance with IEC/EN 60601-1.

⚠ CAUTION The connection of equipment or transmission networks other than as specified in the user instructions can result in an electric shock hazard or equipment malfunction. Substitute or alternate equipment and connections requires verification of compatibility and conformity to IEC/EN 60601-1 by the installer. Equipment modifications and possible resulting malfunctions and electromagnetic interference are the responsibility of the owner.

Peripheral used in the non-patient environment

The Versana Active has also been verified for compatibility, and compliance for connection to a USB HDD/USB memory via the system USB port, provided the USB HDD/USB memory are IEC/EN 60950 compliant.

Interference caution

Intended healthcare environments: Professional healthcare facility environment

⚠ CAUTION   Use of devices that transmit radio waves near the unit could cause it to malfunction.

Devices which intrinsically transmit radio waves, such as cellular phones, radio transceivers, mobile radio transmitters, radio-controlled toys, etc., should preferably not be operated near the unit. See page 2-32 about the recommended minimum separation distances between portable and mobile RF communications equipment and the ultrasound unit.

Medical staff in charge of the unit are required to instruct technicians, patients, and other people who may be around the unit to fully comply with the above recommendations.

Any electrical device can unintentionally emit electromagnetic waves. However, minimum device separation distances cannot be calculated for such unspecified radiation. When the ultrasound unit is used adjacent to or in close proximity to other equipment the user should be attentive to unexpected device behavior which may be caused by such radiation.

The ultrasound unit is intended for use in the electromagnetic environment specified in the tables below.

The user of the ultrasound unit should ensure that the device is used in such an environment.

NOTE: *The EMISSIONS characteristics of this equipment make it suitable for use in industrial areas and hospitals (CISPR 11 class A). If it is used in a residential environment (for which CISPR 11 class B is normally required) this equipment might not offer adequate protection to radio-frequency communication services. The user might need to take mitigation measures, such as relocating or re-orienting the equipment.*

Interference caution (continued)

⚠ WARNING   Use of this equipment adjacent to or stacked with other equipment should be avoided because it could result in improper operation. If such use is necessary, this equipment and the other equipment should be observed to verify that they are operating normally.

⚠ WARNING   Use of accessories, transducers and cables other than those specified or provided by the manufacturer of this equipment could result in increased electromagnetic emissions or decreased electromagnetic immunity of this equipment and result in improper operation.

Declaration of Emissions

This system is suitable for use in the following environment. The user must assure that it is used only in the electromagnetic environment as specified.

Table 2-3:   Declaration of Emissions

Guidance and manufacturer's declaration - electromagnetic emissions		
The system is intended for use in the electromagnetic environment specified below. The user of the system should assure that it is used in such an environment.		
Emission Type	**Compliance**	**Electromagnetic Environment**
RF Emissions CISPR 11	Group 1	This system uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF Emissions CISPR 11	Class A	This system is suitable for use in all establishments, other than domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes. It provides the following warning is heeded: WARNING: This system is intended for use by healthcare professionals only. This system may cause radio interference or may disrupt the operation of nearby equipment. It may be necessary to take mitigation measures, such as re-orienting or relocating the system or shielding the location.
Harmonic Emissions IEC 61000-3-2	Class A	
Voltage Fluctuations/Flicker Emissions IEC 61000-3-3	Complies	

Declaration of Immunity

This system is suitable for use in the following environment. The user must assure that the system is used according to the specified guidance and only in the electromagnetic environment listed.

Table 2-4:   Electromagnetic Immunity

Phenomenon	Basic EMC Standard or Test Method	Regulatory Acceptable Level	EMC Environment and Guidance
Electrostatic discharge	IEC 61000-4-2	± 8 kV contact ± 2 kV, ± 4 kV, ± 8 kV, ± 15 kV air	Floors should be wood, concrete, or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%. Mains power quality should be that of a typical commercial and/or hospital environment. If the user requires continued operation during power mains interruptions, it is recommended that the system be powered from a UPS or a battery. NOTE: U_T is the a.c. mains voltage prior to application of the test level. Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial and/or hospital environment. Separation distance to radio communication equipment must be maintained according to the method below. Interference may occur in the vicinity of equipment marked with the symbol:
Radiated RF EM fields	IEC 61000-4-3	3 V/m 80 MH - 2.7GHz 80%AM at 1kHz	
Proximity fields from RF wireless communications equipment	IEC 61000-4-3	See the RF wireless communication equipment table in "Recommended minimum separation distances".	
Rated power frequency magnetic fields	IEC 61000-4-8	30 A/m 50 Hz or 60 Hz	
Electric fast transients bursts	IEC 61000-4-4	Power supply Port : ± 2 kV, 100 kHz repetition frequency; Signal input/output parts Port: ± 1 kV, 100 kHz repetition frequency	
Surges	IEC 61000-4-5	Line to line: ±0.5 kV, ±1 kV Line to earth: ±0.5 kV, ±1 kV, ±2 kV	
Conducted disturbances induced by RF fields	IEC 61000-4-6	3 V in 0.15 MHz - 80 MHz 6 V in ISM and/or amateur radio bands between 0.15 MHz and 80 MHz 80 % AM at 1kHz	Image degradation or interference may occur due to conducted RF noise on the equipment mains power supply or other signal cable. Such interference is easily recognized and distinguishable from patient anatomy and physiological waveforms. Interference of this type may delay the examination without affecting diagnostic accuracy. Additional mains/signal RF isolation or filtering may be needed if this type interference occurs frequently.
Voltage dips	IEC 61000-4-11	0% U_T: 0.5 cycle at 0°, 45°, 90°, 135°, 180°, 225°, 270°, and 315° 0% U_T: 1 cycle and 70% U_T: 25/30 cycles sine phase at 0°	
Voltage interruptions	IEC 61000-4-11	0% U_T: 250/300 cycle	
NOTE: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people. If noise generated from other electronic equipment is near the probe's center frequency, noise may appear on the image. Good power line isolation is required.			

Minimum distances

Recommended separation distances between portable and mobile RF communications equipment and the ultrasound unit						
The ultrasound unit is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the ultrasound unit can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the ultrasound unit as recommended below, according to the maximum output power of the communications equipment. Portable and mobile radio communications equipment (e.g. two-way radio, cellular/cordless telephones and similar equipment) should be used no closer to any part of this system, including cables, than determined according to the following method:						
Test fre-quency (MHz)	Band (MHz)	Service	Modulation	Maximum power (W)	Distance (m)	Immunity test level (V/m)
385	380 - 390	TETRA 400	Pulse modulation 18Hz	1.8	0.3	27
450	430 -470	GMRS 460 FRS 460	FM ±5 kHz deviation 1 kHz sine	2	0.3	28
710	704 - 787	LTE Band 13, 17	Pulse modulation 217 Hz	0.2	0.3	9
745						
780						
810	800 - 960	GSM 800/900, tetra 800, iDEN 820, CDMA 850, LTE Band 5	Pulse modulation 18 Hz	2	0.3	28
870						
930						
1720	1700 - 1990	GSM 1800, CDMA 1900, GSM 1900, DECT, LTE Band 1, 3, 4, 25, UMTS	Pulse modulation 217 Hz	2	0.3	28
1845						
1970						
2450	2400 - 2570	Bluetooth, WLAN, 802.11 b/g/n, RFID 2450, LTE Band 7	Pulse modulation 217 Hz	2	0.3	28
5240	5100 - 5800	WLAN, 802.11 a/n,	Pulse modulation 217 Hz	0.2	0.3	9
5500						
5785						

Recommended separation distances between portable and mobile RF communications equipment and the ultrasound unit
For transmitters rated at a maximum output power not listed above the recommended separation distance d in metres (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer. NOTE 1: At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies. NOTE 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

Wireless Adapter Specification

Table 2-5:   Wireless Adapter specification

Received frequency (GHz)	Emission frequency (GHz)	Modulation Type	Effective radiation frequency
2.412	2.412	OFDM	<=100mW
2.417	2.417		
2.422	2.422		
2.427	2.427		
2.432	2.432		
2.437	2.437		
2.442	2.442		
2.447	2.447		
2.452	2.452		
2.457	2.457		
2.462	2.462		

Bluetooth Specification

- Frequency Range: 2402 - 2483.5 MHz
- Maximum Output Power: 5 dBm
- Data Transmission Rate: 3 M/s (20 meters on the PC to PC)
- Modulation Type: FSK, GFSK

Basic Safety

1. The creepage distances and air clearance should meet the requirements.
2. The protective earth should meet the requirements.
3. The leakage current should meet the requirements.

Essential performance

The essential performance of the ultrasound unit is:

1. The ability to display physiological images as input for diagnosis by trained physician.
2. The ability to display physiological traces as aid for diagnosis by trained physician.
3. The ability to display quantified data as input for diagnosis by trained physician.
4. The display of ultrasound indexes as aid for safe use of the unit.
5. No component failures.
6. No changes in programmable parameters.
7. No reset to factory defaults (manufacturer's presets).
8. No change of operating mode.

Patient Environmental Devices
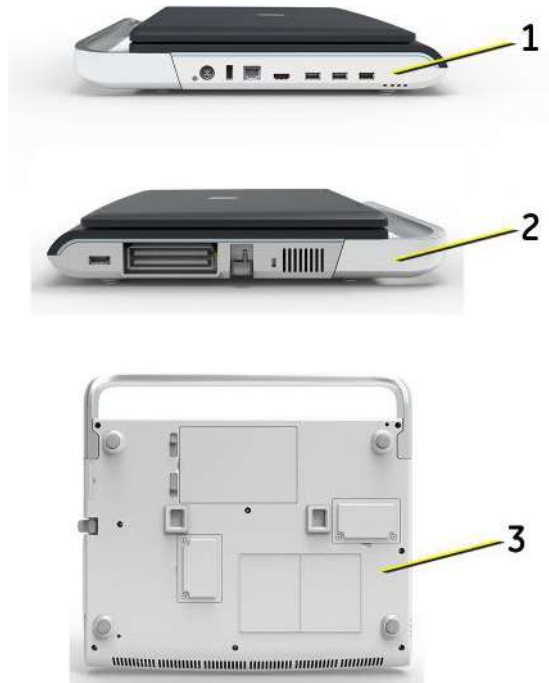
Figure 2-1.   Patient Environmental Devices for Versana Active

1. Left side
    *   Port for DC In (AC Adapter)
    *   1 Network port
    *   2 general USB 2.0 ports
    *   2 general USB 3.0 ports
    *   1 HDMI port

2. Right side
    *   1 Probe port
    *   1 Security Lock
    *   1 Probe Connector Locking Lever
    *   1 4D port (only for Versana Active R1.1.x, R1.2.x)

3. Rear panel

    *   1 Lithium-ion battery port
    *   1 CWD option port
    *   1 SSD option port

Acceptable Devices

The Patient Environmental devices shown on the previous page are specified to be suitable for use within the PATIENT ENVIRONMENT.

⚠ CAUTION   DO NOT connect any probes or accessories without approval by GE within the PATIENT ENVIRONMENT.

See 'Supplies/Accessories' on *page 18-26 for more information.*

Unapproved Devices

⚠ CAUTION   DO NOT use unapproved devices.

If devices are connected without the approval of GE, the warranty will be INVALID.

Any device connected to the Versana Active must conform to the requirements for IEC or equivalent standards appropriate to devices.

Accessories, Options, Supplies

⚠ CAUTION   Unsafe operation or malfunction may result. Use only the accessories, options and supplies approved or recommended in these instructions for use.

Acoustic Output

⚠️ CAUTION | Allowing the machine to transmit acoustic output with the probe not in use (or in its holder) can cause the transducer to build up heat. Always lower the acoustic power or freeze the image when not in use.

When the 'Auto Freeze' preset is selected on the Utility -> System ->System Imaging screen, the system auto freezes if it detects no change in the image.

Located on the upper right section of the system display monitor, the acoustic output display provides the operator with real-time indication of acoustic levels being generated by the system. See the *Acoustic Output chapter* in the *Advanced Reference Manual* for more information. This display is based on NEMA/AIUM Standards for Real-time Display of Thermal and Mechanic Acoustic Output Indices on Diagnostic Ultrasound Equipment.

Acoustic Output Display Specifications

The display consists of three parts: Thermal Index (TI), Mechanical Index (MI), and a relative Acoustic Output (AO) value. Although not part of the NEMA/AIUM standard, the AO value informs the user of where the system is operating within the range of available output.

The TI and MI are displayed at all times. The TI and MI display starts at a value of 0 and increments no more than 0.2.

Always be aware of the acoustic output level by observing the Acoustic Output Display. In addition, become thoroughly familiar with the Acoustic Output Display and equipment controls affecting output.

Thermal Index

Depending on the examination and type of tissue involved, the TI parameter will be one of three types:

- **Soft Tissue Thermal Index (TIS)**. Used when imaging soft tissue only, it provides an estimate of potential temperature increase in soft tissue.

- **Bone Thermal Index (TIB)**. Used when bone is near the focus of the image as in the third trimester OB examination, it provides an estimate of potential temperature increase in the bone or adjacent soft tissue.

- **Cranial Bone Thermal Index (TIC)**. Used when bone is near the skin surface as in transcranial examination, it provides an estimate of potential temperature increase in the bone or adjacent soft tissue.

Acoustic Output Display Specifications (continued)

Mechanical Index

MI recognizes the importance of non-thermal processes, cavitation in particular, and the Index is an attempt to indicate the probability that they might occur within the tissue.

Changing the Thermal Index Type

You can select the displayed TI type on Utility -> Imaging -> B-Mode. This preset is application dependent so each application could specify a different TI type.

TI and MI Display Accuracy

When display MI>= 0.6, TI>= 3.6, the displayed values of MI and IT is not lower than 50% or higher than 150% of the measured value.

When display MI < 0.6, TI < 3.6, the absolute error of MI <= 0.3, the absolute error of TI <= 1.8.

Measurement Precision and Uncertainty

Precision and measurement uncertainty of the system used to measure the acoustic output is provided in the following table. These values are determined in accordance with Section 6.4 of the Standard for Real-Time Display of Thermal and Mechanical Acoustic Output Indices on Diagnostic Ultrasound Equipment, rev 2 AIUM/NEMA 2004, and the Acoustic Output Measurement Standard for Diagnostic Ultrasound Equipment, rev 3 NEMA 2004.

Table 2-6:   Measurement Precision and Uncertainty

	MI	Pr.3 (Pressure)	Ispta.3 (Intesnsity)	W0 (Power)	Fc (Frequency)	dT on phantom	dT in still air
Measurement Uncertainty	13.39%	13.61%	26.60%	26.60%	4.00%	1.0 °C	1.0 °C

Ispta

The Ispta is the Spatial Peak Temporal Average Intensity. The absolute maximum regulatory limit of derated Ispta is 720 mW/cm^2 as set by the FDA 510(k) guidance of September 9, 2008.

Controls Affecting Acoustic Output

The potential for producing mechanical bioeffects (MI) or thermal bioeffects (TI) can be influenced by certain controls.

Direct. The Acoustic Output control has the most significant effect on Acoustic Output.

Indirect. Indirect effects may occur when adjusting controls. Controls that can influence MI and TI are detailed under the Bioeffects portion of each control in the Optimizing the Image sections.

Always observe the Acoustic Output display for possible effects.

Best practices while scanning

HINTS

Raise the Acoustic Output only after attempting image optimization with controls that have no effect on Acoustic Output, such as Gain and TGC.

NOTE: *Refer to the Optimizing the Image sections for a complete discussion of each control.*

WARNING

Be sure to have read and understood control explanations for each mode used before attempting to adjust the Acoustic Output control or any control that can effect Aoustic Output.

Acoustic Output Hazard

Use the minimum necessary acoustic output to get the best diagnostic image or measurement during an examination. Begin the exam with the probe that provides an optimum focal depth and penetration.

Acoustic Output Default Levels

In order to assure that an exam does not start at a high output level, the Versana Active initiates scanning at a reduced default output level. This reduced level is preset programmable and depends upon the exam category and probe selected. It takes effect when the system is powered on or ***Patient*** is selected.

To modify acoustic output, adjust the Power Output level.

Safety statement

GE safety statement

Although no harmful biological effects have been demonstrated for ultrasound frequencies, intensities, or exposure times used in examination with the GE system, GE recommends using the lowest acoustic output settings which will produce diagnostically acceptable information.

General Caution

⚠ CAUTION   Standard maintenance must be performed by authorized service personnel for the lifetime of the product (7 years).

⚠ CAUTION   Proceed cautiously when crossing door or elevator thresholds. Use the handle to push/pull the system, e.g., do not use the monitor. Failure to do so may cause serious injury or system damage.

RoHS Versana Active Hazardous Substances

The following product pollution control information is provided according to SJ/T11364-2014 Marking for Control of Pollution caused by Electronic Information Products.

This symbol indicates the product contains hazardous materials in excess of the limits established by the Chinese standard GB/T 26572 Requirements for Certain restricted Substances in electrical and electronic Products. The number in the symbol is the Environment-friendly Use Period (EFUP), which indicates the period during which the hazardous substances contained in electrical and electronic products will not leak or mutate under normal operating conditions so that the use of such electronic information products will not result in any severe environmental pollution, any bodily injury or damage to any assets. The unit of the period is "Year".

In order to maintain the declared EFUP, the product shall be operated normally according to the instructions and environmental conditions as defined in the product manual, and periodic maintenance schedules specified in Product Maintenance Procedures shall be followed strictly.

Consumables or certain parts may have their own label with an EFUP value less than the product. Periodic replacement of those consumables or parts to maintain the declared EFUP shall be done in accordance with the Product Maintenance Procedures. This product must not be disposed of as unsorted municipal waste, and must be collected separately and handled properly after decommissioning.

Name and Concentration of Hazardous Substances

Table 2-7:   Table of hazardous substances' name and concentration for Versana Active

Component Name	Hazardous substances' name					
	Pb	Hg	Cd	Cr (VI)	PBB	PBDE
LCD Panel	O	O	O	O	O	O
Printed Circuit Board Assemblies	X	O	O	O	O	O
Keyboard Assemblies	X	O	O	O	O	O
Power Assemblies	X	O	O	O	O	O
Battery	O	O	O	O	O	O
Ultrasound Probes	X	O	O	O	O	O

This table is prepared according to SJ/T 11364.
O: Indicates that this hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in GB/T 26572.
X: Indicates that this hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in GB/T 26572.
• Data listed in the table represents best information available at the time of publication.
• Applications of hazardous substances in this medical device are required to achieve its intended clinical uses, and/or to provide better protection to human beings and/or to environment, due to lack of reasonably (economically or technically) available substitutes. For example: Lead is could be used in Printed circuit solder.

Device Labels

Label Icon Description

The following table describes the purpose and location of safety labels and other important information provided on the equipment.

Table 2-8:   Label Icons
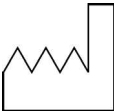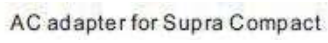
Label/Icon	Purpose/Meaning	Location
Identification and Rating Plate	• Manufacture's name and address	Rating Plate, labels
Identification and Rating Plate	**Date of manufacture:** The date could be a year, year and month, or year, month and day, as appropriate. See ISO 8601 for date formats.	Rating Plate, labels
SN	Serial Number	Rating Plate, labels
REF	Catalog Number	Rating Plate, labels
	Direct Current: For products to be powered from a DC supply	Rating Plate, labels
INPUT	Input	AC adapter
MADE IN CHINA.	Made in China	AC adapter
MODEL	Model	AC adapter
AC adapter for Supra Compact	AC adapter for Supra Compact	AC adapter
NO-LOAD POWER CONSUMPTION	No-Load power consumption	AC adapter

Table 2-8:   Label Icons (Continued)
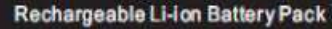
Label/Icon	Purpose/Meaning	Location
AVERAGE ACTIVE EFFICIENCY	Average Active Efficiency	AC adapter
TEST	Test	Battery
Rechargeable Li-ion Battery Pack	Rechargeable Li-ion Battery Pack	Battery
OUTPUT	Output	AC adapter
Type/Class Label	Used to indicate the degree of safety or protection.	
IP Code (IPX8) IPX8: FSU-1000, MKF 2-MED GP26	Indicates the degree of protection provided by the enclosure per IEC60 529.	Bottom of footswitch
EC | REP	Authorized European Representative address.	Bottom panel
R ONLY Rx U.S.	CAUTION: Federal law restricts this device to sale by or on the order of a physician.	Bottom panel
(Type BF symbol)	Type BF Applied Part (man in the box) symbol is in accordance with IEC 60878-02-03.	Beside the probe connector
(Warning triangle)	General Warning.	Various
(Lightning triangle)	"CAUTION" - Dangerous voltage" (the lightning flash with arrowhead) is used to indicate electric shock hazards.	Various
(Power symbol)	Indicates the power on and power off position of the power switch. **CAUTION:** This Power Switch **DOES NOT ISOLATE** Mains Supply.	See the Console Overview section for location information.

Table 2-8:   Label Icons (Continued)

Label/Icon	Purpose/Meaning	Location
	"Protective Earth" indicates the protective earth (grounding) terminal.	Inside Power Box and Console
TÜVRheinland	NRTL Listing and Certification Mark is used to designate conformance to nationally recognized product safety standards. The Mark bears the name and/or logo of the testing laboratory, product category, safety standard to which conformity is assessed and a control number.	Bottom
	Do not use the following devices near this equipment: cellular phone, radio receiver, mobile radio transmitter, radio controlled toy, broadband power lines, etc. Use of these devices near this equipment could cause this equipment to perform outside the published specifications. Keep power to these devices turned off when near this equipment.	Bottom of the system
	Be careful of static	Bottom of the system
	"Consult accompanying documents" is intended to alert the user to refer to the operator manual or other instructions when complete information cannot be provided on the label.	Various
C E 0197	The CE Mark of Conformity indicates this equipment conforms with the Council Directive 93/42/EEC	Various
CISPR 11 / EN 55011 CLASS : A GROUP : 1 CLASSE : A GROUPE : 1	CISPR CAUTION: The Versana Active conforms to the CISPR11, Group 1, Class A of the international standard for Electromagnetic disturbance characteristics.	Bottom of the system

Table 2-8:   Label Icons (Continued)

Label/Icon	Purpose/Meaning	Location
	This symbol indicates that waste electrical and electronic equipment must not be disposed of as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of your equipment.	Bottom and probe connector
Pb/Cd/Hg	The separate collection symbol is affixed to a battery, or its packaging, to advise you that the battery must be recycled or disposed of in accordance with local or country laws. The letters below the separate collection symbol indicate whether certain elements (Pb=Lead,Cd=Cadmium, Hg=Mercury) are contained in the battery. To minimize potential effects on the environment and human health, it is important that all marked batteries that you remove from the product are properly recycled or disposed. For information on how the battery may be safely removed from the device, please consult the service manual or equipment instructions. Information on the potential effects on the environment and human health of the substances used in batteries is available at this url: http://www.gehealthcare.com/euen/weee-recycling/index.html	Battery Pack if contains Pb/Cd/Hg
	This symbol indicates that this electrical and electronic product does not contain any hazardous substances above the maximum concentration value established by the Chinese standard GB/T 26572 , and can be recycled after being discarded, and should not be casually discarded.	

Table 2-8:   Label Icons (Continued)
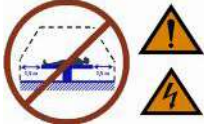
Label/Icon	Purpose/Meaning	Location
	This symbol indicates the product contains hazardous materials in excess of the limits established by the Chinese standard GB/T 26572 Requirements of concentration limits for certain restricted substances in electrical and electronic products. The number in the symbol is the Environment-friendly Use Period (EFUP), which indicates the period during which the hazardous substances contained in electrical and electronic products will not leak or mutate under normal operating conditions so that the use of such electrical and electronic products will not result in any severe environmental pollution, any bodily injury or damage to any assets. The unit of the period is "Year".	Probe and Bottom, China Rating Plate.
	Type CF Defib-Proof Applied Part (heart in the box with paddle) symbol is in accordance with IEC60878-02-06.	ECG module
	When closing the LCD cover, use caution to avoid injuring hands or fingers as there is a closing mechanism which allows the LCD cover to automatically close.	Bottom of the system
	Do not connect the DVD-RW to the system while scanning.	DVD-RW
	GOST symbol: Russia Regulatory Country Clearance.	Rating plate Note: Only after Russian regulatory registration is complete, this label will be located on the console.

Table 2-8:   Label Icons (Continued)
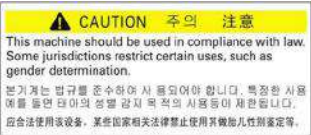
Label/Icon	Purpose/Meaning	Location
Segurança SGS OCP 0040 Compulsório INMETRO	INMETRO Certification: OCP SGS	Rating plate Note: Only after Brazilian regulatory registration is complete, this label will be located on the console.
EAC	"Eurasian Conformity" mark; thesingle conformity mark forcirculation of products on themarkets of member-states ofCustoms Union. This product passed allconformity assessment(approval) procedures thatcorrespond to the requirementsof applicable technicalregulations of the CustomsUnion.	Bottom.
UA.TR.116	Mark of conformity with the Technical Regulations.	This product meets the requirements of the Technical Regulations on medical devices, approved by Resolution No.753 of the Cabinet of Ministers of Ukraine of 2 October 2013. Note: Only after Ukrainian regulatory registration is complete, this label will be located on the console.
⚠ CAUTION 주의 注意 This machine should be used in compliance with law. Some jurisdictions restrict certain uses, such as gender determination. 본 기계는 법규를 준수하여 사 용되어야 합니다. 특정한 사용 예를 들면 태아의 성별 감지 목적의 사용등이 제한됩니다. 应合法使用该设备，某些国家相关法律禁止使用其做胎儿性别鉴定等。	This machine should be used in compliance with law. Some jurisdictions restrict certain uses, such as gender determination.	Bottom of the system Note: For China, Korea and India only
UDI	Every system has a unique marking for identification, the Unique Device Identification (UDI) Label. The UDI label consists of a series of alpha-numeric characters and barcode which uniquely identify the Versana Active system as a medical device manufactured by General Electric. Scan or enter the UDI information into the patient health record as required by country-specific laws.	Rating plate

Table 2-8:   Label Icons (Continued)

Label/Icon	Purpose/Meaning	Location
	Do not put the battery in fire.	Battery Pack
	Do not disassemble or mistreat the battery.	Battery Pack
	The material of battery is environment-friendly. The battery can be recycled after being discarded, and should not be casually discarded.	Batttery Pack
INSTALL	Install	Big Battery Case and Printer/ DVD-RW Shelf
UNINSTALL	Uninstall	Big Battery Case and Printer/ DVD-RW Shelf
	Do not connect or disconnect 4D DP connector to Versana Active while the system is turned on.	Versana Active Advanced Cart
MST: 5920841-X	Symbol indicating that the system software version is R1.2.x, which is compatible with MST 5920841 series.	Bottom of the system

Label Locations

Versana Active warning labels are provided in English.

NOTE: *The labels are on the rear of the system. The label content may be different for different regions. Please refer to the labels on the system for the actual content.*
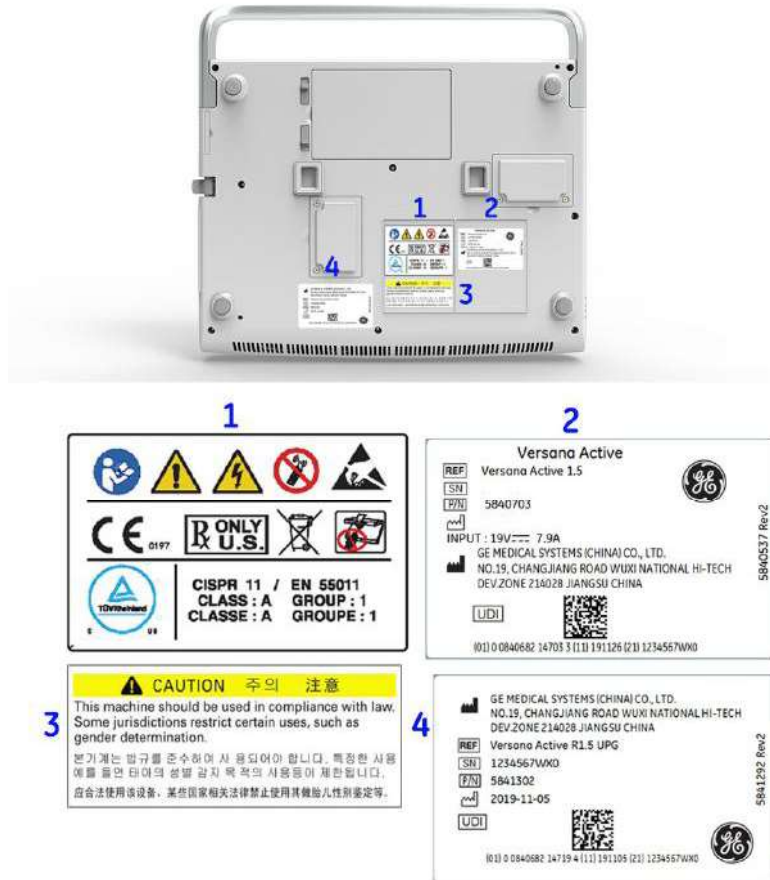
Figure 2-2. Versana Active Rating Plate Label Location

1. Safety label
2. Rating plate
3. Gender warning label (For China, Korea and India only)
4. Upgrade label

   Note: Upgrade label will exist when software version is upgraded from R1.0.x to R1.1.x.

Label Locations (continued)
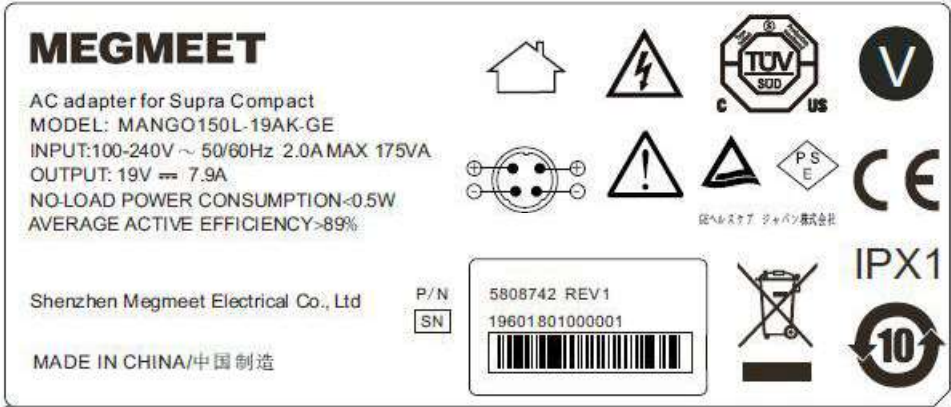
Figure 2-3.   AC Adapter label

Label Locations (continued)

Figure 2-4.   Battery Label

⚠ CAUTION   Do not disassemble or mistreat the battery. Do not put the battery in fire. Replace the battery with the same battery type only. Failure to follow these instructions many present risk of explosion fire or high temperature. See the battery user manual for additional safety instructions.

Probe Label Explanation

The following information appears on all probe labels, regardless of the connector type, except for "IPX7", "CE Mark", and "XDclearTM" which only appears on applicable probes.

NOTE: *The probe label displayed in this manual is only for illustrational purposes. Refer to the actual probe label for the specific information.*
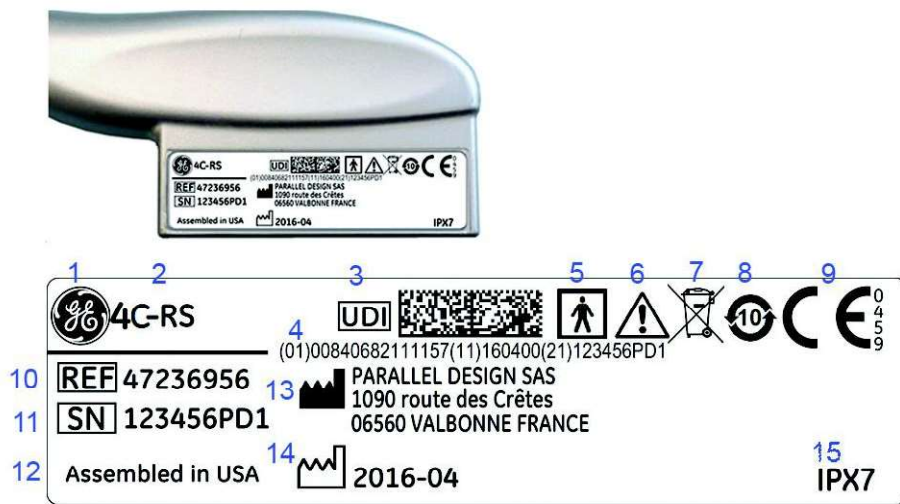
Figure 2-5.   Probe label

1. GE Logo
2. Probe Model (Name)
3. UDI Symbol and Data Matrix
4. UDI Human Readable Label Text: Global Trade Item Number, GTIN, (01), Manufacturing Date (11), Serial Number (21)
5. Type BF/CF Applied Part
6. Caution: Consult the Manual
7. WEEE Waste Symbol
8. Chinese RoHS Hazardous Substance Symbol
9. CE Mark and Notified Body Number
10. REF: Catalog/model number
11. Serial Number
12. Manufacturer's site country of origin
13. Legal Manufacturer's Name and Address
14. Date of Manufacture, as YYYY-MM
15. IP Classification

NOTE: *Non-GE probes will also have a UDI symbol and equivalent information.*

Probe Box Label

> *NOTE:* *The probe box label displayed in this manual is only for illustrational purposes. Refer to the actual probe box label for the specific information.*

Figure 2-6.   Probe box label

UDI Global Trade Item Number (GTIN) Label and Probe Box Barcode Locations
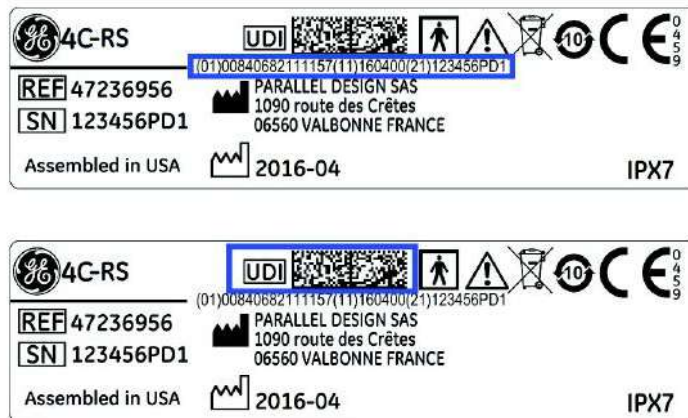
Figure 2-7.   Probe Label UDI GTIN and Barcode Locations

UDI Global Trade Item Number (GTIN) Label and Probe Box Barcode Locations (continued)
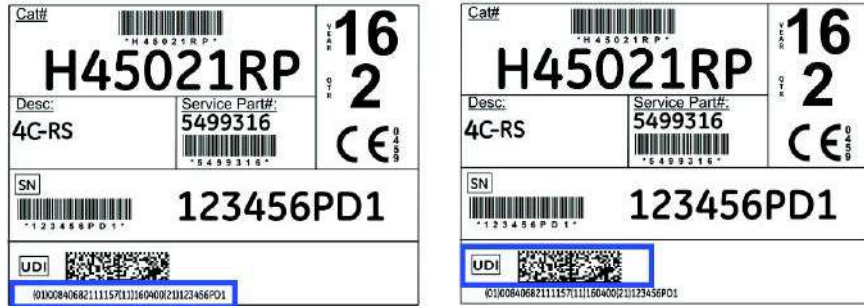
Figure 2-8.　Probe Box Label UDI GTIN and Barcode Locations

Versana Active – Basic User Manual
Direction 5840764-100 English Rev. 10

Chapter 3

Preparing the System for Use

Describes the site requirements, console overview, system positioning/transporting, powering on the system, adjusting the display monitor, probes and operator controls.

Site Requirements

Introduction

Do not attempt to install the system alone. General Electric, Affiliate, or Distributor Field Engineers and Application Specialists will install and setup the system. See 'Contact Information' on *page 1-8 for more information.*

The Versana Active does not contain any operator serviceable internal components. Ensure that unauthorized personnel do not tamper with the unit.

Perform regular preventive maintenance. See 'System Care and Maintenance' on *page 18-6 for more information.*

Maintain a clean environment. Turn off, and if possible, disconnect the system before cleaning the unit. See 'Cleaning and Disinfecting the system' on *page 18-10 for more information.*

Never set liquids on the unit to ensure that liquid does not drip into the control panel or unit.

Before the system arrives

The ultrasound unit must operate within the proper environment and in accordance with the requirements described in this section. Before using the system, ensure that the requirements are met.

Power Requirements

* Mains FUSE in Advanced Cart Power Transformer(optional) appliance inlet: T10AH, 250VP.
* Frequency: 50/60 Hz
* 100V - 240V AC (+/-10%)

Electromagnetic interferences

This medical equipment is approved, in terms of the prevention of radio wave interference, to be used in hospitals, clinics and other institutions which are environmentally qualified. The use of this equipment in an inappropriate environment may cause some electronic interference to radios and televisions around the equipment.

Ensure that the following is provided for the new system:

* Take precautions to ensure that the console is protected from electromagnetic interference.

   Precautions include:
   * Operate the console at least 15 feet away from motors, typewriters, elevators, and other sources of strong electromagnetic radiation.
   * Operation in an enclosed area (wood, plaster or concrete walls, floors and ceilings) helps prevent electromagnetic interference.
   * Special shielding may be required if the console is to be operated in the vicinity of radio broadcast equipment.

CAUTION Do not operate the system in the vicinity of a heat source, of strong electric or magnetic fields (close to a transformer), or near instruments generating high-frequency signals, such as HF surgery. These can adversely affect the ultrasound images.

Environmental Requirements

The system should be operated, stored, or transported within the parameters outlined below. Either its operational environment must be constantly maintained or the unit must be turned off.

NOTE: *You may get an overheating message with regard to fan speed. Ensure adequate system/room ventilation.*

Table 3-1:   System Environmental Requirements

	Operational (Versana Active with probe)	Storage (Versana Active)	Transport (Versana Active)
Temperature	10 - 40° C 50 - 104° F	-5 - 50° C 23 - 122° F	-5 - 50° C 23 - 122° F
Humidity	30 - 80% non-condensing	10 - 90% non-condensing	10 - 90% non-condensing
Pressure	700 - 1060hPa	700 - 1060hPa	700 - 1060hPa

⚠ CAUTION   The system cannot be used in OXYGEN rich environment.

⚠ CAUTION   Ensure that the probe face temperature does not exceed the normal operation temperature range.

Operating Environment

Ensure that there is sufficient air flow around the ultrasound unit when installed in a fixed location.

⚠ CAUTION   Do not cover the ventilation holes of the Versana Active.

⚠ CAUTION   The Versana Active system and probe connector are not waterproof. Do not expose the device to water or any kind of liquid.

Console Overview

Console Graphics

The following are illustrations of the console:

Figure 3-1.   Versana Active System - an example

1. Handle
2. LCD monitor
3. Primary Menu keys
4. Alphanumeric keys
5. Control Panel

NOTE: *The console graphics in this manual are only for illustrational purposes. Refer to the system for actual appearance.*

Battery

> NOTE: *Battery in this section only refers to the battery pack applicable for Versana Active system. For Versana Active Advanced Cart Battery (optional), please refer to Versana Active Advanced Cart Battery User Instruction for detailed descriptions.*

The lithium ion battery provides power when an AC power source is not available. A battery in the battery bay is standard for the Versana Active. Lithium ion batteries last longer than conventional batteries and do not require replacement as often. You can expect minimum 50 minutes of battery life with a single fully charged battery in use to supply power to the system.

> NOTE: *While scanning with the battery supplying power only, the battery life may be shorter. Always archive the data and keep your attention on the battery status. When the battery power is low, charge the battery immediately in case that scanning will be interrupted and the data will be lost due to the automatic shutdown of the system.*

The lithium ion technology used in your system's battery is significantly less hazardous to the environment than the lithium metal technology used in some other batteries (such as watch batteries). Used batteries should not be placed with common household waste products. Contact local authorities for the location of a chemical waste collection program nearest you.

> NOTE: *The battery is designed to work with Versana Active systems only. Only use the batteries authorized by GE.*

Temperature Requirements

The battery should be charged, discharged and stored within the parameters outlined below:

- Operating temperature:
  - Charge: 10 - 30°C (50 - 86°F).
  - Discharge: 10 - 40°C (50 - 104°F)

⚠️ CAUTION DO NOT disconnect the system power cord from the AC outlet when the environmental temperature is below 10°C (50°F) or above 30°C (86°F). The battery may not charge properly if the environmental temperature is below 10°C (50°F) or above 30°C(86°F) which may disrupt the power supplied to the system.

- Storage temperature:
  - Storage time < 3 months: -20 - 40°C (-4 - 104°F)
  - Storage time >= 3 months: -20 - 20°C (-4 - 68°F)

Battery (continued)

WARNING
Do not expose the battery to temperature over 60°C (140°F). Keep it away from fire and other heat sources.

WARNING
- The battery is a safety device. Do not disassemble or alter the battery.
- Do not short-circuit the battery by directly connecting the negative terminals with metal objects.
- Do not heat the battery or discard it in a fire.
- Do not charge the battery near a heat source, such as a fire or heater.
- Do not leave the battery in direct sunlight.
- Do not pierce the battery with a sharp object, hit it, or step on it.
- Do not use a damaged battery.
- Do not solder a battery.
- Do not connect the battery to an electrical power outlet.

WARNING
If the Versana Active is not being used on a monthly basis, the battery needs to be removed during the lengthy non-use period.

CAUTION
To avoid the battery bursting, igniting, or fumes from the battery causing equipment damage, observe the following precautions:

- Do not immerse the battery in water or allow it to get wet.
- Do not put the battery into a microwave oven or pressurized container.
- If the battery leaks or emits an odor, remove it from all possible flammable sources.
- If the battery emits an odor or heat, is deformed or discolored, or in a way appears abnormal during use, recharging or storage, immediately remove it and stop using it. If you have any questions about the battery, consult GE or your local representative.

Discharge/Charge Cycle

When the battery is stored for three months or more, the customer should perform one full discharge/charge cycle.

NOTE: *A full discharge/charge cycle means the system is turned on using battery power until the battery loses its charge completely and the system shuts down. Plug the Versana Active in until the battery is fully charged as indicated by a green LCD light.*

Upon receipt of the Versana Active and before first time usage, it is highly recommended that the customer perform one full discharge/charge cycle.

If the battery has not been used for >2 months, the customer is recommended to perform one full discharge/charge cycle. It is also recommended to store the battery in a shady and cool area with FCC (full current capacity).

One Full Discharge/Charge Cycle Process:

1. Full discharge of battery to let the Versana Active automatically shut down.
2. Charge the Versana Active to 100% FCC (full current capacity).
3. Discharge of Versana Active for complete shut down (takes one hour for discharge).

When storing packs for more than 6 months, charge the pack at least once during the 6 month timeframe to prevent leakage and deterioration in performance.

CAUTION   Use only GE recognized batteries.

Safe Use

Follow below instruction to ensure safe use and adequate maintenance of rechargeable battery.

1. Regularly check the appearance of the cell to see if there is no abnormal deforamtion (bulge) etc.
2. Check the battery interface to see if there is no foreign body and deformation.
3. Regularly charge the battery if the system is not in use.

View battery status

When the system is running on battery power, there is a battery icon in the system status bar.

Figure 3-2.   Console battery icon

Figure 3-3.   Big battery icon

The battery icon will not be displayed when console is connected to AC power supply. And an AC icon will appear in the system status bar.

Figure 3-4.   AC icon

View battery status (continued)

The system displays the battery's current capacity based on the different battery status icons.
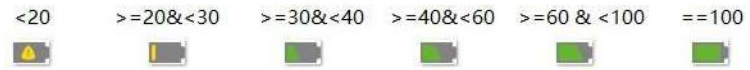
Figure 3-5.   Battery status icon for console battery
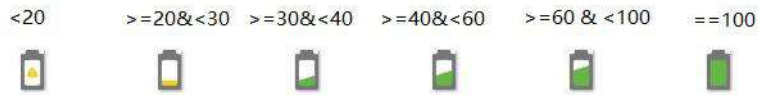
Figure 3-6.   Battery status icon for big battery

Versana Active – Basic User Manual
Direction 5840764-100 English Rev. 10

View battery status (continued)

Detailed battery information is available by clicking on the battery or AC icon and the following information window appears:
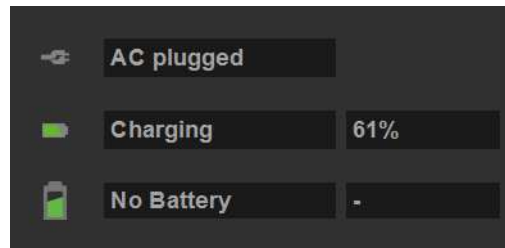
Figure 3-7.   Battery Status Message

- **Current power source**.

  This field displays the current power source: AC power, Battery or Big Battery

- **Remaining console battery power**.

  - When the battery is in use, this field displays the current power remaining capacity.

  - When there is no battery, "No Battery" appears.

  - When the battery is not in use, this field displays current capacity (charging).

- **Remaining big battery power**.

  - When Extended Life Battery is in use to supplying power to the system, this field displays the current power remaining capacity.

  - When the Extended Life Battery is not in use to supply power to the system, this field displays "No Battery".

    Click the big battery icon and a warning message appears on the screen to display "No Big Battery".

  - When the Extended Life Battery is being charged, this field displays the current capacity (charging).

Battery power low warning

If the battery is in use and the battery power is lower than 20%, a warning message appears to warn the user that the battery power is low and it needs to be charged.

The warning message in red will continually appears on status bar at the bottom of the screen.

Figure 3-8.   Low battery power warning on status bar

When the estimated current power is lower than 15%, the Error message appears on the screen to warn that the system is about to shut down.
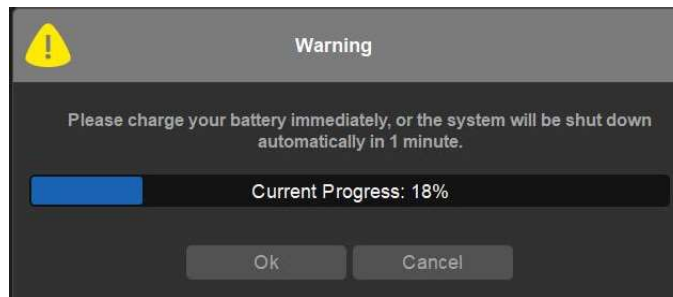
Figure 3-9.   System shutdown warning

When the battery power is low and the user has not charged the battery in time, the system automatically shuts down within 1 minute. This protects the whole system. You need to charge the battery by connecting to power source immediately before the system shuts down or you may lose useful information.

NOTE: *When the system is configured with Advanced Cart and 3PP probe connector, but not configured with a big battery, the low battery power warning will be advanced to 40% and the countdown shutdown will be advanced to 30%.*

Battery Installation

To install the battery to the bottom cover of the system.

1. Shut down the system and disconnect the AC/DC power cord.

2. Put the battery into the battery box.

Figure 3-10.   Put the battery into battery box

3. Push down the battery till the battery lock is in the lock position.
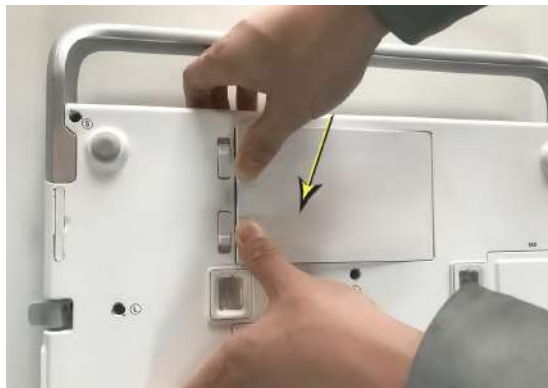
Figure 3-11.   Push down the battery

Battery Removal

To remove the battery to the bottom cover of the system.

1. Shut down the system and disconnect the AC/DC power cord.

2. Push up the battery locks to the other end of the slots.
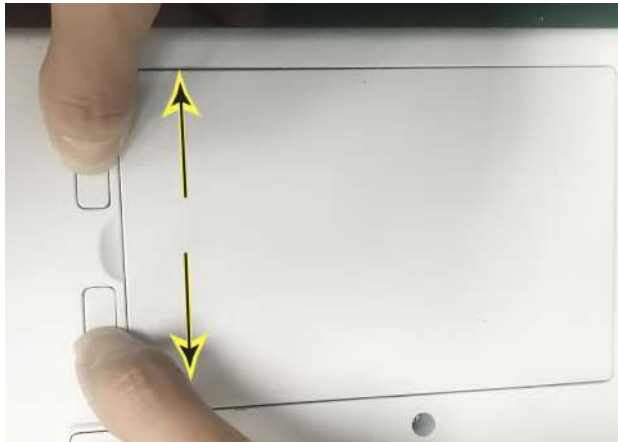
Figure 3-12.   Unlock the battery

3. Put the finger in the breach of the battery box to lift up the battery and remove it.
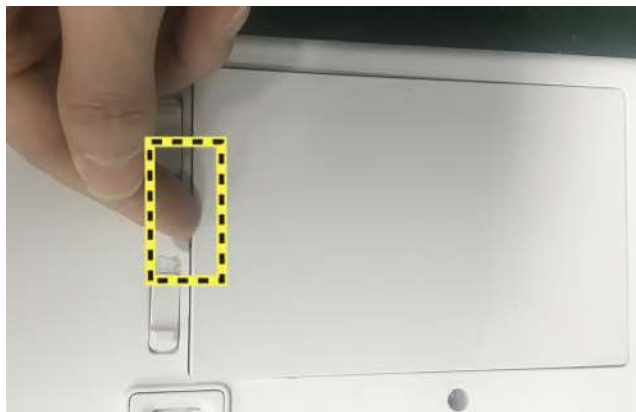
Figure 3-13.   Remove the battery

AC Adapter

CAUTION	Do not use an AC adapter without approval by GE.

Be sure that nothing rests on the AC adapter's power cable and that the cable is not located where it can be tripped over or stepped on.

Place the AC adapter in a ventilated area, such as a desk, when you use it to run Versana Active. Do not cover the AC adapter with paper or other items that will reduce cooling; do not use the AC adapter inside a carrying case.

To prevent damage to the power cable of the AC adapter, DO NOT pull excessively on the cable; DO NOT make any sharp bends; DO NOT bend the power cable frequently.

Peripheral/Accessory Connection

Peripheral/Accessory Connector Panel

Versana Active peripherals and accessories can be properly connected using the connector panel.

⚠ CAUTION Each outer (case) ground line of peripheral/accessory connectors are **Earth Grounded**.

Signal ground lines are Not Isolated.

⚠ CAUTION For compatibility reasons, use only GE-approved probes, peripherals, or accessories.

DO NOT connect any probes or accessories without approval by GE.

⚠ CAUTION The connection of equipment or transmission networks other than as specified in these instructions can result in electric shock hazard. Alternate connections will require verification of compatibility and conformity to IEC/EN 60601-1 by the installer.

⚠ CAUTION DO NOT touch the patient and any of the connectors on the ultrasound unit simultaneously, including ultrasound probe connectors.

DO NOT touch the conducting parts of the USB, Ethernet, Video, Audio cables when connecting equipment to the unit.

⚠ CAUTION When using peripheral device, observe all warnings and cautions given in peripheral manufacture's manuals.

⚠ CAUTION When using external commercial printers, the PUI (Printer USB Isolator) shall be used to provide safety protection.

Peripheral/Accessory Connector Panel (continued)
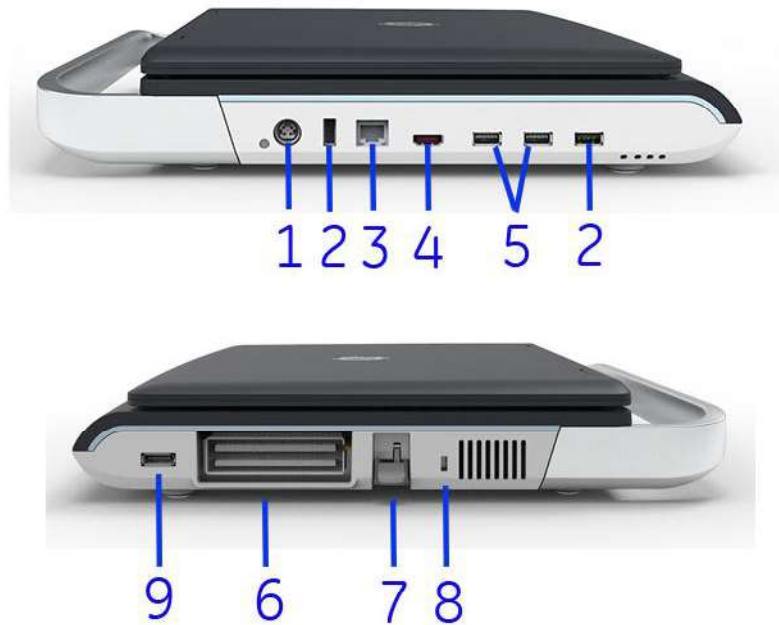
Figure 3-14.   Peripheral/Accessory Connector Panel

1.	Port for DC In (AC Adapter)
2.	2 general USB 2.0 ports
3.	Network port
4.	HDMI port
5.	2 general USB 3.0 ports
6.	1 Probe Connector port
7.	Probe Connector Locking Lever
8.	Security Lock
9.	4D port (only for Versana Active R1.1.x, R1.2.x)

Footswitch (Option)

You can attach the footswitch to the system by connecting it to the USB port on the system.

CAUTION   To avoid damage of the cable, keep the cable away from the wheels. Disconnect the Footswitch before moving the system.

Figure 3-15.   Footswitch MKF 2-MED USB GP26

Figure 3-16.   1 Pedal Type Footswitch

You can configure its function of Footswitch from the **Utility -> Application -> Settings -> Footswitch**.

CAUTION   When using the footswitch, DO NOT hold down the footswitch pedal. Press and release the footswitch pedal. Pushing and holding down the pedal behaves the same way as pushing and holding down a key on the keyboard.

Powering the System

Connecting the System

To connect the system to the electrical supply:

1. Ensure that the wall outlet is of the appropriate type.
2. Uncoil the power cable, allowing sufficient stack so that the unit can be moved sightly.
3. Attach the power connector to the system.

⚠️ CAUTION   Use the appropriate power cord provided by or designated by GE.

4. Push the power plug securely into the wall outlet.

NOTE: *Do not use an extension cord or adapter plug.*

NOTE: *Do not position the Versana Active to make it difficult to operate the mains plug.*

The power plug is an isolation means which used to isolate its circuits electrically from the SUPPLY MAINS.

If powered by Advanced Cart, the mains switch is also an isolation means which used to isolate its circuits electrically from the SUPPLY MAINS.

Connecting the System (continued)

WARNING
To avoid risk of fire, the system power must be supplied from a separate, properly rated outlet. See 'Before the system arrives' on *page 3-3 for more information.*

Under no circumstances should the AC power plug be altered, changed, or adapted to a configuration rated less than specified. Never use an extension cord or adapter plug.

To help assure grounding reliability, connect to a "hospital grade" or "hospital only" grounded power outlet.

CAUTION
To ensure that the power cable does not disconnect during system use.

If the system is accidentally unplugged, data may be lost.

WARNING
Failure to provide an adequate earth ground can cause electrical shock, resulting in serious injury.

Connection of additional protective earth conductors or potential equalization conductors is not necessary in most cases and is only recommended for situations involving multiple equipment in a high-risk patient environment to provide assurance that all equipment is at the same potential and operates within acceptable leakage current limits. An example of a high-risk patient would be a special procedure where the patient has an accessible conductive path to the heart such as exposed cardiac pacing leads.

CAUTION
Only connect Versana Active and mains-operated accessories to the appropriate wall outlet. DO NOT connect them to a single or multiple socket outlets, an extension cord, power strip or an adapter plug.

WARNING
To avoid risk of electric shock, this equipment must only be connected to a supply mains with protective earth.

Connecting the System (continued)
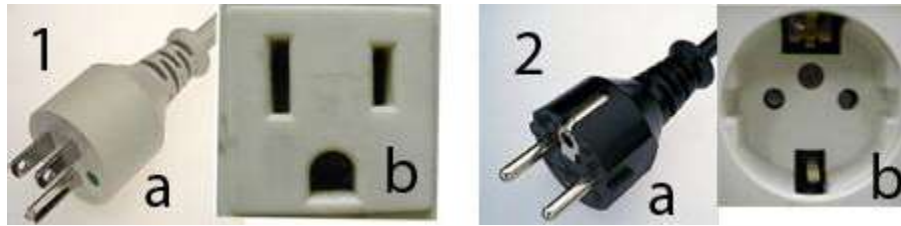
Figure 3-17.   Example Plug and Outlet Configurations

1.   100-120 VAC, 10A

     Plug and Outlet Configuration

2.   220-240 VAC, 10A

     Plug and Outlet Configuration

NOTE: *Country-specific power cords are currently available for China, India/South Africa, Argentina, Europe, Japan, Switzerland, the United Kingdom, the United States, Israel, Denmark, Brazil and Australia/New Zealand.*

Voltage level check

Check the rating label on the bottom of the system. Check the voltage range indicated on the label.

Connecting to the electrical outlet

⚠ WARNING	POWER OUTAGE MAY OCCUR. The ultrasound unit requires a dedicated single branch circuit. To avoid circuit overload and possible loss of critical care equipment, make sure you DO NOT have other equipment operating on the same circuit.
⚠ CAUTION	Disconnect the plug from the wall outlet in case an emergency should occur. Ensure easy access to the power outlet.
⚠ CAUTION	To avoid leakage current above safety limits as prescribed by IEC 60601-1 and to ensure continuity of protective earth. Only connect Versana Active and mains-operated accessories to the appropriate wall outlet. DO NOT connect them to a single or multiple socket outlets, an extension cord, power strip or an adapter plug.

Acclimation Time

After being transported, the unit requires one hour for each 2.5 degree increment its temperature is below 10 degree C or above 40 degree C.

Table 3-2: System Acclimation Time Chart

Degree C	50	45	40	35	30	25	20	15	10	5	0	-5
Degree F	122	113	104	95	86	77	68	59	50	41	32	23
hours	4	2	0	0	0	0	0	0	0	2	4	6

Power On

To turn on the system

1. Check the rating label at the bottom of the system. Check the voltage range indicated on the label.
2. Momentarily press the On/Off switch to turn the power on.
3. The system should now go through its boot-up process with no further user intervention.

Figure 3-18.   Power On/Off Switch Location

Power Up Sequence

The system is initialized. During this time:

- The system boots up and the status is reflected on the monitor.
- Probes are initialized for immediate operation.

NOTE: *If no probe is connected, the system goes into freeze mode.*

- Peripheral devices are activated on power up.

After initialization is complete, the default B-Mode screen is displayed in the monitor display (if a probe is connected).

LED

Press the On/Off Switch to turn the power on.

After a successful boot-up process, the Power On/Off switch illumination turns to green.

Figure 3-19.   LED Indicators

1. Indicates battery status. When the battery is charged, the LED is green. When battery power is low, the LED is orange.

   Color: Green and Orange
2. Indicates hard disk working status. When the LED is flashing, the system is writing or reading from the hard disk.

   Color: Green
3. Diagnostic LED 2.
4. Diagnostic LED 1.

Keyboard Backlight

The keyboard backlight is lit for operation in dimly lit room.

User can adjust the brightness of keyboard backlight in **Utility** -> **System** -> **System Imaging** -> **Control Panel Key Backlight**.

Login

Personal IDs and associated passwords can be preset on the Versana Active.

If the User Auto Logon preset is blank, you are prompted to login.
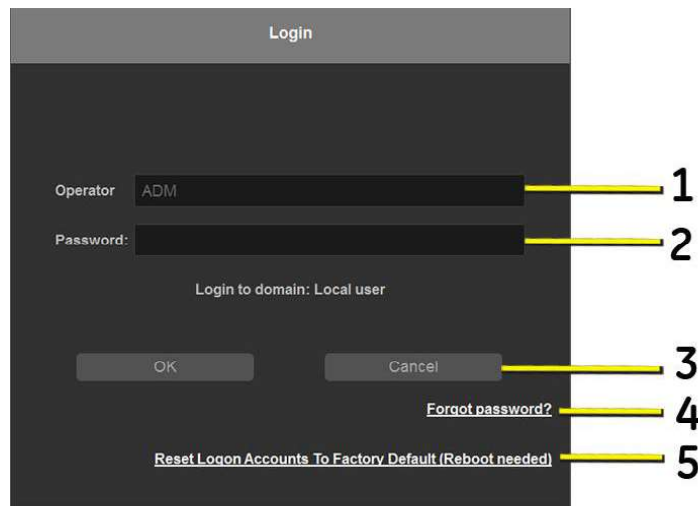
Figure 3-20.   Operator Login Window

1. **Operator**: Enter the Operator ID.
2. **Password**: Enter Operator's password (optional).
3. Select type of Logon or Cancel.
   - **OK**: Proceed with the logon
   - **Cancel**: Cancel logon
4. **Forgot Password?**: User can reset a password.
5. **Reset Logon Accounts To Factory Default (Reboot needed)**: Plug in SSA Dongle to reset Logon accounts.

NOTE: *When you login as administrator for the first time you are prompted to set a password.*

Change Password

User can change ADM password in **Utility** -> **Admin** -> **Users** -> **Identity**.

NOTE: *The new password should meet the password complexity rules for selected Policy Level. Password Level could be set in **Utility** -> **Admin** -> **User policies**.*
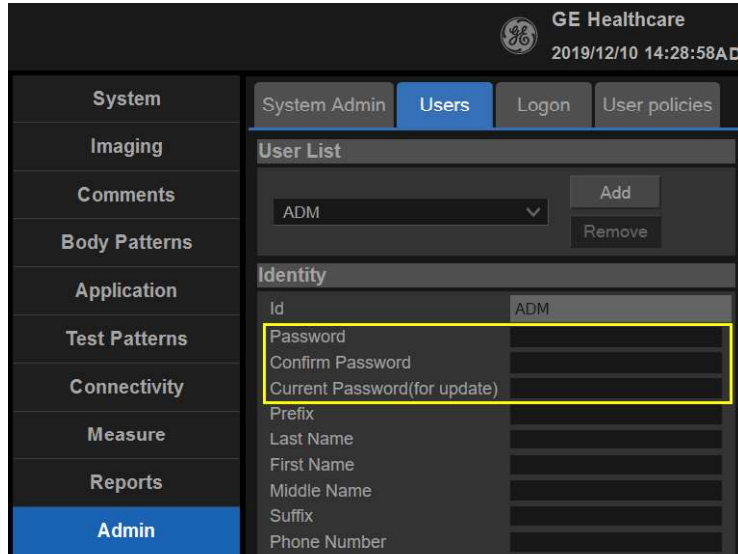
Figure 3-21.   Change Password

Change Password (continued)

> *NOTE: User can change the empty password to a new password (non-empty). When first logging into the Versana Active, the user will be prompted to set up 3 password security questions and answers. Record the answers as they're required for password reset.*

Figure 3-22.   Set Password Security Questions

Forgot Password

If you forgot the ADM login password, the system will help you reset a new password.

To reset your password,

1. Select **Forgot password?**
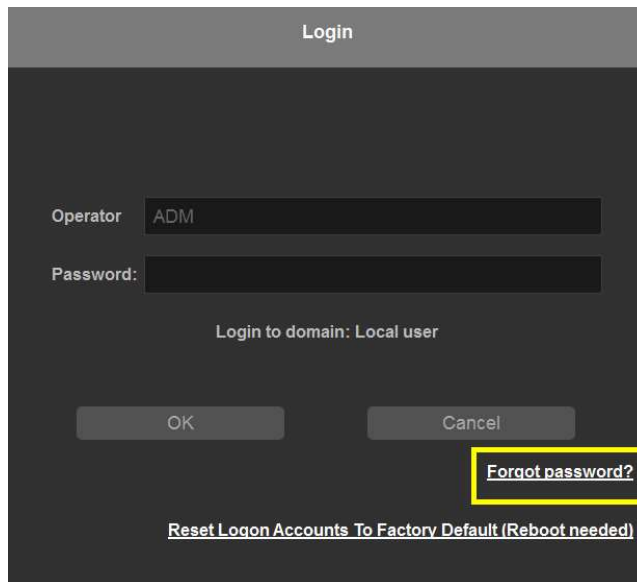
Figure 3-23.   Select Forgot password?

Forgot Password (continued)

2. Reset password pop-up appears. Input user name and press **Next** to continue.
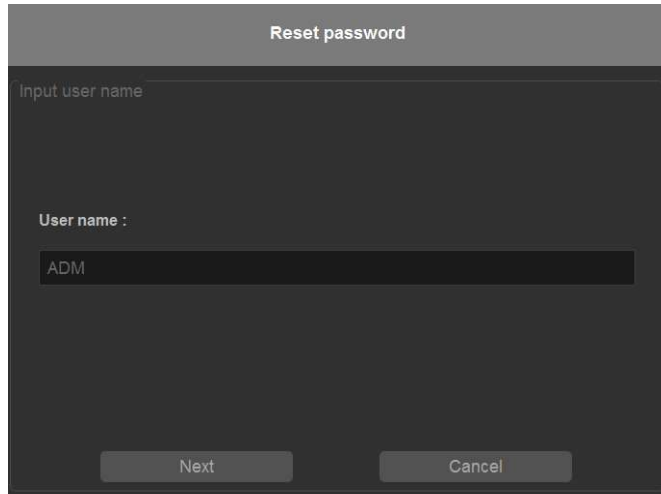
Figure 3-24.   Input user name

If user types the wrong user name or has not set up password security questions yet, a warning message will appear on the screen. Press **Cancel** to exit to Operator Login window and the following steps will be skipped.
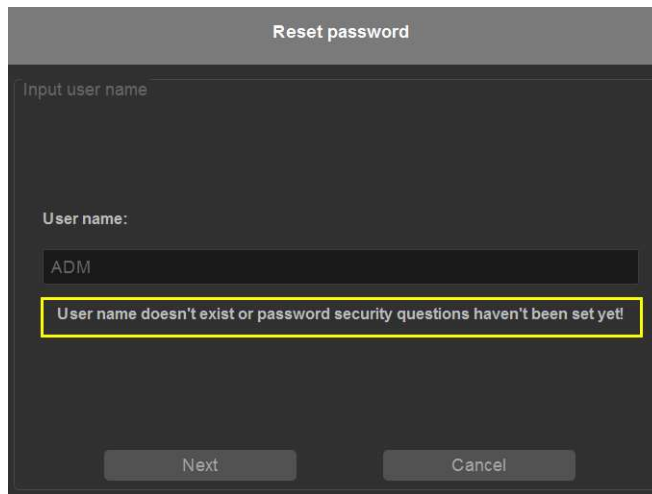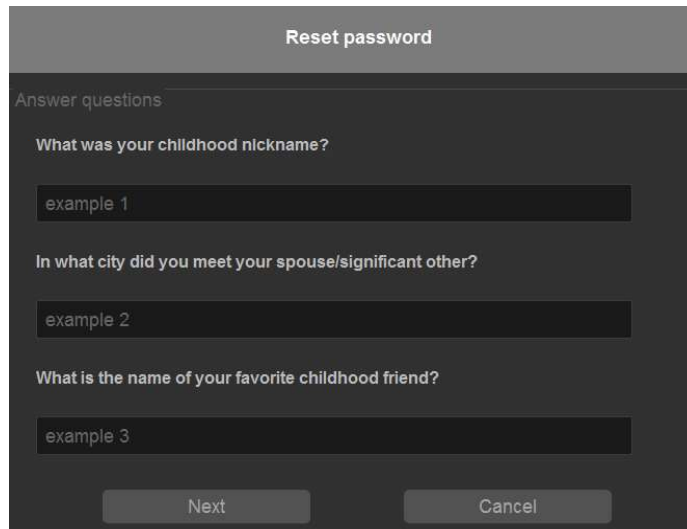
Figure 3-25.   Warning Message

Forgot Password (continued)

3. Answer 3 password security questions that you previously set up when creating ADM password (non-empty) for the first time.

Figure 3-26.   Answer questions

Forgot Password (continued)

4. Set up the new ADM password, based on the selected Policy Level.
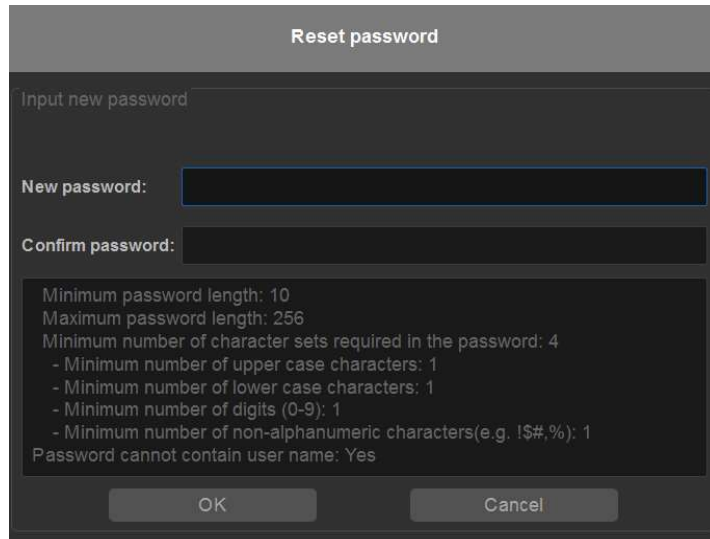
Figure 3-27.   Input a new password

NOTE: *If the password you type doesn't meet the password complexity rules for selected Policy Level, a warning message will appear on the screen and you will be prompted to correct the password.*
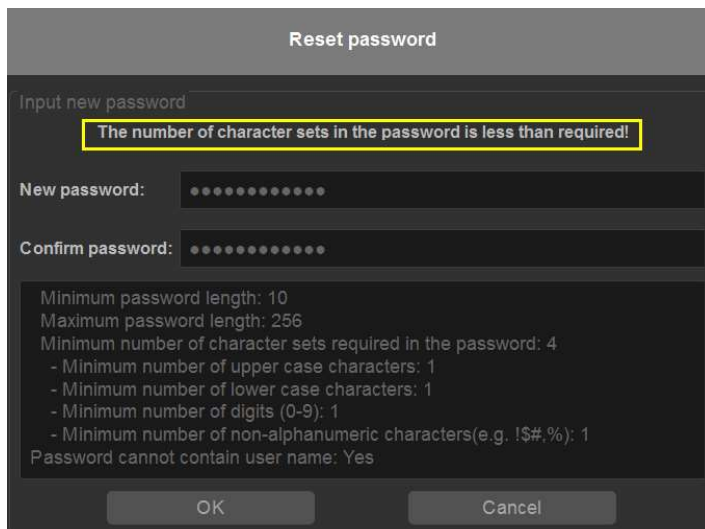
Figure 3-28.   Warning Message

Logoff

To Logoff, press the On/Off switch momentarily and a SYSTEM-EXIT window appears.
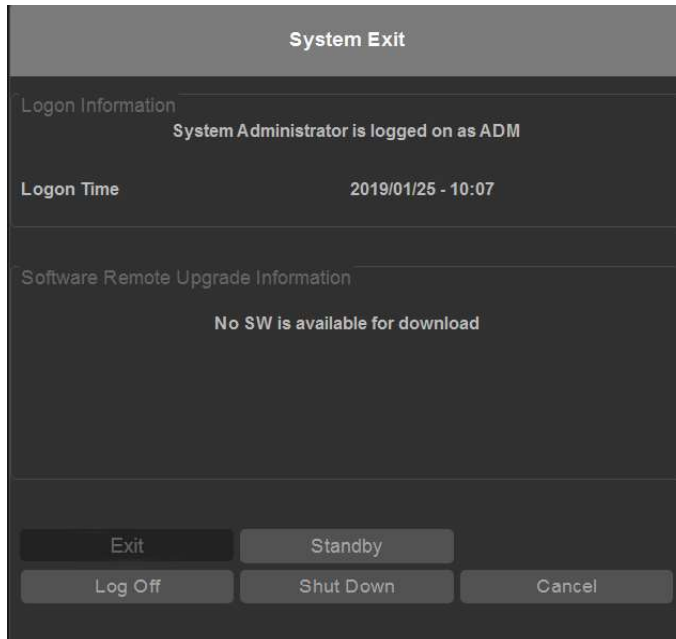
Figure 3-29.   System Exit Window

Power Off

For optimum system operation, we recommend that you restart the system at least once every 24-hour period. If you shut down the system at the end of the day, no other action is needed.

To power off the system:

1. When you shutdown the system, enter the scan screen and lightly press the **Power On/Off** switch on the control panel once. The System-Exit window is displayed.

NOTE: *DO NOT press and hold down the Power On/Off switch to shutdown the system. Instead, lightly press the Power On/ Off switch and select Shutdown.*

2. Using the **Trackball**, select *Shutdown*.

   The shutdown process takes a few seconds and is completed when the Power On/Off switch illumination turnes from green to off.

NOTE: *DO NOT select **Exit** for Shutdown. **Exit** is only available to Service representative.*

NOTE: *If the system has not fully shut down in 60 seconds in the power-off sequence, press and hold down the On/Off switch until the system shuts down.*

3. Disconnect the probes.

   Clean or disinfect all probes as necessary. Store them in their shipping cases or another appropriate probe storage system to avoid damage.

4. Disconnect the AC adapter or mains plug of Advanced Cart (optional) from the power outlet.

NOTE: *It's recommended to disconnect the AC adapter or Advanced Cart mains plug from the outlet if the system has been fully charged.*

Standby Mode

To activate Standby Mode:

1. Press the On/Off switch and select ***Standby***.

System Exit

Logon Information

System Administrator is logged on as ADM

Logon Time 2019/01/25 - 10:07

Software Remote Upgrade Information

No SW is available for download

Exit   Standby

Log Off   Shut Down   Cancel
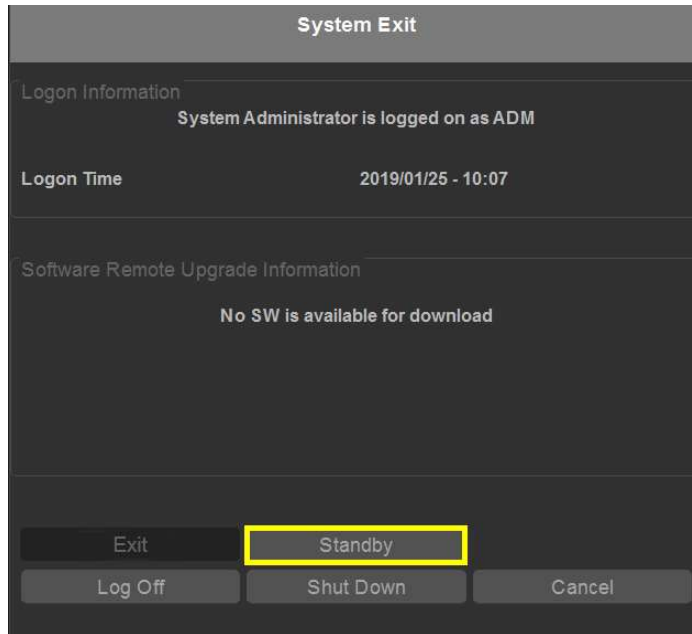
Figure 3-30.   System Exit Window

2. The system will turn off the backlight of LCD.
3. The system will freeze Image.
4. The system will disable all keys(Function Keys, A/N keys, Trackball) except On/Off switch.
5. The system will turn off all backlight and active light of keys except On/Off switch.

Press the On/Off Switch to fast boot up.

NOTE: *Image is still on freeze mode (Frozen Image).*

Check System Date and Time

A warning message "Please check the system date and time are correct" appears on the screen when the system is powered up. This warning message appears for the possible reasons:

- The system is not boot up for over 14 days.
- The system time has been changed by 24 hours earlier than the current system time of last boot-up.

This warning message is to remind the user to check the system date in case the system date and time is incorrect.
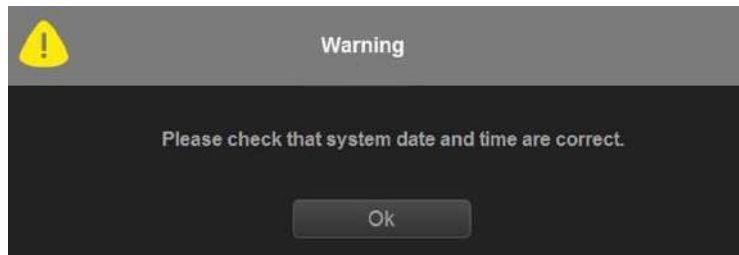
Figure 3-31. Check system date and time message

Move the cursor to **OK** and press **Set** key on the control panel to select **OK**. The system enters scanning mode.

Check the system date and time. If it is incorrect, follow below steps to reset the system date and time.

1. Enter Utility -> System -> General -> Date/Time.
2. Reset the system date and time.
3. Select **Apply** and then select **OK**.
4. Select **Save**.

Crash Recovery Instructions

In cases where the system detects an internal error, the system may reboot on its own. If this happens, the system automatically returns to the start-up screens. All images and measurements, except for generic worksheets, are preserved in the system.

The system automatically ends the current exam and permanently stores all the images and measurements. When the system reboots, check that all images and measurements have been preserved in the system. Then, simply hold down the power switch to initiate a normal power down sequence.

NOTE: *If the image is not updated properly when the system is up, shut down the system again.*

NOTE: *Generic worksheets are not saved if the system crashes before you save it.*

WARNING The system crash may cause the internal HDD corruption. Avoid using the internal HDD as a permanent storage device. Backup data on a regular basis.

Temporary Buffer

When the system shuts down during an exam, the unsaved images and data are stored in temporary buffer. Next time the system starts up, the temporary buffered data is still available. The following dialogue displays.

• **Continue Exam**. Continue the last exam with the temporary images and unsaved data.

• **Delete Exam**. Delete the unsaved images and data of the last exam. Then begin a new exam.

Question
The last exam was not properly finished.
Name
PatientId
ContinueExam   DeleteExam
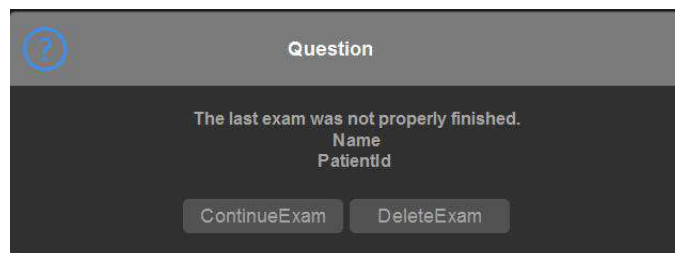
Figure 3-32.   Temporary Buffer

Database Protection Mechanism

Abnormal shutdown, such as power outage, has the risk to cause database corruption. Reboot the system after abnormal shutdown. The below dialog box displays when the system visits damaged database. Press OK, then the system restores the database which have been backuped most recently in the normal condition. The data occurred since last time of normal store and normal shutdown may lost.

Figure 3-33.　Database Protection Mechanism

System Positioning/Transporting

Before moving the system

When moving or transporting the system, follow the precautions below to ensure the maximum safety for personnel, the system, and other equipment.

⚠️ CAUTION | **DO NOT** attemp to move the console using any cables or fixtures, such as the probe connectors.

⚠️ CAUTION | This equipment is not to be used during transportation (e.g. ambulance cars, aircraft).

⚠️ CAUTION | Handle carefully. A drop of more than 5 cm can cause mechanical damages.

Before moving the system (continued)

1. Press the **Power On/Off** switch to power off the system. See 'Power Off' on *page 3-33 for more information.*

2. Unplug the power cord (if the system is plugged in).

3. Disconnect all cables from off-board peripheral devices(external printer, etc.) and the ethernet connection from the console.

NOTE: *To prevent damage to the Power Cord, **DO NOT** pull excessively on the cord or make sharp bends while wrapping.*

4. Store all probes in their original cases or in soft cloth or foam to prevent damage.

5. Store sufficient gel and other essential accessories in the provided space.

Moving the System

1. Always use the handle to move the system.

⚠ CAUTION   The system weighs less than 6kg (13.23 lbs) without any probes or peripherals. To avoid possible injury and equipment damage:

• Do not let the system strike walls or door frame.

Transporting the System

Use extra care when transporting the system using vehicles. See 'Before moving the system' on *page 3-38 for more information.* In addition to the instructions used when moving the system, also perform the following:

1. Before transporting, place the system in its storage case.

2. Ensure that the system is firmly secured while inside the vehicle.

⚠ CAUTION   Remove all peripherals from the console before transportation.

Probes

Introduction

Only use approved probes.

All approved imaging probes can be connected into the probe port of the Versana Active.

See 'Probes and Biopsy' on *page 17-1 for more information.*

Selecting probes

- Always start out with a probe that provides optimum focal depths and penetration for the patient size and exam.
- Begin the scanning session by choosing the correct application and preset for the examination by selecting **Probe**.
- Begin the scan session using the default Power Output setting for the probe and exam.

Connecting the Probe

Inspect the probe before and after each use for damage or degradation to the housing, strain relief, lens, seal, cable and connector. DO NOT use a transducer which appears damaged until functional and safe performance is verified. A thorough inspection should be conducted during the cleaning process.

⚠ CAUTION   Remove any dust or foam rests from the probe pins.

⚠ CAUTION   Fault conditions can result in electric shock hazard. Do not touch the surface of probe connectors which are exposed when the probe is removed. DO NOT touch the patient when connecting or disconnecting a probe.

Probes can be connected at any time, regardless of whether the console is powered on or off.

To connect a probe:

1. Place the probe's carrying case on a stable surface and open the case.

2. Carefully remove the probe and unwrap the probe cord.

⚠ CAUTION   DO NOT allow the probe to hang free. Impact to the probe lens could result in irreparable damage.

Connecting the Probe (continued)

3. Align the connector with the probe port and carefully push into place with the cable facing the front of the system.

Figure 3-34.   Probe connection to Versana Active

4. Flip the connector locking lever up.

Figure 3-35.   Probe conenctor locking lever

5. Carefully position the probe cord so it is free to move and is not resting on the floor.
6. When the probe is connected, it is automatically activated.

⚠ CAUTION   Make sure that the probe and application names displayed on the screen correspond to the actual probe and application selection.

Cable Handling

Take the following precautions with probe cables:

- Do not bend the cable acutely.
- Avoid crossing cables between probes.

Activating/Deactivating the Probe

To activate the probe, select the appropriate probe from the probe indicators in Probe/Preset screen.

To deactivate the probe, select another probe or press **Freeze** key to enter into freeze mode.

The probe's default settings for the mode and selected exam are used automatically.

⚠ CAUTION   Make sure that the probe and application names displayed on the screen correspond to the actual probe and application selection.

Deactivating the Probe

When deactivating the probe, the probe is automatically placed in standby mode.

To deactivate a probe:

1. Ensure the selected probe in deselected or Versana Active is in freeze mode. If necessary, press the *Freeze* key.
2. Gently wipe the excess gel from the face of the probe.

Disconnecting the Probe

Probes can be disconnected at any time. However, the probe should not be active when disconnecting the probe.

1. Ensure the probe is deactivated. Deactivate by selecting another probe or pressing Freeze.

2. Press the connector locking lever down.

Figure 3-36.   Probe connector unlocking lever

3. Pull the probe connector straight out of the probe port carefully.

⚠ CAUTION   DO NOT allow the probe to hang free. Impact to the probe lens could result in irreparable damage. Use the integrated cable management hook to wrap the cord.

4. Ensure the cable is free.

5. Be sure that the probe is clean before placing the probe in its storage box or wall hanging unit.

Transporting Probes

When transporting a probe a long distance, store it in its carrying case.

Storing the Probe

It is recommended that all probes be stored in the provided carrying case for probe storage.

Carrying case:

- First place the probe connector into the carrying case.
- Carefully wind the cable into the carrying case.
- Carefully place the probe into the carrying case. DO NOT use excessive force or impact the probe head.

Operator Controls

Control Panel Map
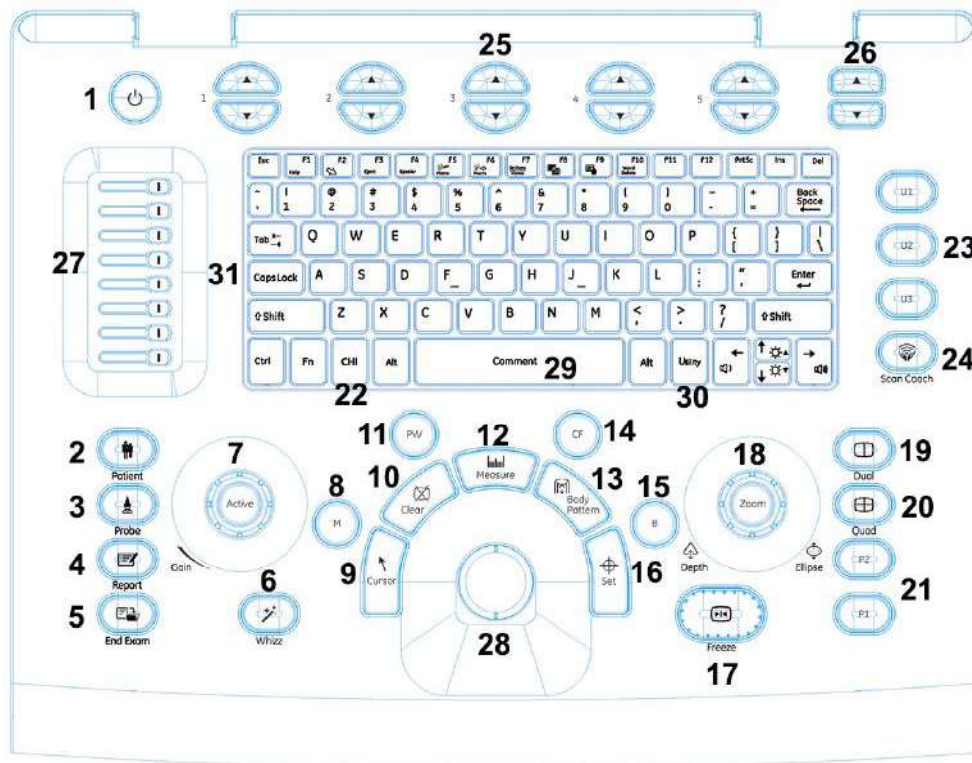
Figure 3-37.   Control panel map

1. Power On/Off
2. Patient key
3. Probe key
4. Report key
5. End Exam key
6. Whizz key
7. Active/Gain key
8. M Mode
9. Cursor key
10. Clear key
11. PW Mode

12. Measure key
13. Body Pattern key
14. CF Mode
15. B Mode
16. Set key
17. Freeze key
18. Depth/Ellipse/Zoom key
19. Dual key
20. Quad key
21. Physcial print buttons (Utility
    -> Connectivity -> Button)
22. CHI key

23. User Configurable Keys
24. Scan Coach key
25. Primary Menu keys
26. Up/Down keys
27. TGC
28. Trackball
29. Comment key
30. Utility
31. Alphanumeric Keyboard

Versana Active – Basic User Manual
Direction 5840764-100 English Rev. 10

Control Panel Map (continued)

> *NOTE:*   *The factory default settings for User Defined Keys can be modified in Utility ->System -> User Configurable Key.*

⚠ CAUTION   Do not apply too much force when adjusting the TGC slide pots as this could damage the slide pots.

Alphanumeric Keyboard
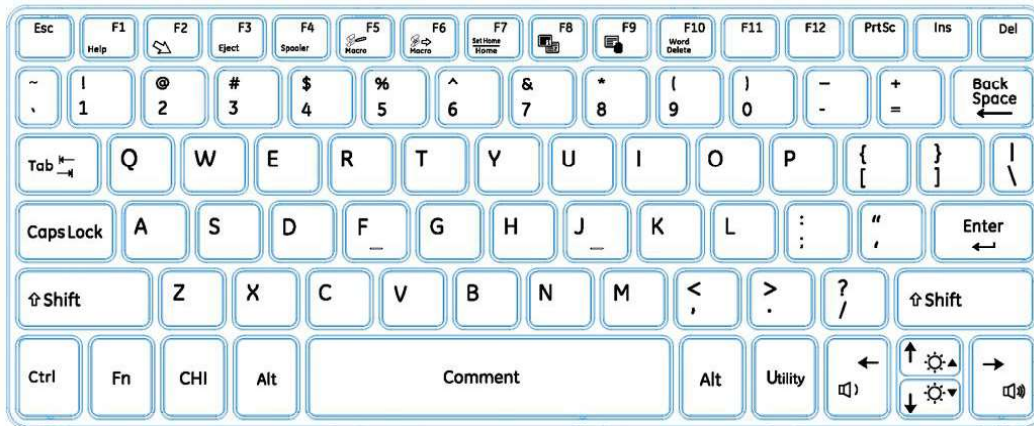
Figure 3-38.   Alphanumeric Keyboard

Alphanumeric Keyboard (continued)

The standard alpha-numeric keyboard has some special functions.

Esc	Exit current display screen.
Help (F1 Key)	Access Online help / user manual.
Arrow (F2 Key)	Annotation arrow.
Eject (F3 Key)	Eject media.
Spooler (F4 Key)	Activates DICOM Job Spooler screen.
Create a Fast Key (F5 Key)	Creates a Fast Key.
Play a Fast Key (F6 Key)	Plays a Fast Key.
Home/Set Home (F7 Key)	Move annotation cursor to home position; shift+key to set current annotation cursor position as the new home position.
Text1/Text2 (F8 Key)	Switch between user text annotation overlays.
Grab Last (F9 Key)	Activate the last selected data for edit.
Word Delete (F10 Key)	Erase word associated with comment cursor.
Fn + Left/Right Keys	Adjust audio volume.
Fn + Up/Down Arrow Keys	Adjust brightness.
Alt+1 or Alt+2	Place a marker in the log.
	If you encounter a problem and cannot collect the logs immediately:
Alt+D	Collect the logs.
	Once the logs are collected, the engineering team would be able to see the marker you added which will help engineering to troubleshoot the problem.

NOTE: *Logs can be collected by pressing Alt+D, Only when peripheral storage devices are connected.*

Primary Menu Keys

The primary menu keys contain exam function and mode/function specific controls.

NOTE: *Different primary menu are displayed depending on which function is selected.*

Figure 3-39.   Primary Menu Keys

Press up/down buttons to adjust the value of the softmenu associated with it.

Press up/down buttons to turn the menu page up and down.

The Primary Menu can be configured in **Utility** -> **Application** -> **Image Controls**.

Button description

Mode, Display and Record

This group of controls provides various functions relating to the display mode, display orientation, image recording/saving, freeze, gain and Cine scroll.

The Mode Controls select the desired display mode or combinations of display modes.

*   During dual display modes the **Dual** and **Quad** keys activate the Left or Right displayed image. See 'Split Screen' on *page 6-4 for more information.*
*   **Whizz** is used to:
    *   initiate auto optimize
    *   turn off auto optimize.

    For more informatio about Whizz, please refer to 'Whizz' on *page 5-8*
*   **Depth/Zoom/Ellipse** controls the image display depth/width and activates the area/ellipse measurement fuction.
*   **P2** key is used to activate/print the designated recording device.
*   **P1** key is used to store the images/loops to the defined designation.
*   The **Freeze** key is used to stop the acquisition of ultrasound data and freeze the image in system memory. Pressing **Freeze** a second time continues live image data acquisition.
*   To activate a specific mode, press the appropriate mode key.

Measurement and Annotation

This group of controls performs various functions related to making measurements, annotating and adjusting the image information.

- The **Comment** key enables the image text editor and displays the annotation library.

- The **Clear** key is generally used to erase functions, such as annotations/comments, body patterns and measurements. Pressing the **Clear** key again exits the selected function.

- Press the **Body Pattern** control, it enables the Body Pattern and displays the default pattern on the screen. When body patterns are active, select Rotate Probe on the primary menu to rotate the probe position indicator.

- Press **Set** to fix the measurement after the ellipse adjustment is complete. The measurement is then displayed in the measurement result window.

- The **Measure** key is used in all types of basic measurements. When the **Measure** key is pressed, the measurement menu is displayed.

- The **Set** key is used for various functions, but is generally used to fix or finish an operation (e.g. to fix a measurement caliper).

- The **Trackball** is used with almost every key function in this group. Trackball control depends on the last key function pressed.

Monitor

Related Hazards- Monitor

CAUTION

- **DO NOT** place a finger, hand or any object on the joint of the monitor to avoid injury when moving the monitor.
- To avoid result of injury or system damage, **NEVER** place any object or liquid on the monitor, whether in the home or flip down/transport position.

  if an object or liquid falls/spills into the monitor or the cabinet, unplug the system immediately. Call the Service Representative for information.

- **DO NOT** scratch or press on the panel with any sharp objects, such as a pencil or pen, as this may result in damage to the panel.
- The monitor screen may have defective pixels. These pixels may appear as a slightly light or dark area on the screen. This is due to the characteristics of the panel itself, and not the product.
- The backlight of the monitor panel has fixed life span. When the screen becomes dark or begins to flicker, contact a qualified Service Representative for information.

NOTE: *Bright light could impact readability of screen.*

Adjusting the Monitor

The monitor position can be adjusted for easy viewing.

- Tilt the monitor for the optimum viewing angle. The maximum angle is 170.

CAUTION   To avoid damage, DO NOT push the monitor over the maximum opening angle.

Brightness and Contrast

1. Press **Cursor** key on the control panel. Move the trackball to position the cursor over the adjustment icon, then press **Set** to display the setting menu.

Figure 3-40.   Setting Menu Icon

2. Follow the procedure below to adjust the Color Temperature, Contrast, Brightness:

   • To adjust the color temperature: press **Standard**, **Brown,** or **Blue** to choose the color temperature. The chosen color temperature displays in the **Color Temp** area.

Figure 3-41.   Active Color Temperature

   • To adjust the Contrast: Press **Set** to choose the adjustment button, hold down the **Set** key and move the trackball to move the adjustment button. Move the adjustment button to the left to decrease the contrast or move the adjustment button to the right to increase the contrast.
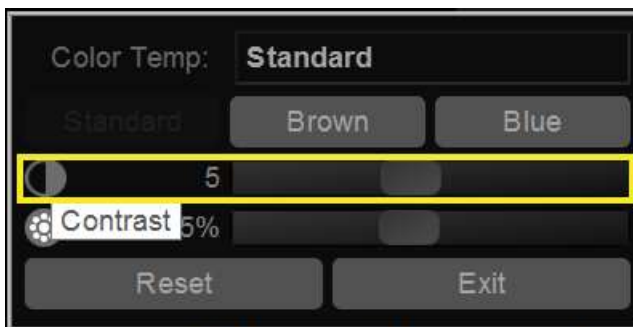
Figure 3-42.   Contrast

Brightness and Contrast (continued)

- To adjust the Brightness: Press **Set** to choose the adjustment button, hold down the **Set** key and move the trackball to move the adjustment button. Move the adjustment button to the left to decrease the brightness or move the adjustment button to the right to increase the brightness.
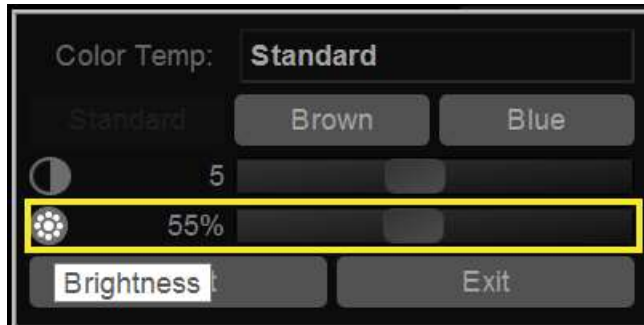
Figure 3-43.   Brightness

3. Press **Reset** to return to the default setting; Press Exit to exit the setting menu.

NOTE: *Press Reset button and the three color temperature settings will return to the default settings.*

Brightness

Adjusting the monitor's brightness is one of the most important factors for proper image quality. If these controls are set incorrectly, the Gain, TGC, Dynamic Range and even Power Output may have to be changed more often than necessary to compensate.

The proper setup displays a complete gray scale. The lowest level of black should just disappear into the background and the highest white should be bright, but not saturated.

To adjust the brightness:

On the alphanumeric keyboard, adjust brightness with the *Fn* + *Up/Down* keys
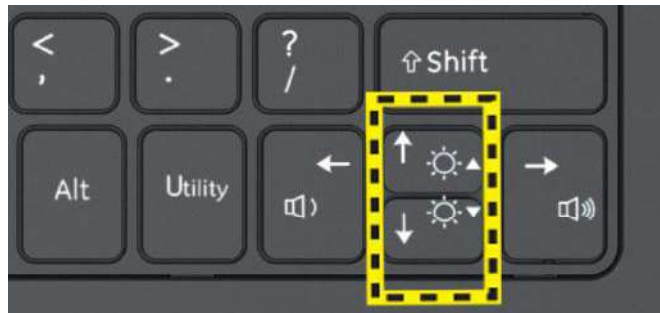
Figure 3-44. Brightness

1. Brightness

NOTE: *After readjusting the LCD monitor's Brightness, readjust all preset and peripheral settings.*

NOTE: *The brightness of the LCD monitor should be set first as it affects the Gain and Dynamic Range settings of your image. Once set, this should not be changed unless the brightness of your scanning environment changes.*

Volume

To adjust the volume:

On the alphanumeric keyboard, adjust volume with the *Fn +
Left/Right* keys
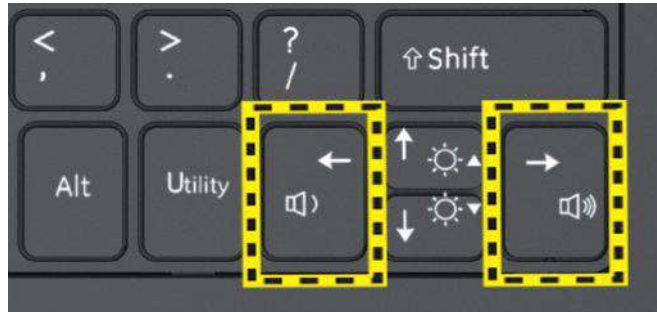
Figure 3-45.   Volume

1.   Volume

Monitor Display

Monitor Display
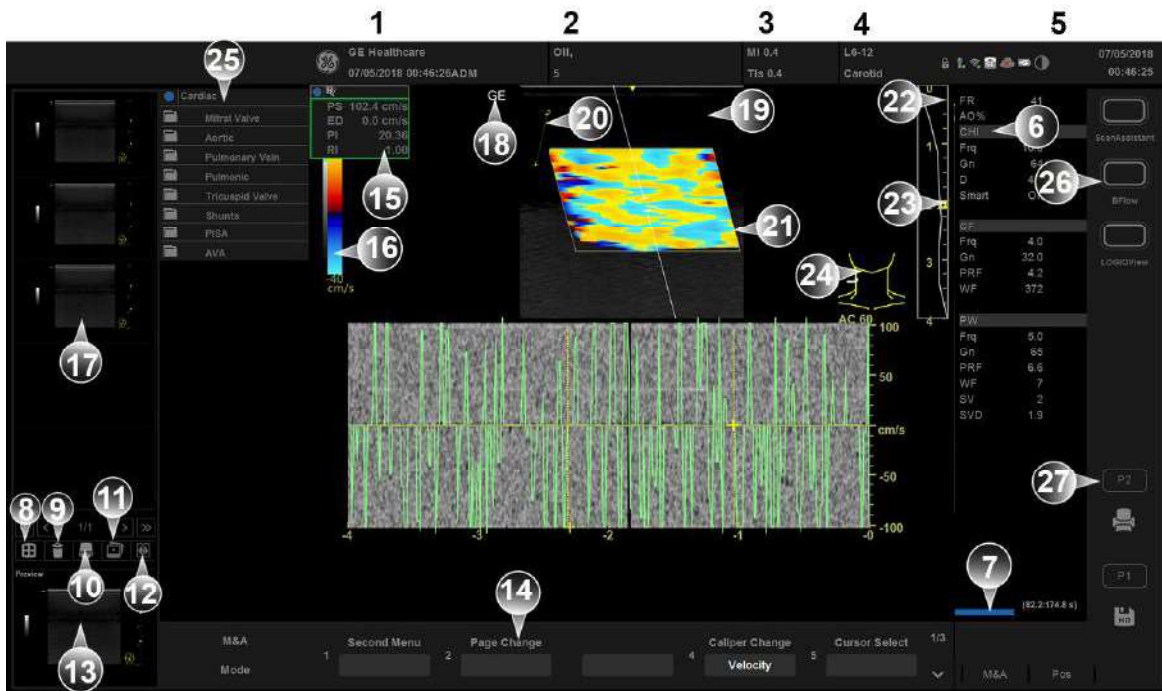
Figure 3-46.   Monitor Display Tour

1. Institution/Hospital Name, Date, Time, Operator Identification.
2. Patient Name, Patient Identification.
3. Power Output Readout.
4. Probe Identifier. Exam Preset.
5. Current date and time, Caps Lock: (lit when on), network connection indicator, system messages display, InSite status, InSite controls.
6. Imaging Parameters by Mode.
7. Cine Gauge.
8. Active Images screen.
9. Delete Image.
10. Save As Menu.
11. Slide Show.
12. Follow-up tool.
13. Image Preview.
14. Primary Menu.
15. Measurement Results Window.
16. Gray/Color Bar.
17. Image Clipboard.
18. Probe Orientation Marker.
19. Image.
20. Measurement Calipers.
21. Region of interest.
22. Depth Scale.
23. Focal Zone Indicator.
24. Body Pattern.
25. Measurement Summary Window.
26. User Configurable Key.
27. P1,P2.

Using the Monitor Display Controls to Manage Images

You can manage images from the display via these on-display controls.
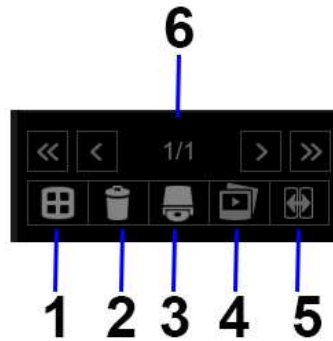
Figure 3-47.   Menu Icons

1. Active Images Screen
2. Delete Image
3. Archive Image
4. Slide Show
5. Follow-up tool
6. Page Number

Active Images Page

Press Active Images Page to go to the Patient Active Images page. See 'Active Images' on *page 4-33 for more information.*

Delete

You can use this to delete an image from the clipboard.

1. Place the cursor on the clipboard image you want to delete, then press **Set** to select the image.
2. Place the cursor on the *Delete* icon and press **Set**.

Archive Image

Activate SaveAs feature. See 'Save As' on *page 15-10 for more information.*

Slide Show

The slide show will show the scan images on the clipboard one by one. See 'Clipboard' on *page 15-8 for more information.*

Number of Images in Exam

The number of images in an exam is tracked on the bottom of these Monitor Display Controls.

Chapter 4

Preparing for an Exam

Describes how to begin an exam.

Beginning an Exam

Introduction

Begin an exam by entering new patient information.

The operator should enter as much information as possible, such as:

1. Dataflow
2. Exam category
3. Patient ID
4. Patient name
5. Exam Information

The patient's name and ID number is retained with each patient's image and transferred with each image during archiving or hard copy printing.

⚠ CAUTION   To avoid patient identification errors, always verify the identification with the patient. Make sure the correct patient identification appears on all screens and hard copy prints.

Patient Screen
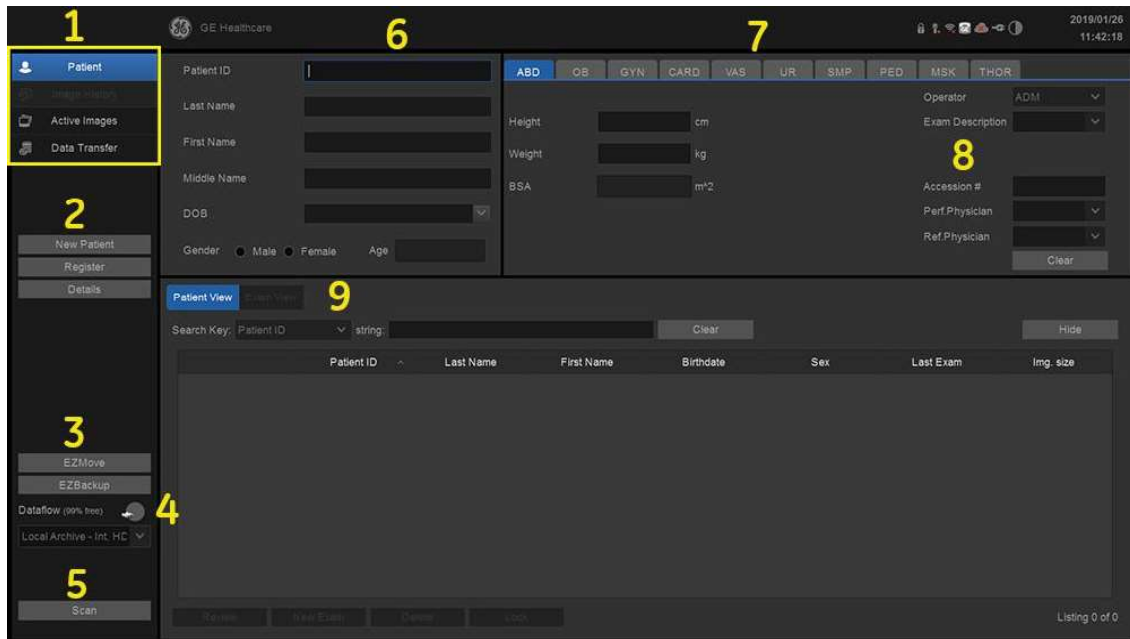
Figure 4-1.   Patient Screen

1.   Image Management
2.   Function Selection
3.   EZBackup/EZMove
4.   Dataflow Selection
5.   Scan
6.   Patient Information
7.   Category Selection
8.   Exam Information
9.   Patient View/Exam View

Enter Patient Data with the alphanumeric keyboard.

Image Management

- Patient - Provides a search and creation of patient.
- Image history - Provides a list of images per exam for the currently selected patient.
- Active Images - Provides preview of the currently selected exam.
- Data Transfer - Provides an interface to handle patient data from a remote device.

Function Selection

- New Patient–Used to clear patient entry screen in order to input a new patient's data into the database.
- Register–Used to enter new patient information into the database prior to the exam.

NOTE: *If you are using the auto-generate Patient ID feature, do not select Register.*

- Details–Select the Details box to activate/deactivate the exam details. Exam details include Indications, Comments, Admission Number, Performing Physician's Telephone Number, Referring Physician's Telephone Number, Operator Telephone Number, and Exam Description.
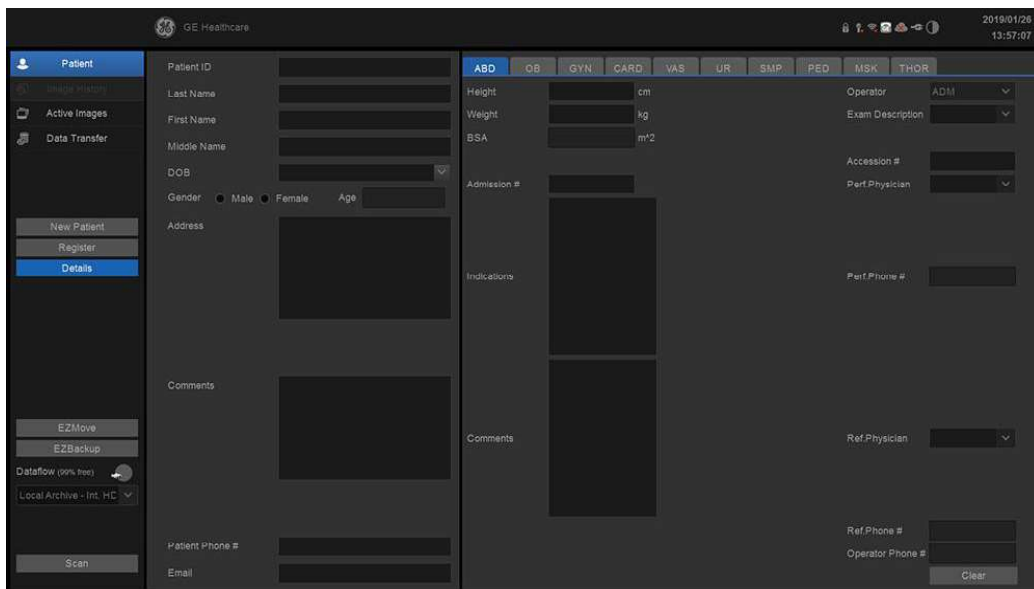
Figure 4-2.   Details Window

EZBackup/EZMove

- EZBackup–One-step method to backup patient images to an external media.
- EZMove–Move and delete patient images.

Dataflow Selection

Select the appropriate dataflow.

NOTE: *If you use a DVD-R, select DICOM CD Read in Dataflow.*

If you place the cursor on the icon, the pop-up menu displays disk capacity.

Figure 4-3.   Dataflow location

Scan

Used to exit Patient Menu and enter scanning screen.

Patient Information

- Patient ID Number (Required)
- Other ID Number

  The other ID is used to add additional information of the patient, such as Citizen ID.

NOTE: *To enable/disable the other ID field, go to Utility -> Connectivity -> Miscellaneous.*

- Patient Name–Last, First and Middle
- DOB (Birthdate)
- Age (automatically calculated when birthdate is input)
- Sex

Category Selection

Select from 10 exam application categories: Abdomen, Obstetrics, Gynecology, Cardiology, Vascular, Urology, Small Parts, Pediatrics, Musculoskeletal Conventional and Thoracic.

When a category is selected, the measurement and category presets are displayed.

Exam Information

Shows the Current/Active Exam information. Information pertinent to the selected exam category appears in the window. All possible information needs to be entered.

- Clear–Clears existing data.
- Past Exam (only for OB)–Input past exam data (register the patient before using).

Figure 4-4.   Input Past Exam

Patient View/Exam View

Patient View

Lists the patients in the database.

NOTE: *When you double-click the patient on the patient list with the **Set** key, the Review screen displays.*

- Search key–select search item from Patient ID, Last Name, First Name, Birthdate, Sex (f, m), Examdate, Exam today, Accession Number, Exam Description, Examdate before, Exam between, Examdate after, Other ID, Locked (Y, N) or Img. Archived (Y, N).

NOTE: *If "Exam between" is selected, the Input Dialog displays and you can select the date from the displayed calender.*

NOTE: *If "Exam between" is used for the Search key, the From and To dates are separated by a "-" (dash) in the Search String.*

NOTE: *Img. Archived means that the exam was backed up to external media by EZBackup or Export.*

- String–enter appropriate information.

    If you select Locked (Y, N) or Archived (Y, N) for the Search key, enter Y (Yes) or N (No).

- Clear–Clears the entered string.
- Listing XX of XXX -- Displays the quantity of patients in the search window and the quantity of patients in the database.
- Resume Exam–Continues the exam for that patient if you select the last exam of the day.
- New Exam–Creates a new exam based on a current or searched patient.
- Lock/Unlock–Locks the exam/patient. Prevents move and delete functions.

    If you select the patient, all exams are locked, the lock icon displays in the patient ID cell.

    To lock, select the patient to be locked and select **Lock**.

    To unlock, select the locked patient and select **Unlock**.

- Delete–Deletes Patient/Exam.

NOTE: *"Delete" is only displayed when you login as Administrator.*

Patient View/Exam View (continued)

Exam View–Displays the Exam History of the selected patient.

• The system can display the Detail Mode instead of Exam View when you double click the patient in the patient list or select the patient in the patient list and then select Details. If the Detail Mode preset on Utility -> Connectivity -> Miscellaneous menu is selected, the Detail Mode displays.

• Disk - Displays the disk name on which you saved the exam's image data. If "+" displays behind the disk name, the data is saved on two or more disks.

⚠ CAUTION To maintain optimum performance and to safeguard patient data, keep the total number of patients in the database below 1,000.

To reduce the total number of patients in the database, perform the following procedure.

1. Prepare the unformatted media before EZBackup.

NOTE: *Formatted CD-R or DVD-R cannot be used for EZBackup.*

2. First perform EZBackup and then Backup (Patient Archive and Report Archive).

3. Go to the archive screen, select the patients/exams to delete. Select "Delete" to delete the selected data.

NOTE: *Removing image data with the "EZMove" function does not reduce the patient number in the database.*

NOTE: *Ensure that all patients are exported or backed up BEFORE deleting them.*

We recommend attaching the patient list to the EZBackup media. Insert the media and select DICOM CD Read for dataflow (if you use a USB drive, select DICOM USB Drive Read). Select any patient and press the programmable Set key to print the patient list on the digital printer or PC printer.

Beginning a New Patient

Scanning a New Patient

⚠️ WARNING | Imaging functions may be lost without warning. Develop emergency procedures to prepare for such an occurrence.

⚠️ WARNING | Ensure you have selected a dataflow. If No Archive is selected, no patient data is saved. The Dataflow will display as below:
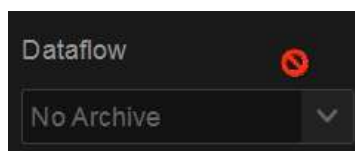
⚠️ CAUTION | To avoid patient identification errors, always verify the identification with the patient. Make sure the correct patient identification appears on all screens and hard copy prints.

⚠️ CAUTION | Always use the minimum power required to obtain acceptable images in accordance with applicable guidelines and policies.

⚠️ CAUTION | Always use the system on a flat surface in the patient environment.

⚠️ CAUTION | Ensure that the hands of the patient are away from the system during the exam.

The position of the operator and the patient vary by the anatomy of interest being scanned.

In most cases, the operator sits/stands straight in front of the operator console and the patient lies on the bed on the right (or left) side of the system.

Scanning a New Patient (continued)

When starting a new patient's exam, ensure you do the following:

1. Select **Patient** on the control panel.
2. Select **New Patient** on the patient menu.

    If there are images on the clipboard, a pop-up menu appears. Specify whether you want to store images, delete images, or go to active images.

3. Choose the exam category.
4. Verify the dataflow.

NOTE: *DO NOT use the removable media Dataflows on the New patient menu.*

NOTE: *The system will display a warning dialog when the patient is registered to "No Archive". if the "Warn register to No Archive" preset is selected in the Utility -> Connectivity -> Miscellaneous menu, a warning displays. Please select a different dataflow for permanent storage of patient data.*

5. Fill in patient information.

NOTE: *You can also select a patient from the patient database at the bottom of the Patient menu if the patient has a patient ID.*

NOTE: *Columns drive the ordering of the patients displayed. The colums that you select drives the order of the displayed paient database.*

NOTE: *Do not use the following characters when filling in patient information:*

" ' / : ; . , * < > | + = [ ] & !, @, #, $, %, ^, &, *, (,), ?, /, ~ , [,], {, }

6. Select *Register*. Enter Past OB Exam information, if desired.
7. Select the probe to start scanning (or select Esc, Scan, or Freeze).
8. Perform the exam.

Scanning a New Patient (continued)

9. Store the images/loops to the clipboard.

    To store the still image, press **Freeze** and scroll through the frames using the **Trackball**. Select the frame and press **P1**.

    To store the cineloop, press **Freeze** and run the cineloop using the **Trackball**. Select the start/end frame and run the selected loop. Press **P1**.

    Select the start/end frame and scroll through the frames, or, store loops by pressing **P1** during the live scan.

10. When you have completed the study, press *End Exam*. The Active Images screen displays. Select the images (still frame or cineloop) you want to store or simply select *Permanent Store* to store the images permanently.

| CAUTION | DO NOT use the following special characters when saving images: !, @, #, $, %, ^, &, *, (,), |, :, ;, <, >, ?, /, ~, [,], {, }. |

| CAUTION | After completing the measurement, verify that the measurement result window is updated before you send or save the image. |

Entering a Patient List Prior to Starting an Exam

All patient information can be entered before starting an exam.

1. Press **Patient** to display the Patient Screen.
2. Press *New Patient* to erase the current patient data.
3. Select **Store All** if data from previous patient was not saved.
4. Enter the Patient ID.
5. Enter the patient and exam information.
6. Press *Register*.
7. Repeat above steps as required.

Select the patient from the Patient List. Select **Resume Exam** to continue the last exam that was performed on the selected patient.

Select **New Exam** to start a new exam on the selected patient.

Starting a new exam on an existing patient

1. Select **Patient** on the control panel.
2. Select the patient from the Patient List.
3. Select **New Exam**.
4. A new exam is created. Enter the data and begin the scan.

Scanning without entering any patient data

To scan a patient without entering any patient data until the end of the exam:

1. Scan the patient and save images to clipboard without the patient information, the system displays a Warning message, "A patient must be selected for permanent storage of images." Select **OK**, a warning message is also displayed at the bottom of the image monitor in red.

2. When the scanning is finished, press **Patient** to display the Patient Search screen.

3. Enter the Patient ID, patient data and exam information as necessary, select *Register*.

4. If images or measurements have been stored to the clipboard, the system will display the following message:

   "Unsaved images, measurements or fetus number will be linked to the current patient information, continue?" Press **OK** if you want to permanently store the images/ measurements that were just taken.

5. Enter the Active Images Screen, select *Permanent Store*.

6. Return to patient page, select **New Patient**.

Ending a Patient

To end a patient:

Press *Patient* -> *New Patient*, then select **Store All** in the pop-up menus to store exam data.

Changing Current Patient to Existing Patient (with Patient ID)

To change the current patient (with patient ID) to an existing patient, when there are some unsaved images on the clipboard for the active exam:

Select the existing patient from the patient list, the following dialog displays.
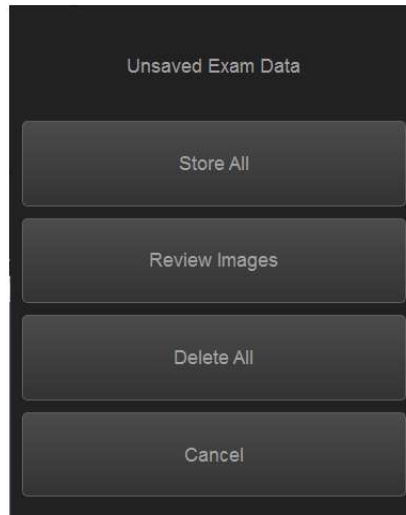
Figure 4-5.   Unsaved Exam Data

1. **Store All** All the unsaved images will be saved to the current patient.

2. **Review Images.** Review the unsaved images in **Active Images** page and select to permanent store or delete.

3. **Delete All.** Delete all the unsaved images.

    The system will display a dialog: "Do you really want to delete all temporary images?" Select OK to delete the unsave iamges, select Cancel not to delete the images.

4. **Cancel.** Do nothing with the unsaved data, and return to **Patient** page.

Changing Current Patient to Existing Patient (without Patient ID)

To change the current patient (without patient ID) to an existing patient, when there are some unsaved images on the clipboard for the active exam:

Select the existing patient from the patient list, the following dialog displays.
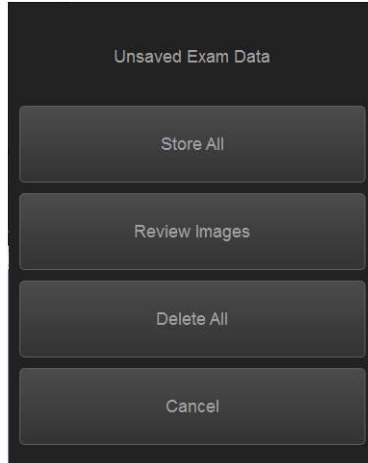
Figure 4-6.   Unsaved Exam Data

1. **Store All** All the unsaved images will be saved. The current patient doesn't have Patient ID, the system will indicate to enter patient ID.
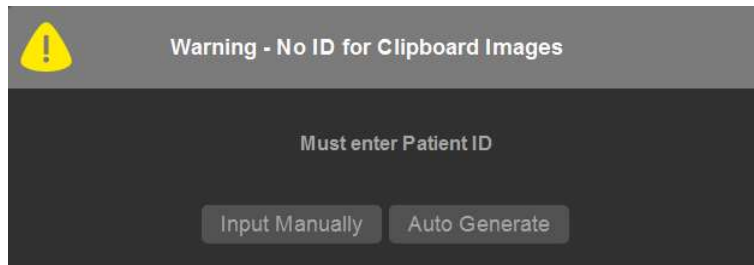
Figure 4-7.   Enter Patient ID

Changing Current Patient to Existing Patient (with Patient ID) (continued)

- •   **Input manually** Input the Patient ID and other information manually, and then select **Register** to register the new patient. And the system will display:

  "Unsaved images, measurements or fetus number will be linked to the current patient information, continue?" Select OK to save the images.

- •   **Auto Generate** The system will generate a new patient ID and the unsaved images will be saved to this new patient automatically.

2. **Review Images.** Review the unsaved images in **Active Images** page and select to permanent store or delete.

3. **Delete All.** Delete all the unsaved images.

    The system will display a dialog: "Do you really want to delete all temporary images?" Select OK to delete the unsave iamges, select Cancel not to delete the images.

4. **Cancel.** Do nothing with the unsaved data, and return to **Patient** page.

Deleting the existing patient/exam/image

 CAUTION   Before deleting a patient or image from the Patient Screen, make sure you have already saved the data with EZBackup/ EZMove, Backup, or Export. Verify the media before deletion.

Deleting the existing patient

1. Search and select the patient in the patient list.
2. Select *Delete*. The confirmation dialog box displays.

    OR

    Press the **Cursor** key. A pop-up menu displays. Select *Delete*. The confirmation dialog box displays.
3. Select **OK** to delete or **Cancel**.

Delete multiple patients from the patient list

1. Select the multiple patients to be deleted from the patient list by holding down the Ctrl key and selecting patients one by one or holding down the Shift key to select a group of patients.
2. Select *Delete*. The confirmation dialog box displays.

    OR

    Press the **Cursor** key. A pop-up menu displays. Select *Delete*. The confirmation dialog box displays.
3. Select **OK** to delete or **Cancel**.

Deleting an existing exam

1. Search and select the patient in the patient list under patient screen.
2. Select *Exam View* to display patient exam screen.
3. Select the exam to be deleted.
4. Select *Delete Exam*. The confirmation dialog box displays.
5. Select OK to delete or Cancel.

Deleting an existing image

1. Search and select the patient in the patient list under patient screen.

2. Select *Exam View*. The patient exam screen displays.

3. Select the exam which contains the image to be deleted.

4. Select *Active Images* to display the image list.

5. Select the image to delete and select *Delete*. The confirmation dialog box displays.

6. Select **OK** to delete or **Cancel**.

Printing the Patient List

You can print the patient list on a connected printer.

1. Move the cursor to the patient list and select any patient.

2. Press the **Cursor** key. The pop-up menu displays.
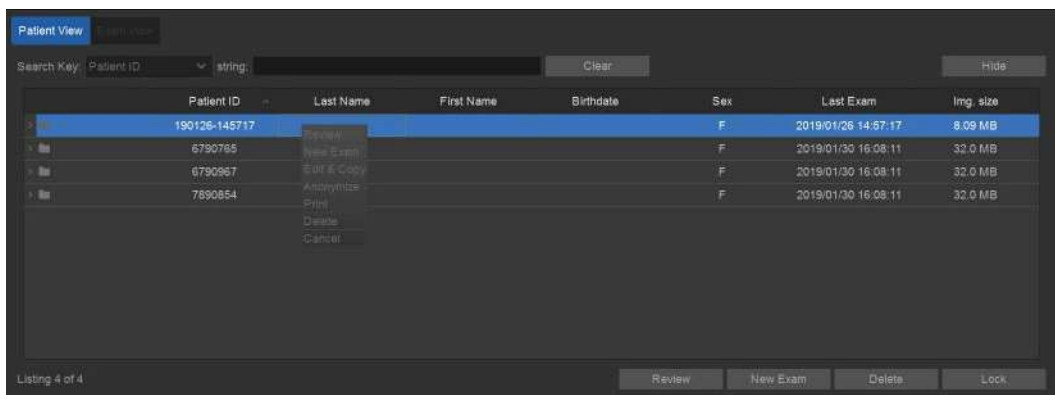
Figure 4-8.   Print the patient list

3. Select *Print* and press the **Set** key.

Retrieving and editing archived information

Searching for an existing patient

1. Select **Patient** to display the Patient Screen.

2. Select the search key. Enter the search string.

NOTE: *When the number of patients on a hard disk is in the hundreds, it takes time to search for a patient or switch to another screen. In this case, do one of the following:*

- *Uncheck the Auto Search for patient function at the Utility -> Connectivity -> Miscellaneous screen.*
- *Delete unnecessary patient data.*

3. An appropriate patient is displayed.
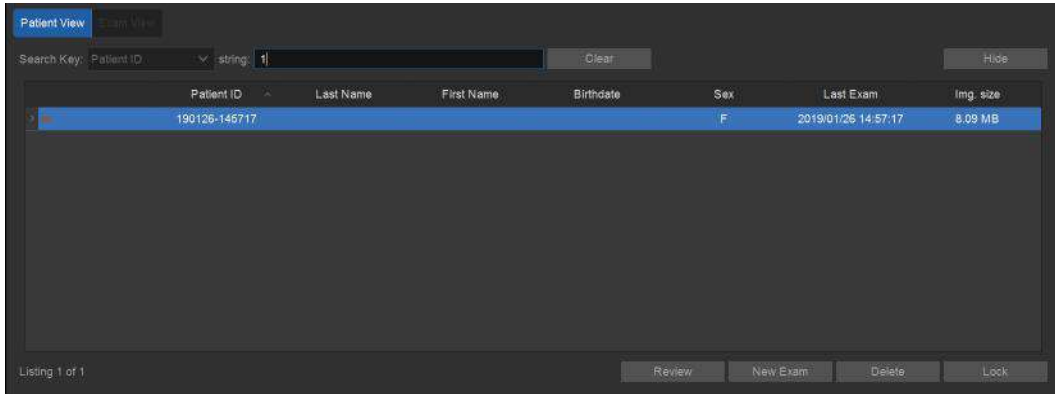
Figure 4-9.   Patient Search Screen

- Select **Review** to review the exam history of this patient.
- Select **New Exam** to create a new exam for this patient.
- Select **Delete** to delete this patient. See 'Deleting the existing patient' on *page 4-18 for more information.*

NOTE: *"Delete" is only displayed when you login as Administrator.*

Pop-up menu

If you select the patient and press the **Cursor** key, the pop-up menu displays.
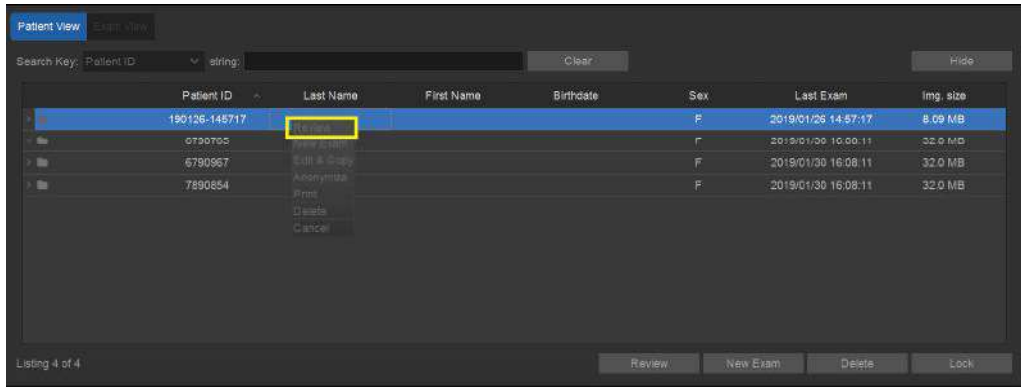
Figure 4-10.   Archived Patient

If you select the patient of the day, *Resume Exam* displays to continue the exam.
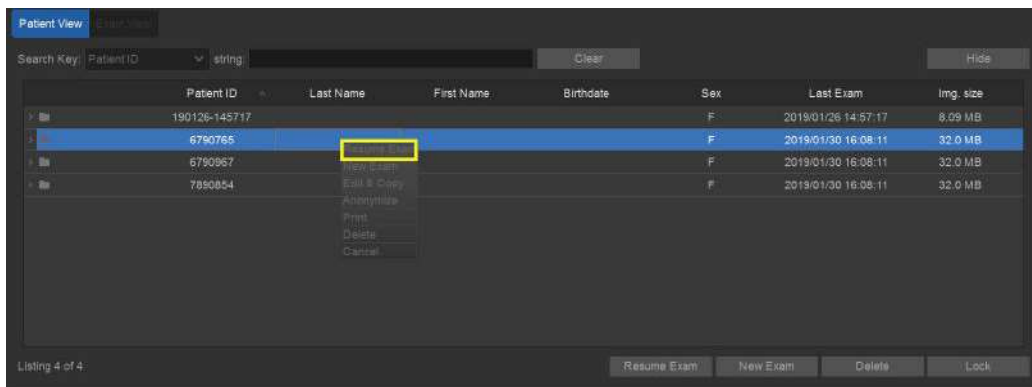
Figure 4-11.   Patient of the Day

NOTE: *The preset "Double click on patient list to start", located on the Utility -> Connectivity -> Miscellaneous screen, allows you to display either the Review or New Exam screen by double clicking the **Set** key on the patient name.*

Edit and Copy Patient

The "Edit and Copy Patient" function:

- Copies data of a registered patient from the local archive to a newly-created patient in the local archive. The newly-created patient would have a new identification: patient ID, other ID, patient name, and sex etc.

- Assigns a new identification: new UIDs to the copied exam data. The newly-copied patient would have the same medical data as the patient being copied but with a different identification.

NOTE: *"Edit and Copy Patient" will only copy patient data, images inside the local archive; it will not allow patient data or images from outside of the local archive. This includes the following types of images: EZMove, exported, MPEGvue, SaveAs, DICOM Store, or (DICOM) print.*

NOTE: *Remove the EZMove image link from the database for the copied patient.*

NOTE: *"Edit and Copy Patient" does not copy the patient's report and remove the report link from the database for copied patient.*

NOTE: *"Edit and Copy Patient" does not deal with patient information already burned in image pixels.*

NOTE: *The image and title bar, including patient information, is copied as is.*

NOTE: *The "Edit & Copy" function does not display for a current patient.*

NOTE: *The "Edit & Copy" function does not display when multiple patients are selected.*

CAUTION The user is responsible for patient data, diagnostic information or any other patient-related information entered in the database.

Edit and Copy Patient (continued)

1. Ensure that you are logged in as an Administrator on the system.

2. Select the Local Archive dataflow.

3. Select the patient from the Patient View list and press the **Cursor** key to bring up the "Edit & Copy" pop-up menu.
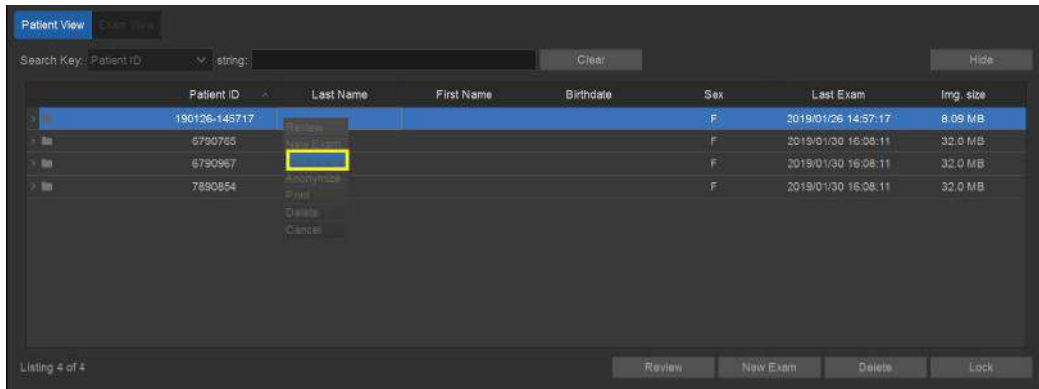
Figure 4-12.   Select an Exam to Copy and Edit

4. A confirmation dialog displays. Select *OK*.
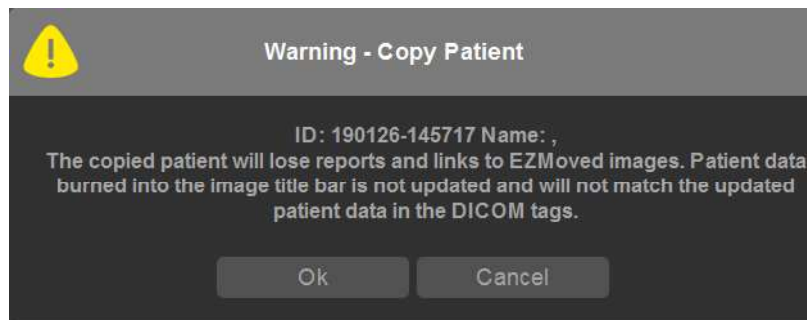
Figure 4-13.   Copy Patient Pop-Up Confirmation

Edit and Copy Patient (continued)

5. The "Edit and Copy Patient" dialog displays. All the fields inherit the values from the original patient's exam, except for Patient ID.

Figure 4-14.   Edit and Copy Dialogue

- • ***Generate Patient ID*** generates a patient ID.
- • ***Clear All*** clears all fields except for Patient ID and Other ID.
- • ***Cancel*** button cancels the "Edit and Copy Patient" function.

6. Fill in the Patient information fields, then press OK.

NOTE: *If the new entered Patient ID is not unique in the database, the Patient ID turns to red and an error message displays on the status bar.*
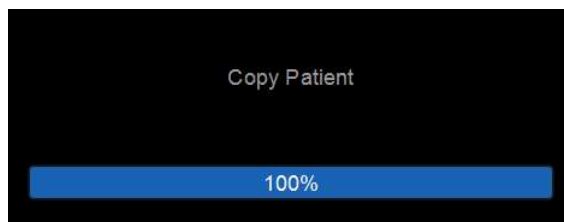
Figure 4-15.   Copy Status Bar

Edit and Copy Patient (continued)

7.   When the copy is done, the patient list is refreshed.

Figure 4-16.   Completed Patient Copy

Changing Patient Information or an Exam

⚠ CAUTION	The user is responsible for patient data, diagnostic information or any other patient related information entered in the database.

If patient information needs to be edited, pressing *Patient* enables the Patient Screen for modifying information.

If the exam for the patient is still active, you can choose the tab that is desired. The exam changes in the Exam View area.

If the exam category needs to be changed, pressing *New Exam* allows modification of the Patient Screen without erasing accumulated patient images, measurements, annotations, calculations and worksheets.

1. Display the Patient screen by pressing *Patient*.

2. Select patient from the Patient list. If need to search the patient, the system automatically searches to see if the patient is already in the database.

   • Select Search key (Patient Data: Patient ID, First Name, Last Name, Birthdate, Examdate etc.).

   • Enter search string (for example, initial letter of Patient Name)

   To have the database shown in its entirety, *Backspace* to clear all contents on the Search string and all patient names appear.

3. The appropriate patient is displayed.

   If patient information needs to be edited or the exam category changed, use the New Exam feature. Pressing *New Exam* allows modification of the Patient Screen without erasing accumulated patient images, measurements, annotations, calculations and worksheets.

NOTE: *Patient identification information cannot be modified.*

4. Select **Resume Exam** or **New Exam** to register the new exam.

   A new exam is automatically created on that patient unless an exam already exists on that day for that patient.

5. On the control panel, press the *Esc* key, the **B-Mode** key or select *Scan* key.

   Select the *Probe* on control Panel to select preset and appropriate probe, if necessary.

Anonymize the patient information

The Anonymize function:

1. Copies data from a registered patient on the local archive to a newly-created patient on the local archive. The newly-created patient will has new identifiers: patient ID, other ID, patient name, sex, etc.

2. Assigns a new UID to the copied exam data. The newly-copied patient has the same medical data as the copied patient but with a different UID.

3. Assigns new DICOM tags to the copied exam data.

NOTE: *"Anonymize" does not copy the patient's report. Remove the report link from the database for copied patient.*

NOTE: *"Anonymize" does not deal with patient information already burned in image pixels.*

NOTE: *The "Anonymize" function does not display for a current patient.*

NOTE: *The "Anonymize" function does not display when multiple patients are selected.*

⚠ CAUTION   The user is responsible for patient data, diagnostic information or any other patient-related information entered in the database.

1. Ensure that you are logged in as an Administrator on the system.

2. Select the Local Archive dataflow.

Anonymize the patient information (continued)

3. Select the patient from the Patient View list and press the **Cursor** key to bring up "Anonymize" pop-up menu.
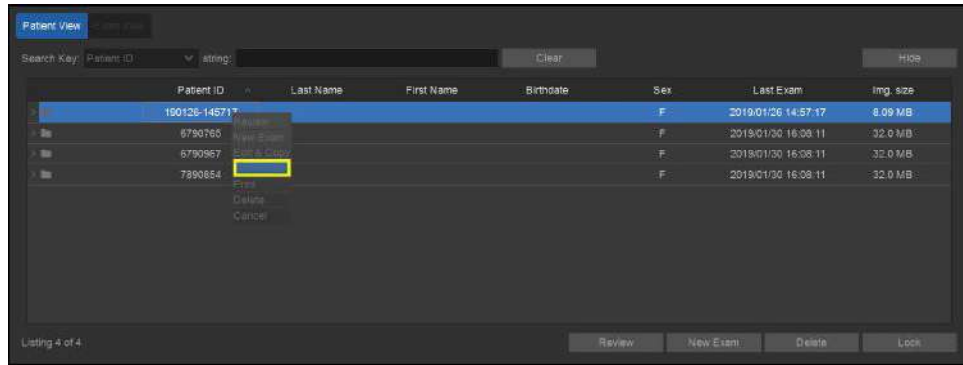
Figure 4-17.   Select an Exam a patient to anonymize

4. A confirmation dialog displays. Select **OK**.
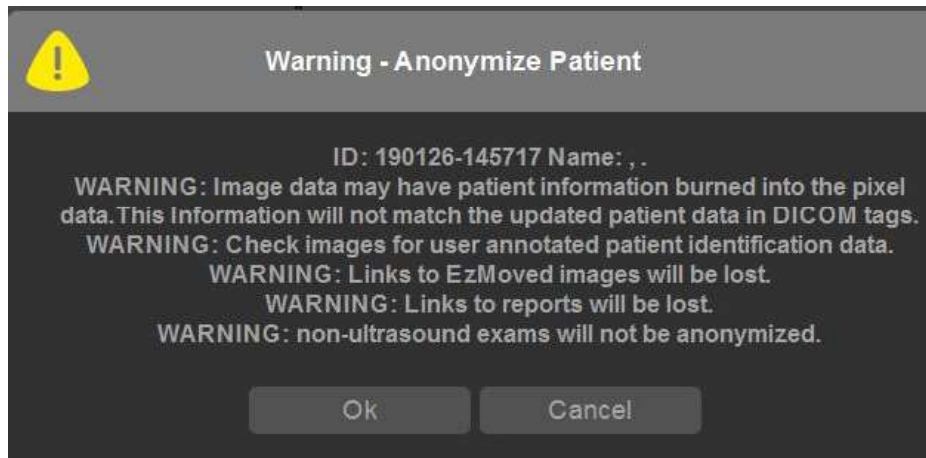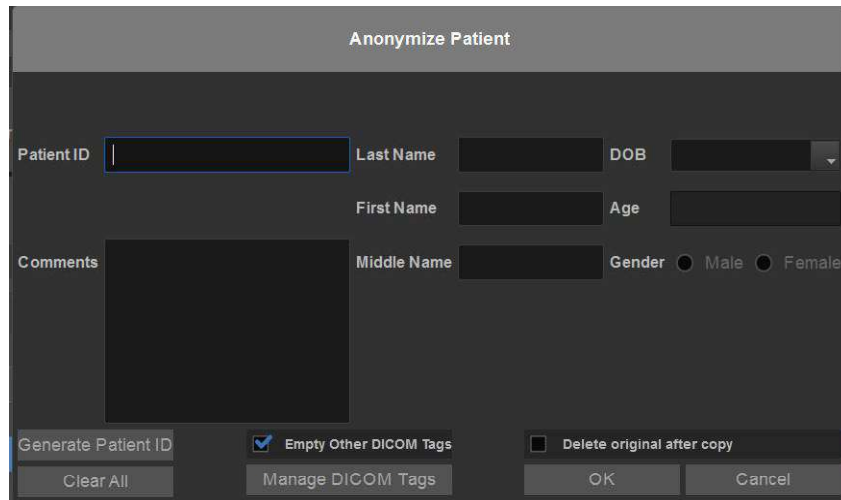
Figure 4-18.   Anonymize Patient Pop-up confirmation

NOTE: If the selected patient has no exams, the warning message "Failed to copy the patient" displays.

Anonymize the patient information (continued)

5. The "Anonymize" dialog displays. All the fields inherit the values from the original patient's exam, except for Patient ID.

Figure 4-19.   Anonymize Patient Dialogue

- **Generate Patient ID** generates a patient ID.
- **Clear All** clears all fields except for Patient ID and Other ID.
- **Cancel** button cancels the "Anonymize" function.

Anonymize the patient information (continued)

- • **Manage DICOM Tags** edits the DICOM Tags for the new Patient. This is available when Empty Other DICOM Tags is checked.

  Select **Save and Exit** to save the new DICOM Tags.
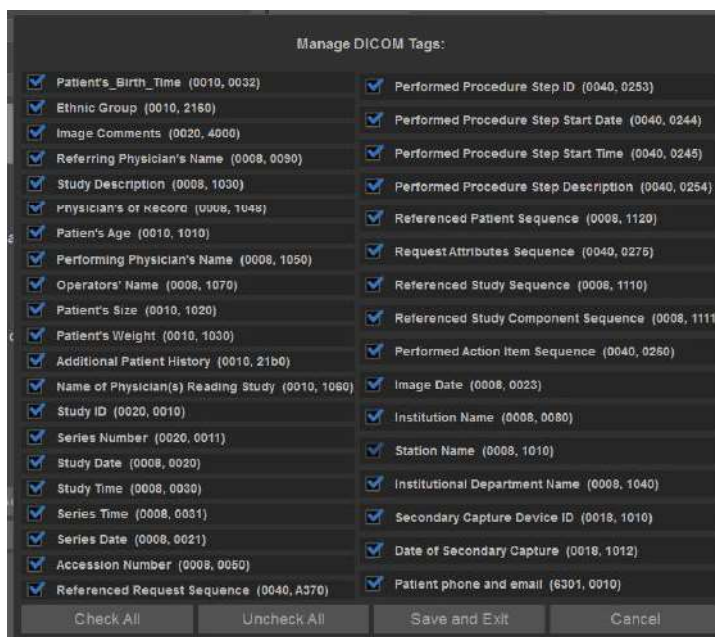
Figure 4-20.   Manage DICOM Tags

NOTE: *If **Empty Other DICOM Tags** is unchecked, **Manage DICOM Tags** is not available.*

6. Fill in the Patient information fields, then press **OK**.

NOTE: *The new entered Patient ID should be unique in the database.*
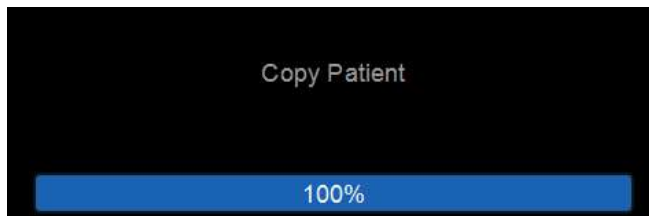
Figure 4-21.   Anonymize Patient status bar

Anonymize the patient information (continued)

7. When Anonymizing Patient is done, the patient list is refreshed.

Figure 4-22.   Completed Anonymizing Patient

Review images in archive

There are two ways to access to archived images:

- Review the images from a selected examination.
- Select images from the Active Image screen displaying all the images sorted by examination for the actual patient record.

Review the patient exam/image

To review the patient exam,

1. Move the cursor to the patient in the Patient View and double-click. Exam View displays.

   or

   Move the cursor to the patient and select Exam View tab. Exam View Displays.

2. Move the cursor to the desired exam and double-click.

3. Active Images screen displays. Move the cursor to the image and double click or press **Review**.

4. The review screen displays. Select the image from clipboard.

NOTE: *See 'Clipboard' on page 15-8 for more information.*

Active Images

Active Images displays the images of the exam.

NOTE: *CINE loops are not played interactively as you view the active images on the Archive screen.*
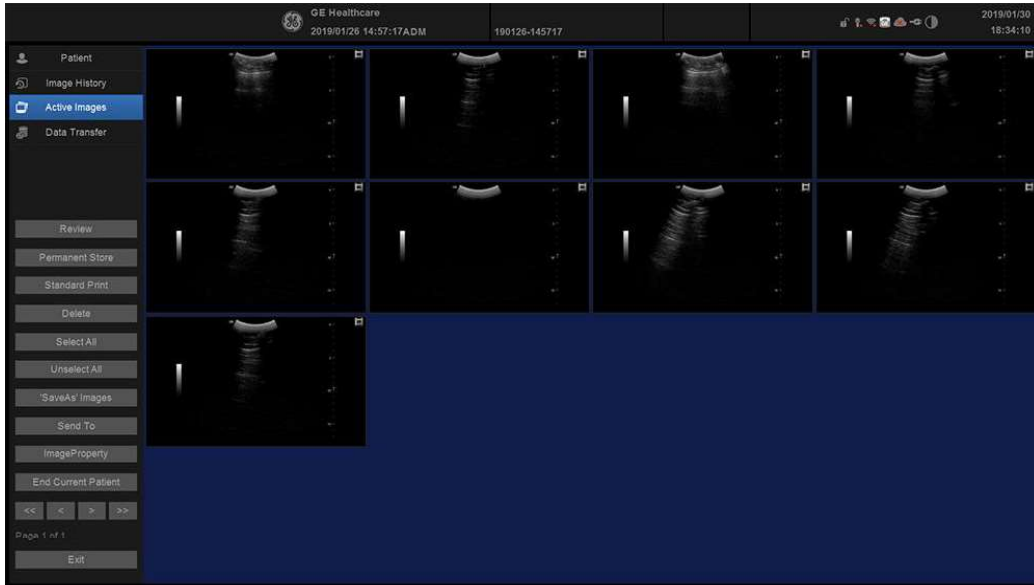
Figure 4-23.   Active Images Screen

1. Select the exam which includes the image to review.

2. Select **Active Images**.

3. Select the image and press **Review** or double click on the image. The image is displayed.

    If you select 2 - 4 images and select **Review**, the archived images are displayed in the split screen.

Active Images (continued)

Table 4-1:   Active Images

Parameters	Description
Review	Select the image and press **Review**, the image is displayed.
Permanent Store	Select the images which you want save to the Local hard disk drive.
Standard Print	To print an image, 1. Select the image you want to print from the Active Images screen. You can print one (1) image per sheet or 2x3 images per sheet. 2. Press **Standard Print**. NOTE: If the printer is not assigned to the button, you will get a message telling you to Check Printer Button Configuration. NOTE: There is no warning to let you know that the printer is not functioning. Check the printer. You need to configure the printer to the Standard Print button via **Utility** --> **Connectivity** --> **Button**.
Delete	To delete images, select the images in the active screen, then select **"Delete"** on the monitor display.
SaveAs Images	Refer to ''SaveAs' Images' on *page 15-15* for the detail. You can select the multiple images collectively in Active Image screen which you want save by SaveAs. NOTE: We suggest that you save the images page by page with 'SaveAs' Images in Active Images. It takes time if you have many images or raw data.
Send To	Refer to 'Send To (Send the image to the DICOM Device)' on *page 15-32* for the detail. Note: "Send To" button is not displayed in Active Images menu if the patient is not selected.

Analyzing Images

To analyze the archived images, select the image, then select **Review**. The archived images is displayed with the date and time of archival.

To compare the analyzed image to a live image, press **Dual**. Now both the archived and live images appear on the monitor display. Unfreeze the live image area.

Selecting an Application Preset and a probe

Selecting an Application Preset

The exam category preset that best describes the desired exam to be performed is chosen after the exam category is selected. The factory default preset selections are displayed on the menu area.

Use these parameters as a starting point for the exam.

User-Defined Application Presets

1. Press **Probe** on the control panel. Select the Model and Application you want to use as a basis for the new Application Preset. And then select **Create New**.
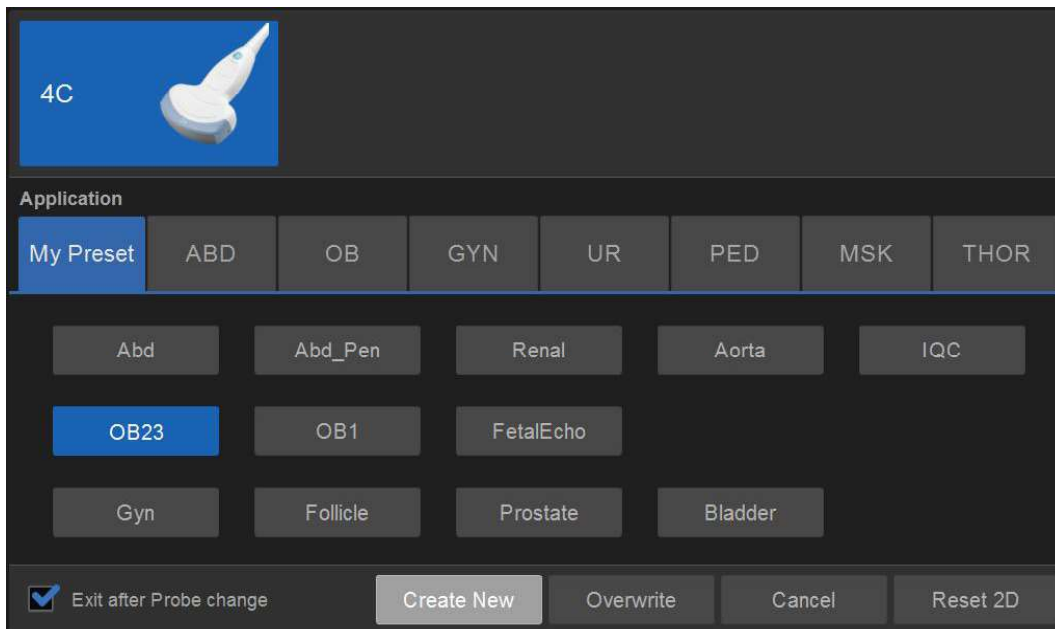
Figure 4-24.   Application Preset Menu

User-Defined Application Presets (continued)

2. The Create New Application menu appears. Enter the name
    and check the "Add to My Preset" box, then select *Create*.
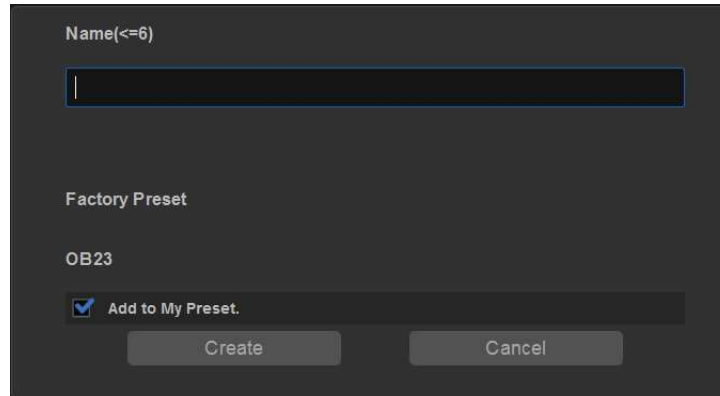
Figure 4-25.   Create New User Application Menu

NOTE: *The new user application is based upon the current exam
              category and application, plus any modifications you have
              made, including the comment library and M&A calcs.*

NOTE: *The name of the new application cannot include spaces or
              symbols. However, the name can include numbers and
              letters.*

User-Defined Application Presets (continued)

3. To view/edit the parameters for the user-defined preset, select *Utility* --> *Preset Manager*, then check **Imaging Preset Maganer**.
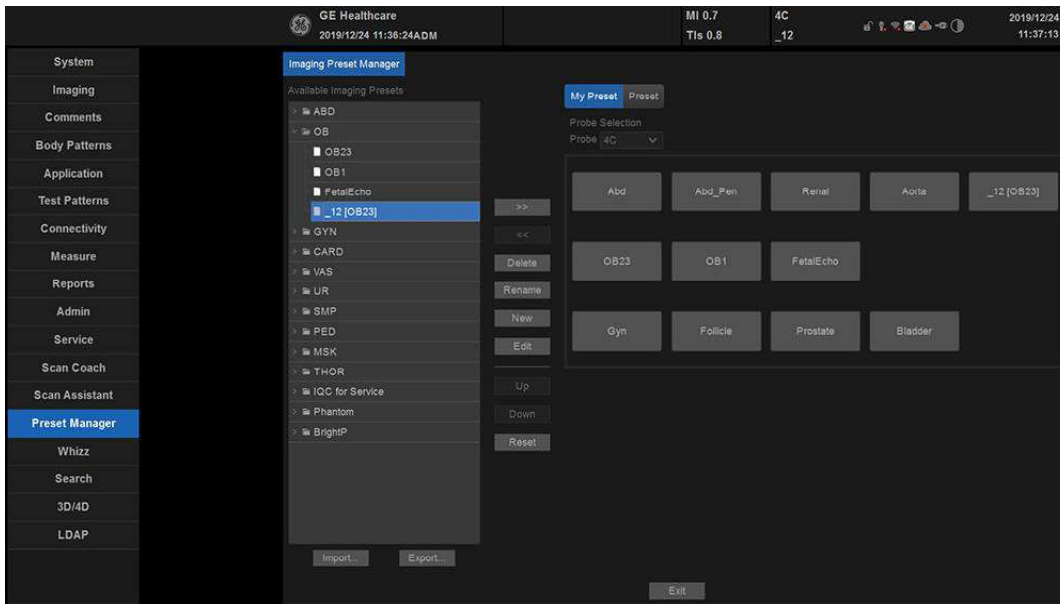
Figure 4-26.   Imaging Preset manager

If you change the settings for this application, make sure to save the changes via Save --> Overwrite (user application).

NOTE: *If you select Reload Factory Defaults for the User-Defined application that you created, the settings for this user-defined application revert back to the factory settings for the exam category and application it was based upon.*

NOTE: *If you use the user-defined preset as default preset, re-select the preset in Utility whenever you overwrite the user-defined preset.*

NOTE: *You can delete, rename, edit a user-defined application. And you can also create a new application preset by selecting* **New**.

Updating User Presets

You can edit, reset to factory default, or delete any user preset you create, as long as you have selected it in the "Available Imaging Presets" column on the left.

Editing imaging Parameters

To view/edit the parameters for the user-defined preset,

1. Adjust the image while in the user preset you want to edit.
2. Press **Probe** on the control panel.
3. Select [Preset Name] and press *Overwrite* .
4. From the Utility--> Preset Manager.

To view/edit the parameters for the user defined preset

1. Press Utility--> Preset Manager. Select the user preset you want to view/edit from Available Imaging Presets Column.
2. Press *Edit.* The Imaging page appears.
3. Edit the presets as necessary and press *Save.*

or

1. Adjust the image while in the user preset you want to edit.
2. Press **Probe***.*
3. Select [Preset Name] and press *Overwrite* .

Renaming a User Preset

To rename a user preset,

1. Press Utility--> Preset Manager. Select the user preset you want to rename.
2. Press *Rename.* The Rename Preset pop-up menu appears.
3. Type the new name and select Rename*.*

Deleting a User Preset

To delete a user preset,

1. Press Utility--> Preset Manager. Select the user preset you want to delete.
2. Press *Delete.* The Delete Preset pop-up menu appears.
3. Confirm that you want to delete this user preset and select **Yes***.*

Arranging Presets on Application Preset Menu

On this screen, you specify where you want the new user (and existing) presets to appear on Application Preset Menu.

Each control in Preset Manager matches the location in Application Preset Menu.
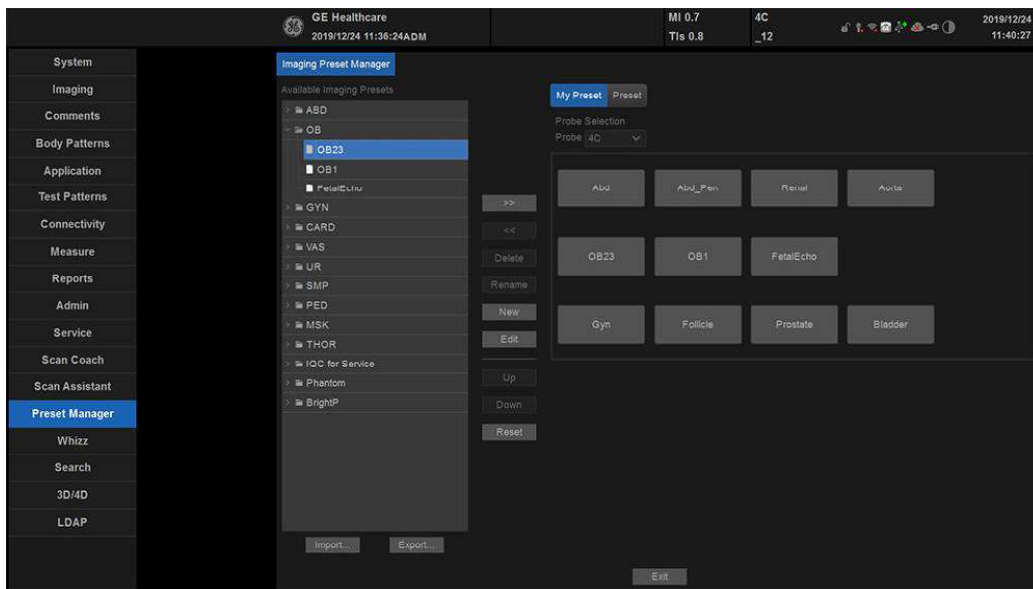
Figure 4-27.   Mapping Application Preset Menu

Arranging Presets on Application Preset Menu (continued)

You can move the location of where the application appears on the Application Preset Menu via the Preset Manager.

To reposition an application on the Application Preset Menu,

1. Enter Utility->Preset Manager, select the My Preset you want to move from the My Preset Column.

2. Use the up/down button on the screen to move the preset to a new position.
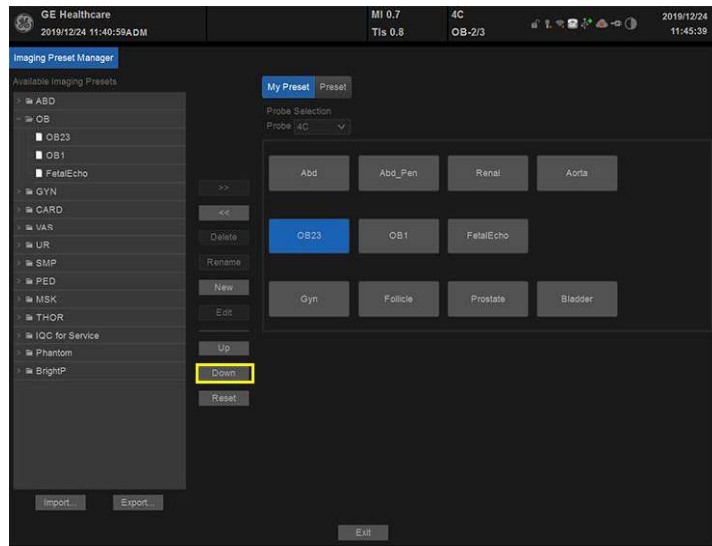
Figure 4-28.   Adjust the position of the Preset

In the example below, the preset OB23 has been moved to the 2nd position on the Application Preset Menu.
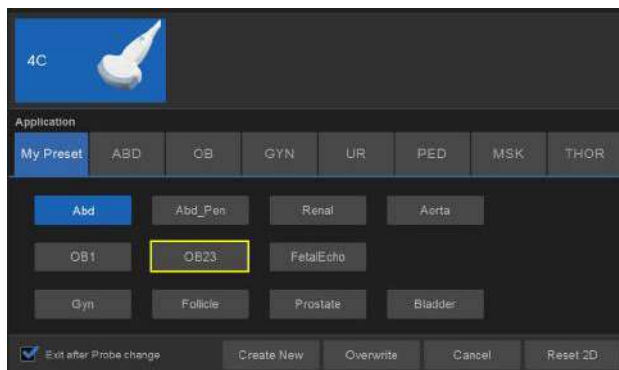
Figure 4-29.   Repositioned User Preset

Share My Presets between Versana Active Systems

You can share the My Presets you have created between Versana Active systems by exporting/importing the preset(s) you want to share.

To move a user preset from one Versana Active to another Versana Active system (same software level), first export the user preset(s) you wish to share.

Exporting User Presets

To export a user preset (or presets),

1. Enter Utility-> Preset Manager.
2. Insert the media (Flash Drive, USB Hard Drive).

Exporting User Presets (continued)

3. Select **Export** (on the bottom).
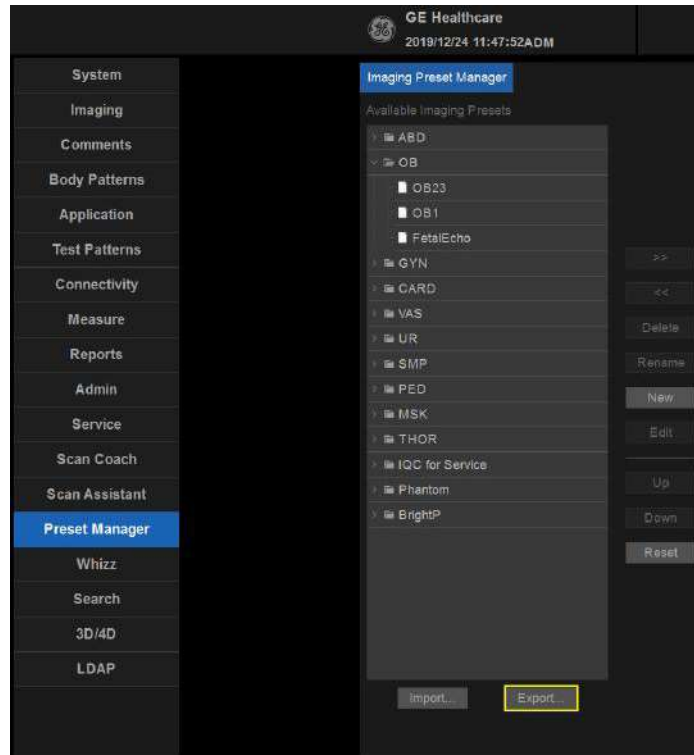
Figure 4-30.   Exporting a User Preset

Exporting User Presets (continued)

4. An Export Presets pop-up menu appears that indicates:

    a.   destination location (USB Flash Drive/Hard Disk Drive drive location).

    b.   preset directory where the preset should be saved (Preset Export).

    c.   available presets on the scanner.

    Select the name for the Preset Directory from the Preset Directory pull-down.
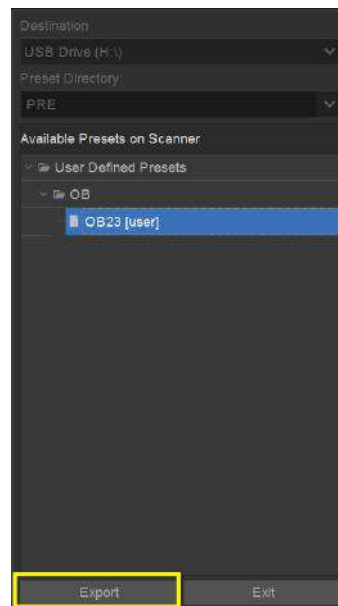
Figure 4-31.   Export Presets

5. Select the User Defined Presets under Available presets on Scanner and press Export.

6. Upon a successful export, an informational message will pop-up indicating that "1 preset successfully exported." Press OK. Then press Exit to close the Export Presets pop-up menu.

7. Press F3 to Eject the media. Take the media to the other system and follow the Importing User Presets instructions below.

Importing User Presets

To import a User Preset,

1. Enter Utility-> Preset Manager.

2. Insert the media (Flash Drive, USB Hard Drive).

3. Press Import. The Import Presets pop-up appears and displays the Source Directory and Available Imaging Presets.

4. Select the "User Defined Presets" under Available Imaging Presets and press Import.

    If these presets are already on this Versana Active, you will be asked whether you want to:

    •   Overwrite this preset (Yes, Yes to All, No or No to All).

    •   Rename this preset (Type the new name and press Rename).

    •   Cancel.

5. Upon a successful Import, an informational message will pop-up indicating that "1 preset successfully imported." Press OK. Then press Exit to close the Import Presets pop-up menu.

6. Press F3 to Eject the media.

Selecting a probe

- Always start out with a probe that provides optimum focal depths and penetration for the patient size and exam.
- Begin the scan session using the default Power Output setting for the probe and exam.
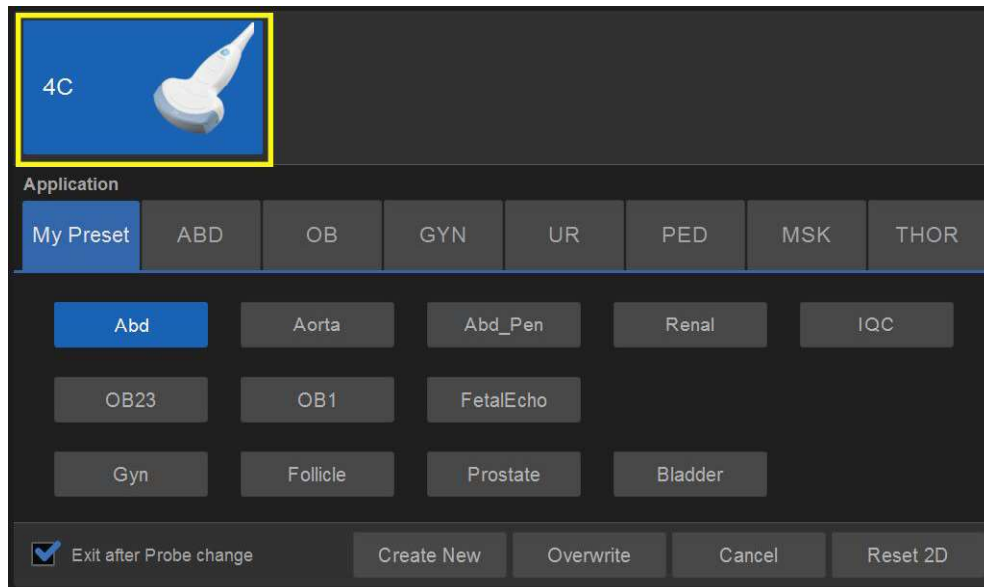
Figure 4-32.   Probe Indicators (Example)

1. Probe Indicators.

Follow-up Tool

Overview

The Follow-up tool is intended to perform serial scans on a patient, and compare the images of a previous ultrasound exam to the current exam.

When performing a follow-up exam, the system automatically reloads the scanning parameters including ROI for QAnalysis from previous exam, and allows for side by side scanning for image comparison. This allows the physician to use consistent scanning parameters and Region of Interest (ROI) from exam to exam on the same patient and may assist in assessing a patient condition over time.

Follow-up tool configuration

- Follow-up tool is available in B / B (CHI) / CF/ PDI mode.
- In order to utilize the follow-up tool, images should be saved in RawDICOM format.

  To configure image format as RawDicom:

  Enter Utility -> Connectivity -> Button to set the Print button for this format. RawDicom should be selected in the **Format** field.
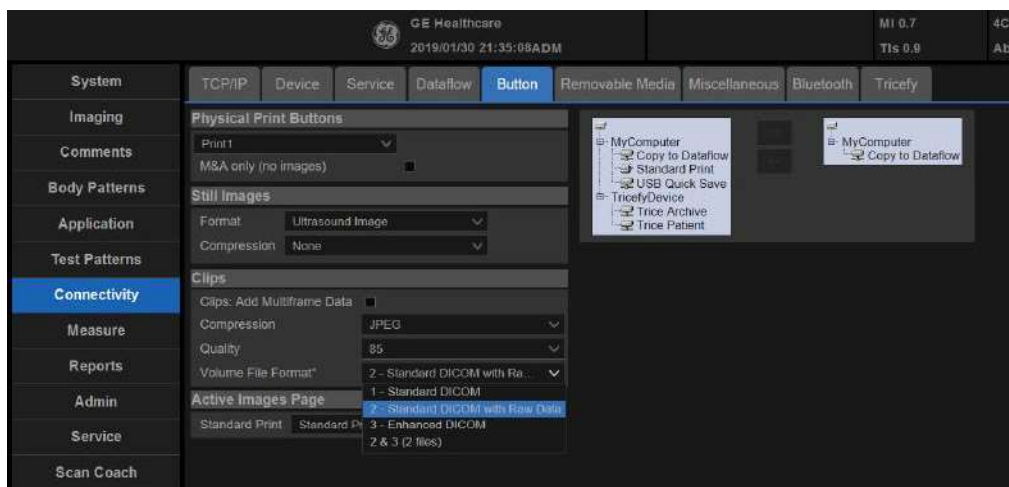
Figure 4-33.   Set Image format

Follow-up tool configuration (continued)

- The Customer can configure the Follow Up Button in Utility ->System -> User Configurable Key.

  The Customer can configure Follow Up in the Keyboard Key or the User Defined key.
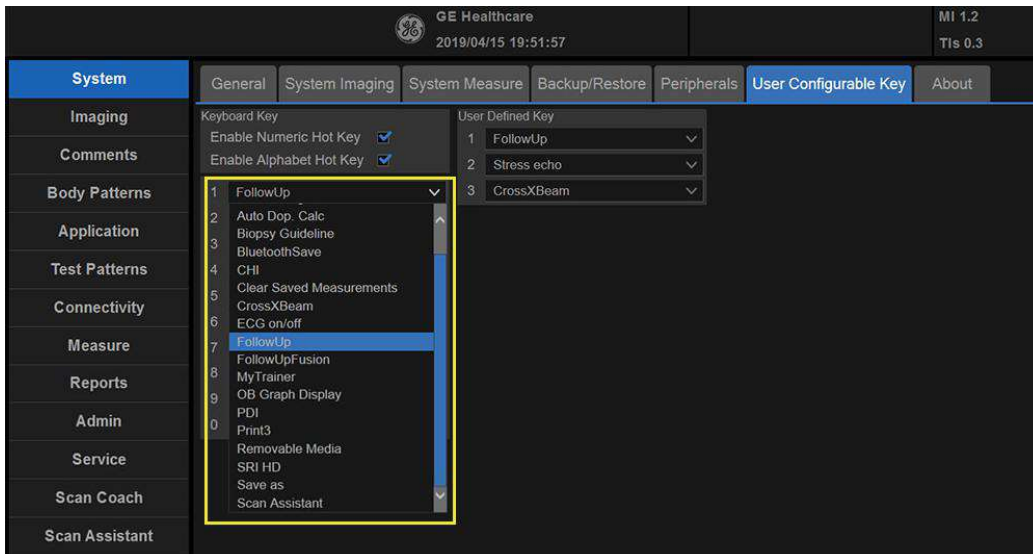
Figure 4-34.   Follow Up Tool Configuration (1)
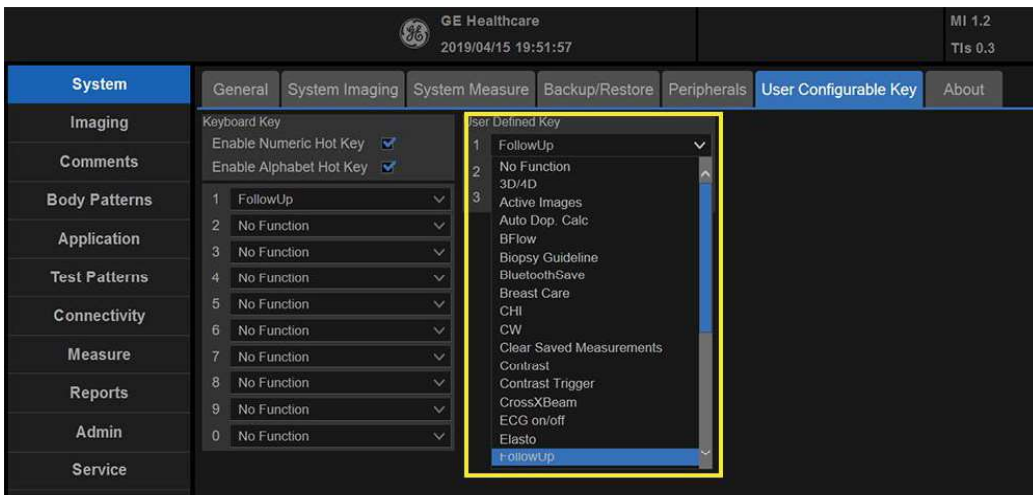
Figure 4-35.   Follow Up Tool Configuration (2)

Follow-up tool configuration (continued)

- The Customer can configure the Follow Up Tool settings in Utility -> System -> System Imaging -> Follow Up Tool.
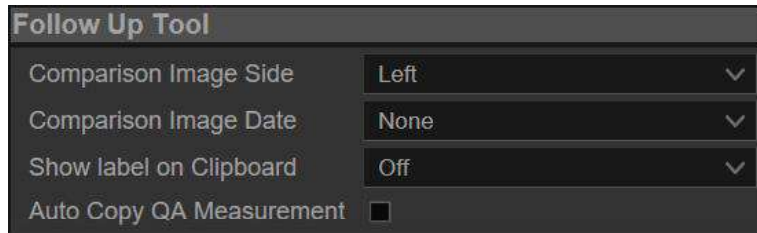
Figure 4-36.   Follow Up Tool Setting

- Comparison Image Side: select the comparison image displayed position. The Choices are: Right and Left. The Factory Default value is Left.
- Comparison Date: Choose the date display condition of images which are used for comparison. The choices are: All Dates, Different Dates, None.

  All Dates - The date is always displayed on the comparison image.

  Different Dates - The date only displays when the date of the comparison image is different from the active exam date.

  None - No Comparison image date is displayed.
- Show label on Clipboard: choose when to show the comment label for the image on clipboard. The Choices are: Always, Follow up tool and Off.
- Auto Copy QA Measurement:

  Check the box, QAnalysis measurement is copied automatically from comparison image to the current scanning image.

  Uncheck the box, QAnalysis measurement is not copied automatically from comparison image to the current scanning image.

  The factory default is that the box is unchecked.

Follow-up Tool Workflow

The First Exam

1. Press **Patient** to enter the Patient page.

2. Create a New Patient, and create a new exam for the patient. Select **Scan** to enter scanning mode.
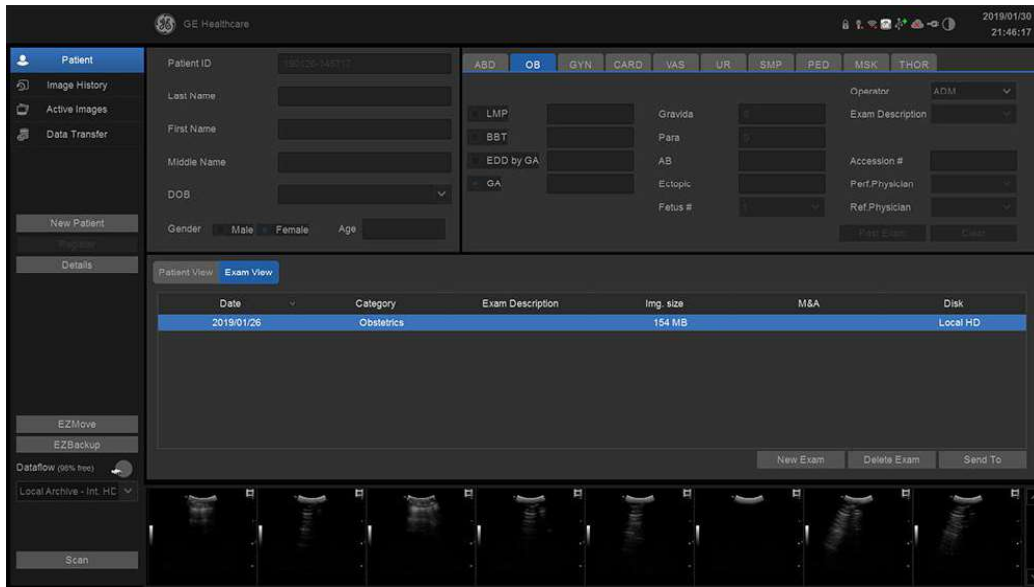
Figure 4-37.   Patient Page

3. Press *Probe* to select the application and preset.

4. Scanning with B mode and adjust the scanning parameters.

The First Exam (continued)

5. Press **Freeze**.

NOTE: *Comments and Body Pattern can be added, and will be stored with the images.*

Figure 4-38.   Scanning B Mode Page

6. Activate CF or PDI mode and adjust the scanning parameters. Here CF mode is used for example.

7. Press **Freeze**. Press P1 key to save the image.

NOTE: *Comments and body mark can be added, and will be stored with the images.*

8. Press **Measure** to activate measurement and select measurement from measurement folder.

The First Exam (continued)

9. Select measurement folder and select a measurement item.

NOTE: *Follow-up Tool only available for the measurement items under MSK -> Knee -> Fusion.*

Figure 4-39.   Example - Select Measurement

The First Exam (continued)

10. Draw only one ROI and the result is displayed in result window.
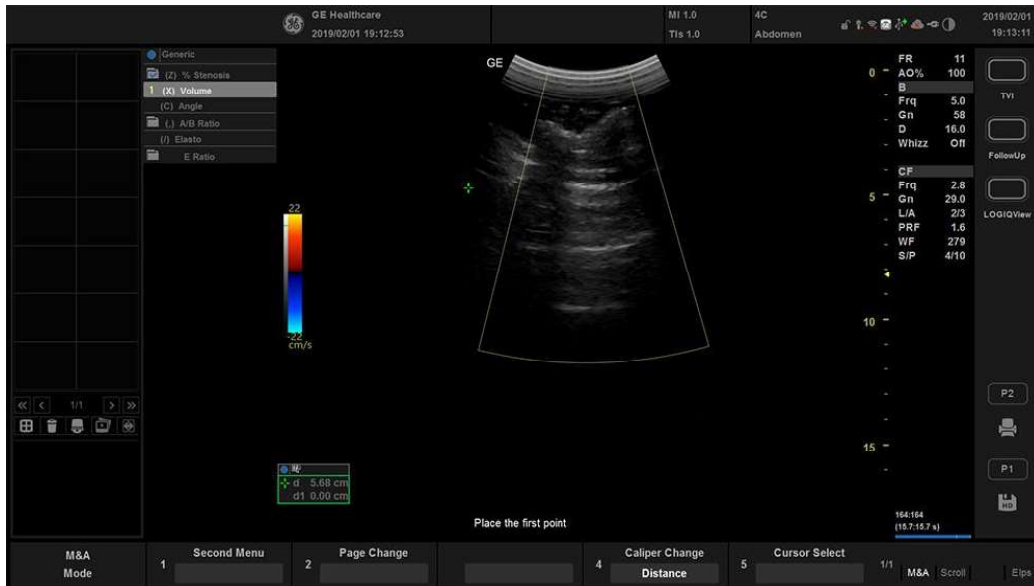
Figure 4-40.   Measurement

Select **Rt** (Right) or **Lt** (Left) for the patient's right and left side.

Select **Prox** (Proximal), **Mid** (Middle) or **Dist** (Distal) if the vessel has a location.

11. Press P1 key which is assigned to save the image with measurement.

The Follow-up Exam

NOTE: *Before starting Follow-up exam, define a key from User Defined Key for activating/deactivating Fusion via Utility -> System -> User Configurable Key.*

NOTE: *Before starting Follow-up exam, set the Fusion values via Utility -> Imaging -> B/HAR mode page.*

1. Enter Patient page, and select the patient from the **Patient View** list.

2. There are different methods to activate Follow up exam.

NOTE: *Be sure to activate the same probe used for the initial exam.*

- To access Follow up exam:
a. Select the Exam.
b. Select **Image History** or **Active Images**.
c. Select one image, then select **Compare**.

NOTE: *Only one image is selected at a time so **Compare** can be activated. If more than one image is selected, **Compare** can not be activated.*
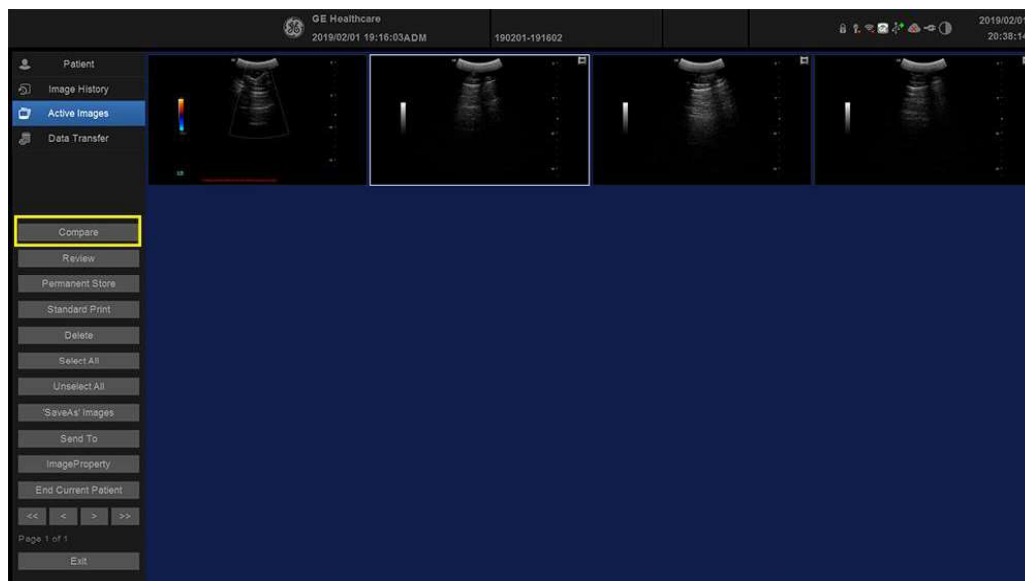
Figure 4-41.   Select Image to Compare

The Follow-up Exam (continued)

- In scanning mode, select the Follow up exam icon, the Follow up exam is activated.

Figure 4-42.   Follow up exam icon

OR

Press **Follow Up** key to activate Follow up exam.

The user can configure the **Follow Up** key in Utility -> System -> User Configurable Key.

3. The system enter scanning mode with Follow-up exam. The screen reverts to split screen.

Click the Follow-up icon to deactivate or activate the Follow-up exam.

Figure 4-43.   Follow-up exam screen

The Follow-up Exam (continued)

As factory default setting, the live image is displayed on the right side of the screen and the selected comparison image is on the left.

The user can configure the display position in Utility -> System -> System Imaging -> Follow Up Tool -> Comparison Image Side.

4. Select a B mode image on the clipboard to do follow up and the body mark and the comments which are added in the selected image will be transferred to the current scanning image.

Figure 4-44.   Follow-up Compare Screen - B Mode

The Follow-up Exam (continued)

5. Press the key assigned for Fusion to turn on Fusion. The overlay will appear on the active image. Align the bony landmarks or fascial planes with overlay to find the same scanning position from comparative study.

NOTE: *You can assigned a key from key User Defined Key to turn on/off Fusion via Utility - System -> User Configurable Key.*

Move the probe until the scanning position gets to the mark.
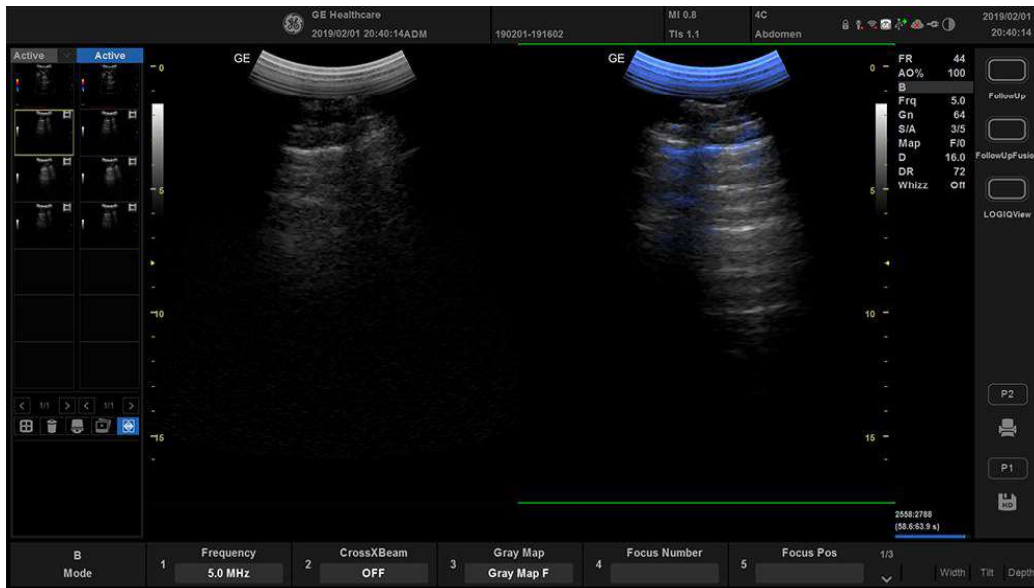
Figure 4-45.   Use Fusion

6. Select the assigned key again to deactivate Fusion.

NOTE: *Fusion should be turned off before saving the image, otherwise the mark will remain on the image which is frozen and saved.*

NOTE: *For additional follow-up, select the appropriate clipboard image for comparison.*

The Follow-up Exam **(continued)**

7. Press **Freeze**. Press P1 to save image. An image with split screens will be stored in the exam report.

Figure 4-46.   Follow up image

The Follow-up Exam (continued)

8. Select one image of Color Flow Mode on the clipboard to do follow up. Color Flow Mode is used for example here.

    The color window automatically appears on the same position and in the same size with the comparison image.

    The scanning parameters is reloaded from the comparison image to the current image.
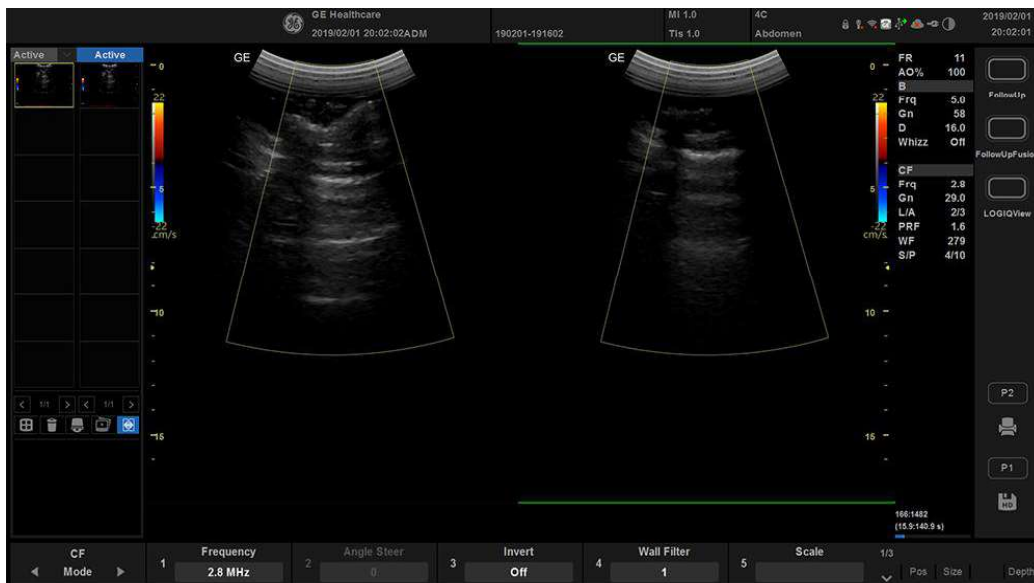
Figure 4-47.   Color Mode follow up exam

The Follow-up Exam (continued)

9. Select Fusion from the assigned Function key. When Fusion is activated with image that has been saved in Color, the color disappears automatically from color window. The color bar and color window will remain.
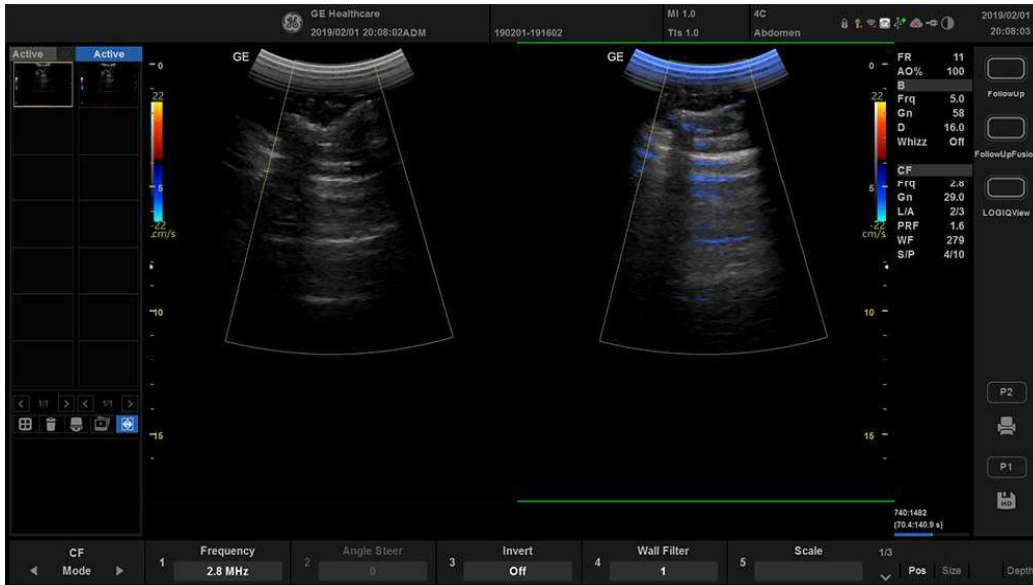
Figure 4-48.   Turn on Fusion

10. After the scanning position is located, press the key assigned for Fusion to turn off Fusion. When the Fusion is turned off, color appears automatically in color window. During this operation, the user does not need to press **Color** key to activate color.

11. Press **Freeze**.

    Select the desired frame by using **Frame By Frame** control on the primary menu.

The Follow-up Exam (continued)

12. Press **Measure**. The measurement method, measurement item and ROI will be transferred automatically from comparison image to the current scanning image.

NOTE: *Be sure **Auto Copy QA Measurement (Dual Screen)** has been checked in the Follow Up Tool portion in Utility -> System -> System Imaging. This is not available through factory default.*

NOTE: *If **Auto Copy QA Measurement (Dual Screen)** is not selected, the QAnalysis measurement will not be copied automatically from comparison image to the current scanning image. The user can perform the measurement with new measurement method, measurement item and ROI on the current image.*

The result window displays the measurement result of comparison image and the current image.
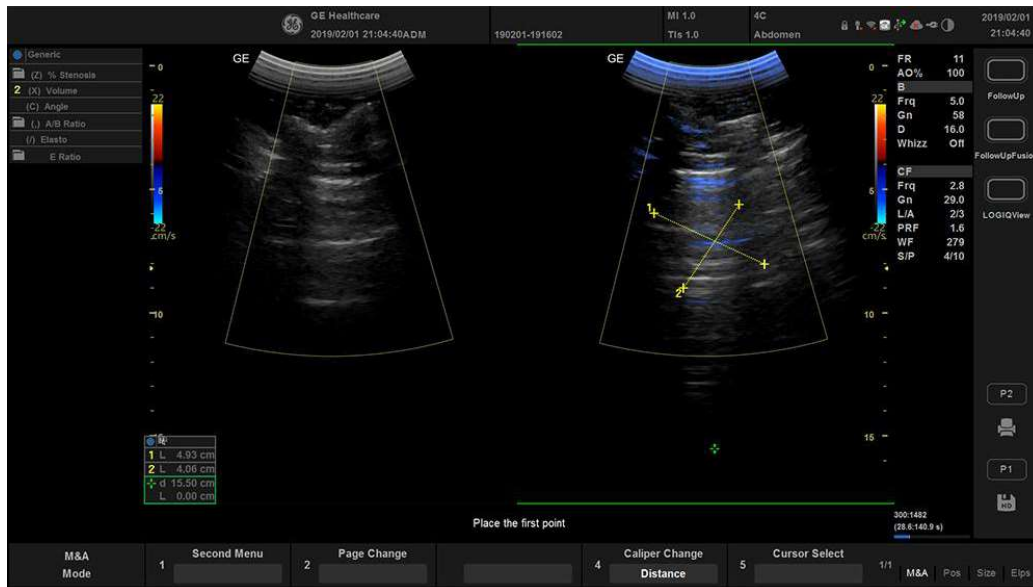
Figure 4-49.   Follow up measurement

The Follow-up Exam (continued)

13. Press P1 to save the image and measurement.

    The image with split screens and measurement result for current image and comparison image is stored.
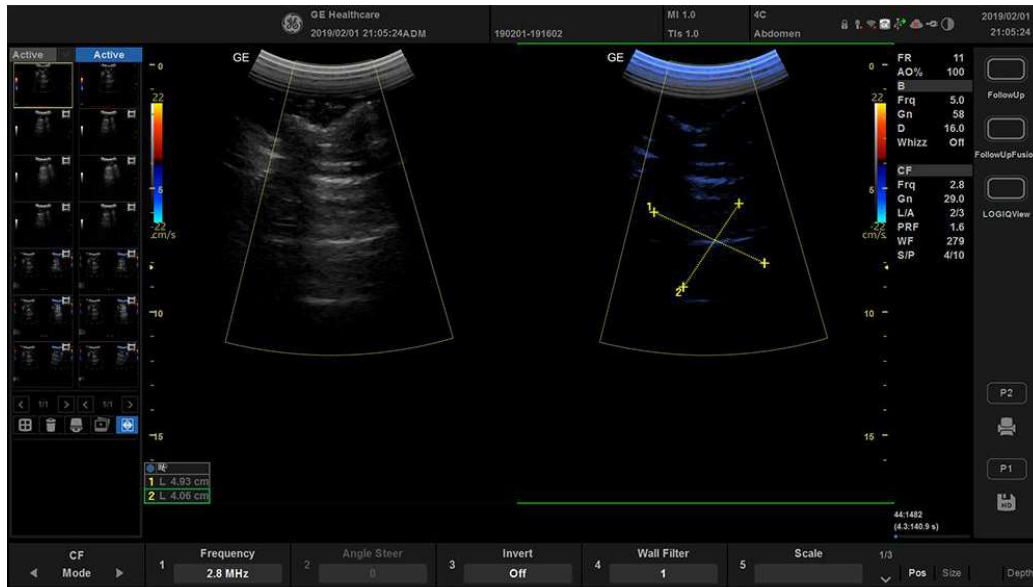
Figure 4-50.   Approve the image and measurement

Worksheet

To view a worksheet, press the **Report** key on the control panel. See 'Viewing and Editing Worksheets' on *page 7-61 for more information.*
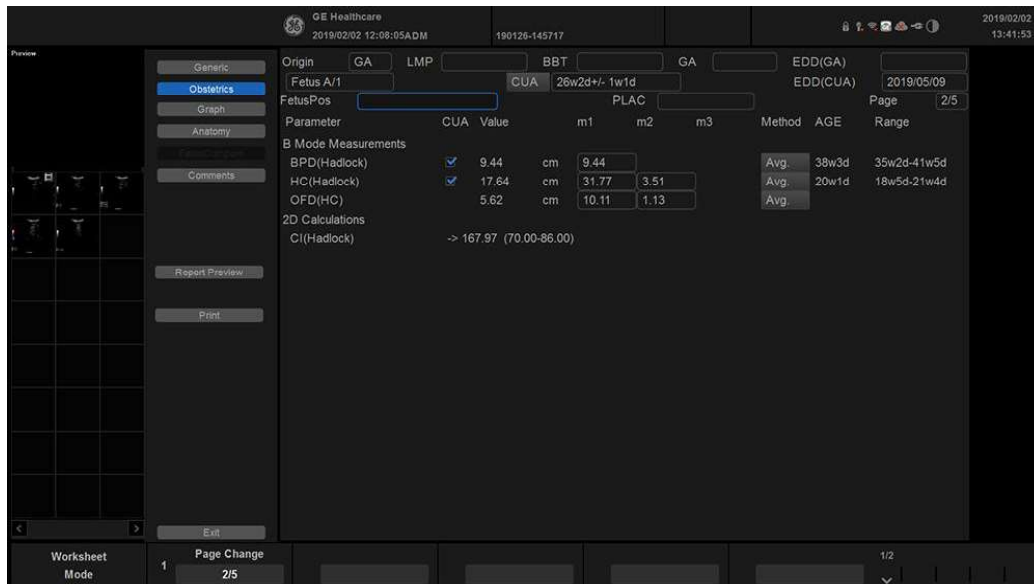
Figure 4-51.   Worksheet

Report

To view the report, press **Report** on the control panel.

Select **Report Preview** to enter report. Double click the image, the image will display in the Image window.

The measurement result window with measurement data of current image and comparison image is kept on the image and displays.

NOTE: *You can refer to Chapter 14 for more information about Report.*
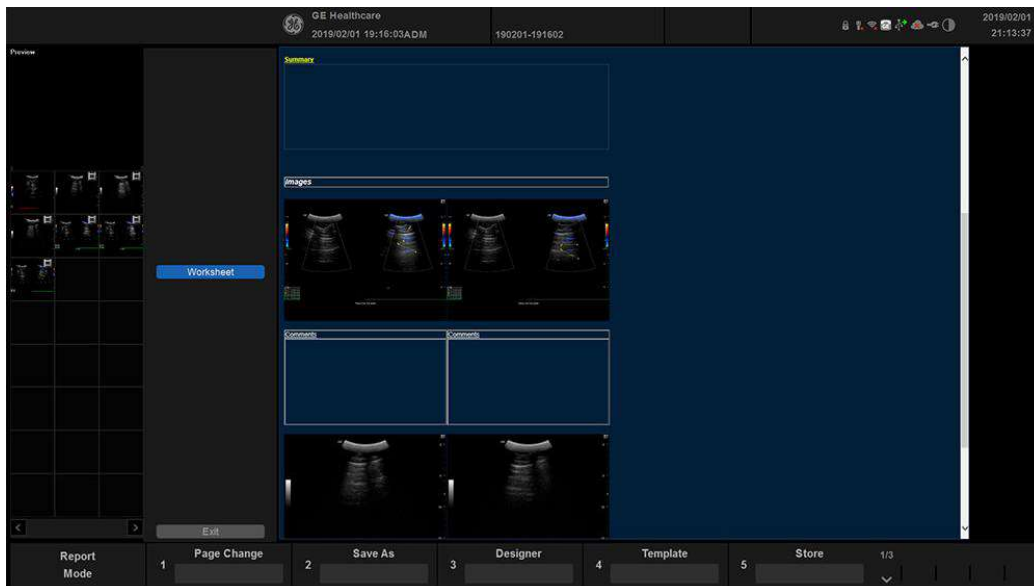
Figure 4-52.   Report

Chapter 5

Optimizing the Image

Describes how to adjust the image. This chapter is broken into the following sections: B-Mode, M-Mode, Color Flow Mode, M Color Flow, Doppler Mode, Using 3D/4D Mode and TruScan.

Optimizing B-Mode

Intended Uses

B-Mode is intended to provide two-dimensional images and measurement capabilities concerning the anatomical structure of soft tissue.
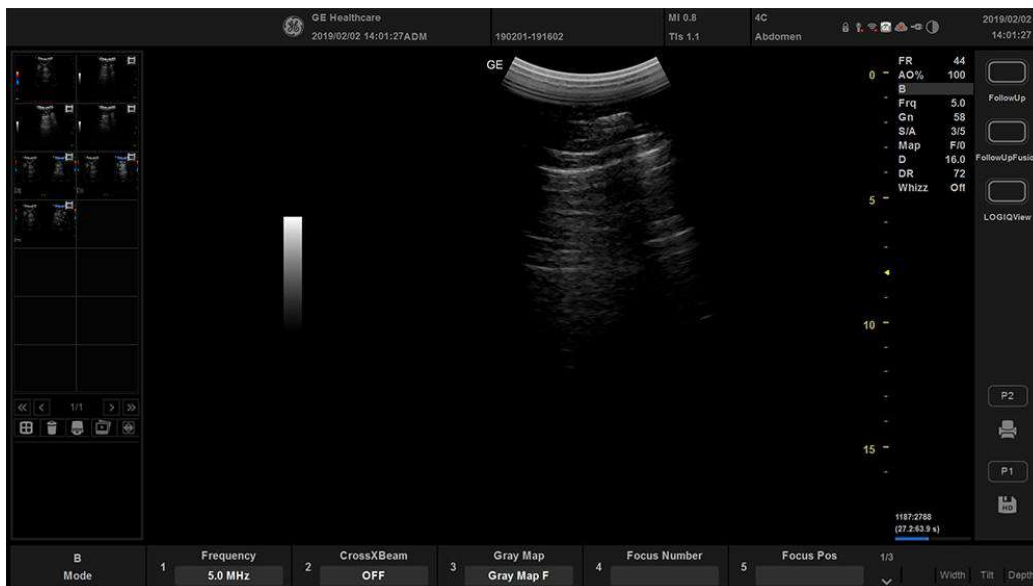
Figure 5-1.   B-Mode Display -- Representative Example

Typical B-Mode Exam Protocol

A typical examination using B-Mode might proceed

1. Record exam-related patient information. Verify system setup (probes and presets).
2. Position the patient and the console for optimum operator and patient comfort. Perform the scan.
3. Complete the study by collecting all the data.

CAUTION Ensure that the hands of the patient are away from the system during the exam.

The position of the operator and the patient vary by scan region.

In most case, the operator sits/stands straight in front of the operator console and the patient lies on the bed on the right (or left) side of the system.

CAUTION Always use the minimum power required to obtain acceptable images in accordance with applicable guidelines and policies.

B-Mode Scanning Hints

HINTS

These B-Mode controls produce the following results:

Whizz. Whizz will continuously optimize the brightness, contrast and uniformity of B-Mode images when scanning different tissues.Whizz in PW/CW Doppler Mode (ASO: Auto Spectral Optimization) optimizes the spectral data. Auto adjusts the Velocity Scale/PRF(live imaging only), baseline shift, and invert (if preset). Upon deactivation, the spectrum is still optimized. Specify the Whizz Level: Low or High via Utility --> Whizz --> Whizz Level.

Coded Harmonics. Enhances near field resolution. Multiple frequencies available to increase penetration.

Frequency. Higher frequency improves resolution and can be used for imaging superficial structures or small body habitus. Lower frequency improves penetration.

Gray Map. Affects the presentation of B-Mode information. Choose the gray map prior to making other adjustments. There is an interdependency between gray maps, gain, and dynamic range. If you change a map, revisit gain and dynamic range settings.

Dynamic Range. Changes the amount of gray scale information displayed. A higher dynamic range shows more gray scale information displayed, while a lower dynamic range displays less gray scale information more contrast onto the same display scale.

Frame Average. Smooths the image by averaging frames.

Focus Number/Position. Focus is the area where the soundbeam is concentrated to enhance detail in the image. Put focal zone(s) below the area of interest. Frame rate canbe affected by the number of focal zones used.

TGC. Time gain compensation is used to adjust gain at a specific level in the image.

Width. Adjusts the size of region of interest.

Depth

Description	Depth controls the distance over which the B-Mode images anatomy, and the field of view. To visualize deeper structures, increase the depth. To visualize superficial structures, decrease the depth.
	Transmit frequency and focus position shall be changed automatically with Depth controls.
Adjusting	Each adjustment cycles you to the next Depth setting. Imaging and display parameters adjust automatically.
	To increase/decrease, adjust **Depth**.
Preset	You can set the depth by probe and application on the Utility --> Imaging page.
Values	Depth increments vary by probe and application. Depth displays on the monitor in centimeters.
	Depth values are returned to the factory or user preset value when you change the following: Probe, Exam Calc, or End Exam.
Affect on other controls	TGC and focus position may need to be adjusted after adjusting depth.
	Changing Depth,
	• Clears Cine memory.
	• Erases real-time calculations graphics on the display (but not the completed results on the worksheet page).
Bioeffects	Changing the depth may change the TI and/or MI. Observe the output display for possible effects.

Gain

Description   B-Mode Gain increases or decreases the amount of echo information displayed in an image. It may have the effect of brightening or darkening the image if sufficient echo information is generated.

Adjusting   To decrease/increase, rotate **Gain**.

Gain values vary depending on the probe; they are not associated with a particular position of the key.

NOTE: *B-Mode gain is independent of M-Mode and Doppler and Color Flow Gain. Changing the M-Mode Gain while in M-Mode does not affect the B-Mode image gain.*

Preset   You can set gain by probe and application on the Utility --> Imaging page.

Values   Gain displays on the monitor in Gn. Gain values vary by probe, application, and frequency setting.

NOTE: *Maximum gain is factory preset to an optimum setting to eliminate noise in the display.*

Gain values are returned to the factory or user preset value when you change the following: Probe, Exam Category/Exam Calc, or Patient.

Affect on other controls   After you adjust the Power Output, you may need to adjust the gain. Generally speaking, if you increase the Power Output, you need to decrease the gain; if you decrease the Power Output, you need to increase the gain. Gain and TGC interact by adding together.

Bioeffects   Gain has no affect on Power Output. However, with increased gain, the power output level can usually be reduced to produce an equivalent image quality.

NOTE: *Always optimize gain before increasing the Power Output.*

Focus

Description   Focus is the area where the soundbeam is concentrated to enhance detail in the image. Put focal zone(s) below the area of interest. Frame rate can be affected by the number of focal zones used. A graphic caret corresponding to the focal zone position(s) appears on the right edge of the image.

Adjusting   To increase/decrease the number of focal zones, adjust *Focus Number* on the primary menu.

To move the focal zone to the near/far field, adjust *Focus Pos* on the primary menu.

Focal zones adjust automatically when you adjust the depth.

NOTE: *You can set the focus (Depth % and Number, and Number Crossbeam) by probe and application on the Utility--> Imaging page.*

Values   Focus zone number and position vary depending on the depth, zoom, probe, application, and frequency setting selected.

Focal zone number values are returned to the factory or user preset value when you change the following: Probe, Exam Category, Exam Calc, or Patient.

Affect on other controls   Changing the focal number affects the frame rate. The greater number of focal zones, the slower the frame rate.

Bioeffects   Changing the focal zone may change the TI and/or MI. Observe the output display for possible effects.

Whizz

Description   Whizz will continuously optimize the brightness, contrast and uniformity of B mode images when scanning different tissues.

Whizz in PW/CW Doppler Mode (ASO: Auto Spectral Optimization) optimizes the spectral data. Auto adjusts the Velocity Scale/PRF (live imaging only), baseline shift, and invert (if preset). Upon deactivation, the spectrum is still optimized.

Benefit   Whizz can enhance productivity by reducing keystrokes.

Adjusting   To activate Whizz, press **Whizz** key.

Press **Whizz** key again to turn off Whizz.

NOTE: *When the Whizz function is active, the [Whizz] key is illuminated green.*

Preset   Specify the Whizz Level: Low or High via Utility --> Whizz --> Whizz Level.

To set up Auto Spectrum Optimization (ASO) for Doppler mode, press **Whizz** key.

CrossXBeam

Description CrossXBeam is the process of combining three or more frames from different steering angles into a single frame. CrossXBeam is available on Convex and Linear probes.

Adjusting To activate CrossXBeam, select **CrossXBeam** on the primary menu.

NOTE: *The Primary Menu can be set in Utility -> Application -> Imaging Controls.*

To adjust the number of frames being compounded, select CrossXBeam. Select OFF, Low, Medium, or High.

Preset You can preset B-Mode CrossXBeam:

- Preset the CrossXBeam #
- Preset Focus Width CrossXBeam
- Preset Focus Number CrossXBeam
- Preset Line Density CrossXBeam
- Preset CrossXBeam Type
- Frame Average CrossXBeam

These presets can be made via the Utility --> Imaging page.

CrossXBeam (continued)

Values

CrossXBeam is available on Convex and Linear probes. Multiple focal zones are supported. B-Mode CrossXBeam is available while in B-Mode, Color Flow, or PW Doppler Mode. Steering is optimized by probe. The displayed compound image depth is equal to the image depth of the non-steered frame.

Virtual convex scanning shall be available while CrossXBeam is enable on probe that support both features.

The following features are supported in CrossXBeam:

- Harmonic Imaging
- CINE Loops acquired using CrossXBeam.
- Read Zoom
- All Measurement and Analysis packages
- SRI HD, Rejection, Colorize, Revert, Edge Enhance, Gray Map, Rotation, Biopsy Kit, Dynamic Range, Depth, TGC, Gain, Acoustic Output, Auto.

Benefits

The combined single image has the benefits of reduced speckle noise, reduced clutter, and continuity of specular reflectors. This technique can improve contrast resolution.

SRI-HD (High Detection Speckle Reduction Imaging)

Description   SRI-HD (High Detection Speckle Reduction Imaging) is an adaptive algorithm to reduce the speckle in the ultrasound image. Image speckle usually appears as a grainy texture in otherwise uniform areas of tissue. Its appearance is related to image system characteristics, rather than tissue characteristics, so that changes in system settings, such as probe type, frequency, depth, and others, can change the appearance of the speckle. Too much speckle can impair image quality and make it difficult to see the desired detail in the image. Likewise, too much filtering of speckle can mask or obscure desired image detail. Extra care must be taken to select the optimal SRI-HD level.

SRI-HD is available in B-Mode imaging and may be used with any transducer or clinical application when image speckle appears to interfere with the desired image detail.

Figure 5-2.   B-Mode Image before SRI-HD (left) and
After SRI-HD (right)

SRI-HD (High Detection Speckle Reduction Imaging) (continued)

Values
We recommend that you select the SRI-HD level by observing the enhanced image in side-by-side dual image comparison with the original, unprocessed image. Dual display mode is activated by pressing the Dual key.

In selecting the level of SRI-HD, you must observe the effects of SRI-HD in the desired region of interest and should make a real-time comparison with the original image. The optimal level depends on the clinical situation and improves with experience. Observing the original and SRI-HD-processed images together helps to determine whether too much or too little SRI-HD has been applied.

Dual image mode for SRI-HD can also be activated on a stored CINE Loop. This allows you to always see the original, unprocessed or enhanced image by going into the Dual display mode and to change the SRI-HD settings when reviewing the CINE Loop.

SRI-HD is available on 3D.

• You cannot change SRI-HD after the scan starts.
• The effects for the rendered image are less than the 2D-image.

Benefits
Smooths the image when image speckle interferes with the desired image detail.

Coded Harmonic Imaging (CHI)

Description   Harmonic imaging utilizes Digitally Encoded Ultrasound (DEU). Coded Harmonics enhances near field resolution as well as far field penetration.

Adjusting   To activate Coded Harmonic imaging, press **CHI** key on the control panel.

   NOTE: *You can assign CHI On/Off function to the User Defined key. See 'System/User Configurable Key' on page 16-42 for more information.*

   NOTE: *You can specify the parameters for CHI in Utility -> Imaging -> HAR.*

   NOTE: *Frequency cannot be changed when the image is frozen.*

Values   On/Off. 'CHI' appears in place of 'B' in the imaging parameters.

   NOTE: *Changing frequency resets those parameters which are presettable by frequency to their preset values for the current harmonic frequency.*

Benefits   Coded Harmonics diminishes low frequency high amplitude noise and improves imaging technically difficult patients.

Bioeffects   Activating **CHI** mode may change the TI and/or MI. Observe the output display for possible effects.

Frequency

Description   Changes system parameters to best optimize for a particular patient type.

Adjusting   Adjust Frequency until the desired frequency is selected.

The selected frequency appears as "Frq" in the upper, right-hand portion of the monitor display.

NOTE: *Frequency change is not active when the image is frozen.*

NOTE: *Changing frequency resets those parameters which are presettable by frequency to their preset values for the current frequency.*

Values   Vary, depending on the probe and application.

Frequency values are returned to the factory or user preset value when you change the following: Probe, Exam Category, Exam Calcs, or begin a new patient.

Benefits   This optimizes the probe's wide band imaging capabilities at multiple frequencies to image at greater depths.

Bioeffects   Adjusting frequency may change the TI and/or MI. Observe the output display for possible effects.

Steer

Description   You can slant the B-Mode or Color Flow acoustic beam without moving the probe. The steer function only applies to linear probes.

Adjusting   To slant the linear image to the left/right, adjust **B-Steer** button on the primary menu.

NOTE: *The Primary Menu can be set in Utility -> Application -> Imaging Controls.*

NOTE: *Steer is not available while using CrossXBeam.*

Values   Linear probes can be steered left, center, or right up to a maximum of 15 degrees, depending on the probe.

Steer values are returned to factory or user preset value when you change: Probe, Exam Category, Exam Calcs, or Patient.

Preset   Reverse Steer Controls via Utility --> System --> System Imaging.

Benefits   Provides a Doppler cursor angle suitable for linear probe orientation. Beneficial in Peripheral Vascular to image carotids.

Bioeffects   Activating angle steer may change the TI and/or MI. Observe the output display for possible effects.

Mode Cursor

Description   Displays the Mode cursor on the B-Mode image.

Adjusting   To activate the cursor mode, select ***Activate M/D Cursor*** via Utility --> System --> System Imaging --> *Controls*.

Press PW/CW or M key one time, the M/D cursor appears on the active 2D image. Move trackball to position M/D cursor. Adjust Angle and SV Length as necessary. Press M/PW/CW key again to active M/Doppler mode.

Benefits   Position M/D cursor on B-Mode image first before activating M-Mode or Doppler Mode.

Virtual Convex

Description On Linear and Sector probes, Virtual Convex provides a larger field of view in the far field.

Adjusting To activate/deactivate Virtual Convex, select ***Virtual Convex***.

Values On/Off

Benefits Virtual Convex allows for a wider field of view. Available in B-Mode, Color Flow Mode, and Doppler Mode. CrossXBeam is available on Virtual Convex with linear probes.

Bioeffects Activating Virtual Convex may change the TI and/or MI. Observe the output display for possible effects.

NOTE: *Color Flow can be steered when in straight fire, but not in Virtual Convex.*

TGC

Description　　　　TGC amplifies returning signals to correct for the attenuation caused by tissues at increasing depths. TGC slide pots are spaced proportionately to the depth. The area each pots amplifies varies as well. A TGC curve may appear on the display (if preset), matching the controls that you have set (except during zoom). You can choose to deactivate the TGC curve on the image.

Adjusting　　　　To decrease/increase TGC, move slide pot to the left/right.

NOTE:　　　　*TGC adjusts automatically when using zoom.*

Values　　　　When you change the depth, TGC is rescaled across the new depth range. Each pot is proportionately scaled across the depth.

Preset　　　　TGC Display On/Off -- preset via Utility --> System --> System Imaging --> Display.

Benefits　　　　TGC balances the image so that the density of echoes is the same throughout the image.

⚠ CAUTION　　　　Do not apply too much pressure to the TGC slide pots as this could damage the slide pots.

Width

Description	You can widen or narrow the size of the sector angle to maximize the image's region of interest (ROI).
Adjusting	To narrow/widen the angle, press **Set** key until the **Width** is highlighted, then move the Trackball to move left/right to decrease/increase the angle size. Then press **Set** key to set the ROI.
Values	Varies, depending upon the probe (not applicable to linear probes) and application.
Benefits	Increase the sector angle to see a wide field of view; decrease the sector angle when you need to have a faster frame rate, as in fetal heart.
Affect on other controls	Changing the sector angle affects the frame rate. The narrower the sector angle, the faster the frame rate.
Bioeffects	Changing the sector angle may change the TI and/or MI. Observe the output display for possible effects.

Tilt

Description	You can steer the sector angle to get more information without moving the probe while in B-Mode, M-Mode, Doppler Mode, and Color Flow Mode. Tilt is not available on Linear probes.
Adjusting	To tilt the angle to the left/right, press **Set** key until **Tilt** is highlighted, then move the Trackball to the left/right.
Values	Varies, depending on the probe.
Benefits	Allows you to move a reduced sector angle laterally, without moving the probe.
Bioeffects	Steering the sector angle may change the TI and/or MI. Observe the output display for possible effects.

Dynamic Range

Description   Dynamic Range controls how echo intensities are converted to shades of gray, thereby increasing the adjustable range of contrast.

The Dynamic Range control name changes to Compression on frozen images.

Adjusting   To increase/decrease, adjust ***Dynamic Range***.

Values   The settings cycle in 3 or 6 dB steps from 36 dB to 96 dB. The current value displays. Dynamic Range values vary by probe, application, and frequency setting.

Dynamic Range levels are returned to the factory or user preset value when you change the following: Probe, Exam Calcs, Patient, or Multi Frequency.

Affect on other controls   Dynamic range operates in real-time, Freeze, CINE, and CINE Timeline.

Revert

Description	Flips the image 180 degrees left/right.
Adjusting	To flip the image 180 degrees, select **Revert** on the primary menu.

NOTE: *The **Revert** Tab can be set in Utility -> Application -> Imaging Controls.*

Values	The image rotates in 180 degrees left/right. Revert settings vary by probe and application.
	Revert settings are returned to the factory or user preset value when you change the following: Probe, Exam Category, Exam Calcs, or Patient.
Benefits	Used for anatomical correctness.

⚠ CAUTION   When reading a reverse image, be careful to observe the probe orientation to avoid possible confusion over scan direction or left/right image reversal.

Line Density

Description	Optimizes B-Mode frame rate or spatial resolution for the best possible image.
Adjusting	Adjust *Line Density* to increase resolution or to increase frame rate.
	Select the default value via Utility -> Imaging -> B -> Line Density and press *Save*.
Values	Varies by probe.

NOTE: *Not available in cine mode.*

	Values vary by probe and application. Line Density values are returned to the factory or user preset value when you change the following: Probe, Exam Category, Exam Calcs, or Patient.
Benefits	A lower line density is useful in fetal heart beat, adult cardiac applications and in clinical Radiology applications requiring significantly higher frame rates.
	A higher line density is useful in obtaining very high resolution, e.g., thyroid, testicles.
Affect on other controls	Line density changes the vector density and frame rate.
Bioeffects	Activating color flow line density may change the TI and/or MI. Observe the output display for possible effects.

Line Density Zoom

Description	You can set the default value for Line Density in zoom independently.
Adjusting	Select the default value via Utility -> Imaging -> B -> Line Density Zoom and press *Save*.

Colorize

Description   Colorize is the colorization of a conventional B-Mode image or Doppler Spectrum to enhance the user's ability to discern B, M, and Doppler Mode intensity valuations. Colorize is NOT a Doppler Mode.

NOTE: *You can colorize real-time or CINE images.*

Colorizes the gray scale image to enhance the eye's discrimination capability.

Spectrum Colorize colorizes the spectrum as a function of power using the inverse of the Colorize map for the signal intensity in each Doppler line.

Colorize enhances the visibility of the spectrum's characteristics and enhances your ability to identify spectral broadening and the edge contours of the spectrum used to define the peak frequency/velocity.

The gray bar displays while Colorize is activated.

Adjusting   To activate Colorize,

1.   Select *Colorize*.
2.   Press Primary Menu keys to select available maps.

To deselect, select a gray map.

PRF

Description	Reduces noise artifacts in the image. When you activate PRF, the frame rate decreases and the noise artifacts are filtered.
Adjusting	To activate PRF, select **PRF** on the primary menu.

> *NOTE: The Primary Menu can be set in Utility -> Application -> Imaging Controls.*

> *NOTE: Available for only Cardiac application.*

Edge Enhance

Description	Edge Enhance brings out subtle tissue differences and boundaries by enhancing the gray scale differences corresponding to the edges of structures. Adjustments to M-Mode's edge enhancement affects the M-Mode only.
Adjusting	To cycle through settings, adjust **Edge Enhance**.
Values	Values vary by probe, application and multi frequency setting. Edge Enhance values are returned to the factory or user preset value when you change the following: Probe, Exam Category, Exam Calcs, or Patient.
Benefits	Edge Enhance cleans out the B-Mode image/M-Mode time line by subduing some of the gray scale in order to highlight the vessel wall or organ. This is helpful when you cannot differentiate between the chambers of the heart.
Affect on other controls	Edge Enhance operates in real-time only; not in Freeze or CINE.

Frame Average

Description	Temporal filter that averages frames together, thereby using more pixels to make up one image. This has the effect of presenting a smoother, softer image.
Adjusting	To adjust frame averaging, adjust **Frame Average**.
Values	Values vary by probe, application and multi frequency setting. Frame Average values are returned to the factory or user preset value when you change the following: Probe, Exam Category, Exam Calcs, or Patient.
Benefits	Smooths the image.

Gray Map

Description   The system supplies B, M, and PW Mode system maps.

In Doppler mode, the Clear map offers a bluish coloring compared to the standard gray map. Clear Maps provide a more transparent map. Clear maps are displayed under gray maps.

Adjusting   To select a map, select the *Gray Map*. A map window displays. The image reflects the map as you go through the selections.

Values   Map values vary by probe, application, and frequency setting. Map values are returned to the factory or user preset value when you change the following: Probe, Preset, Exam Calcs, or Patient.

Rejection

Description   Selects a level below which echoes will not be amplified (an echo must have a certain minimum amplitude before it will be processed).

Benefits   Allows for the elimination from the display of low level echoes caused by noise.

Rotation

Description   Flips the image 90 degrees/180 degrees/270 degrees.

Benefits   Beneficial in transvaginal scanning.

⚠️ CAUTION   When reading a rotated image, be careful to observe the probe orientation to avoid possible confusion over scan direction or left/right image reversal.

Suppression

Description   Suppresses the noise in the image.

LOGIQ View (Option)

Description   LOGIQ View provides the ability to construct and view a static 2D image which is wider than the field of view of a given transducer. This feature allows viewing and measurements of anatomy that is larger than what would fit in a single image. Examples include scanning of vascular structures and musculoskeletal structures.

LOGIQ View constructs the extended image from individual image frames as the operator slides the transducer along the surface of the skin in the direction of the scan plane. The quality of the resulting image is somewhat user-dependent and requires some additional skill and practice to develop proper technique and become fully proficient.

LOGIQ View is not available for the following:

- Multi Image
- Timeline Modes
- Color Flow Mode
- PDI Mode

Using LOGIQ View   To perform an exam using LOGIQ View,

1. Perform a detailed examination of the anatomy. Optimize parameters for tissue texture and visible window PRIOR TO activating LOGIQ View.
2. Press the user defined key for **LOGIQ View**.
3. To start acquiring the image, press **Dual** key.

HINTS   Slowly scan in a uniform motion lengthwise, end-to-end (with or against the probe orientation marker). LOGIQ View acquires images via leading edge vectors (and does not acquire slices, as in CINE). The image is being stored as you perform the scan and you can watch the LOGIQ View as it is being acquired.

LOGIQ View (Option) (continued)

4. To restart the scan, press **Dual**. You can back up the probe, realign it, then go forward to redo a portion of the scan.

5. To complete the scan, press **Quad** or Freeze (or allow the scan to auto complete). The LOGIQ View is then displayed, scaled to fit entirely on the screen.

6. Perform measurements and record images.

Hints   The quality and usefulness of LOGIQ View images is affected by transducer motion. Incorrect technique can contribute to image distortion.

Guidance and precautions for uniform motion:

- Continuous contact is required throughout the length of the extended image. DO NOT lift the transducer from the skin surface.

- Always keep the transducer perpendicular to the skin surface. DO NOT rock the transducer.

- Keep the motion within the same scan plane, if possible. DO NOT slide the transducer laterally.

- Lateral turning (change in direction to follow anatomical structure) can be accommodated with slower motion. DO NOT make abrupt changes in direction.

- The system accommodates a reasonable range of motion velocity. DO NOT make abrupt changes in speed of motion. Deeper scans generally require reduced speed.

Bioeffects   Activating LOGIQ View has no affect upon Acoustic Output values.

Needle Recognition (Option)

Description   Needle recognition functionality is available with linear probes (12L-RS, L6-12-RS, 9L-RS) and convex probe, 4C-RS. Figure 5-3.b illustrates the position between the needle and probe. Needle recognition can only enhance in-plane needles. The **needle angle** is defined as the angle between the needle and probe surface.
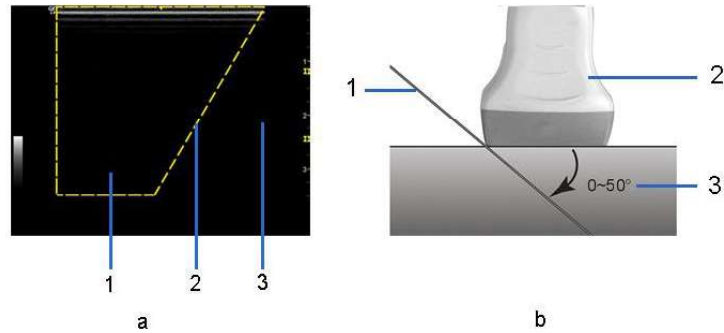
Figure 5-3.   a. Enhanced area   b. Needle Angle

a   **b**

1. Enhanced area   1. Needle
2. Needle guide line   2. Probe
3. Unenhanced area   3. Needle angle

NOTE: *Needle Recognition is only available in B/CF/PDI.*

NOTE: *The parameters for adjusting can be set in Utility -> Imaging -> B. To set the desired parameters in the Primary Menu for each button, See 'System Presets' on page 16-3 for more information.*

Needle Recognition (Option) (continued)

Adjusting

- Activating Needle Recognition:

  Press user defined **Needle** key on the control panel to activate Needle Recognition

- Adjusting steer direction:

  Needle key cycles through Off/Left or Off/Right depending on the setting in Utility -> Imaging -> B Tab. If the system is set for Off/Left/Right, press **Needle** key again after activating the Needle Recognition in order to change the steering angle from left to right.

- Adjusting the needle recognition beam angle:

  Adjust **Beam Angle** by pressing Primary Menu keys. Max available angles are up to 50 degrees on 12L-RS, 9L-RS, 45 degrees on 4C-RS, and 30 degrees on L6-12-RS.

NOTE: *Adjust the needle recognition steering angle to form the needle and the beam angle as perpendicular as possible to get the best needle enhancement.*

- Adjusting Needle Gain:

  Adjust **Needle Gain** by pressing Primary Menu keys. Available Needle Gain ranges from 0 to 100 in the increment of 5.

NOTE: *Increasing the Needle Gain enhances the needle visibility while decreasing the Needle Gain decreases artifacts and noise. Adjust the Needle Gain to balance the needle enhancement versus level of artifacts/noise.*

- Adjusting Needle Thickness:

  Adjust **Needle Thickness** by pressing Primary Menu keys to change the appearance of needle thickness between thick and thin.

NOTE: *"Thick" option displays thicker and more prominent appearance of needle while "Thin" option displays thinner but more realistic needle appearance.*

Needle Recognition (Option) (continued)

NOTE: *The beam divergence and effects of beam steering with a transducer may prevent a segment of the needle shaft from showing in the image if the needle angle is too steep (Figure 5-4).*
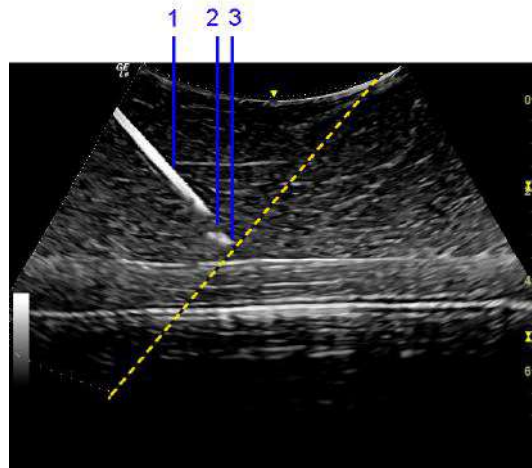
Figure 5-4.   Example of needle that is too steep

1. Needle shaft
2. Un-enhanced needle shaft
3. Needle tip

NOTE: *For best results please insert the needle at perpendicular to the dotted guide line (Figure 5-5), or at a **needle angle** that is slightly less than the **Beam Angle** (Figure 5-6).*
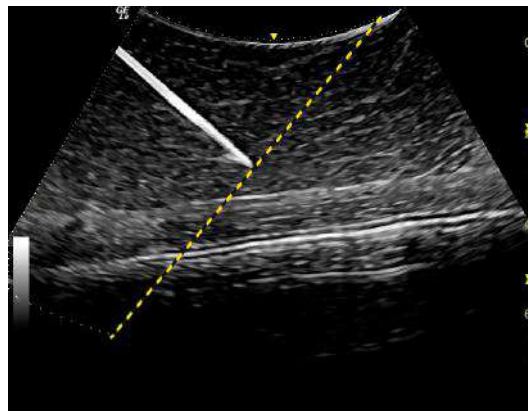
Figure 5-5.   Example of needle that is perpendicular to the guide line

Needle Recognition (Option) (continued)
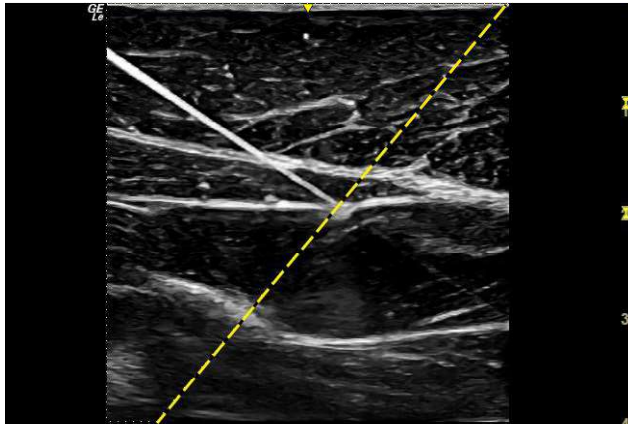
Figure 5-6.   Example of needle angle that is slightly less than the beam angle

HINTS

To help verify the location and trajectory of the needle tip, please use needle movement and / or fluid injection.

Make sure the needle is always in the ultrasound plane by slightly moving or tilting the probe to get the best needle enhancement during the needle procedure.

Switch needle On/Off can help to identify artifacts and other not interesting structures.

Needle Recognition values (including enable/disable, Needle Direction, Beam Angle and Needle Gain, etc.) are returned to factory or user preset value when you change: Exam Category, Exam Calcs, or New Patient.

Preset   Needle Directions - preset via Utility -> Imaging -> B Tab.

Beam Angle - preset via Utility -> Imaging -> B Tab.

Needle Gain - preset via Utility -> Imaging -> B Tab.

Needle Thickness - preset via Utility -> Imaging -> B Tab.

Interactive Needle Line - preset via Utility -> Imaging -> B Tab.

Benefits   Provides better biopsy needle visualization than normal B-Mode with steered beam angle and post processing.

Bioeffects   Activating angle Needle Recognition may change the TI and/or MI. Observe the output display for possible effect.

B Flow / B Flow Color (Option)

B Flow

Description   B-Flow is intended to provide a more intuitive representation of non-quantitative hemodynamics in vascular structures.

B-Flow is digitally-encoded Ultrasound, using digital codes to enhance weak signals from small particulate reflectors (blood flow) and suppress signals from strong reflectors (tissue). Flow and tissue are displayed simultaneously without threshold decision and overlay.

All B-Mode measurements are available with B-Flow active: depth, distance along a straight line, % stenosis, volume, trace, circumference, and enclosed area.

Presetting   Preset the default B Flow Mode, either B Flow or B Flow Color via Utility--> Imaging --> BF/BFC button. Specify the default to be either B Flow or B Flow Color.

Activating   To activate/deactivate B-Flow, press user-defined hard key. Doppler Mode is available while in B-Flow; however, M-Mode and Color Flow/PDI Modes are not available.

Using B-Flow   To optimize the image:

Adjust the frequency, display depth, and focal zone location basded on the patient body type and anatomy of interest. Adjust Sensitivity/PRI and Background setting as needed (see below).

Adjust the remaining Imaging parameters and presets as needed; functionally is the same as B-mode when in B-Flow mode.

B Flow (continued)

Scanning Hints

B-Flow is especially intuitive when viewing blood flow, for acute thrombosis, parenchymal flow, and jets. B-Flow helps you visualize complex hemodynamics and highlights moving blood and tissue. B-Flow was implemented using Digitally Encoded Ultrasound (DEU). There are no artifacts such as bleeding, blooming, or aliasing.

The greater the speed, the better the image scatter density and size. If the scan direction is the same as the flow direction, then the image scatter is elongated; if the scan direction is the opposite as the flow direction, then the image scatter is tighter. Therefore, have the scan direction opposite to that of flow direction. Switch the way you hold the probe, with the probe orientation marker inferior to maintain correct orientation on the monitor. Flow starts from where the focal zone is located.

Turn off the background when imaging the kidney, liver, and spleen. Keep the focal zone as close to flow as possible. It is beneficial to narrow the sector width and increase the frame rate.

Benefits

Compared to Color Doppler mode, B-Flow provides better spatial and temporal resolution, displays blood flow in the entire image, i.e. NO ROI, and is not angle dependent as it does not use the Doppler Principle. B-Flow is therefore a more realistic (intuitive) representation of flow information, allowing you to view both high and low velocity flow at the same time.

Affect on other controls

When you activate B-Flow, the system remembers the imaging parameters set while in B-Mode. When you optimize the frame rate via Line Density, you compromise the resolution and when you optimize the resolution, you compromise the frame rate. B-Flow is not available in 3DView.

Bioeffects

When you select B-Flow, the PRF increases.

B Flow (continued)

Flow Type

	Available in B-Flow.
Value	Low or High.

- Low= Most sensitivity for slow flow (venous, small parts). This setting has the slowest frame rate.
- High= Most sensitivity for fast flow. Provides the highest frame rate and better detection of flow dynamics. Use whenever possible to capitalize on the high frame rate.

Accumulation

Description	Accumulation enhances the flow in an image; ideal to capture dynamic flow in a still picture.
Values	Off - Infinite. Infinite provides the same result as applying CINE Capture to a B-Flow CINE clip.
Benefit	Accumulation detects the maximum signal and holds it (accumulates it) for the level specified (Off - Infinite).

Background

Description	In the Background ON mode, both of B-Flow and B-mode are displayed in one image.
Value	On or Off.

B Flow (continued)

Sensitivity/PRI

Description   Sensitivity/PRI (Pulse Repetition Interval) is proportional to the time interval between the pulses sent to develop the B-Flow image.

In general, a larger value is recommended for slow flow as slow flow detection requires more time separation between pulses so the system can detect the difference in flow profile. However, a larger value could cause bar artifacts on the image. Therefore, it is suggested to not increase the PRI value more than needed. A small value of PRI should be used when the interest is in fast flow only, e.g. viewing a jet in a stenosis case, where the jet is of interest.

NOTE: *Sensitivity/PRI is Probe and Model dependent.*

B-Flow Color (BFC)

Description   B-Flow Color is intended to provide a B-Flow representation with colorized flow and background B-Mode image.

Although the BFC is based on B-Flow technology, the BFC image is processed and made by the Color Flow processor and therefore has both the advantages of B-Flow and Color Flow. Consequently, imaging parameters and presets are functionally the same as Color Flow/PDI.

Refer to 'Optimizing Color Flow' on *page 5-44* for details on each parameter.

Activating   To activate B-Flow Color,

- While in B-Mode, press user-defined hard key to activate B-Flow. Then select **B Flow Color** on the primary menu.
- Adjust the parameters to get the best image.

B-Flow Color (BFC) (continued)

Enhance (B-Flow Color)

Description	*Enhance* provides a range of choices for B-Flow Color image quality.
Values	Enhance "Off" is the original B-Flow Color setting which gives you the dynamic appearance of the flow with high frame rate.
	Enhance "On" adds sensitivity and stability/continuity to the flow's appearance, along with lower frame rates than Enhance "Off."

Scale

Description	Same as Scale in Color Flow/PDI Mode.
Values	Increase for higher flow states.
	Decrease to display smaller vessels and slower flow.

Optimizing M-Mode

Intended Use

M-Mode is intended to provide a display format and measurement capability that represents tissue displacement (motion) occurring over time along a single vector.

Introduction

M-Mode is used to determine patterns of motion for objects within the ultrasound beam. The most common use is for viewing motion patterns of the heart.

Typical exam protocol

A typical examination using M-Mode might proceed as follows:

1. Get a good B-Mode image.
2. Press **M**-Mode. Survey the anatomy and place the area of interest near the center of the B-Mode image.
3. Move the trackball to position the mode cursor over the area that you want to display in M-Mode.
4. Adjust the Sweep Speed, TGC, Gain, Power Output, and Focus Position, as needed.
5. Press **Freeze** to stop the M trace.
6. Record the trace to disk or to the hard copy device.
7. Press **Freeze** to continue imaging.
8. To exit, press **M**-Mode.

M-Mode Display
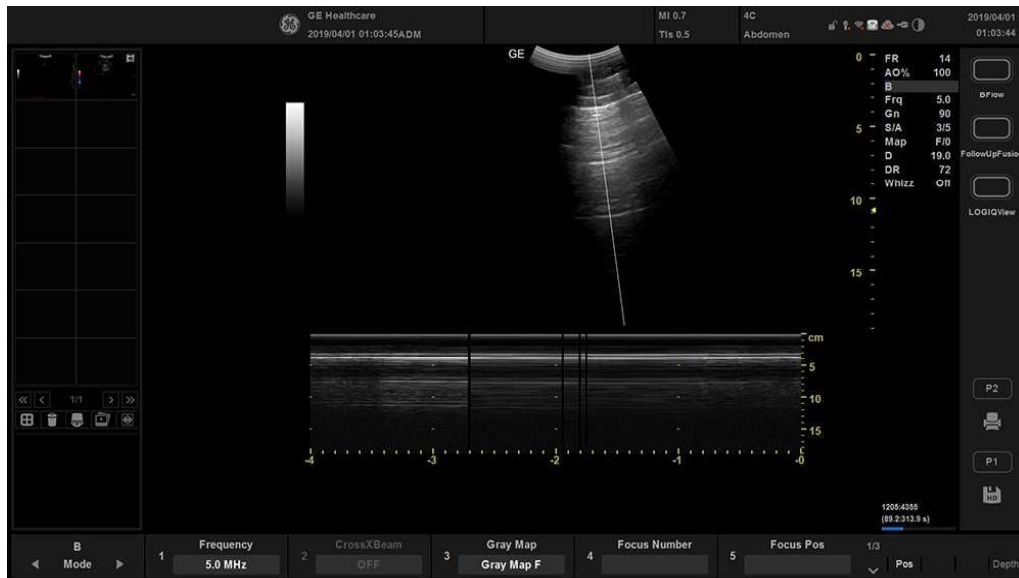
Figure 5-7.   M-Mode Display -- Representative Example

Scanning Hints

HINTS | These M-Mode controls produce the following results:

Sweep Speed. Controls speed of M-Mode update.

Dynamic Range. Affects the amount of gray scale information displayed.

Sweep Speed

Description   Changes the speed at which the time line is swept.

Available in M-Mode and Doppler Mode.

Available in M Color Flow Mode.

Adjusting   To increase/decrease, select ***Sweep Speed***.

Values   Each selection represents a different sweep time.

Sweep Speed values are returned to the factory or user preset value when you change the following: Probe, Exam Category, Exam Calcs, or Patient.

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

NOTE: *The sweep speed information represents the user selected sweep speed and should be used only as a reference to confirm that the image was acquired at the selected sweep speed. It is not to be used for measurements or analysis. This is not an absolute value, but simply a reference number. Users performing studies using standardized protocols may find this sweep speed information useful for reading studies from other institutions.*

Anatomical M-Mode

Description   Anatomical M-Mode gives you the ability to manipulate the cursor at different angles and positions. The M-Mode display changes according to the position of the cursor.

Anatomical M-Mode displays a distance/time plot from a cursor line, which is independent from the axial plane. AMM is available in B, Color and TVI.

NOTE: *To set up AMM, go to Utility--> Imaging--> AMM. Select the specific probe and parameters.*
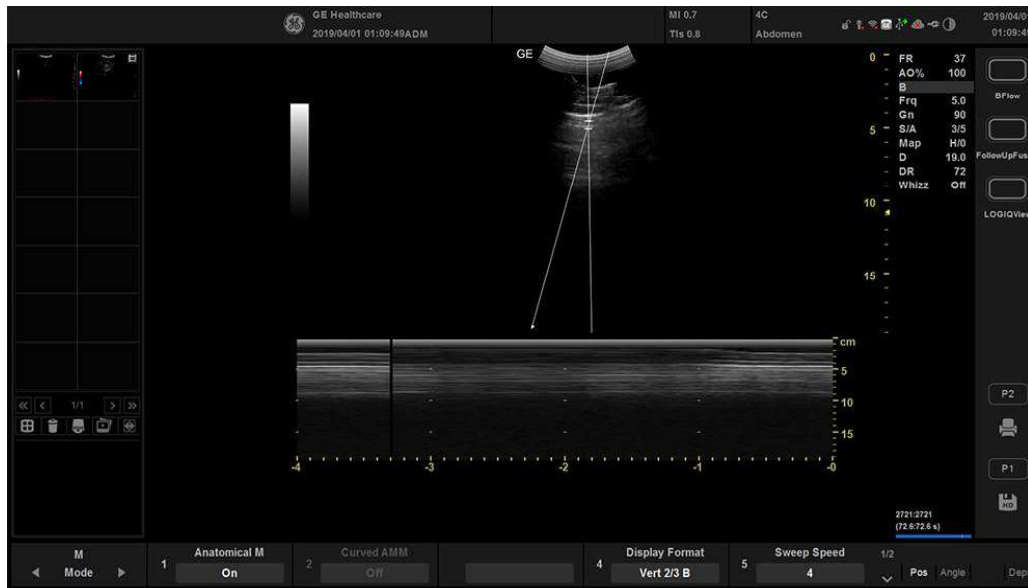
Figure 5-8.   Anatomical M Mode

Anatomical M-Mode (continued)

Activating   To activate Anatomical M-Mode:

1. While in M-Mode, select ***Anatomical M***.

2. Press **Set** key until **Pos** is highlighted, move the trackball to position the M cursor over the required area of the image.

3. Press **Set** key until **Angle** is highlighted, move the trackball to allow free rotation of the solid arrow line throughout the 2D image.

Benefits   Anatomical M-Mode gives you the ability to manipulate the cursor at different angles and positions. The M-Mode display changes according to a motion of the M cursor.

Bioeffects   Changing the Packet Size, PRF, and ROI size may change the TI and/or MI. Observe the output display for possible effects.

Curved Anatomical M-Mode (CAMM)

Curved Anatomical M-Mode (CAMM) displays a distance/time plot from a free-drawn cursor line. CAMM is available in B, CF and TVI.

NOTE: *Curved Anatomical M-Mode can also be used with previously acquired digitally stored B-Mode images.*

1. While in AMM mode, Change Curved AMM to ON in the primary menu.
2. Use the Trackball to position the start point of the time motion curve in the B-Mode image.
3. Press **Set** to fix the start point.
4. Use the Trackball to position the next point.

   The time motion curve is drawn by the green line.
5. Press **Set** to fix the point.
6. Repeat step 4 and 5 to draw a complete time motion curve.

NOTE: *The time motion curve can be edited by following the curve back to the desired point and redrawn as desired. Following the curve back to the starting point will delete the time motion curve.*

7. Press **Set** twice to complete.

NOTE: *Move the cursor to the desired anchor point and press **Set**. Move the point to the desired position and press **Set**.*

8. The arrow cursor appears on the M-Mode image and the red bar appears on the time motion curve.

   The red bar indicates the position of the time motion curve relative to the arrow cursor on the CAMM image. They move relative to one another.

NOTE: *Press **Set** to clear a cursor line.*

Optimizing Color Flow

Intended Use

Color Flow Mode and Color M-Mode are Doppler Modes intended to add color-coded qualitative information concerning the relative velocity and direction of fluid motion within the B-Mode or M-Mode image.

Introduction

A typical examination using Color Flow Mode.

1. Follow the same procedure as described under B-Mode to locate the anatomical area of interest.

2. After optimizing the B-Mode image, add Color Flow.

NOTE: *Use all noise reduction controls with care. Excessive application may obscure low level diagnostic information.*

3. Move the color flow area of interest as close to the center of the image as possible.

4. Optimize the color flow parameters so that a high frame rate can be achieved and appropriate flow velocities are visualized.

5. Press **Freeze** to hold the image in memory.

6. Record color flow images as necessary.

7. If more definitive information is needed about flow, utilize the procedures described under Doppler Mode.

8. To exit Color Flow, press **CF**-Mode or **B**-Mode.

Color Flow Mode

Figure 5-9.   Color Flow Mode screen -- Representative Example

Uses

Color Flow is useful to see flow in a broad area. Color Flow allows visualization of flow in the CF ROI, whereas Doppler Mode provides spectral information in a smaller area.

Color Flow is also sometimes used as a stepping stone to Doppler. You use Color Flow to locate flow and vessels prior to activating Doppler.

HINTS

Color Flow Mode controls produce the following results:

Line Density. Trades frame rate for sensitivity and spatial resolution. If the frame rate is too slow, reduce the size of the region of interest, select a different frame rate setting, or reduce the packet size.

Wall Filter. Affects low flow sensitivity versus motion artifact.

Color *Threshold*. Percentage of gray scale level where color Doppler is overwritten.

Frame Average. Affects temporal smoothing and color Doppler `robustness.'

Flash Suppression. Flash Suppression is a proprietary algorithm for motion artifact control.

Packet Size. Affects the amount of color Doppler sensitivity versus frame rate.

Size. Adjust the size of color window.

Focus Position. The best focusing is at the focal zone location. Put focal zone(s) at the area of interest.

Flow Model shortcuts

Flow Model Shortcuts values vary by application. In the lower Extremity Vein (LEV) and Abdominal applications, user can quickly select the flow state via a shortcut on the Color Flow Mode menu.

In the Abdominal application on the Color Flow, you will see Aorta, Renal, Renal Art, or Penetration flow selections.

In the Vascular Exam Category--> LEV Application on the Color Flow menu, you will see Low Flow or Fast Flow selections.

Gain

Description	Gain amplifies the overall strength of echoes processed in the Color Flow window or spectral Doppler time line.
Adjusting	To decrease/increase Gain, rotate **Gain**.
	Gain values change depending on the probe and application; they are not associated with a particular position of the button.
Values	Values vary by probe, application, and multi frequency setting. Gain displays as Gn on the screen. Gain values are returned to the factory or user preset value when you change the following: Probe, Exam Category, Exam Calcs, Patient, or Multi Frequency.
Benefits	Allows you to control the amount of color within a vessel or to fill in or clean out spectral information.
Bioeffects	Gain has no affect on Power Output. However, with increased Gain, the power output level can usually be reduced to produce an equivalent image quality.

Scale (Velocity Scale)

Description	Increases/decreases the Scale on the color bar.
Adjusting	To raise/lower the velocity scale, adjust *Scale* on the primary menu.
Values	Scale is in kHz.
	Velocity Scale values are returned to the factory or user preset value when you change the following: Probe, Exam Category, Exam Calcs, or Patient.
Benefits	Imaging of higher velocity flow requires increased scale values to avoid aliasing.
Affect on other controls	Changing the Velocity Scale may affect Power Output, frame rate, and wall filter. When you adjust the velocity scale, CINE memory is cleared.
Bioeffects	Changing the Velocity Scale range may change the TI and/or MI. Observe the output display for possible effects.

Wall Filter

Description   Filters out low flow velocity signals. It helps get rid of motion artifacts caused from breathing and other patient motion.

Values   Values vary, depending upon probe, application, and packet size. The wall filter is displayed numerically on the monitor (Hz).

Wall Filter values vary by probe and application and are returned to factory or user preset value when you change: Probe, Exam Category, Exam Calcs, or Patient.

Benefits   Gets rid of excess, unnecessary low frequency signals caused by motion.

Wall Filter Target Override (Hz)

Description   Wall filter target override sets to "**0**".

The algorithm selects a new regression wall filter it updates the wall filter setting and the wall filter cutoff on the user display. If using this algorithm, then the system automatically maintains a target wall filter cutoff as the scale is changed. The target wall filter cutoff is initially set by the results of the user-defined presets for wall filter, scale. The target regression wall filter cutoff shall be updated when the user changes the wall filter setting.

Wall filter target override sets to "**-1**".

The algorithm keeps a user selected regression wall filter, when the user changes the color scale.

Wall filter target override sets to other value.

The algorithm selects a new regression wall filter it updates the wall filter setting and the wall filter cutoff on the user display. In this case, the selected value from the user is the target cut off (Hz).

Values   Set the value on the Utility -> Imaging -> PDI -> Wall filter Target Override (Hz) and press *Save*.

Size/Position of the color window

Description   Adjust size and position of the color window.

Adjusting   The window grows from the center of the color window. To adjust the size, press **Set** until **Size** (Size/Position appears in the **Trackball** status area on the monitor display) is highlighted, then move the Trackball left/right, up/down. To adjust the position, press **Set** until **Pos** is highlighted, then move the **Trackball** to position the color window.

Benefits   Increase the color window to see a larger area; decrease the color window to improve frame rate and spatial resolution.

Affect on other controls   The smaller the color window, the faster the frame rate and vice versa.

Bioeffects   Sizing the color window may change the TI and/or MI. Observe the output display for possible effects.

CF/PDI Focus Depth

Description   You can set the default CF/PDI ROI width.

Adjusting   Select the value on the Utility -> Imaging -> CF mode and press *Save*.

Invert (Color Invert)

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

        NOTE: *Invert reverses the color map, NOT the color PRF.*

Adjusting   To reverse the color flow, adjust ***Invert (Color Invert)***.

           In Triplex, both Color Flow and Doppler Mode velocity scales are inverted.

Values   Invert values are returned to the factory or user preset value when you change the following: Probe, Exam Category, Exam Calcs, or New Patient.

Benefits   Allows you to view blood flow according to your personal preference, without flipping the probe.

Baseline

Description   Changes the Color Flow or Doppler spectrum baseline to accommodate higher velocity blood flow. Minimizes aliasing by displaying a greater range of forward flow with respect to reverse flow, or vice versa.

           Baseline adjusts the alias point. The default baseline is at the midpoint of the color display and at the midpoint of the color bar reference display.

Adjusting   To adjust the baseline, adjust **Baseline**.

Values   Zero velocity follows the baseline. The total PRF range remains the same. Values vary by probe and application.

           Baseline values are returned to the factory or user preset value when you change the following: Probe, Exam Category, Exam Calcs, or new patient.

Benefits   Unwraps the alias during color flow imaging. Higher velocities can be displayed without reversal of colors.

Angle Steer

Description You can slant the ROI of the Color Flow linear image left or right to get more information without moving the probe. The Angle Steer function only applies to linear probes.

Adjusting To slant the ROI of Color Flow linear image to the left/right, adjust **Angle Steer**.

Angle Steer can be set in Utility -> Imaging -> CF/PDI.

Limit to 3 Angle Steer if you want to use all angles or just available only 3 angles (left 20, 0, right 20).

Values Linear probes can be steered left (20, 15, 10 degrees), center, or right (20, 15, 10 degrees). Angle Steer values are returned to the factory or user preset value when you change the following: Probe, Exam Category, Exam Calcs, or new patient.

Benefits Provides a Doppler cursor angle suitable for linear probe orientation. Beneficial in Peripheral Vascular to image carotids.

Bioeffects Activating angle steer may change the TI and/or MI. Observe the output display for possible effects.

Accumulation

Description Accumulation enhances the flow in an image.

Values 8 settings: Off, 6 Various levels, or frames, of accumulation, and Infinite. If Accumulation is turned off, then Frame Averaging is used; if Accumulation is set, then Accumulation is used.

Availability Available in Color Flow, PDI.

Benefit Accumulation detects the maximum signal and holds it for the level specified.

Color Flow Line Density

Description	Optimizes the Color Flow frame rate or spatial resolution for the best possible color image.
Adjusting	To adjust the line density, adjust **Line Density**. Select the default value on the Utility -> Imaging -> CF -> Line Density and press **Save**.
Values	Frame Rate/Resolution values vary by: Probe, Exam Category, Exam Calcs, new patient, and Frequency. Settings are returned to factory or user preset value when you change any of the above.
Benefits	Low line density is useful in fetal heartbeat, adult cardiac applications, and clinical Radiology applications which require significantly higher frame rates. High resolution is useful in situations where very small vessels are being imaged, e.g., thyroid, testicles.
Affect on other controls	Line density changes the vector density and frame rate.
Bioeffects	Modifying line density may change the TI and/or MI. Observe the output display for possible effects.

Line Density Zoom

Description	You can set the default value for Line Density in zoom independently.
Adjusting	Select the default value via Utility -> Imaging -> CF -> Line Density Zoom and press *Save*.

Map

Description   Allows you to select a specific color map. After you have made your selection, the color bar displays the resultant map.

Adjusting   After you activate Color Flow, the Color Flow menu displays. To cycle through available maps, select ***Map***, press primary menu keys to view available maps, and press **Set** to select.

Values   Velocity Maps (V). Flow shown as blue away/red toward the probe.

Velocity Variance Maps (VV). Provides a measure of turbulence (stenosis). Adds green to velocity maps.

Benefits   Shows the direction of the flow and highlights the higher velocity flows.

Map Compress

Description   When you increase the value, high velocity elements in the map are compressed so that the map darkens. When you decrease the value, low velocity elements in the map are compressed so that the map lightens. The effect is visible in the color bar.

Benefits   Changes the gradation in the map.

Threshold

Description   Threshold assigns the gray scale level at which color information stops.

Adjusting   To increase/decrease the gray scale threshold, adjust **Threshold**.

Values   The settings cycle through various values: 0%-100% of the gray scale. High values display more color; low values displays more B-Mode gray scale data.

Values vary by probe and application and are returned to factory or user preset value when you change: Probe, Exam Category, Exam Calcs, or new patient.

Benefits   Limits color flow overlay to low level echoes inside vessel walls. Helps minimize color `bleeding' outside vessel walls.

Frame Average

Description   Averages color frames.

Adjusting   To smooth temporal averaging, select *Frame Average*. The selected value is displayed.

Values   Frame Average values vary by probe and application. The values are returned to factory or user preset value when you change: Probe, Exam Category, Exam Calcs, or new patient.

Benefits   Higher frame averaging keeps the color displayed longer for increased flow visualization while lower frame averaging provides greater flow dynamics.

Affect on other controls   Trades off between frame rate and color quality. As the color quality increases, the frame rate may decrease and as the frame rate increases, the color image quality decreases.

Transparency Map

Description   Brings out the tissue behind the color data.

Adjusting   Select **Transparency Map** to adjust.

> *NOTE:*   *Select the default value on the Utility -> Imaging -> CF -> Transparency Map and press **Save**.*

Benefits   Helps demonstrate the tissues behind the color.

Spatial Filter

Description   Smooths out the color, makes it look less pixely.

Adjusting   Select **Spatial Filter** to adjust.

> *NOTE:*   *Select the default value on the Utility -> Imaging -> CF -> Spatial Filter and press **Save**.*

Benefits   Smooths the image.

Flash Suppression

Description   Activates/deactivates Flash Suppression, a motion artifact elimination process.

Values   Values are returned to factory or user preset value when you change: Probe, Exam Category, Exam Calcs, or new patient.

Benefits   Beneficial to suppress flash.

Packet Size

Description	Controls the number of samples gathered for a single color flow vector.
Values	Values vary by probe and application and are returned to factory or user preset value when you change: Probe, Exam Category, Exam Calcs, or new patient. Values are displayed on the monitor display as P.
Benefits	Allows you to improve the color sensitivity and accuracy of color averaging (increase packet size) or frame rate (decrease packet size), as needed.
Affect on other controls	When you decrease the packet size, you increase the frame rate at the expense of image quality. When you increase the packet size, you improve image quality at the expense of frame rate.
Bioeffects	Changing packet size may change the TI and/or MI. Observe the output display for possible effects.

Sample Volume

Description	Adjusts the size of the color flow doppler transmit wave (or pulse) and size (or length). Lower setting gives better flow resolution and a higher setting increases sensitivity.

CF/PDI Sample Volume

Description	You can set the default CF/PDI Sample Volume.
Adjusting	Select the value on the Utility -> Imaging -> CF -> CF/PDI Sample Volume and press *Save*.

CF/PDI Center Depth

Description   You can set the default CF/PDI Center Depth (cm).

Adjusting   Select the value on the Utility -> Imaging -> CF mode and press *Save*.

CF/PDI Frequency (MHz)

Description   You can set the default CF/PDI Frequency (MHz).

Adjusting   Select the value on the Utility -> Imaging -> CF mode and press *Save*.

CF/PDI Auto Frequency

Description   You can set the default CF/PDI Auto Frequency.

Adjusting   Select the value on the Utility -> Imaging -> CF mode and press *Save*.

Power Doppler Imaging (PDI)

Description   Power Doppler Imaging (PDI) is a color flow mapping technique used to map the strength of the Doppler signal coming from the flow rather than the frequency shift of the signal. Using this technique, the ultrasound system plots color flow based on the number of reflectors that are moving, regardless of their velocity. PDI does not map velocity, therefore it is not subject to aliasing.

Figure 5-10.   Power Doppler Imaging screen -- Representative Example

Adjusting   Press the user defined key for **PDI**. The color flow window appears over the B-Mode image. Move the Trackball to move the CF window. To exit, press **PDI** or select a new mode.

Values   On/Off.

Twelve power (P0-P6 and P8-P12) and one directional PDI maps (P7) are available.

Benefits   Since PDI does not display velocity, it does not alias.

Power Doppler Imaging (PDI) (continued)

Affect on other controls

When PDI is activated, the following controls are adjusted: Color Map is set to a power map. Line Density is adjusted. Threshold is set to 100%. Frame Averaging is adjusted. Packet Size is adjusted.

NOTE: *These controls are reset to their previous values upon exiting PDI.*

HINTS

When changing maps, higher gain settings may be needed.

Directional Power Doppler

You can select the P7 Directional Power Doppler map while in PDI.

NOTE: *If you store a PDI image and recall it, you can still switch to the Directional Power Doppler map and vice versa. However, an image stored as non-directional then switched to directional just adds direction to a non-directional map and vice versa.*

HINTS

If the image is aliasing while in Directional Power Doppler, increase the Scale and reduce the Wall Filter.

Tissue Velocity Imaging (Option)

Intended Use

Tissue Velocity Imaging (TVI) calculates and color-codes the velocities in tissue. The tissue velocity information is acquired by sampling of tissue Doppler velocity values at discrete points.The information is stored in a combined format with gray scale imaging during one or several cardiac cycles with high temporal resolution.

TVI can be activated on the sector probes only.
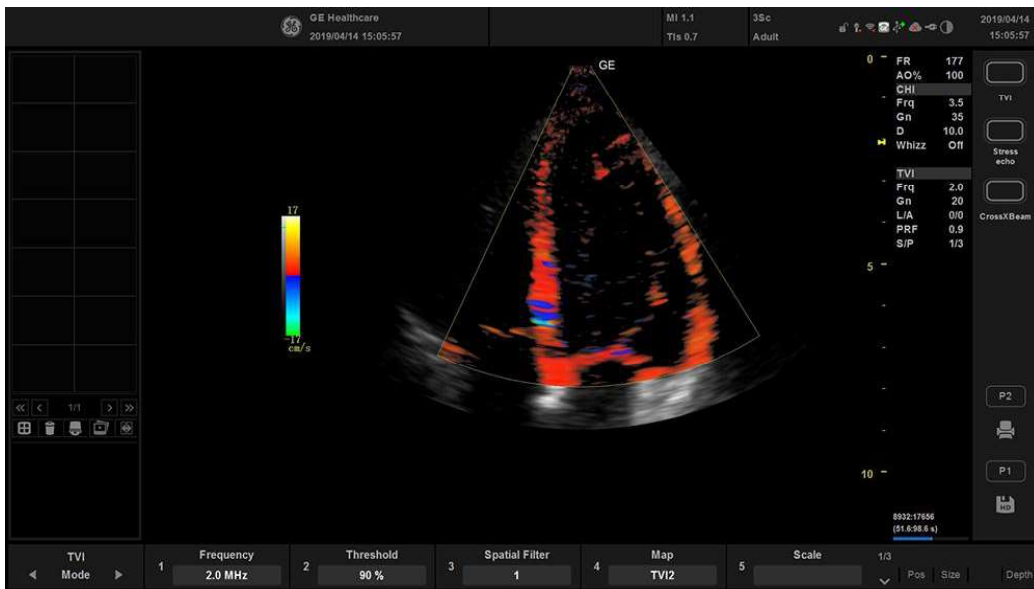
Figure 5-11.   Tissue Velocity Imaging Display

Activating TVI

1. Select the sector probe 3Sc-RS.

2. While in B-Mode, press the user defined key for TVI. The TVI image and the menu display.

   While in TVI, press **PW** to activate TVD.

   While in TVI, press **M** to activate TVM.

3. Press **Set** until **Pos** is highlighted, then move the **Trackball** to position the ROI frame over the area to be examined.

4. Press **Set** until **Size** is highlighted, then move the **Trackball** to adjust the dimension of the ROI.

Optimizing TVI

The use of preset gives optimum performance with minimum adjustment. If necessary, the following controls can be adjusted to further optimize the TVI display:

- To reduce quantification noise (variance), the Nyquist limit should be as low as possible, without creating aliasing. To reduce the Nyquist limit: Reduce the Scale value.

NOTE: *The Scale value also affects the frame rate. There is a trade off between the frame rate and quantification noise.*

- TVI provides velocity information only in the beam direction. The apical view typically provides the best window since the beams are then approximately aligned to the longitudinal direction of the myocardium (except near the apex). To obtain radial or circumferential tissue velocities, a parasternal view must be used. However, from this window the beam cannot be aligned to the muscle for all the parts of the ventricle.

NOTE: *PW will be optimized for Tissue Velocities when activated from inside TVI.*

NOTE: *You can preset the value on the Utility -> Imaging -> TVI or TVD mode and press **Save**.*

TVI Parameters

You can preset all parameters in Utility -> Imaging ->TVI.

The TVI parameters function the same as those described in the Color Flow specific section. The only differences would be that it pertains to tissue velocity rather than the color flow image. In the table below any TVI parameter or parameter specifics are noted.

About optimizing other parameters, see 'Optimizing Color Flow' on *page 5-44* for details.

Table 5-1:   TVI Parameters

Control	Details
Visible Description Adjusting Values	In LIVE/Freeze/Archive, you can display TVI Color with TVI. Select **Visible**. On or Off.
Line Density	0 or 1. Optimizes B-Mode frame rate or spatial resolution for the best possible image.
Map	Values: TVI1 and TVI2.
Threshold	High values display more color. Low values limit the color to lower tissue echo (Opposite of Threshold in Color Flow Mode).
Spatial Filter	Values 0, 1 and 2.
TVI Gain	Control color transparency. High values display more color; low values display more tissue. This parameter is assigned to the Color Gain control.

TVD Parameters

About optimizing other parameters, see 'Optimizing Spectral Doppler' on *page 5-67* for details.

TVM Parameters

Tissue Velocity M Mode image (TVM): Active M mode while in TVI. To display myocardium motion velocity and direction.

Optimizing M Color Flow

M Color Flow Mode

Description

M Color Flow is used for cardiac applications. Color Flow overlays color on the M-Mode image using velocity and variance color maps. The Color Flow wedge overlays the B-Mode image and M-Mode time line.

The Color Flow maps available in M-Mode are the same as in Color Flow Mode. The size and position of the Color Flow window in B-Mode determines the size and position of the Color Flow window in M-Mode.

All M-Mode measurements are available with M Color Flow active: depth, distance along a straight line, % stenosis, volume, trace, circumference, enclosed area, distance, time, slope, and heart rate.

M Color Flow mode can be activated on the sector probes only.

M Color Flow Mode (continued)

Activating   To activate M Color Flow Mode, press **M** (M-Mode). Then press
CF (Color Flow) - or - press **CF**, then press **M**. CM tab is
displayed.
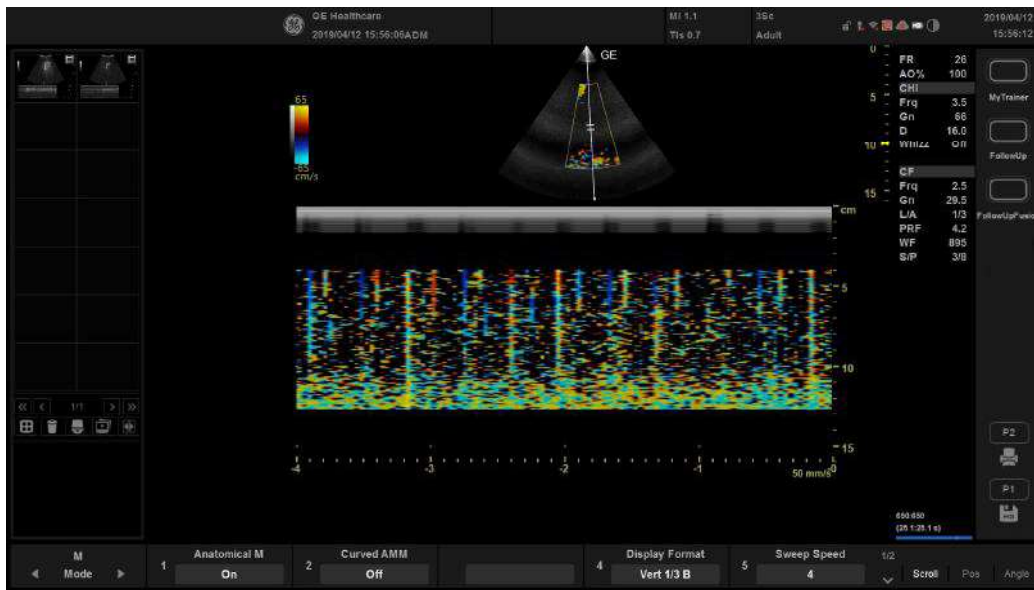
Figure 5-12.   M Color Flow screen -- Representative Example

Benefits   Color Flow Mode and Color Flow M-Mode are Doppler Modes
intended to add color-coded qualitative information concerning
the relative velocity and direction of fluid motion within the
B-Mode or M-Mode image.

Bioeffects   Changing the Sweep Speed, Packet Size, Frame Rate/
Resolution, Zoom, PRF, and ROI size may change the TI and/or
MI. Observe the output display for possible effects.

Optimizing Spectral Doppler

Intended Use

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

Typical Use - PW Doppler

In Pulsed Wave Doppler (PW) Mode, energy is transmitted from the ultrasound probe into the patient, as in B-Mode. However, the received echoes are processed to extract the difference in frequency between the transmitted and received signals. Differences in frequencies can be caused by moving objects in the path of the ultrasound signal, such as moving blood cells. The resultant signals are presented audibly through the system speakers and graphically on the system display. The X axis of the graph represents time while the Y axis represents the shift in frequency. The Y axis can also be calibrated to represent velocity in either a forward or reverse direction.

PW Doppler is typically used for displaying the speed, direction, and spectral content of blood flow at selected anatomical sites. PW Doppler operates in two different modes: conventional PW and High Pulse Repetition Frequency (HPRF).

PW Doppler can be combined with B-Mode for rapidly selecting the anatomical site for PW Doppler examination. The site where PW Doppler data is derived appears graphically on the B-Mode image (Sample Volume Gate). The sample volume gate can be moved anywhere within the B-Mode image.

Typical exam protocol

A typical examination using PW Doppler Mode might proceed as follows:

1. Connect the appropriate probe, leaving the probes in their respective holders.

2. Position the patient for the examination.

3. Press **Patient**. Enter the appropriate patient data using the appropriate exam category.

4. Select the preset, application and probe to be used.

5. Locate the anatomy to be examined. Get a good B Mode image. Press CF to help locate the vessel you wish to examine.

6. Press **PW**. The PW Doppler spectrum appears and the system operates in combined B+Doppler Mode. Adjust **Volume** to adjust Doppler audio. The Doppler signal is heard through the speakers.

   To activate CW, press the user defined key for CW.

7. Position the sample volume cursor by moving the **Trackball** left and right. Position the sample volume gate by moving the **Trackball** up and down. Size the gate by adjusting **SV Length**.

8. Optimize the PW Doppler spectrum, as necessary. Refer to the *Doppler Optimization* section of this chapter for more information.

Typical exam protocol (continued)

9. Press **Set** to toggle between real time B-Mode with Doppler Mode (with audio).

10. Sample along the whole length of the vessel. Make sure that the probe is parallel to flow. Listen, then look, when positioning the sample volume cursor.

11. Press **Freeze** to hold the trace in memory and stop imaging. Activate CINE Timeline, as necessary. See 'Activating CINE' on *page 6-11 for more information.*

12. Perform measurements and calculations, as necessary. Refer to the Measurements and Calculations chapter for more information.

13. Record results by pressing the appropriate print key, depending on the setup of your recording devices.

14. Press **Freeze** to resume imaging.

15. Repeat the above procedure until all relevant flow sites have been examined.

16. Replace the probe in its respective holder.

17. To exit PW, press **PW**. To exit CW, press the user defined key for CW.

Spectral Doppler Display

Time zero (the start of the trace) appears on the left side of the graph. As time progresses, the trace moves to the right. The baseline of the graph (representing zero velocity, zero frequency shift, or no detected flow), appears as a solid line running horizontally across the display. By convention, movement toward the probe is positive and movement away from the probe is negative. Positive frequencies or velocities appear above the baseline. Negative frequencies or velocities appear below the baseline.

Typically, blood flow is not uniform but is composed of a mix of blood cells moving at different velocities and in different directions. Thus, the display is composed of a spectrum as gray scale values. Strong signals are displayed as bright while weak signals are displayed as varying shades of gray.

HPRF (High Pulse Repetition Frequency) is invoked when you are operating in PW Doppler Mode and conditions activate HPRF (when the velocity scale factor or sample volume gate depth exceeds certain limits). When HPRF is active, multiple sample volume gates appear along the Doppler mode cursor. Doppler information can be received from any of the multiple sample volume gates. The Doppler signals from all the gates are added together and displayed in one spectrum.

Information about the PW Doppler display is automatically written on the screen and updated when scanning parameters are changed.

This chapter includes:

- A discussion of PW Doppler.
- Activating Pulsed Wave Doppler.
- Optimizing the Doppler spectrum.

Doppler Mode Display
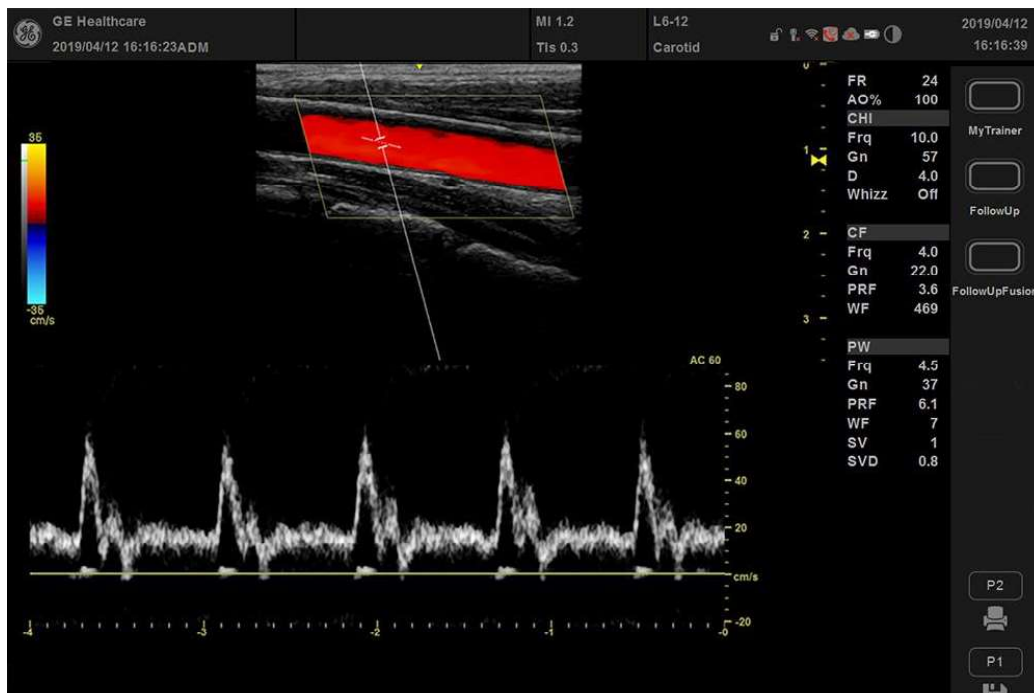
Figure 5-13.   PW Doppler Mode Display -- Representative Example

Table 5-2:   Doppler Mode Display Explanations

Doppler Display	Description, Format, Values
PRF	Pulse repetition frequency, displayed as PRF in kHz.
Wall Filter	Wall filter size, displayed as WF in Hz.
Doppler Gain	Displays as GN in decibels (dB).
Sample Volume Depth	Displays (in Cm) when Doppler cursor is present.
Doppler Angle (AC ##)	Indicates angle in degrees between the Doppler mode cursor and the angle correction indicator. Displays when Doppler cursor is present. The Doppler Angle displays in red when the angle exceeds 60°. Velocities obtained when the angle is greater than 80° are displayed as asterisks (***).
Spectral Invert	INVERT appears when the spectral trace is inverted and the plus/minus signs (+/-) are reversed.
HPRF	HPRF mode is used when detected velocities exceed the processing capabilities of the currently selected PW Doppler scale or when the selected anatomical site is too deep for the selected PW Doppler scale.

Table 5-2:   Doppler Mode Display Explanations (Continued)

Doppler Display	Description, Format, Values
Time Scale	Each selection represents a different sweep time.
Angle Correct	Indicates flow direction.
Sample Volume Gate	Indicates sample volume box. Each probe defaults to a specific range gate.
Doppler Velocity Scale	Flow direction has a positive and negative indicator, noted in centimeters per second (cm/sec.). When the velocity scale is less than 10 cm/s, it is displayed to the first decimal point (4.6 rather than 5 cm/s). The Doppler velocity scale adjust as you adjust the PRF.

Doppler Sample Volume Gate Position (Trackball)

Description   Moves the sample volume gate on the B-Mode's Doppler Mode cursor. The gate is positioned over a specific position within the vessel.

Adjusting   To move Doppler Mode cursor position, move **Trackball** left or right until positioned over the vessel.

To move sample volume gate position, move **Trackball** up or down until positioned inside the vessel.

Values   Defaults to 50% of the depth and can move continuously throughout the field of view.

Benefits   Positions the sample volume gate to sample blood flow.

Bioeffects   Changing the sample volume gate position may change the TI and/or MI. Observe the output display for possible effects.

Doppler Sample Volume Length

Description   Sizes the sample volume gate.

Adjusting   To increase/decrease the gate size, adjust *SV Length*.

You can adjust the sample volume gate length whenever the sample volume gate appears on the display.

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

Values   Values vary by probe and application.

Sample volume gate size values are returned to the factory or user preset value when you change the following: Probe, Exam Category, Exam Calcs, or new patient.

Benefits   A smaller gate produces accurate sampling results because it is more sensitive. You can also enlarge the gate for sampling large vessels or areas.

Bioeffects   Changing the sample volume gate size may change the TI and/or MI. Observe the output display for possible effects.

Angle Correct

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

NOTE: *When the Doppler Mode Cursor and angle correct indicator are aligned (the angle is 0), you cannot see the angle correct indicator.*

Adjusting   Flow toward the probe is mapped above the baseline and vice versa.

To adjust the angle relative to the probe face, adjust ***Angle Correct***. The velocity scale changes when you adjust angle correct.

NOTE: *Angle Correct can be adjusted in Triplex Mode when Update is activated.*

Angle Correct values vary by probe and application. Angle Correct values are returned to the factory or user preset value when you change the following: Probe, Exam Category, Exam Calcs, or New Patient.

Benefits   Optimizes the accuracy of the flow velocity. This is especially useful in vascular applications where you need to measure velocity.

Quick Angle

Description   Quickly adjusts the angle by 60 degrees.

Adjusting   Adjust ***Quick Angle*** to toggle between Off, Right and Left.

Steer and Fine Steer

Description	You can slant the mode cursor of the linear image left or right to get more information without moving the probe. The angle steer function only applies to linear probes.
Adjusting	To slant the mode cursor to the left/right, adjust **Steer** or **Fine Steer**.
Values	Linear probes can be steered left (10, 15, 20 degrees), center, or right (10, 15, 20 degrees).
	Steer values are returned to factory or user preset value when you change: Probe, Exam Category, Exam Calcs, or new patient.
	Fine Steer value can be changed in 2 degree increments.
Benefits	Provides a doppler cursor angle suitable for linear probe orientation. Beneficial in Vascular applications.
Bioeffects	Activating angle steer may change the TI and/or MI. Observe the output display for possible effects.

Volume

Description   Controls audio output.

⚠ CAUTION   Audio sounds change rapidly, often abruptly. Increase the volume in small steps to avoid startling the patient.

Benefits   An audio representation of the flow within a vessel can be used to evaluate proper probe angle and position.

Auto Spectrum Optimize (Auto)

For details on Auto, See 'Whizz' on *page 5-8 for more information.*

Cycles to Average

Description   The average value over a number of cycles (from 1-5). For example, if you set the number of cycles at 3, values would be averaged for 3 cycles. If you have 5 cycles on the display, the PS would be the average of 3 of the 5 cycles, which are identified by a line drawn over the 3 averaged cycles.

Available for live and frozen images.

Display Format

Description   Changes the horizontal/vertical layout between B-Mode and Doppler Mode, or time line only.

Benefits   You can select how to have your Doppler time line and anatomy displayed.

Set

Description	Toggles between simultaneous and update presentation while viewing the timeline.
Adjusting	To activate, press **Set** to toggle between simultaneous and update. Doppler Mode does not restart each time the image is updated; however, a black bar may appear with a lightning bolt signalling a break in the timeline.
Values	On/Off.
Benefits	Update increases the Spectral Doppler display quality.
Bioeffects	Activating Update may change the TI and/or MI. Observe the output display for possible effects.

Simultaneous (Duplex/Triplex)

Description	Duplex allows two modes to be active at the same time; Triplex allows three modes to be active at the same time.

- B + PW or B + CW or B + CF (Duplex)
- B + PW + CF or B + CW + CF (Triplex)

Update pauses the image while keeping the CW / PW time line active.

When Duplex/Triplex is OFF, either the image or time line is active. Update then switches the active side between the image and the time line.

Preset	You can preset Simultaneous in Utility --> Imaging --> General.
Benefits	Allows the user to have multiple modes active at the same time.

Baseline

Description   Adjusts the baseline to accommodate faster or slower blood flows to eliminate aliasing.

Adjusting   Baseline adjusts the point in the spectrum where the velocity trace is at zero. The default baseline is at the midpoint of the spectrum.

The baseline displays as a solid line running across the spectrum. The baseline is raised and lowered in equal increments, depending on the current Doppler scale factor. The control does not wrap when the maximum baseline shift (in either direction) has been reached.

Values   50% is the center of the display, +95% is the top edge of the display and 5% is the bottom edge of the display. Baseline values vary by probe and application and are returned to the factory or user preset value when you change: Probe, Exam Category, Exam Calcs, or New Patient.

Benefits   Unwraps the alias. Rearranges the velocity scale without changing the velocity scale. Readjusts the positive and negative velocities limit without changing the total velocity range.

Compression

Description	Compression controls how echo intensities are converted to shades of gray, thereby increasing the range of contrast you can adjust.
Values	The current value displays on the menu. Compression values vary by probe and application and are returned to the factory or user preset value when you change the following: Probe, Exam Category, Exam Calcs, or New Patient.
Benefits	Optimizes the image's texture and smoothness by increasing or decreasing the amount of gray scale.

Invert

Description	Vertically inverts the spectral trace without affecting the baseline position.
	The plus (+) and minus (-) signs on the velocity scale reverse when the spectrum is inverted.
	Positive velocities display below the baseline.
Values	Forward/reverse. The trace corresponds to flow direction (positive flow is forward flow toward the probe or negative flow is reverse flow away from the probe). The invert setting is returned to the factory or user preset value when you change the following: Probe, Exam Category, Exam Calcs, or New Patient. In Triplex, both Color Flow and Doppler Mode velocity scales are inverted.
Benefits	If you change the probe angle to accommodate anatomy, blood flow still moves in the same direction, but the Doppler information will be reversed. It is easier in cases like this to invert the spectrum instead of reversing the probe orientation.

Scale (Velocity Scale)

Description   Adjusts the velocity scale to accommodate faster/slower blood flow velocities. Velocity scale determines pulse repetition frequency.

If the sample volume gate range exceeds single gate Scale capability, the system automatically switches to high PRF mode. Multiple gates appear, and HPRF is indicated on the display.

High PRF   High Pulse Repetition Frequency (HPRF) is a special operating mode of PW Doppler. In HPRF mode, multiple energy pulses are used. This allows higher velocities to be detected without causing aliasing artifacts. HPRF mode is used when detected velocities exceed the processing capabilities of the currently selected PW Doppler scale or when the selected anatomical site is too deep for the selected PW Doppler scale. The pulse repetition frequency (PRF) is displayed to the left of the spectrum in frames per second.

NOTE: *Ensure that only one gate overlays a blood vessel at a time. Otherwise, signals from more than one flow area are superimposed.*

Adjusting   To raise/lower, adjust the *Scale* on the primary menu. The display updates velocity scale parameters after you adjust the velocity scale.

Values   Velocity Scale values vary by probe and application. In Triplex, when you change the velocity scale in Color Flow, the Doppler Mode velocity scale is also updated if Triplex is on.

Velocity Scale values are returned to the factory or user preset value when you change the following: Probe, Exam Category, Exam Calcs, or New Patient.

Scale (Velocity Scale) (continued)

Benefits	Blood flow information is not cut off due to the effect of aliasing.
Affect on other controls	When you raise the velocity scale, the spectral waveform may decrease in size; when you lower the velocity scale, the spectral waveform may increase in size. Changes in the spectrum are relative to changes in the velocity scale, that is, it sizes accordingly. When you adjust the velocity scale, CINE memory is cleared. Adjustments may affect sample volume size and Doppler wall filter.
Bioeffects	Changing the velocity range may change the TI and/or MI. Observe the output display for possible effects.

Wall Filter

Description	Insulates the Doppler signal from excessive noise caused from vessel movement.
Adjusting	To increase/decrease, adjust *Wall Filter* on the primary menu.
Values	Values vary, depending upon the probe and application. The current value displays on the monitor. Wall Filter values are returned to the factory or user preset value when you change the following: Probe, Exam Category, Exam Calcs, New Patient.
Benefits	Gets rid of excess, unnecessary information. Cleans out low level noise above and below the baseline so you don't see or hear it on the spectrum.
Affect on other controls	Wall filter may be changed by changes to the velocity scale.

Trace Method

Description   Traces the average mean and peak velocities in real-time or frozen images.

Adjusting   To get a peak trace, click MAX. A green trace displays on the spectrum.

To get a mean trace, click MEAN. A blue trace displays on the spectrum.

Benefits   Lets you trace the cardiac cycle.

Trace Sensitivity

Description   Adjust the trace to follow the waveform for signal strength.

Benefits   If the signal is very faint, increasing the Trace Sensitivity will allow the system to trace that signal strength.

Trace Direction

Description   Specifies trace direction.

Selecting Trace Position   You can select where on the waveform to perform the trace, above, below, or both (above and below).

Mode Cursor

Description   Displays the Doppler Mode cursor on the B-Mode image, or displays the M/D-Mode cursor on the PW-Mode image.

Modify Auto Calcs

Description   Activates the menu to select which calculations are automatically calculated.

Auto Calcs

Description   Activates the calculation automatically which you select in the Modify Auto Calculation when the system is in a state of freeze or live.

Continuous Wave Doppler (CWD) (Option)

Allows examination of blood flow data all along the Doppler Mode cursor rather than from any specific depth. Gather samples along the entire Doppler beam for rapid scanning of the heart. Range gated CW allows information to be gathered at higher velocities.

Steerable

Allows viewing of the B-Mode image to position the Doppler cursor to the area of interest while viewing the Doppler spectrum (shown below in the B-Mode image) and listening to the Doppler Audio signal.

Works with the sector probes.

Activating CW Doppler

To activate CW Doppler Mode, press the user defined key for CW.

The Steerable CW Doppler spectrum displays along with the B-Mode image. The cursor changes to a Doppler cursor.

You can now position and size the sample volume gate to get a velocity. Use Doppler Audio to listen for when the sample volume gate is positioned over an area of flow.

Set toggles between real time B-Mode with Doppler Mode and real time spectral display.

Exiting CW Doppler

To exit CW Doppler Mode, press the user defined key for CW again.

Contrast Imaging (Option)

Overview

NOTE: *Please be advised that Contrast imaging MAY NOT BE available on your system. Contrast agents for radiology use are not yet available.*

NOTE: *The Versana Active is designed for compatibility with most commercially available Ultrasound contrast agents. Because the availability of these agents is subject to government regulation and approval, product features intended for use with these agents may not be commercially marketed nor made available before the contrast agent is cleared for use. Contrast-related product features are enabled only on systems for delivery to an authorized country or region of use.*

WARNING   Appropriate training

Only physicians or echo technicians who have received appropriate training can use the Contrast applications.

WARNING   **Misdiagnosis based on image artifacts**

Misdiagnosis in ultrasound contrast images may be caused by several artifacts, most importantly:

Motion artifacts: gives rise to signals independently of contrast presence. This may be caused by patient movement; including respiration, or by probe movement influenced by the operator.

Regional drop outs: caused by unintentional destruction of the contrast agent, too low concentration of contrast agent, poor acoustic penetration due to rib/lung shadows or system failing to detect the contrast agent due to erroneous settings induced by the operator.

Tissue harmonics: gives contrast-like signals independently of the presence of contrast agent.

Overview (continued)

⚠ CAUTION	Cardiac rhythm disturbances during perfusion studies using gas ultrasound contrast agents have been observed in the diagnostic range of Mechanical Index (MI) values. See the specific package insert for the contrast agent being used for details.

⚠ CAUTION	Read and follow contrast agent instructions provided by the manufacturer.

NOTE: *The Versana Active is designed for compatibility with commercially available Ultrasound contrast agents. Because the availability of these agents is subject to government regulation and approval, product features intended for use with these agents may not be commercially marketed nor made available before the contrast agent is cleared for use. Contrast-related product features are enabled only on systems for delivery to an authorized country or region of use.*

By adjusting the acoustic output, you can enhance either contrast harmonics or stimulated acoustic emission (SAE).

Benefits   The contrast imaging technique, facilitated by the use of a contrast agent, detects non-linear signals while suppressing linear signals from surround tissue. Blood containing the contrast agent stands out brightly against a dark background of normal tissue.

Clinical Use   Possible clinical uses are to detect and characterize lesions of the liver, kidney, and pancreas and to enhance flow signals in the determination of stenosis or thrombus.

Overview (continued)

Affect on other controls

The default acoustic output adjusts for contrast imaging and the Power Output key provides more subtle gradations for use while in contrast imaging. When you exit Contrast Imaging, the system returns the acoustic output to its original setting. When you reactivate Contrast Imaging, the system enters the default Contrast Mode.

Most system controls are available (Depth, Zoom, Colorize, etc.). However, some controls are not available (Anatomical M Mode and Rejection).

Controls adjusted while in Contrast Imaging retain these values when you exit Contrast Imaging (except for post-processing controls).

Bioeffect

Activating Contrast Imaging may change the TI and/or MI. Observe the output display for possible effects.

Feature Availability

3D is available; Multi Image and LOGIQView are not available.

Probe

Contrast is only available on the 4C-RS probe in Abdominal application.

Mode

Reference Mode

Reference (Ref) Mode is to image the anatomical reference, not the contrast enhancement.

Contrast Mode

There are several contrast imaging techniques. Note that the appropriate imaging technique may vary by agent and application. In other words, the imaging technique is not dedicated for the agent and vice versa.

Contrast Tech.

Description

Select the active contrast acquisition mode: "AM".

Table 5-3:

Label	Description	Clinical Use
Amplitude Modulation (AM)	The main purpose of AM mode is to image the non-linear signal from the contrast agent. This mode transmits two or more consecutive pulses with the different amplitude as a contrast transmit group. The received signals are summed with the different coefficients to cancel the linear responses and then the non-linear responses are extracted.	lesions detection and characterization

NOTE: *The available options for the Contrast Tech. is depend on the supported contrast acquisition mode for the active probe.*

Parameters

You can preset almost controls in the Utility --> Imaging --> CON or Ref Tab.

Single View/Dual View

Description

Single View displays the active Contrast image only.

Dual View displays the active Contrast image and the reference image simultaneously.

Visualization

Description

Define the display technique.

Values

- **Contrast**. Displays the contrast-enhanced image.
- **Tissue**. Displays the tissue image.
- **Hybrid Contrast**. Displays the contrast-enhanced image and the tissue image using Hybrid Map.

Visualization/Map Indication

Figure 5-14.   Imaging parameter

1. Gray/Colorize Map for current visualization.
2. Visualization: C=Contrast, T=Tissue, HC=Hybrid Contrast

Parameters (continued)

Hybrid Map

Description	Select the hybrid map for the Hybrid Contrast visualization in the Dual/Hybrid Display.

Gray Map

Description	You can select a map for the contrast image and reference tissue image independently.
Adjusting	Select *Gray Map*.

Contrast Color

Description	Select the color map for the Contrast mode image.
Adjusting	Select *Colorize*.

Contrast only

Description	Only transmit and receive the acoustic power signal for the contrast-enhanced image.
Adjusting	Select *Contrast Only*.

Parameters (continued)

Frequency

Description   Select frequency type for each contrast technique.

Adjusting   Frequency can be preset in the Utility -> Imaging -> CON.

  •   Frequency (AM): Res, Gen, Pen

Sonazoid

Description   If you use Sonazoid for Contrast agent, you have to check
                       Sonazoid in Utility -> Imaging -> CON.

Target MI

Description   Target MI Control provides the automated adjustment of the
                       acoustic output to keep the specified target MI value to reduce
                       the unexpected results on the contrast exam.

                       Target MI control can be preset in the Utility -> Imaging -> CON
                       and Ref.

Accumulation

Description   Accumulation enhances the flow in an image.

                       If Accumulation is turned off, then Frame Averaging is used; if
                       Accumulation value is set, then Accumulation is used.

Availability   Available in Contrast, Color Flow, PDI, and B-Flow.

Benefit   Accumulation detects the maximum signal and holds it for the
                       level specified.

Parameters (continued)

Max (Maximum) Enhance

Description	Sets the acoustic output to its maximum setting (100%)
Values	On/Off. When you deactivate Max Enhance, the acoustic output is returned to its previous setting. Max Enhance is deactivated by the system when you turn it off, change probes, or change the contrast technique.
Benefits	This control provides quick transition to High MI imaging. This allows the user a quick one-button push to destroy the agent. Useful when the user is interested in the bubble wash-in characteristics of the anatomy being scanned.

Time Trigger

Description	The Contrast Trigger scans images at set intervals, delaying imaging according to the time delay that you specify.
Adjusting	On/Off. Adjust **Time Trigger**.

Time Delay

Description	The Contrast Trigger scans images at set intervals, delaying imaging according to the time delay that you specify. Adjust **Time Delay**.
Adjusting	Set the default seconds of Time Delay in Utility -> Imaging -> Con.

Parameters (continued)

Flash

Description	This feature provides a way to expose the higher acoustic power for a specified time duration by pressing a control once.
Adjusting	Select *Flash* on the Primary Menu.

NOTE: *Set the frame numbers to scanned with the higher acoustic power in Utility--> Imaging--> Con--> Flash Frames. The frame numbers defined by Flash Frames are applied to both the contrast imaging modes.*

- If you select Flash once in the menu, the system scans with 100% acoustic output burst pulses for the specified number of frames. The acoustic output then reverts to the original settings.
- When Max Enhance is ON for the contrast imaging modes, the system keeps Max Enhance = ON with no acoustic output change when Flash is selected in the menu.

Parameters (continued)

Contrast Clock (Timer)

Description You can use the Contrast Clock by activating it at the time of injection and deactivating it at the end of the exam.

Two timers can be displayed on the bottom-left corner in image area and info area for several injection.

NOTE: *You can also configure the system to perform a countdown for the contrast injection with the Utility -> System -> System Imaging -> Countdown Time for Contrast preset.*

Adjusting
- Press **Contrast Clock 1** to start/stop the T1 timer.
- Press **Contrast Clock 2** to start/stop the T2 timer.

Display There are two areas on the screen where the Contrast Clock displays: on the image and on the lower, left-hand portion of the display. The timer on the image freezes when you freeze the image (the timer updates when you unfreeze the image). However, the timer located on the lower, left-hand portion of the display continues to display over a freeze, probe change, mode change, multi image, and zoom.

The timer also appears on CINE Loops and archived images.

Benefits The Contrast Clock measures the time since injection.

You can save the data of contrast clock to an external file by using Export Traces of TIC.

1. Press **Freeze**. Scroll with the Trackball to show Cine tab.
2. Select **TIC Analysis** on the primary menu to enter TIC application.
3. Put a ROI on the image.
4. Select Export Traces. Type the file name and store it to the storage device.

Relationship with other controls

- L + R Simultaneous Display (L: Tissue, R: Active Visualization)
    - Accumulation/Cine Capture
        - Applied on the right side image only.
        - You cannot compare On and Off image using L + R.
    - SRI-HD
        - Applied on both side image.
    - Frame Average
        - Applied on both side image.
- TIC
    - Measured on active visualization, except "Hybrid Contrast".
    - "Hybrid Contrast" is disabled and measured on "Contrast" visualization.
- Easy 3D
    - Build volume data from active visualization, except "Hybrid Contrast".
    - Hybrid map is disabled and forces "Contrast" visualization.
- Archive
    - The raw data size increases between two to three times the size compared to the previous raw data. It takes a longer period of time to save as Cine.

Time Intensity Curve (TIC) Analysis

The basic TIC process works as follows

1. Scan the patient after injecting the contrast agent.
2. Watch the agent flow through the anatomy of interest.
3. When the desired contrast effect has been visualized, freeze the image and select a range of images for analysis.
4. Position an ROI (region of interest) on one of those images where the contrast effect is visible.
5. The system then calculates the mean pixel intensity within that ROI for all frames in the user designated loop and plots the resulting data as a function of time.

You can also choose to fit this data to one of several mathematical functions. The fundamental idea is that the contrast effect flowing through the organ of interest can be modeled mathematically, and details of the wash in and washout of the agent can be gleaned by analyzing the numerical parameters of the mathematical model.

Activating TIC

1. Scan the patient in Contrast mode or select a desired cine loop from the stored images.

NOTE: *Images from the current scan session (already in CINE) or from a saved image loop can be used for TIC analysis.*

NOTE: *TIC analysis is only available if the user has selected an image loop. If the user has selected a saved still image (just one frame), TIC analysis is not available.*

2. Press **Freeze**. Move the Trackball

NOTE: *The TIC package is only available when the system is in FREEZE mode.*

3. ***TIC Analysis*** displays on the primary menu.

NOTE: *Subsequent TIC processing is done on the images stored in CINE memory.*

4. Select ***TIC Analysis***. The TIC Analysis screen displays. To toggle the trackball function between QA and Scroll, press **Cursor** key.

Activating TIC (continued)

Table 5-4:   TIC Mode Display Explanations

Parameter	Description
Max Gradient	Between the CINE Start and End frame, displays the time and gradient that becomes the maximum gradient.
Accumulation	Enhances the flow in an image.
Disable Frame	The current frame is excluded from the CINE Loop display.
Enable All Frames	Re-enables disabled frames.
Horizontal Sweep	Allows you to increase/decrease the time interval over which to plot the TIC curve.
Smoothing	Smooths the trace displayed by applying a filter over a defined time window. Both the filter type and time window are user-selectable. The type of filter available depends on the analysis signal displayed.
Delete Sample Area	Removes selected sample area from the CINE Loop window and accompanying trace in the Analysis window. The Trackball marker must be pointed at an anchored sample area.
Export Trace	Saves trace data in ASCII format, readable in spreadsheet programs. If present, trace data for physiological traces are also exported.
Curve Fitting	Toggles between Wash-In, Wash-Out, and Off.
Set Sample Area Shape	Enables resizing of a selected sample area by setting height, width, and tilt angle. The Trackball marker must be pointed at an anchored sample area.

Exiting TIC Analysis

There are several methods to exit TIC Analysis.

- Select *Exit TIC Analysis* on the primary menu.
- Press **Freeze** to unfreeze and resume scanning.

TIC Analysis Screen Description
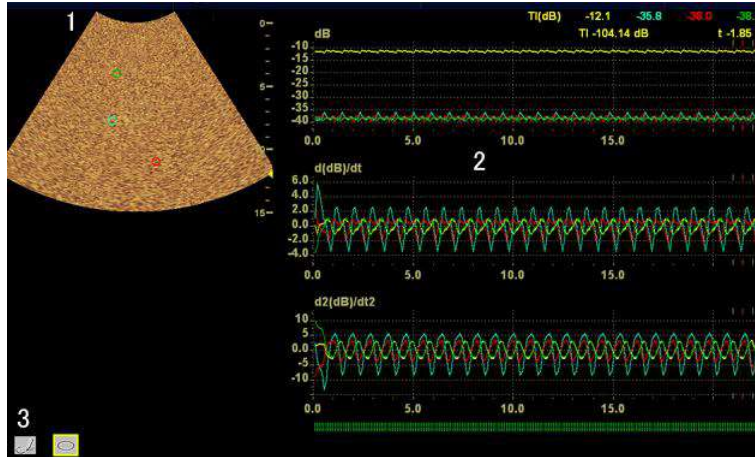
Figure 5-15.   TIC Analysis Screen

Table 5-5:   QAnalysis Screen Description

1.	Contrast Cineloop Window Sample Area: Indicates sampling position of the intensity (contrast) trace. The sample area is color-coded: the first sample area is yellow, the second green, etc.
2.	Displays time-intensity curve. • Y axis: Intensity scale (logarithmic) (db) or linear acoustic units (AU). • X axis: Time(s) or Dt(s), elapsed time from previous frame. • ECG (where available -- not shown), Frame Marker: displays ECG trace (where available), the current frame marker and the start and stop markers for the cineloop. • Time at cursor position and velocity at cursor position. • Intensity (dB or AU) at cursor position. • Intensity (dB or AU) at frame marker position (color coded)
3.	Sample Area Tools. • Pencil Icon: Creates a sample area based on freehand drawing. • Shape Icon: Creates a sample area with a pre-defined circular/ellipse shape.

System Menu

The System menu on the monitor display can be used.

Analysis Window System Menu

Position the cursor over the analysis window and select **System Menu**. The Analysis Window system menu displays at the cursor position.

NOTE: *The system menu is dependent on mode.*
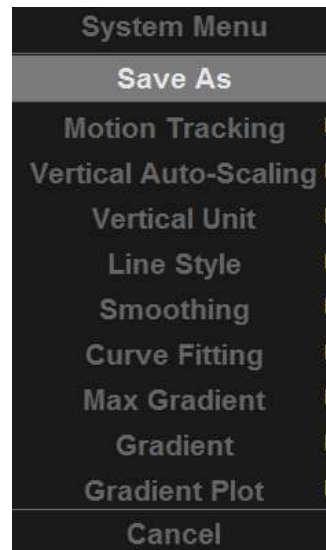
Figure 5-16.   Analysis Window System Menu - example

System Menu (continued)

ROI System Menu

Position the cursor on the ROI and select **System Menu**. The ROI system menu displays at the cursor position.
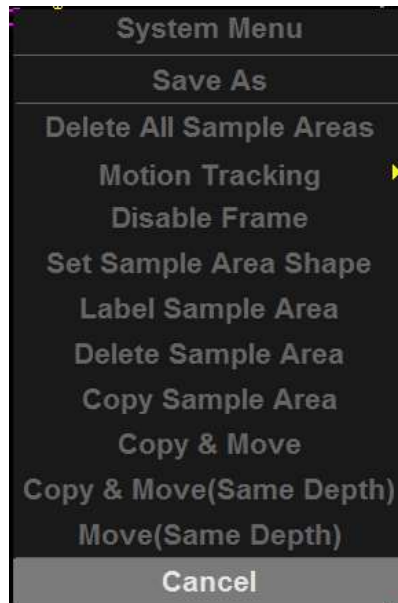
Figure 5-17.   ROI System Menu

Frame Marker System Menu

Position the cursor on the Frame Marker in the Analysis Window and select **System Menu**. The Frame Marker system menu displays at the cursor position.
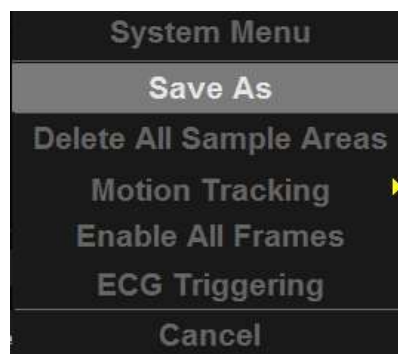
Figure 5-18.   Frame Marker System Menu

Versana Active – Basic User Manual
Direction 5840764-100 English Rev. 10

Selecting TIC Analysis Image Range

A range of frames is selected for the TIC analysis in Cine mode (before accessing TIC Analysis). Only the frames in this range are used for the TIC analysis.

If a range is not selected prior to accessing the TIC Analysis, the system uses the default Cine start and end frames as the default TIC start and stop frames.

1. The first frame in the analysis series is selected by adjusting *Start Frame* to the desired frame

    OR

    using **Trackball** or *Frame by Frame* to select the desired first frame and then selecting *Start Frame*.

2. The last frame in the analysis series is selected by adjusting the *End Frame* to the desired frame

    OR

    using **Trackball** or *Frame by Frame* to select the desired last frame and then selecting *End Frame*.

Generating a Trace

Up to eight traces can be generated.

About the sample area

The sample area can be in three different states:

- **Free sample area**: freely moving sample area (QA cursor) before anchoring.

NOTE: *The free sample area disappears when the QA cursor is moved over a static anchored frame.*

- **Static sample area**: the free sample area is anchored by pressing Set.
- **Dynamic anchored sample area**: the sample area is anchored in two or more frames (see Manual tracking below). In these particular frames, the sample area is displayed with an anchor. The sample area moves smoothly between the anchored positions when playing/scrolling the cineloop.

Trace from a pre-defined sample area

1. Press **Cursor** on the control panel to select QA function for trackball.
2. If necessary, select the sample area Ellipse ROI button (shape icon on the monitor display).
3. Move the cursor to one of the Cineloop windows using the **Trackball**.

   The cursor is changed to a sample area (white circle). A preview of the trace is displayed in the Analysis window.
4. Press **Set** to anchor the sample area.

   In this frame, the sample area is marked with an anchor. If the cineloop has more than one heart cycle, a sample area will also be anchored in the corresponding frame in the next heart cycle.

   The trace is updated accordingly in the Analysis window.

Generating a Trace (continued)

Trace from freehand sample area

1. Select the Freehand ROI button (pencil icon on the monitor display).

2. Move the cursor to one of the Cineloop windows using the **Trackball**.

3. Trace the outline of the desired ROI by moving the caliper with the **Trackball**.

4. Press **Set** to anchor the sample area.

   The sample area is automatically closed and the trace is updated accordingly in the Analysis window.

Manual tracking of the sample area (dynamic anchored sample area)

The sample area can be moved within the loop to ensure that data in the trace is generated from the same anatomical location during the cyclic motion of the heart.

1. Place a sample area over a region of interest. Note the anatomical location of the sample area.
2. Scroll to a new frame using the **Trackball**.
3. Press **Cursor** on the control panel to select QA function for trackball.
4. Move the cursor to the sample area using the **Trackball**.
5. Press **Set**. The sample area is unanchored.
6. Drag the sample area to the corresponding anatomical location in the new frame.

   When the sample area is anchored in more than one frame, linear interpolation is performed so that the sample area is smoothly moved between the anchored positions in the selected frames when running the cineloop.

NOTE: *In the original frame and this particular frame the sample area is marked with an anchor.*

7. Press **Cursor** on the control panel to select Scroll function for trackball.
8. Using the **Trackball**, scroll through the cineloop and control that the sample area follows the moving anatomical structure.
9. Add anchored sample areas in several frames to obtain a more accurate displacement of the sample area.

Manual tracking of the sample area (dynamic anchored sample area) (continued)

Moving a dynamic anchored sample area

1.   Freeze the image.
2.   Press **Cursor** on the control panel to select Scroll function for trackball.
3.   Using the **Trackball**, browse through the cineloop to display one of the frames where the sample area was anchored.

NOTE: *In these frames, the sample area is marked with an anchor.*

4.   Press **Cursor** on the control panel to select QA function for trackball.
5.   Move the cursor to the sample area using the **Trackball**.
6.   Press **Set**. The sample area is unanchored.
7.   Drag the sample area to a new location.
8.   Press **Set** to anchor the sample area to the new location.

If you want to move the sample area to the same depth, select *Move (Same Depth)* from the System Menu.

Zooming in the Analysis window

To zoom:

1. In the Analysis window, press and hold down the **Set** key while dragging the cursor to define the zooming area.

2. Release the **Set** key.

To unzoom:

1. Press the Cursor key in the Analysis window. The system menu displays.

2. Select *Unzoom*.

NOTE: *Shown only in zoom mode.*

Delete a trace

The user can delete all traces at once or one at a time.

1. If necessary, press **Cursor** on the control panel to select QA function for trackball.

2. Move the cursor over one of the sample area. Confirm that cursor is changed to hand icon.

3. Select *Delete Current Sample* or *Delete All Samples* on the primary menu as necessary.

Disabling/Enabling the frame

Frame disabling excludes the actual frame from the cineloop display. Frame disabling is available only with contrast data.

Disabling the frame from the frame marker

To disable One Frame :

1. Use the **Trackball** to move the cursor to the frame maker to disable.

2. Press **Disable Frame**.

3. The frame marker is changed from green to red to indicate the frame has been disabled.

NOTE: *The disabled frame is no longer displayed in the reference window when scrolling through CINE memory.*

Disabling multi-frames from the frame marker

1. Use the Trackball to move the cursor to the first frame maker to disable.

2. Press and hold down *Disable Frame*.

3. Move the maker to the last frame to be disabled and release **Disable Frame**.

    The marker is turn red and the data from that frame is removed from the trace and any subsequent trace processing.

Disabling/Enabling the frame (continued)

Disabling a frame from the cineloop window

1. Use the Trackball to move the cursor to the cineloop window.
2. Press *System Menu*. The system menu displays.
3. Select *Disable frame*.

   The current frame is disabled and the corresponding frame marker displays red.

Disabling ECG triggered frame (where available)

In a multi-cycle acquisition, the user may deselect all frames in all heart cycles but a selected one. This function can be used for example to select a particular systolic frame for each heart cycle.

1. Scroll through the cineloop to identify the cardiac phase to analyze or identify the cardiac phase on the ECG trace (where available).
2. Position the cursor on the ECG trace (where available) and press **System Menu**. The system menu displays.
3. Select *ECG triggering* (where available).

   All frames in all heart cycles are disabled except for the selected and corresponding frames in the other heart cycles.

Disabling/Enabling the frame (continued)

To enable the frames

To re-enable all deleted frames :

1. Position the cursor on the Frame Marker line and press the **System Menu**. The system menu is displayed at the cursor position.
2. Select **Enable all frames**.
3. All disabled frames are re-enabled.
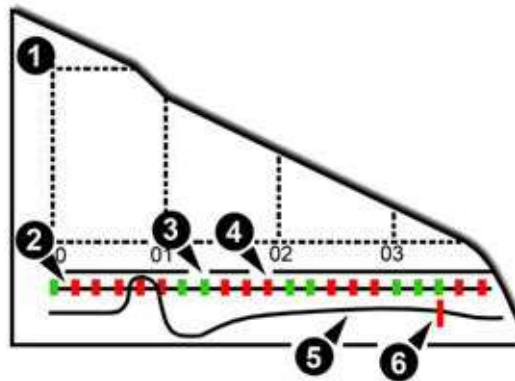
Figure 5-19.   Frame markers

1. Analysis Window
2. Frame markers axis
3. Enabled frame (Green)
4. Disabled frame (Red)
5. ECG (where available)
6. Current frame

Manipulating the Sample Area

Up to eight ROIs can be saved on the reference image, with the corresponding eight traces plotted simultaneously on the graph. Each ROI display has a different color, and its corresponding trace data is plotted using that same color.

Once eight ROIs have been saved, the system does not automatically generate an active ROI when the cursor is positioned over the displayed reference image.

The saved ROIs can be a mixture of elliptical and freehand ROIs.

When the user repositions an ROI, the old trace data is erased from the plot and the trace data for the new position replotted.

If the ROI position on the last frame of the selected image range is moved, the corresponding ROIs on all frames are repositioned to match the last frame.

The user shall also have the capability of setting separate ROI positions on different frames of the contrast images, and the system shall linearly interpolate the ROI positions for the frames in between the selected frames.

Manipulating the Sample Area (continued)

Setting the default sample area shape

1. Select *Set sample area shape*. The Information Box displays.
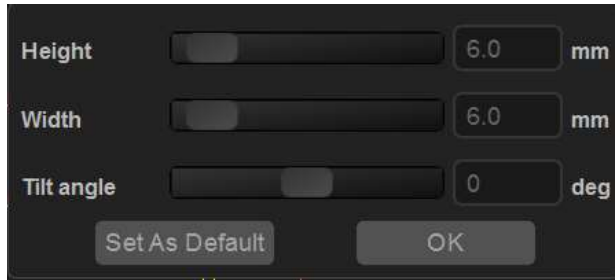
Figure 5-20.   Sample Area Information Box

2. Select Height, Width and Tilt angle.

3. Select *Set as default*. The current ROI size is set as the default for subsequent Ellipse ROIs.

Reshaping a Sample Area

To reshape the sample area:

1. Position the cursor on the ROI to reshape and press **System Menu**.

2. The ROI system menu displays. Select *Set sample area shape*.

3. Adjust Height, Width and Tilt angle.

4. Press *OK*. The selected ROI size changes.

Labeling a Sample Area

The sample area label is used to identify data associated with the sample area when exporting.

1. Position the cursor on the ROI to label and press **System Menu**.

2. The ROI system menu displays. Select *Label sample area*. The Label Dialog box displays.

3. Enter a name for the sample area.

4. Select *OK*.

Manipulating the Sample Area (continued)

Sample Area Shapes

There are two different methods for determining the shapes of the sample area.

Ellipse ROI

1. Select the ellipse icon (shape icon on the monitor display).

2. When the trackball positions the image display cursor over the reference image(s), an elliptical ROI is automatically generated and displays on the reference image(s).

3. The average intensity value inside the ellipse is calculated for every image in the image analysis range and plotted in the image display area.

4. The last generated or selected ellipse is considered the active ROI, and its trace plot automatically updates as the user repositions it on the reference image. Old traces are erased.

5. When scanning with an elliptical ROI, press **Set** to fix the ROI position and freeze its corresponding trace on the plot. A new active ROI is generated whose position is manipulated by the trackball and whose time-intensity curve traces will be plotted as before, while the previous ROI and trace remain fixed at the points they were saved at.

NOTE: *Elliptical ROIs can be positioned in any manner that keeps their center within the image boundaries. In the case that part of the ROI is outside the image boundary, only data from within the image boundary is used for calculating the mean intensity value.*

NOTE: *You can change the size of the Ellipse ROI by adjusting the Ellipse control.*

Sample Area Shapes (continued)

Freehand ROI

1. Select Freehand icon (pencil icon on the monitor display).

    Use the **Trackball** to position the caliper on the reference image at the start point. Press **Set** to fix the start point.

2. Trace the outline of the desired ROI by moving the caliper with the **Trackball**.

3. When a suitable ROI has been drawn, press **Set** a second time.

    The system automatically links the start point to the end point by drawing a straight line between them. The caliper is then free for repositioning for another freehand ROI.

NOTE: *You cannot go outside the image boundary when drawing a freehand ROI.*

Manipulating the Sample Area (continued)

Copy, move and paste a Sample Area

To copy and paste the ROI,

1. Move the cursor over the ROI and press **System Menu**. The system menu displays.

2. Select *Copy sample area*.

3. Move the cursor to the desired location for the copied ROI and press the **System Menu** Key. The system menu displays.

4. Select *Paste sample area*.

To copy and move the ROI,

1. Move the cursor over the ROI and press **System Menu**. The system menu displays.

2. Select *Copy & move*. Or if you want to move to the same depth as the original ROI, select *Copy & move (same depth)*.

3. Move the copied ROI using the **Trackball**. Press **Set** to fix the position.

Deleting a Sample Area

Sample ROIs and their corresponding traces can be deleted using *Delete Current Sample or Delete All Samples*.

1. Select *Delete Current Sample* to delete the currently active ROI.

2. Select *Delete All Samples* to delete all currently set ROIs and all of their traces.

NOTE: *The corresponding traces for the deleted ROIs are erased from the plot.*

NOTE: *Deleting an ROI causes the ROIs to be deleted from all frames in the analysis loop.*

TIC Plot Control

The following controls are user configurable presets which are configurable via the Utility Menu or through the pull-down menu in TIC Analysis mode. When using the pull-down menu:

1. Position the cursor over the analysis window and press **System Menu**. The system menu displays at the cursor position.
2. Select the appropriate parameter.

Vertical Unit

When analyzing the contrast data, the Y-axis can be set to display either logarithmic scale (dB) or linear, acoustic units (AU) for both tissue intensity (2D) or Angio intensity data.

To toggle between dB and acoustical display units for the Y-axis.

- *dB*—The traditional log compressed B-mode data is used to calculate the time-intensity curve values.
- *Acoustic*—The system reverse the log compression function to provide un-log compressed data for the TIC analysis.
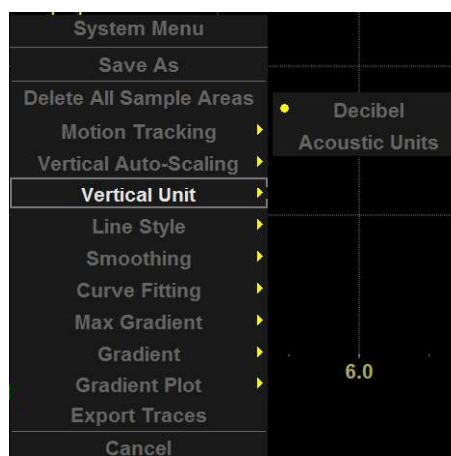
Figure 5-21.   Vertical Unit Pop-up menu

TIC Plot Control (continued)

Vertical auto-scaling

The system can be configured to display the full unit range or a range according to the maximum and minimum values of the displayed trace(s) (auto-scaling function). In addition, the auto-scaling function can be set to be live update (updates while the sample area is moved) or delayed (updated when the sample area is anchored).

- *Delayed*—The system automatically rescale the vertical axis of the trace graph only when a new ROI is saved, to account for changing input dynamic range.

- *On*—The system automatically rescale the vertical axis of the trace graph every time the currently selected (active) ROI is moved.

- *Off*—Disable any automatic scaling of the vertical axis. There is user-defined system defaults on the system preset page for the fixed vertical scale to be used for the plot.
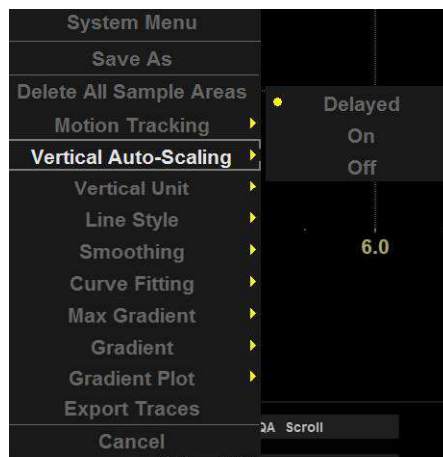
Figure 5-22.   Vertical Autoscale Pop-up menu

TIC Plot Control (continued)

Line Style

- • **Solid**—Setting the results in a plotted trace that does not display small boxes at the data points
- • **Squares**—Setting the results in a plot where small squares are displayed at each data point, and the squares are linked together by lines.

Figure 5-23.   Line style Pop-up menu

Horizontal Sweep

Horizontal Sweep allows you to increase or decrease the time interval over which to plot the TIC curve.

The Horizontal Sweep control can range from TBD on the short side to the time interval between the user selected first and last frame. The default is the user selected image range. If the user has not yet selected a first and last frame, the first and last default frames from the displayed CINE loop are used.

TIC Plot Control (continued)

Smoothing

The system can smooth the traces displayed by applying a filter over a defined time window. The type of filter availabe is depending on the analysis signal displayed.

1. Select *Smoothing*.

    OR

    Position the cursor over the analysis window and press **System Menu**. The System menu is displayed at the cursor position. Select *Smoothing*.

NOTE: *When smoothing is turned on, it applies to all traces in the plot window.*

2. The smoothing filter list displays. Select the appropriate parameter.

NOTE: *If 'dt' is selected for Horizontal Scale, you cannot use Smoothing.*

Trace Measurement

Gradient

Gradient is displayed on the screen instead of Intensity (db or AU). The gradient calculates from 7 points (includes previous and next frames).
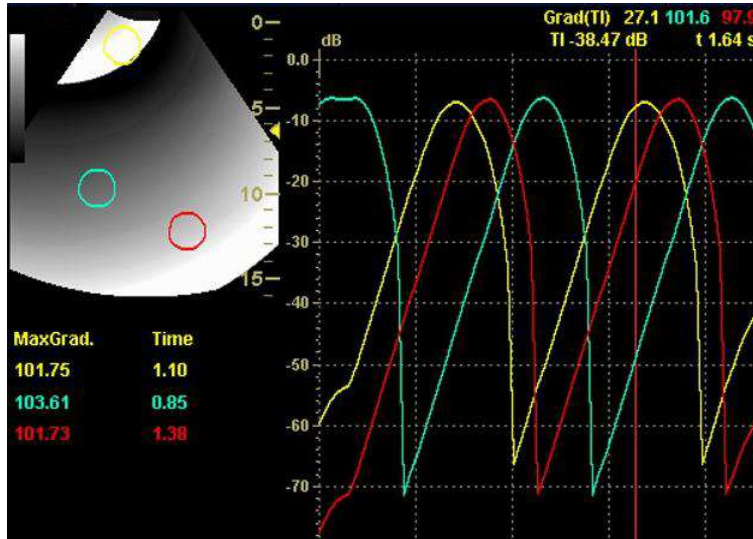
Figure 5-24.   Gradient

Trace Measurement (continued)

Max Gradient

Displays the time and gradient that becomes the maximum gradient between the CINE start and end frame.
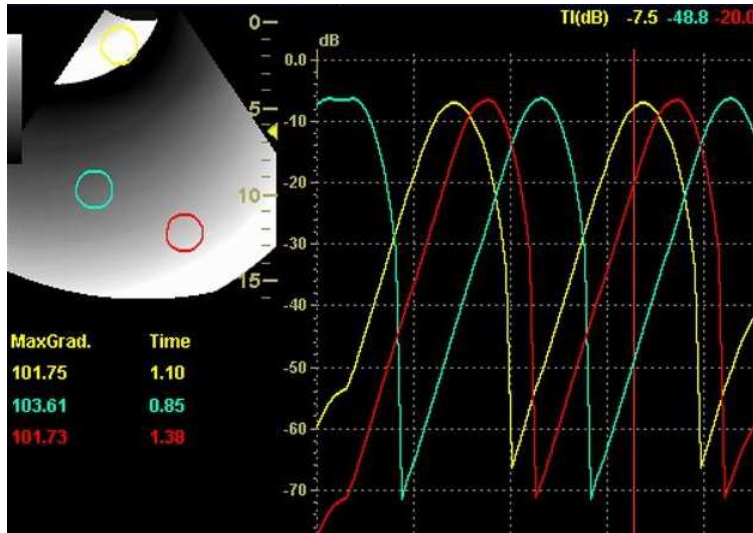
Figure 5-25.   Max Gradient

Trace Measurement (continued)

Show graph (Gradient plot)

1. Gradient Plot displays on the TIC system menu.
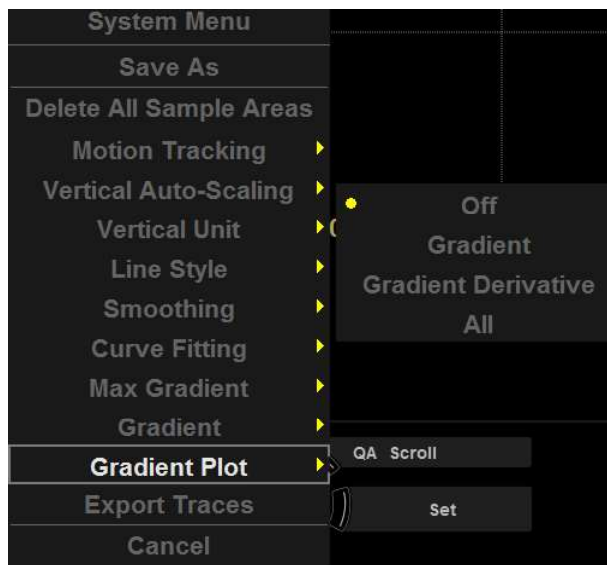
Figure 5-26.   System Menu

Show graph (Gradient plot) (continued)

2. Select the parameter.

- Off: A graph plots TIC.

- Gradient: Two graphs plot TIC and TIC gradient.

  - Unit of Y-axis is dB or AU in case of intensity.

  - The unit is d(db)/dt or d(AU)/dt in case of the intensity gradient.

  - Gradient values for the current frame are displayed in the upper right corner of the graph.
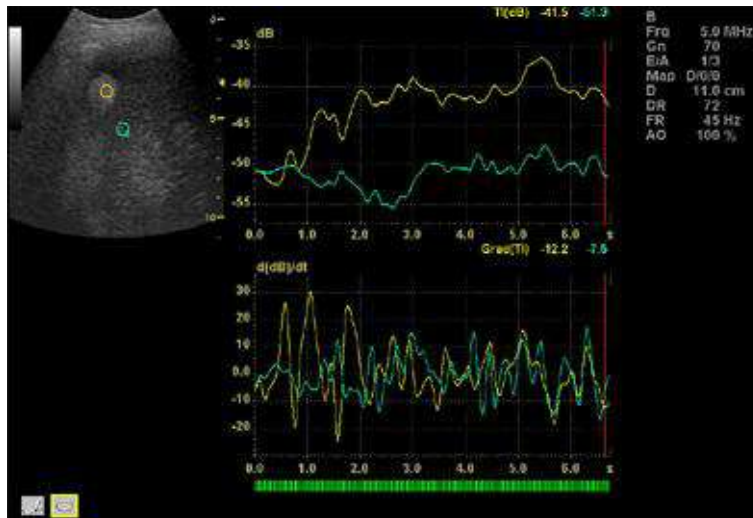
Figure 5-27.   Gradient

Show graph (Gradient plot) (continued)

- Gradient Derivative: Two graphs plot TIC and TIC gradient derivative.

  - The Y-axis units is d2(dB)/dt2 or d2(AU)/dts in case of the intensity gradient derivative.

  - Gradient derivative values for the current frame are displayed in the upper right corner of the graph.
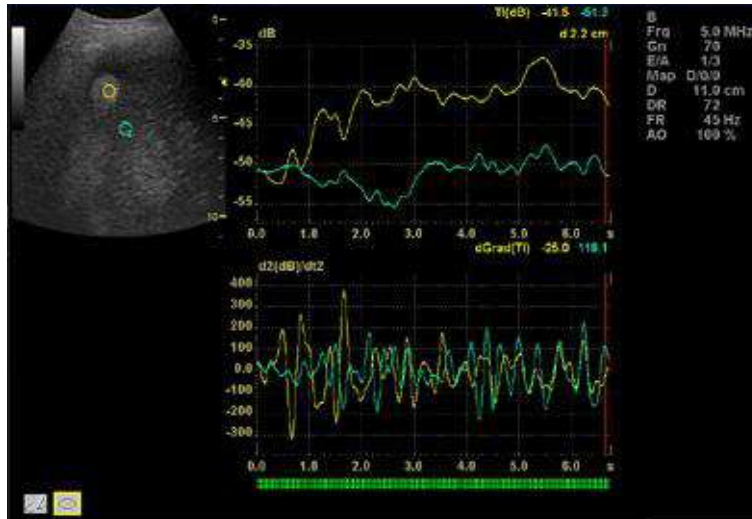
Figure 5-28.   Gradient derivative

Show graph (Gradient plot) (continued)

- All: Three graphs plot TIC, TIC gradient and TIC gradient derivative.
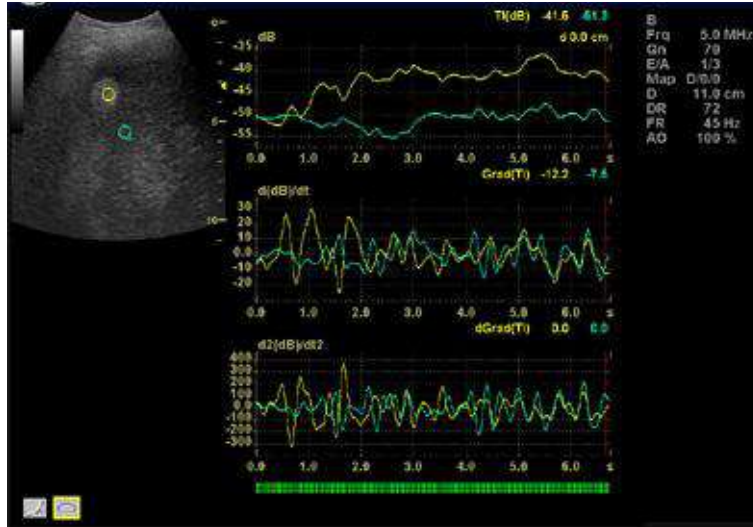
Figure 5-29.   All

Curve Fitting

Curve fitting analysis: for research studies of perfusion rates using contrast agents.

1. Select **Curve Fitting**.

   OR

   Position the cursor over the analysis window and press **System Menu**. The system menu displays at the cursor position. Select **Curve Fitting**.

2. The Curve Fitting selection list displays.
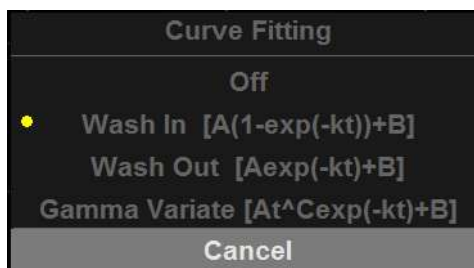
Figure 5-30.   Curve Fitting Selection List

- **Off**—Remove the fitted curves from the plot and the fit parameters from the display.

- **Wash-in**—Used to find and estimate the local perfusion rate using the contrast agent. Expotential wash-in is described by the function:

   $Y(t) = A(1-\exp(-kt))+B$, where:

   - A (dB or AU) is the intensity from the contrast agent.

   - B (dB or AU) is the intensity at time t=0 (defined as the time of the left marker). This corresponds to the tissue (baseline) signal if no contrast is present at the selected starting point.

NOTE: *A + B = contrast + tissue = plateau level.*

   - k (1/s) is a time constant.

Curve Fitting (continued)

- ***Wash-out***—Used to find and estimate a local wash-out rate. Expotential wash-out is described by the function:

  $Y(t) = A\exp(-kt)+B$, where :

  - A (dB or AU) is the intensity from the contrast agent.
  - B (dB or AU) is the intensity from the tissue = baseline signal.

  NOTE: *A + B is the initial intensity level.*

  - k (1/s) is a time constant.

- ***Gamma Variate***

  $Y(t) = At^c\exp(-kt)+B$

Curve Fitting (continued)

Parameters of Gamma curve fitting
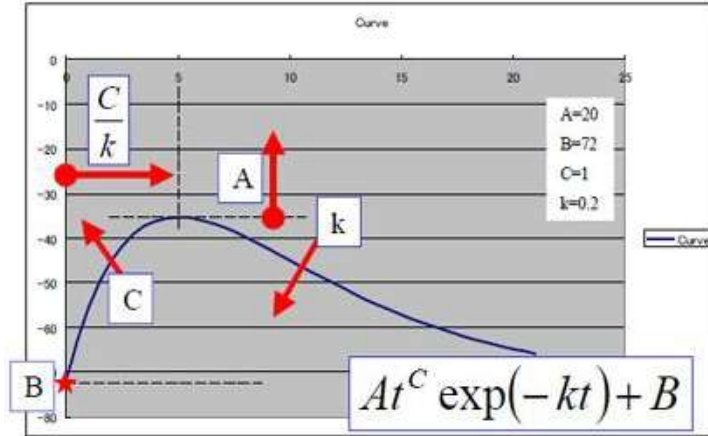
Figure 5-31.   Gamma Curve

- t^C: Increasing function (C>0) for "Wash-in".

  For larger C, the intensity increases quickly before the peak.
- exp(-kt): Decreasing function (k>0) for "Wash-out".

  For larger k, the intensity decreases quickly after the peak.
- B: Intercept intensity at t=0.
- The peak intensity of the curve is affected by all parameters.

  Larger A, larger B, larger C, and smaller k make larger peak. The peak time is calculated by C/k.
- MSE: Mean Square Error

  If the MSE is small, the difference of actual data and the fitted curve is small.

Set Start/End Frame for Curve Fit per ROI position

1. Generate TIC and perform a Curve Fit.

   In this state, the Curve Fit graph is drawn from Cine Start Frame to Cine End Frame for all the ROIs.
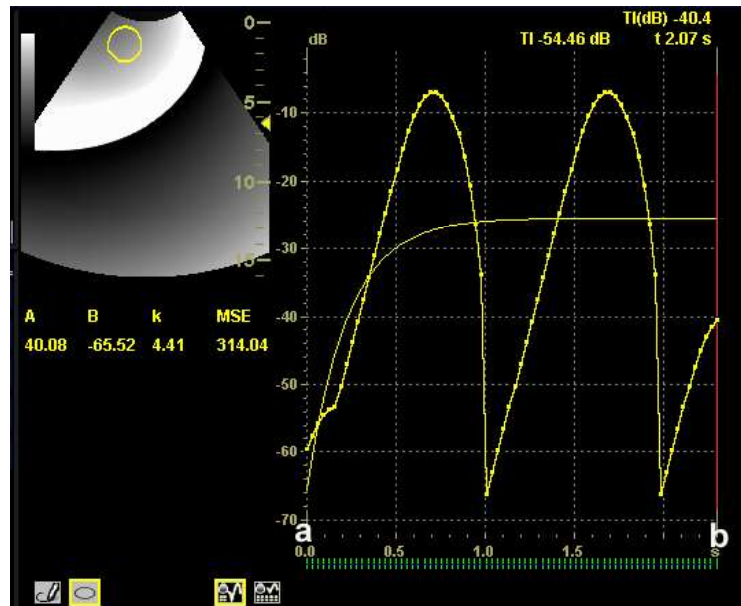
Figure 5-32.   Curve Fit screen

a. Cine Start Frame
b. Cine End Frame

Set Start/End Frame for Curve Fit per ROI position (continued)

2. Select the Start Frame as with Cine or use the trackball to select Start Frame and press **Set** with setting Scroll function to trackball by toggle **Cursor**.

3. Set QA function to trackball by toggle **Cursor**, move the arrow pointer on the ROI (hand cursor appears) and press **System Menu**. The system menu appears.

4. Select *Set curve fit start frame* from the menu.

5. Select the End Frame as with Cine or use the trackball to select End Frame and press **Set** with setting Scroll function to trackball by toggle **Cursor**.

6. Set QA function to trackball by toggle **Cursor**, move the arrow pointer on the ROI (hand cursor appears) and press **System Menu**. The system menu appears.

7. Select *Set curve fit end frame* from the menu. The ROI colored line displays.
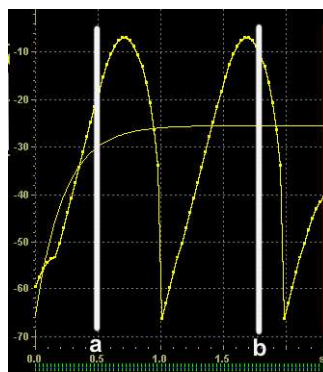
Figure 5-33.   New Start Frame and End Frame (Example)

   a. Start Frame
   b. End Frame

8. Repeat the above procedures as necessary.

   The system retains the start/end frame per ROI while TIC is active. Once the TIC menu is closed, the settings are lost.

Display/Hide Calculation Values

You can specify Time to Peak, Area under the curve, Curve gradient, and Arrival time values for Wash-in, Wash-out, and Gamma Variate curve fitting values.

1. Select *Curve Fitting Parameters* on the primary menu. The Curve Fitting Parameters dialog appears.
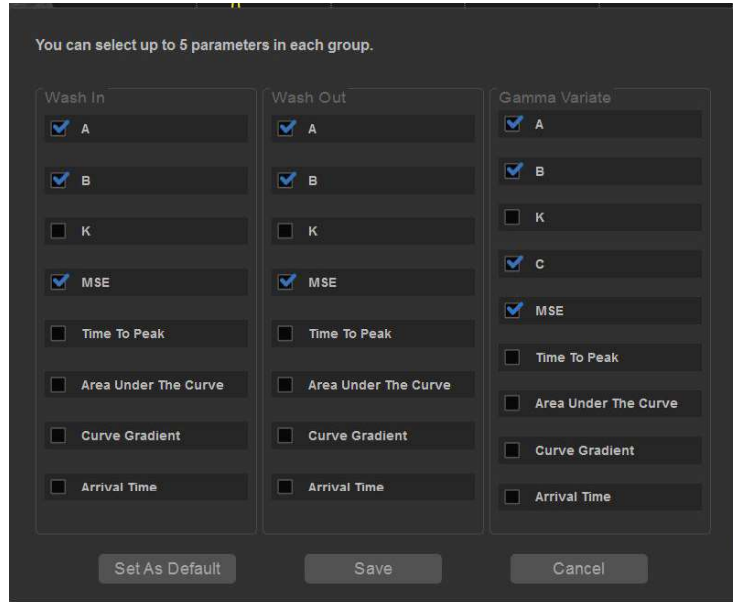
Figure 5-34.   Curve Fitting Parameters Dialog

2. Select a maximum of 5 parameters to display for each curve fitting.

    •   Save as default: saves as a system preset.

    •   Save: saves as temporary.

    •   Cancel

NOTE: *If you select more than 5 parameters and select "Save" or "Save as default," you will be prompted the message that "More than 5 parameters selected".*

Display/Hide Calculation Values (continued)

3. The selected parameter displays below the image with the curve fitting active.
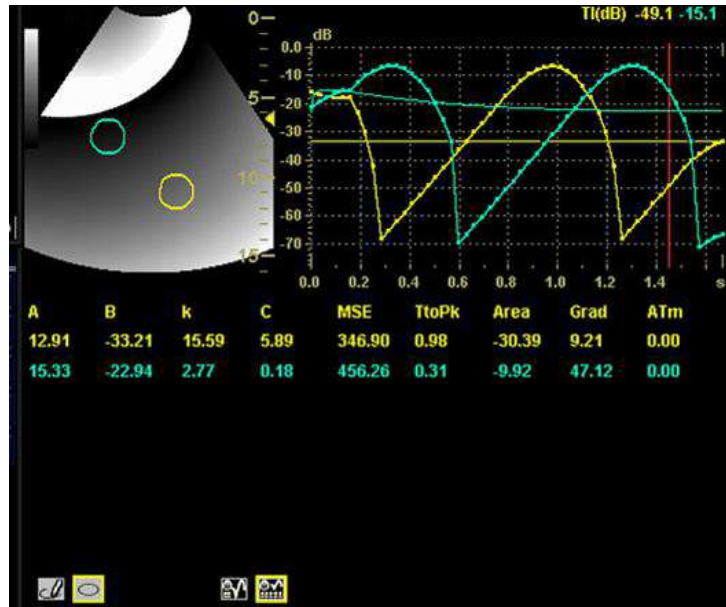
Figure 5-35.   TIC image with all selected parameters

Exporting Traces (Saving the Trace Data)

You can save the trace data to an external file.

1. Select *Export Traces* on the primary menu to save the trace data.

   OR

   Position the cursor to the Analysis window and press **System Menu**. The system menu displays. Select *Export traces*.

2. The following window displays.
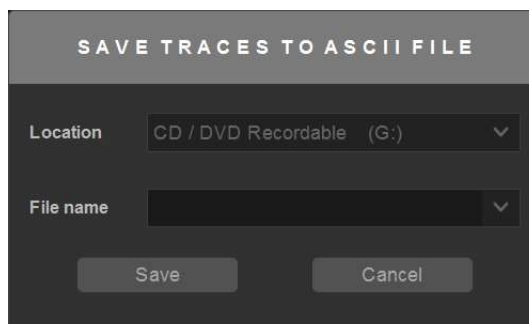
Figure 5-36. Export Trace Window

- Location: Select Location which to save.
- Filename: Enter the filename. (Only Text)

3. Select *OK* to save the data and return to the TIC Analysis screen.

   - All displayed ROI traces are saved in the exported file.
   - The fit parameters are included in the trace file if the user has done a curve fit.

Exporting Traces (Saving the Trace Data) (continued)

All plot data (intensity, gradient and gradient derivative) are exported to a text file by "Export Trace".

Table 5-6:   Example of exported file

Time(s):	Trace 1:	Trace 1 dGrad.:	Trace 1 dGrad.
0.00000	-3.97995e+000	-2.15924e+001	8.05159e+001
0.03121	-5.14631e+000	-1.64719e+001	1.74256e+001
0.06242	-5.75798e+000	-1.27675e+001	-7.78004e+001
0.09362	-6.02222e+000	-1.27675e+001	-1.93426e+002
0.12483	-6.11224e+000	-1.44515e+001	-4.17252e+002

NOTE: *The Smoothed trace is the one saved if the user has applied a smoothing filter.*

NOTE: *Only data from the user selected image range is included in the exported trace file.*

NOTE: *Data for disabled frames are not be included in the exported trace file.*

NOTE: *No trace results are saved in the standard image database.*

NOTE: *Trace results are not shown on the Worksheet.*

Annotating the TIC Data

The user can annotate both the reference image and the trace plot displays. Use **Comment** key to type the annotation. See Chapter 6 for reference.

Printing TIC Data

Press the appropriate print key in the TIC mode.

The system capture a single still frame which consists of the plot, the reference image and user annotation.

Elastography (Option)

Description

Elastography shows the spatial distribution of tissue elasticity properties in a region of interest by estimating the strain before and after tissue distortion caused by external or internal forces. The strain estimation is filtered and scaled to provide a smooth presentation when displayed.

Below is an example of Elastrography. The Elastography image appears in dual image mode, the Elastography color map/bar appearson the left side of the image, this Elastrography parameters appear on the right side of the screen below E.

Elastography can be activated via the User defined key on the Control Panel.

Elasto is only available on linear probes.
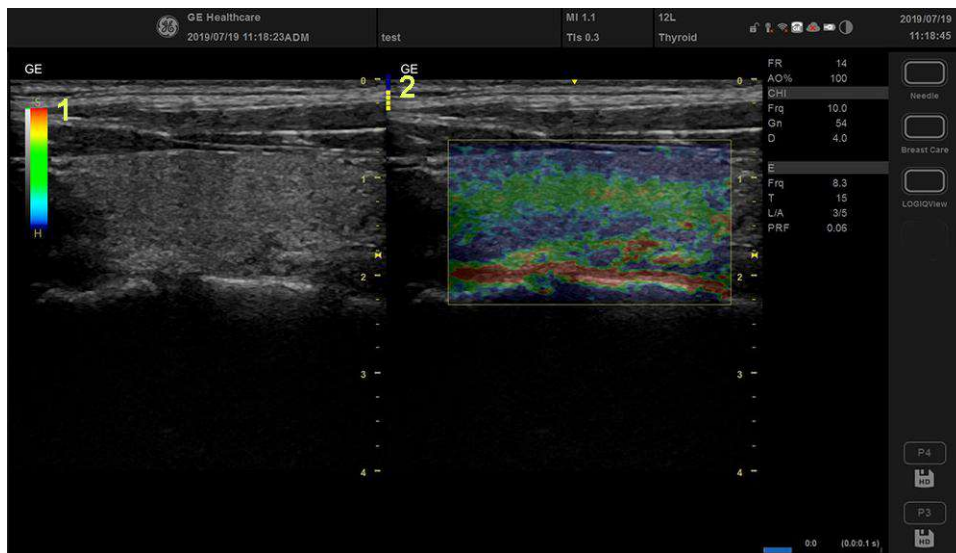
Figure 5-37.   Elastography Example

1.   Color Map
2.   Color Bar

Activating Elastography

Table 5-7:   Elastography Parameters Description

Parameter	Description
Axial Smoothing	Controls the smoothness of the elastography image in the axial direction. A higher value means a smoother image.
Lateral Smoothing	Controls the smoothness of the elastography image in the lateral direction. A higher value means a smoother image.
Window	Controls the RF data segment size for the motion tracking. A higher Window value gives a better signal to noise ratio (SNR) at the cost of axial resolution.
Map	Controls the elastography maps. Six different maps are available with various contrast and color schemes, including a grayscale map.
Frame Average	Controls the persistence of the elastography images.
Frequency	Controls the transmit frequency.
Soft Compress	Individually controls the image enhancement for the softer than average tissues.
Hard Compress	Individually controls the image enhancement for the harder than average tissues.
Scale	Controls the time interval between consecutive firings. A lower value dictates a higher sensitivity to weak manual motion.
Transparency	High values bring out the tissue behind the elastography data. You adjust via the Color Gain control; this imaging parameter appears as a "T" on the right-hand portion of the display.
Biopsy Kit	Biopsy Kit.
Sample Vol	Controls the transmit pulse length. A higher value means longer transmit pulse which gives better SNR but reduces axial resolution.
Frame Reject	Controls how many frames get rejected due to low quality vertical motion. A higher value means more frames get rejected. A rejected frame has a completely transparent ROI with the B-Mode background showing through.

Table 5-7:   Elastography Parameters Description (Continued)

Parameter	Description
Noise Reject	Controls how many frames get rejected due to lateral and elevational motion. A higher value means more frames get rejected. A rejected frame has a completely transparent ROI with the B-Mode background showing through.
Line Density	Optimizes B-Mode frame rate or spatial resolution for the best possible image.

How to Use

The Elastography image is achieved by pulsating the probe while you are scanning the anatomy of interest. Here are some criteria to use:

Handheld elasticity imaging can be very dynamic as the size of distortion depends on the movement of the hand-held probe. To maintain stable and consistent displayed strains, pay attention to the Quality graph. Two forms of feedback are provided. In either form, an ideal manual compression is indicated by a high value feedback. In addition, apply the following post-processing controls: Smoothing, Window, Scaling, and Frame Averaging.

Elastography displays firmer tissue in blue and softer tissue in red. To enhance Blue, increase Hard Compress; to enhance Red, increase Soft Compress. To enhance elastography contrast, reselect the Color Map.

If you need more resolution, increase Smoothing, increase Frequency, reduce Sample Volume, or reduce Window.

If you need a smoother image, increase Window, Smoothing, and Sample Volume.

If the images seem too flashy, decrease Frame Reject to 1.0 and Noise Reject to have consistent imaging throughout.

NOTE: *Please see 'Q Analysis' on page 5-156 for instructions on how to use Elastography Quantification.*

Additional Notes for Elastography

NOTE: *Elasticity Index is not available in the United States.*

Definition. Elasticity index (E) is defined as the value from 0.0 to 6.0. This index shows the color distribution within the measured circle (ROI) relative to the whole ROI box. A higher value means "higher stiffness" and "blue color is dominant".
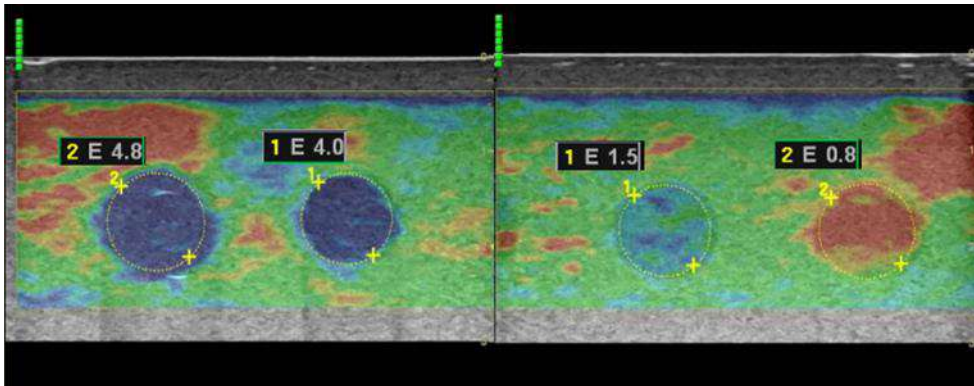
Figure 5-38.   Elastography Quantification Definitions

Elasto Raw Data has two data sets of index and color for each pixel. Therefore, this index is not affected by the color appearance change (color map and hard/soft compression). Index detects smaller strain difference of hard region by a assigning wider dynamic range for a smaller strain.

Additional Notes for Elastography (continued)

2D Measurement. Measures the elasticity index of a single ROI and calculates the ratio between two ROIs. You can label two different regions. You can also set the ROI on a reference screen (B mode) with dual screen.
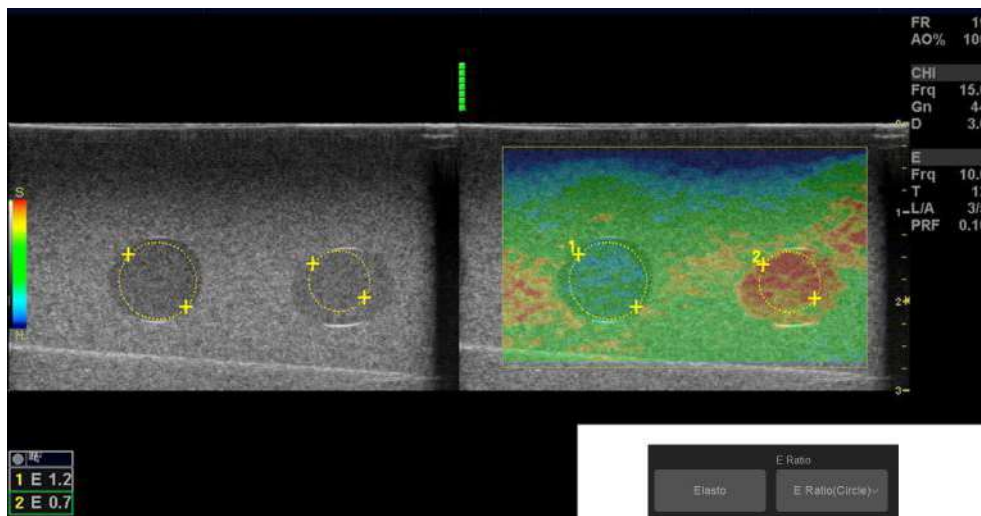
Figure 5-39.   2D Measurements

Additional Notes for Elastography (continued)

HINTS

Limitations:

- This is a relative quantification tool based on freehand manual palpation technology. It cannot show the stiffness by the kPa (kilopascal).

- There is no compatibility among manufacturers regarding the value. It depends on their strain imaging technology and definition of the value.

- Colors indicate degree of stiffness and do not directly correlate to a specific tissue type. Interpretation of what the tissues are and how to apply these ratios clinically is at the discretion of the user.

- Elastography physics dictates that cystic structures will be displayed with a three-layer pattern. This three-layer pattern will start with blue on the Versana Active factory default map (which corresponds to hard), then progresses to green and then to red (which corresponds to soft). The posterior displacement of elastography patterns also may cause the B-Mode cyst to consist primarily of blue with the green to red being posterior to the B-Mode cyst. You need to be aware of the three-layer pattern of a cyst in elastography. Utilizing elastography quantification and setting the ROI in the blue portion of the three-layer pattern on the cyst and then setting the ROI in the "normal" tissue may cause you to misinterpret the elastography quantification ratio as the cyst to be hard as compared to the "normal" tissue.

Breast Care (Option)

Overview

Breast Care provides a protocol of breast scanning which helps user to scan breast by 4 Quadrants or 12 O'clock and axillary fossa consistently. User can use **'P1'** key to follow the scanning steps that allows user to focus on performing the exam rather than on controlling the system and can help user to increase consistency while reducing keystrokes. The system automatically invokes the correct modes, advances to the next step in the exam. After finishing whole scanning steps, report will be generated.

Breast Care does not perform automatic breast lesion detection or classification. The user is required to detect and diagnose any breast tissue abnormality, as well as verify any outputs of Breast Scanning, Breast Lesion M&A, BI-RADS classification.

Breast care is divided into 3 steps: prepare the patient information, scanning and report.

Breast Care

Before Perform the scan, user creates a New Patient. And user can set up modes, PW, Elasto which can be included in scanning steps and 4 Quadrants or 12 O'clock, Review Old Report options in *Utility -> System -> General -> Breast Care*.

Example of 4 quadrants scanning steps:

1. User selects the appropriate transducer for breast imaging and breast preset selected.
2. Breast Care has been configured as a User Configurable key. User presses to begin protocol.
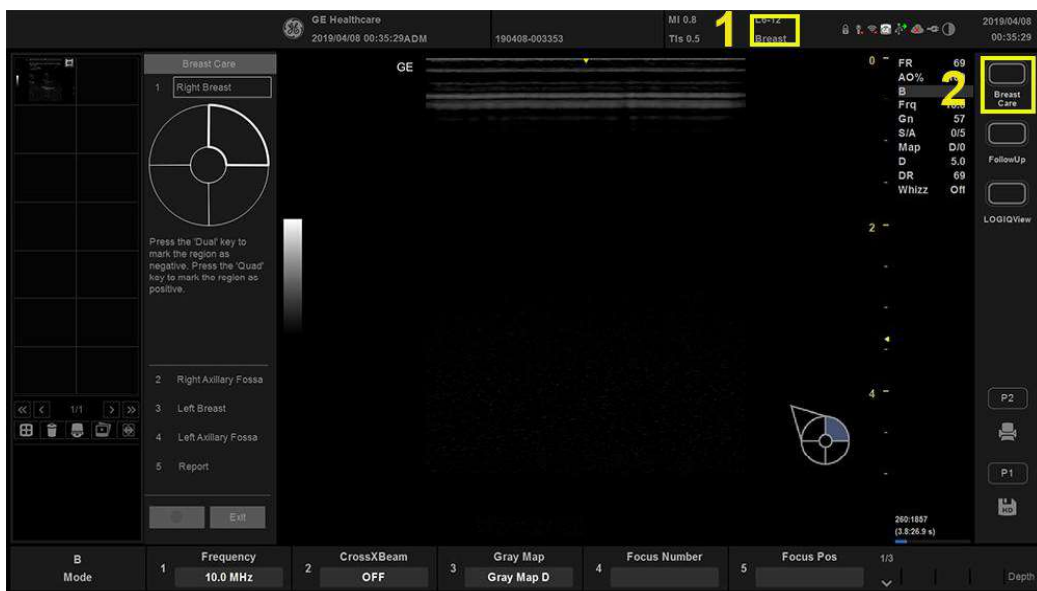
Figure 5-40.   Breast scan screen

Breast Care (Option) (continued)

3. The Breast Care protocol appears on the left side of the display.

   Breast scanning is divided into 4 areas: Right Breast, Right Axillary Fossa, Left Breast, Left Axillary Fossa.

Figure 5-41.   Breast scan screen1

Breast Care (Option) (continued)

The pie chart is used to display the breast scan area and result:
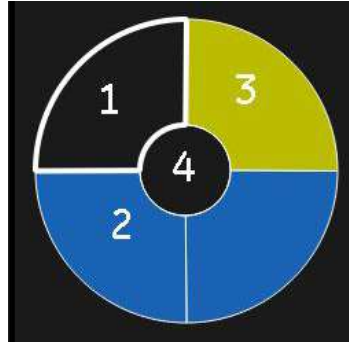
Figure 5-42.   Pie Chart in Breast Care

- The current scanned area: the circum is highlighted
- Dark blue area: Negative area, there is no finding/lesion with breast anatomy.
- Yellow area: Positive area, there is a finding/lesion with breast anatomy, probable pathology.
- Nipple

Breast Care (Option) (continued)

4. Users have the choice to follow the sequential evaluation of the respective anatomy, and instructions for which keys are used if the user selects to manually categorize a segment as negative or positive for findings.

   The system will visually display blue for a segment if negative selected by user. Positive segment will display yellow if selected by user.

   User can manually mark the lesion in the positive area with bright circles **b** via the button **a** refer to Figure 5-43.
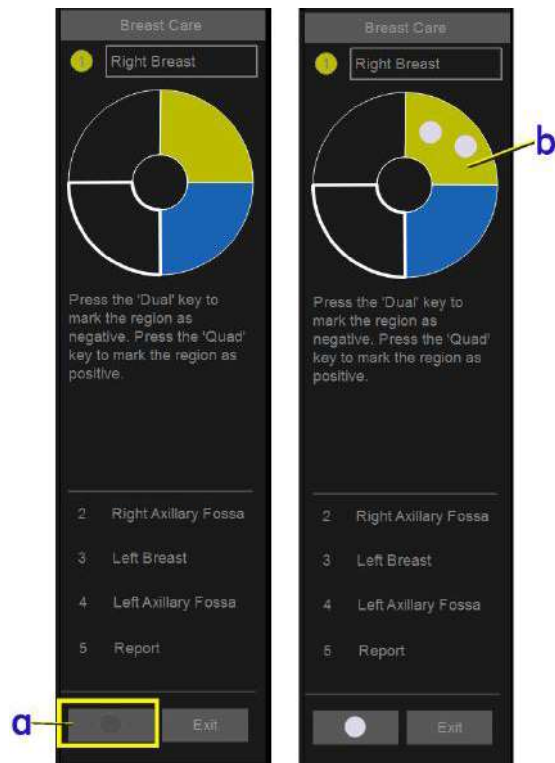
Figure 5-43.   Circle marker

If a segment is marked positive by the user, the system will return to that segment for further measurement and color Doppler, refer to steps 5-13.

Breast Care (Option) (continued)
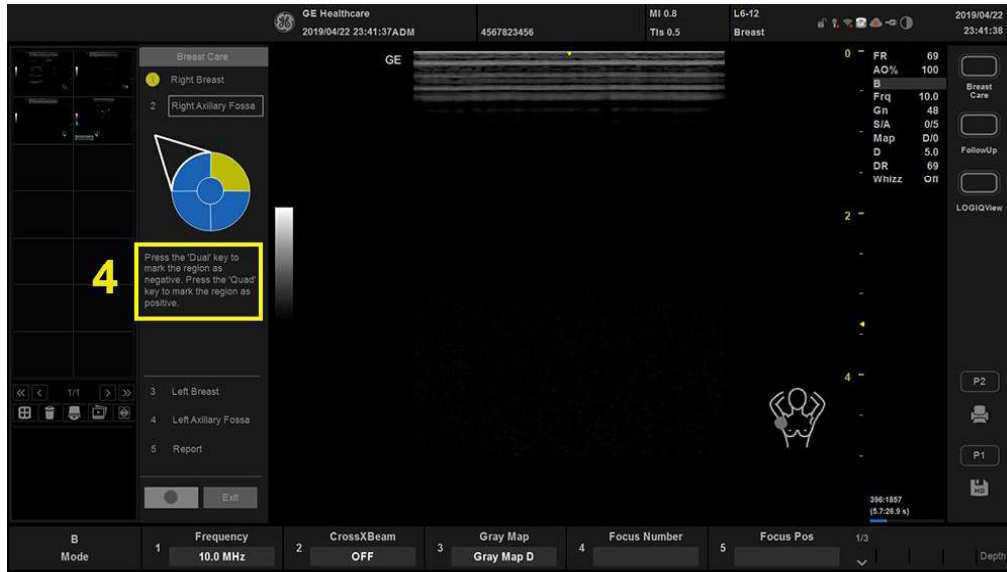
Figure 5-44.   Breast scan screen 2

5.   Press **P1** key, the screen is split in to dual screen.

The frozen longitudinal plane scan image is placed on the left side. The live image is on the right side and the user performs the transverse plane scan.
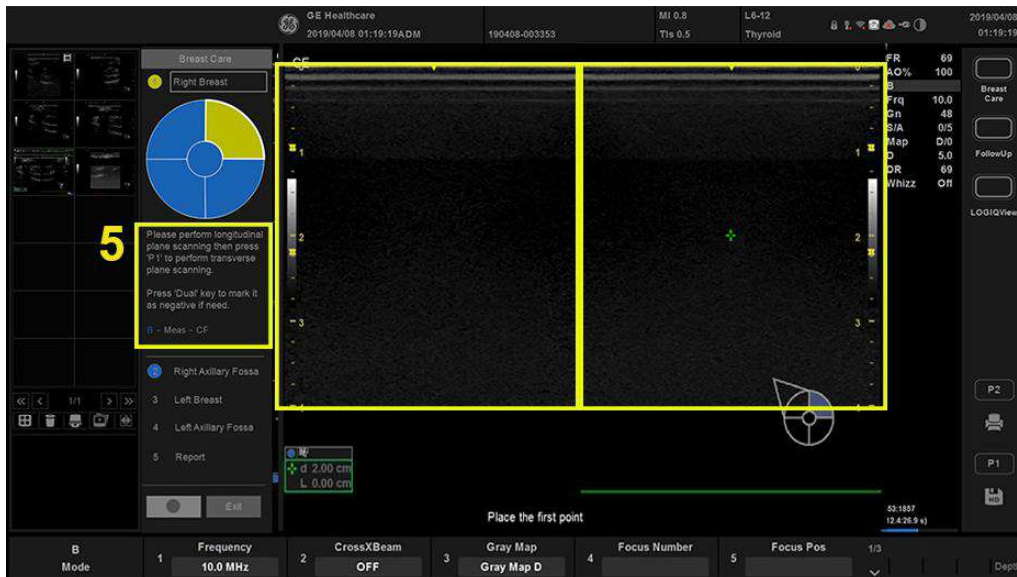
Figure 5-45.   Breast scan screen 3

Versana Active – Basic User Manual
Direction 5840764-100 English Rev. 10

Breast Care (Option) (continued)

6. Press **P1** key, perform measurements.

7. User can select to manually measure the Length (L), Height (H), Width (W) of structures.

8. Or user can select to use the semi-automated Auto Contour measurement feature for (HxL) and (HxW).

9. The semi-automated Auto Contour feature prompts the user to set the cursor in the center of the lesion.
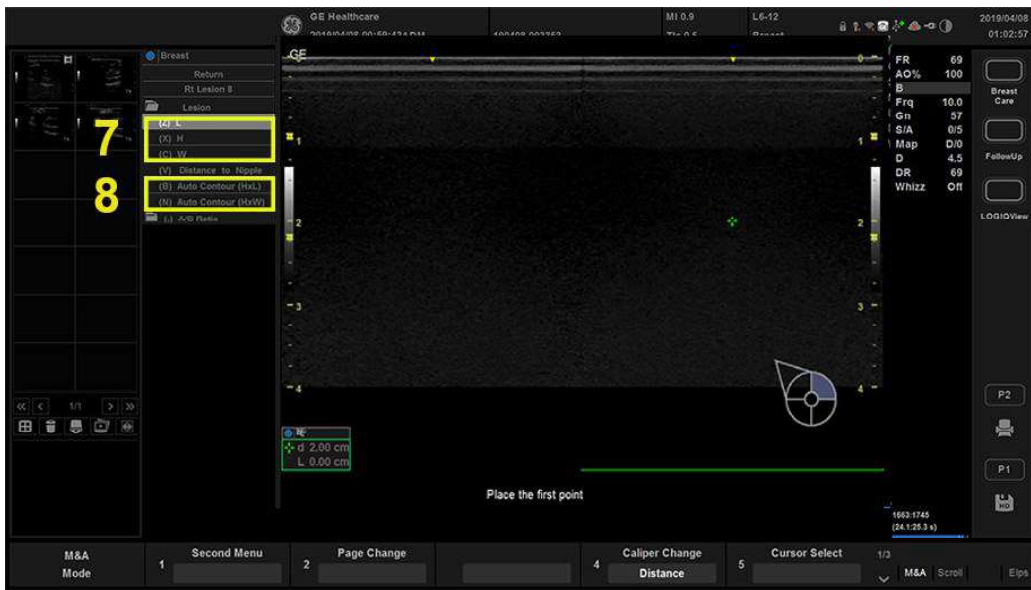
Figure 5-46.   Breast scan screen 4

Breast Care (Option) (continued)

10. The next step with the semi-automated Auto Contour feature prompts the user to use the trackball to resize the circle, the measurement circle now acts as a region of interest, based on the size of the lesion to be contoured.
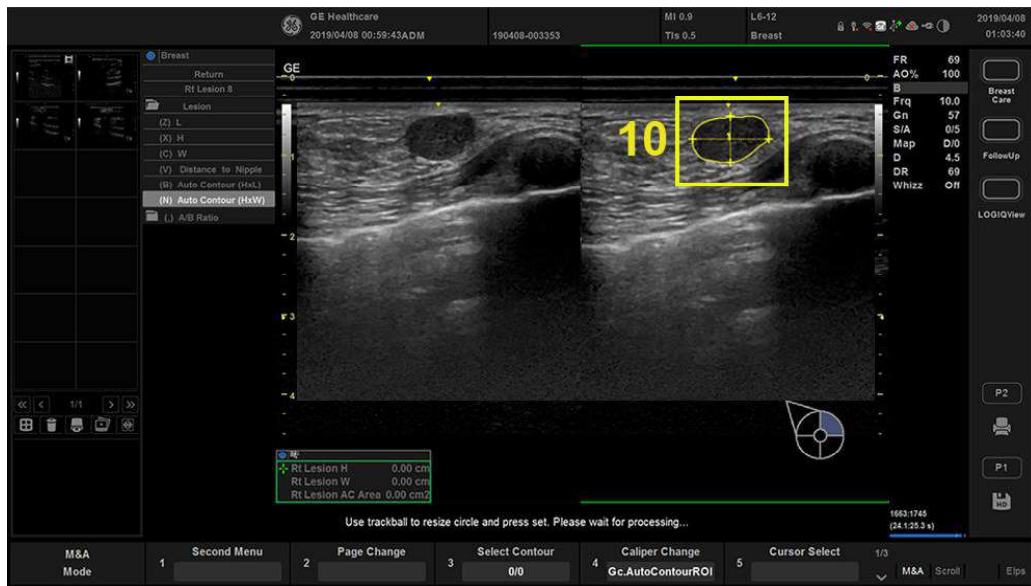
Figure 5-47.   Breast scan screen 5

Versana Active – Basic User Manual
Direction 5840764-100 English Rev. 10

Breast Care (Option) (continued)

11. The Auto-Contour feature now responds with an editable trace for the area within the region of interest.

Editing features for auto contour available for users before proceeding to next step including delete lesion.

After the measurement is completed, press **P2** to store image to accept Auto Contour measurement. User can ser P2 as Print button in **Utility** -> **Application** -> **Print Controls**.
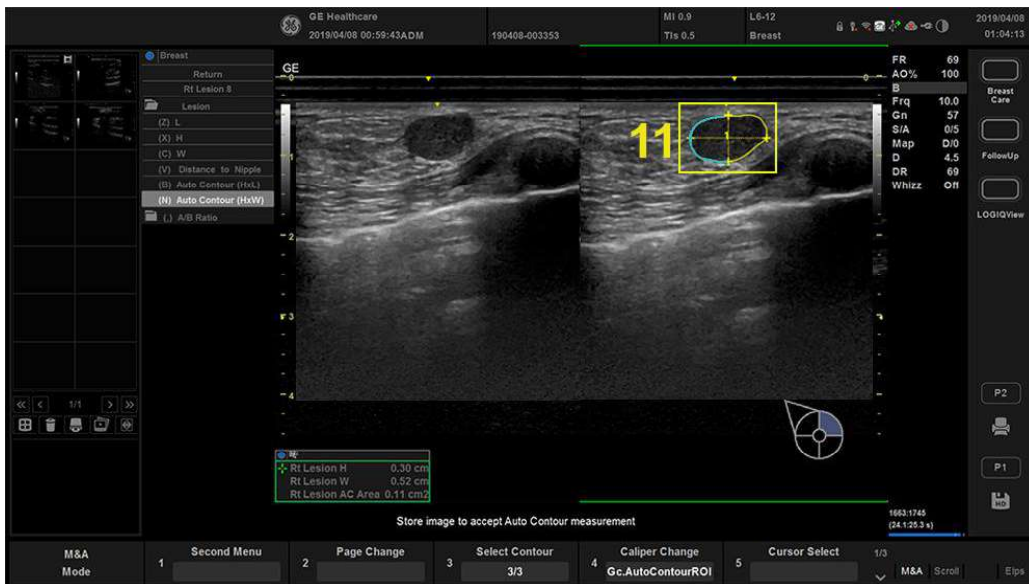
Figure 5-48.   Breast scan screen 6

Breast Care (Option) (continued)

12. The system enters CF mode automatically. Press P2 to store image.
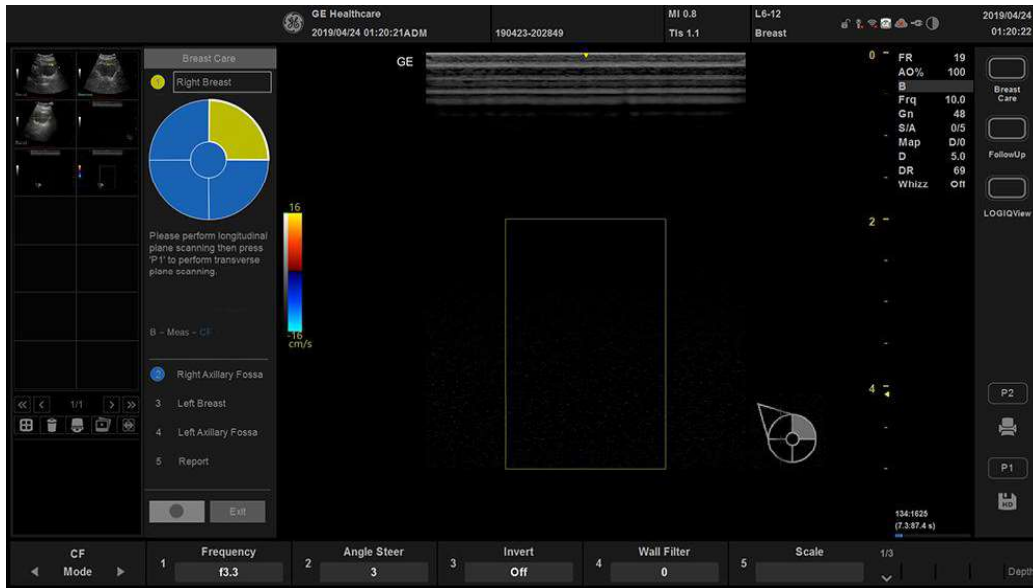
Figure 5-49.   Breast scan screen 7

13. User can review or revise the previous measurements by pressing B or Meas or CF or PW (PW appears after user selects PW in Utility -> System -> General -> Breast Care).
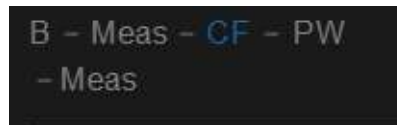
Figure 5-50.   Breast scan screen 8

Breast Care (Option) (continued)

14.   User can press **P1** key to generate report.
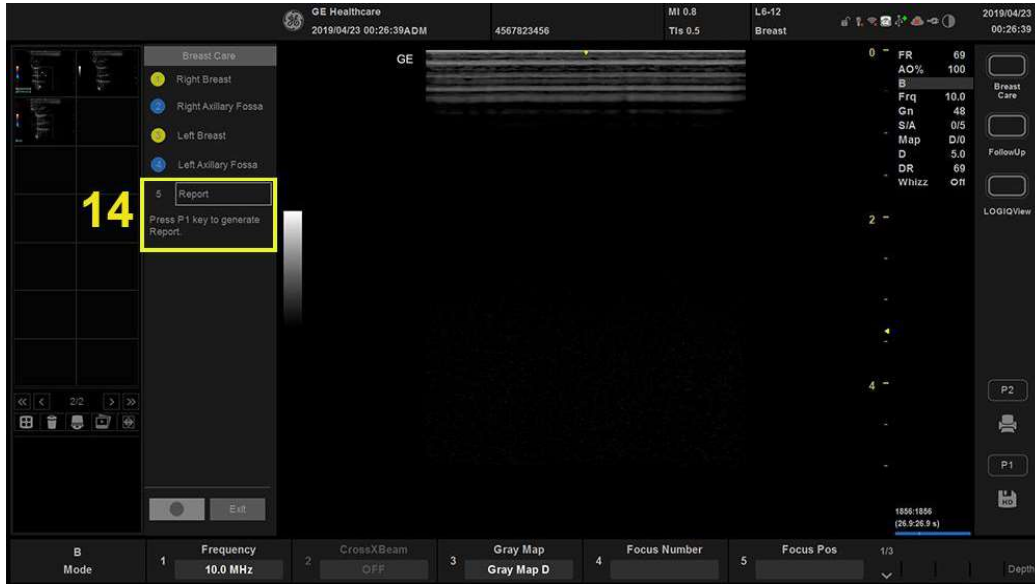
Figure 5-51.   Breast scan screen 9

Breast Care (Option) (continued)

15. User can insert an image to the report, refer to 'Inserting an image to the report' on *page 14-19*.
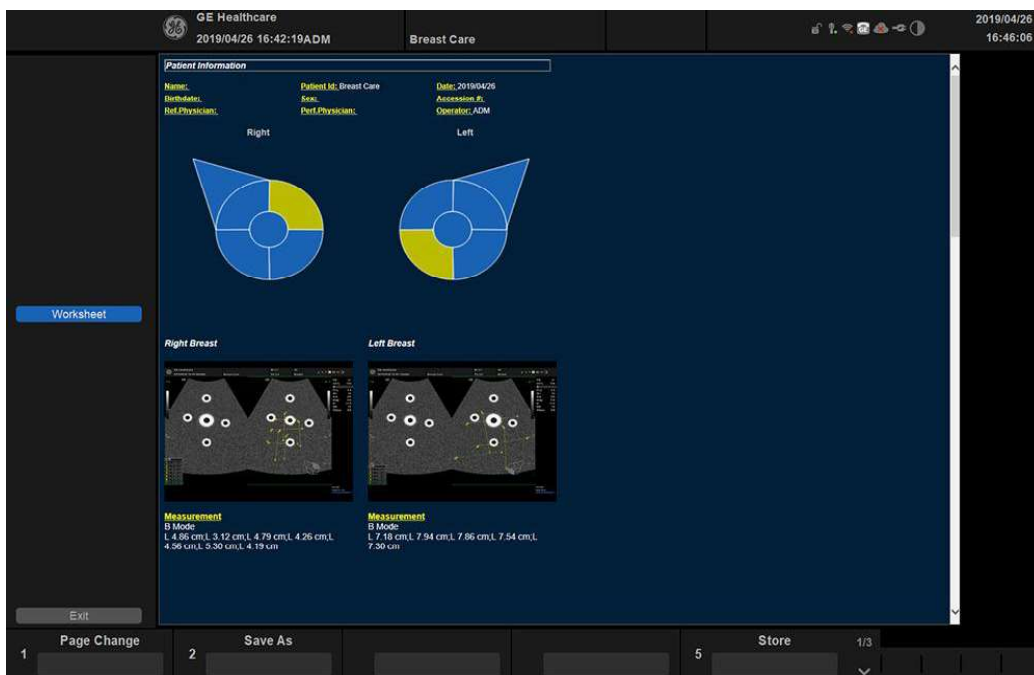
Figure 5-52.   Report

TruScan

Overview

TruScan allows you to change imaging parameters to help optimize the images that are set/frozen or archived. TruScan is applicable on cine loops, not just single static DICOM images. This feature provides the user with an opportunity to review and manipulate images after the scan. The function allows you to select a specific area of interest, zoom in and optimize for closer observation.

TruScan on B-mode

To apply various post-processing tools to the image:

- Recall a B-mode raw data image.

  For example: Fetal cardiac image.

- Resize the acquired image by using the zoom function.

- Adjust the image by using various imaging controls.

  a. Use the Active mode key to access B-mode controls on the top menu.

  b. Reduce posterior saturation by adjusting the TGC.

  c. Adjust the image gain and dynamic range.

  d. Use the SRI function to reduce the speckle noise in the image and get an enhanced image.

  e. Use the colorize option to further adjust the image.

  f. Annotate and save the image.

TruScan on Color-Flow

To adjust an image acquired in the Color Flow mode using the post-processing controls:

1. Obtain an image in B-mode and color.

    For example: Carotid image.

2. Freeze and then store the image.

3. Use the Invert function to flip the color map for correct color mapping.

4. Customize the Color Flow by adjusting color gain and choosing a different color map. Choose a transparency map instead of the regular color maps to see the underlying B-mode anatomy.Adjust The baseline and threshold values to optimize the Color Flow and get maximum Color Flow information from the image.

TruScan on Pulse Wave Doppler

To work on a Pulse Wave Doppler spectrum after image acquisition:

1. Acquire a B+Color+spectral Doppler image of the carotid.

2. Obtain a PW spectrum and then freeze.

3. Store the image obtained.

4. Use the Angle correct function to optimize the angle between the Doppler cursor and the vessel to get a velocity measurement.

5. Adjust the baseline, sweep speed and the display format to customize the spectral display.

TruScan and Measurements

Versana Active supports Auto Doppler calcs in both live and frozen mode. This is configured from the secondary menu in the measurement mode. The parameters selected for calculation can be changed later after the image is acquired.

Measurements are also supported on recalled grey scale images saved in DICOM format. This enables users to review patient images and redo measurements and calculations without reimaging or inconveniencing the patients.

Reporting

The raw data acquisition capabilities of TruScan enables re-annotation and re-measurement during remote reporting using a reporting software.

Q Analysis

Overview

Quantitative Analysis (Q Analysis) is available for the image loop acquired in the following modes: Color Flow Mode, Power Doppler Mode and Tissue Velocity Mode. The difference of Q Analysis operations is small among different modes.

Activating QAnalysis

1. Scan the patient in CF/PDI/TVI mode or select a desired cine loop in CF/PDI/TVI mode from the stored images.

NOTE: *Images from the current scan session acquired (already in CINE) or from a saved image loop can be used for QAnalysis.*

NOTE: *QAnalysis is only available if the user has selected an image loop. If the user has selected a saved still image (just one frame), QAnalysis is not available.*

2. Press **Freeze**. Then move the trackball to enter CINE mode.

NOTE: *QAnalysis is only available when the system is in CINE mode.*

3. Select *QAnalysis* to activate Quantitative Analysis function. To toggle the trackball function between QA and Scroll, press the **Cursor** key.

Q-Analysis Screen Description
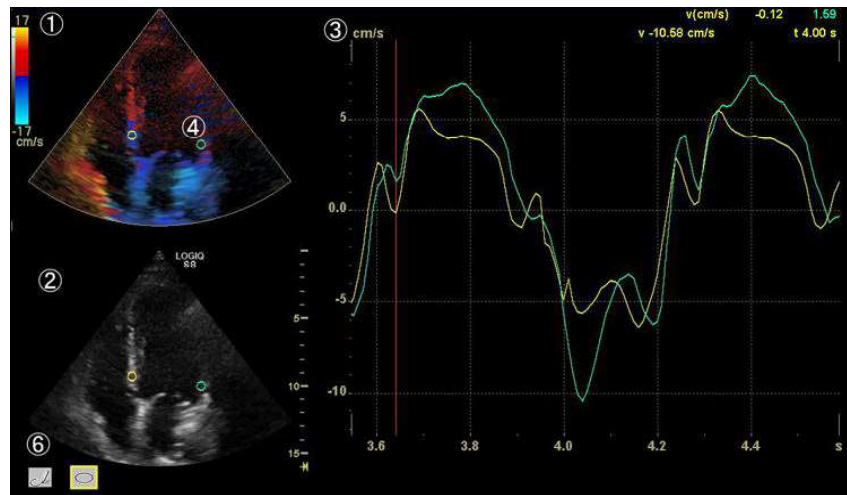
Figure 5-53.   TVI mode Q-Analysis Example

Table 5-8:   QAnalysis Screen Description

1.	TVI Cineloop Window Sample Area: Indicates sampling position of the velocity. The sample area is color-coded: the first sample area is yellow, the second green, etc.
2.	B Cineloop Window Sample Area: Indicates sampling position of the velocity. The sample area is color-coded: the first sample area is yellow, the second green, etc.
3.	Analysis Window. • Y axis: Velocity scale (cm/s) • X axis: Time(s) • Time at cursor position. • Velocity at Cursor position. • Velocity at frame marker position (Color coded)
4.	Sample Area
5.	Time at cursor position and velocity at cursor position. Position the pointer cursor over the analysis window.
6.	Sample Area Tools. • Pencil Icon: Creates a sample area based on freehand drawing. • Shape Icon: Creates a sample area with a pre-defined circular/ellipse shape.

Q-Analysis Screen Description (continued)

Figure 5-54.   CF Mode Q-Analysis Example

Selecting QAnalysis Image Range

A range of frames is selected for the TIC analysis in Cine mode (before accessing TIC Analysis). Only the frames in this range are used for the TIC analysis.

If a range is not selected prior to accessing the TIC Analysis, the system uses the default Cine start and end frames as the default TIC start and stop frames.

1. The first frame in the analysis series is selected by adjusting *Start Frame* to the desired frame

    OR

    using **Trackball** or *Frame by Frame* to select the desired first frame and then selecting *Start Frame*.

2. The last frame in the analysis series is selected by adjusting the *End Frame* to the desired frame

    OR

    using **Trackball** or *Frame by Frame* to select the desired last frame and then selecting *End Frame*.

Generating a Trace

Trace from a pre-defined sample area

1. Select the sample area Ellipse ROI button (shape icon on the monitor display).
2. Move the cursor to one of the Cineloop windows using the **Trackball**.
3. Press **Set** to anchor the sample area.

   In this frame, the sample area is marked with an anchor. If the cineloop has more than one heart cycle, a sample area will also be anchored in the corresponding frame in the next heart cycle.

   The trace is updated accordingly in the Analysis window.

Trace from freehand sample area

1. Select the Freehand ROI button (pencil icon on the monitor display).
2. Move the cursor to one of the Cineloop windows using the **Trackball**.
3. Trace the outline of the desired ROI by moving the caliper with the **Trackball**.
4. Press **Set** to anchor the sample area.

   The sample area is automatically closed and the trace is updated accordingly in the Analysis window.

Manual tracking of the sample area (dynamic anchored sample area)

The sample area can be moved within the loop to ensure that data in the trace is generated from the same anatomical location during the cyclic motion of the heart.

1. Place a sample area over a region of interest. Note the anatomical location of the sample area.
2. Scroll to a new frame using the **Trackball**.
3. Press **Cursor** on the control panel to select QA function for trackball.
4. Move the cursor to the sample area using the **Trackball**.
5. Press **Set**. The sample area is unanchored.
6. Drag the sample area to the corresponding anatomical location in the new frame.

    When the sample area is anchored in more than one frame, linear interpolation is performed so that the sample area is smoothly moved between the anchored positions in the selected frames when running the cineloop.

NOTE: *In the original frame and this particular frame the sample area is marked with an anchor.*

7. Press **Cursor** on the control panel to select Scroll function for trackball.
8. Using the **Trackball**, scroll through the cineloop and control that the sample area follows the moving anatomical structure.
9. Add anchored sample areas in several frames to obtain a more accurate displacement of the sample area.

Moving a dynamic anchored sample area

1. Freeze the image.
2. Press **Cursor** on the control panel to select Scroll function for trackball.
3. Using the **Trackball**, browse through the cineloop to display one of the frames where the sample area was anchored.

NOTE: *In these frames, the sample area is marked with an anchor.*

4. Press **Cursor** on the control panel to select QA function for trackball.
5. Move the cursor to the sample area using the **Trackball**.
6. Press **Set**. The sample area is unanchored.
7. Drag the sample area to a new location.
8. Press **Set** to anchor the sample area to the new location.

If you want to move the sample area to the same depth, select *Move (Same Depth)* from the System Menu.

Delete a trace

The user can delete all traces at once or one at a time.

1. If necessary, press **Cursor** on the control panel to select QA function for trackball.
2. Move the cursor over one of the sample area. Confirm that cursor is changed to hand icon.
3. Select *Delete Current Sample* or *Delete All Samples* on the primary menu as necessary.

Manipulating the Sample Area

Up to eight ROIs can be saved on the reference image, with the corresponding eight traces plotted simultaneously on the graph. Each ROI display has a different color, and its corresponding trace data is plotted using that same color.

Once eight ROIs have been saved, the system does not automatically generate an active ROI when the cursor is positioned over the displayed reference image.

The saved ROIs can be a mixture of elliptical and freehand ROIs.

When the user repositions an ROI, the old trace data is erased from the plot and the trace data for the new position replotted.

If the ROI position on the last frame of the selected image range is moved, the corresponding ROIs on all frames are repositioned to match the last frame.

The user shall also have the capability of setting separate ROI positions on different frames of the contrast images, and the system shall linearly interpolate the ROI positions for the frames in between the selected frames.

Manipulating the Sample Area (continued)

Setting the default sample area shape

1. Position the cursor on the ROI on Cineloop windows, a white circle appears.

Figure 5-55. Sample Area Information Box

2. Select *Set sample area shape*. The Information Box displays.
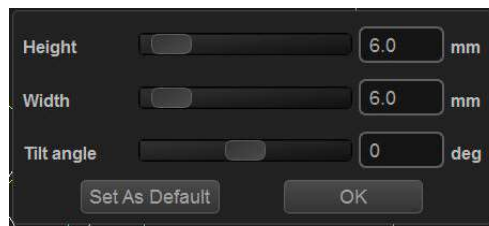
Figure 5-56. Sample Area Information Box

3. Select Height, Width and Tilt angle.
4. Select *Set as default*. The current ROI size is set as the default for subsequent Ellipse ROIs.

Manipulating the Sample Area (continued)

Reshaping a Sample Area

To reshape the sample area:

1. Position the cursor on the ROI to reshape and press **System Menu**.
2. The ROI system menu displays. Select *Set sample area shape*.
3. Adjust Height, Width and Tilt angle.
4. Press *OK*. The selected ROI size changes.

Sample Area Shapes

There are two different methods for determining the shapes of the sample area.

Ellipse ROI

1. Select the ellipse icon (shape icon on the monitor display).
2. When the trackball positions the image display cursor over the reference image(s), an elliptical ROI is automatically generated and displays on the reference image(s).
3. The average intensity value inside the ellipse is calculated for every image in the image analysis range and plotted in the image display area.
4. The last generated or selected ellipse is considered the active ROI, and its trace plot automatically updates as the user repositions it on the reference image. Old traces are erased.
5. When scanning with an elliptical ROI, press **Set** to fix the ROI position and freeze its corresponding trace on the plot. A new active ROI is generated whose position is manipulated by the trackball and whose time-intensity curve traces will be plotted as before, while the previous ROI and trace remain fixed at the points they were saved at.

NOTE: *Elliptical ROIs can be positioned in any manner that keeps their center within the image boundaries. In the case that part of the ROI is outside the image boundary, only data from within the image boundary is used for calculating the mean intensity value.*

NOTE: *You can change the size of the Ellipse ROI by adjusting the Ellipse control.*

Sample Area Shapes (continued)

Freehand ROI

1. Select Freehand icon (pencil icon on the monitor display).

    Use the **Trackball** to position the caliper on the reference image at the start point. Press **Set** to fix the start point.

2. Trace the outline of the desired ROI by moving the caliper with the **Trackball**.

3. When a suitable ROI has been drawn, press **Set** a second time.

    The system automatically links the start point to the end point by drawing a straight line between them. The caliper is then free for repositioning for another freehand ROI.

NOTE: *You cannot go outside the image boundary when drawing a freehand ROI.*

Deleting a Sample Area

Sample ROIs and their corresponding traces can be deleted using *Delete Current Sample or Delete All Samples*.

1. Select *Delete Current Sample* to delete the currently active ROI.

2. Select *Delete All Samples* to delete all currently set ROIs and all of their traces.

NOTE: *The corresponding traces for the deleted ROIs are erased from the plot.*

NOTE: *Deleting an ROI causes the ROIs to be deleted from all frames in the analysis loop.*

Disabling/Enabling the frame

NOTE: *Disabling/Enabling the frame is available when enter QAnalysis from CF and PDI mode.*

Frame disabling excludes the actual frame from the cineloop display. Frame disabling is available only with contrast data.

Disabling the frame from the frame marker

To disable One Frame :

1. Use the **Trackball** to move the cursor to the frame maker to disable.
2. Press **Disable Frame**.
3. The frame marker is changed from green to red to indicate the frame has been disabled.

NOTE: *The disabled frame is no longer displayed in the reference window when scrolling through CINE memory.*

Disabling multi-frames from the frame marker

1. Use the Trackball to move the cursor to the first frame maker to disable.
2. Press and hold down *Disable Frame*.
3. Move the maker to the last frame to be disabled and release **Disable Frame**.

The marker is turn red and the data from that frame is removed from the trace and any subsequent trace processing.

Disabling/Enabling the frame (continued)

Disabling a frame from the cineloop window

1. Use the Trackball to move the cursor to the cineloop window.
2. Press *System Menu*. The system menu displays.
3. Select *Disable frame*.

   The current frame is disabled and the corresponding frame marker displays red.

To enable the frames

To re-enable all deleted frames :

1. Position the cursor on the Frame Marker line and press the *System Menu*. The system menu is displayed at the cursor position.
2. Select *Enable all frames*.
3. All disabled frames are re-enabled.

Smoothing

NOTE: *Smoothing is not available when entering QAnalysis from CF/ PDI mode.*

The system can smooth the traces displayed by applying a filter over a defined time window. The type of filter availabe is depending on the analysis signal displayed.

1. Select *Smoothing*.
   OR
   Position the cursor over the analysis window and press **System Menu**. The System menu is displayed at the cursor position. Select *Smoothing*.

NOTE: *When smoothing is turned on, it applies to all traces in the plot window.*

2. The smoothing filter list displays. Select the appropriate parameter.

Horizontal Sweep

Horizontal Sweep allows you to increase or decrease the time interval over which to plot the TIC curve.

The Horizontal Sweep control can range from TBD on the short side to the time interval between the user selected first and last frame. The default is the user selected image range. If the user has not yet selected a first and last frame, the first and last default frames from the displayed CINE loop are used.

Drift Compensation

NOTE: *Drift Compensation is only available when entering QAnalysis from TVI mode.*

Drift Compensation compensates drifting of Tissue Tracking curves by either resetting the curve to zero at the tracking start point (cycle resetting) or by linear compensation throughout the cycle (linear compensation).

NOTE: *When Displacement is chosen by AnalysisSignal, Drift Compensation is active.*

Statistics

Select **Statistics** to enable/disable display of statistics of the frame or loop. The statistics are shown only when the loop is stopped.

- Ratio: Ratio of Color (Power) Doppler pixel over total ROI area.
- Area (mm2): The size of ROI.
- Max Ratio/ Time of Max Ratio: Maximum Ratio of Color (Power) Doppler pixels in each ROI, and which frame that occurs in.
- Min Ratio/Time of Min Ratio: Minimum Ratio of Color (Power) Doppler pixels in each ROI, and which frame that occurs in.

Trace Measurements

Max Gradient

Displays the time and gradient that becomes the maximum gradient between the CINE start and end frame.
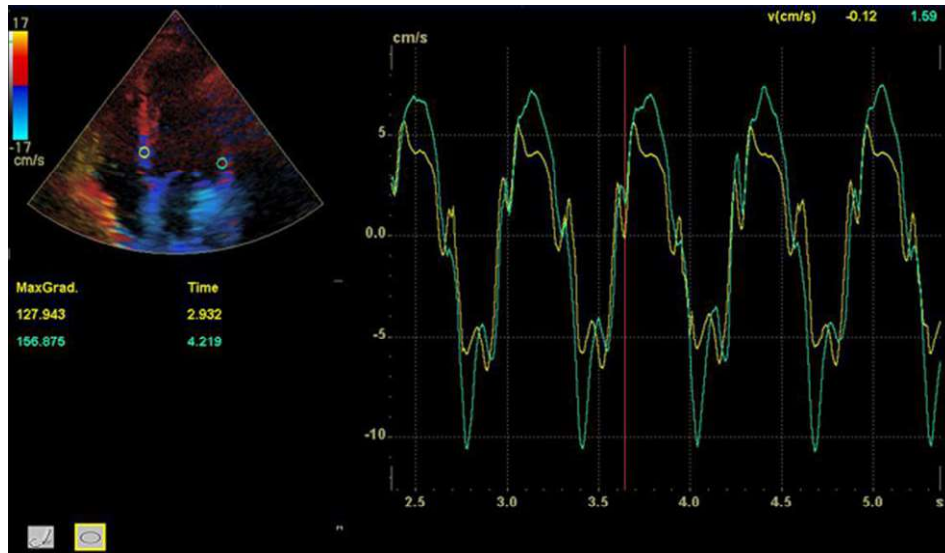
Figure 5-57.   Max Gradient

Exporting Traces (Saving the Trace Data)

You can save the trace data to an external file.

1. Select **Export Traces** on the primary menu to save the trace data.

2. The following window displays.

SAVE TRACES TO ASCII FILE

Location   CD / DVD Recordable (G:)

File name

Save   Cancel
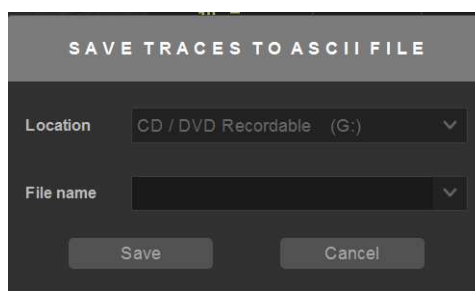
Figure 5-58.   Export Trace Window

- Location: Select Location which to save.
- Filename: Enter the filename. (Only Text)

3. Select **OK** to save the data and return to the QAnalysis screen.

- All displayed ROI traces are saved in the exported file.

All plot data (intensity, gradient and gradient derivative) are exported to a text file by "Export Trace".

Table 5-9:   Example of exported file

Time(s):	Trace 1:	Trace 1 dGrad.:	Trace 1 dGrad.
0.00000	-3.97995e+000	-2.15924e+001	8.05159e+001
0.03121	-5.14631e+000	-1.64719e+001	1.74256e+001
0.06242	-5.75798e+000	-1.27675e+001	-7.78004e+001
0.09362	-6.02222e+000	-1.27675e+001	-1.93426e+002
0.12483	-6.11224e+000	-1.44515e+001	-4.17252e+002

NOTE: *The Smoothed trace is the one saved if the user has applied a smoothing filter.*

NOTE: *Only data from the user selected image range is included in the exported trace file.*

NOTE: *No trace results are saved in the standard image database.*

Annotating the QAnalysis Data

The user can annotate both the reference image and the trace plot displays. Use **Comment** key to type the annotation. See Chapter 6 for reference.

Exiting QAnalysis

There are several methods to exit QAnalysis.

- Select *Exit QAnalysis*.
- Press **Freeze** to unfreeze and resume scanning.
- Press any other button that returns the system to real-time scanning.

Using 3D (Option)

Overview

Table 5-10:   3D Package Options

3D Type	Description	Sensor/No Sensor	Available Tabs
Easy 3D	Designed for rendering B Mode images, e.g., Baby Face scans.	No sensor	3D Acquisition, Easy 3D, Movie
Advanced 3D	Designed for rendering B Mode images, e.g., vessel trees.	No sensor	3D Acquisition, Easy 3D, Advanced 3D, Movie

Easy 3D

Acquiring a 3D Scan

To acquire a 3D scan,

1. Define the key assigned for 3D in Utility -> System -> User Configurable Key.
2. Optimize the B-Mode image. Ensure even gel coverage.
3. Press the User defined key assgined to 3D. Two screens appear.

NOTE: *Set appropriate values for Acq Mode and Scan Plane. Also, set the scan distance before scanning.*

4. To start acquiring the image, press **Dual**.
5. To perform a parallel scan, scan evenly. To perform a sweep (fan) scan, rock the probe once. Note the distance of the scan.
6. The 3D volume of interest (VOI) is dynamically assembled on the right side of the screen.

NOTE: *If the image stops before you're done scanning, start acquiring the 3D volume of interest again.*

7. To complete the 3D scan, press **Quad**.

NOTE: *You can also press Freeze, but then you need to also press the 3D key to obtain the final render.*

3D Notes

- Adjust the 3D data set brightness with B-Mode Gain.
- Use Colorize to change the color of the active data set.
- Use Zoom to increase the zoom factor of the active data set.
- Vertical lines may be seen in a resliced image. This usually happens when you scan too fast or if the scan distance is set to a high value.

    Scan more slowly, adjust the frame rate for a faster rate or adjust the scan distance.

Manipulating the Volume of Interest

Imagine you are able to manipulate the 3D volume of interest (VOI) in your hand. The 3D VOI is a tangible anatomical object that you can see and manipulate easily using the Trackball and Set control panel keys.

Practice positioning the pointer at different places within the 3D VOI. Highlight different colors (white, red, yellow, or green). Press Set to select a VOI for manipulation. Use the hand to manipulate the 3D VOI.

Rotating the 3D VOI Left/Right or Forward/Backward

You can rotate it left to right or right to left. You can rotate it forward/backward. Press **Set** key when the white pointer finger is positioned on the white box. Move the closed white hand to manipulate the 3D VOI.
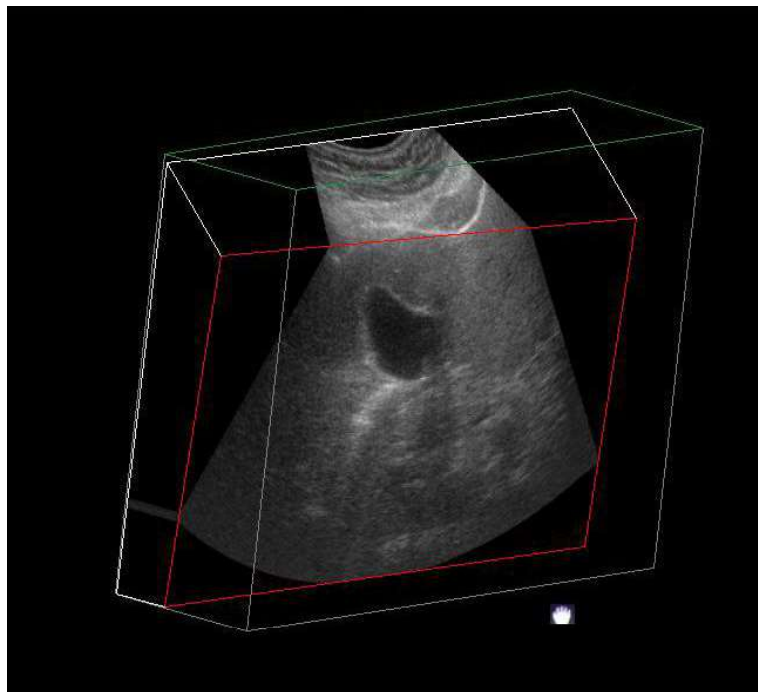
Figure 5-59.   Manipulating the 3D Volume of Interest (White Hand)

Moving Through the 3D VOI

You can move through the 3D VOI using the red hand. Press Set when the red pointer finger is positioned on the red box. Move the closed red hand to move through the 3D VOI.
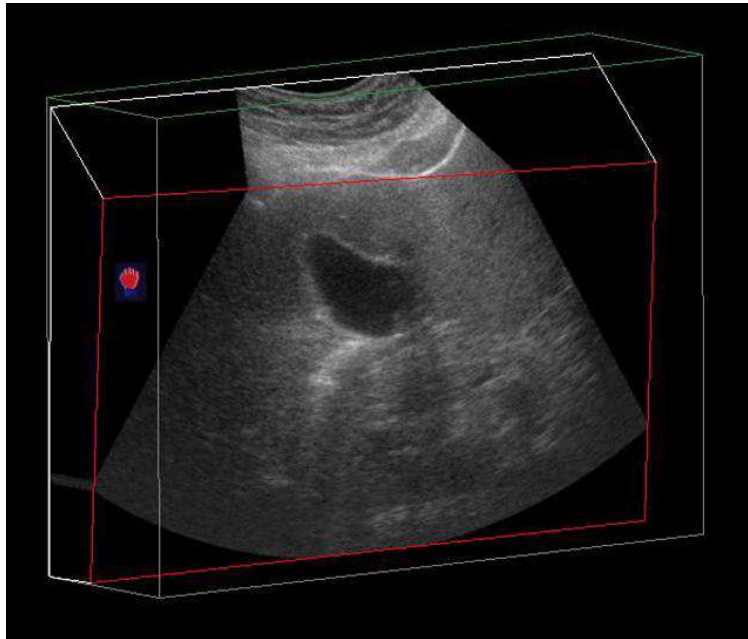
Figure 5-60.   Moving through a 3D Volume of Interest (Red Hand)

NOTE: *Any plane in the volume can be made active (highlighted with red box) by clicking on it.*

Viewing Specific Portions of the Anatomy

You can pull back tissue to view specific portions of anatomy using the yellow hand. Press Set when the yellow pointer finger is positioned on the yellow box. Move the closed yellow hand to manipulate the 3D VOI.

NOTE: *This actually moves an edge. A yellow hand appears only when the pointer is on an edge of the VOI.*
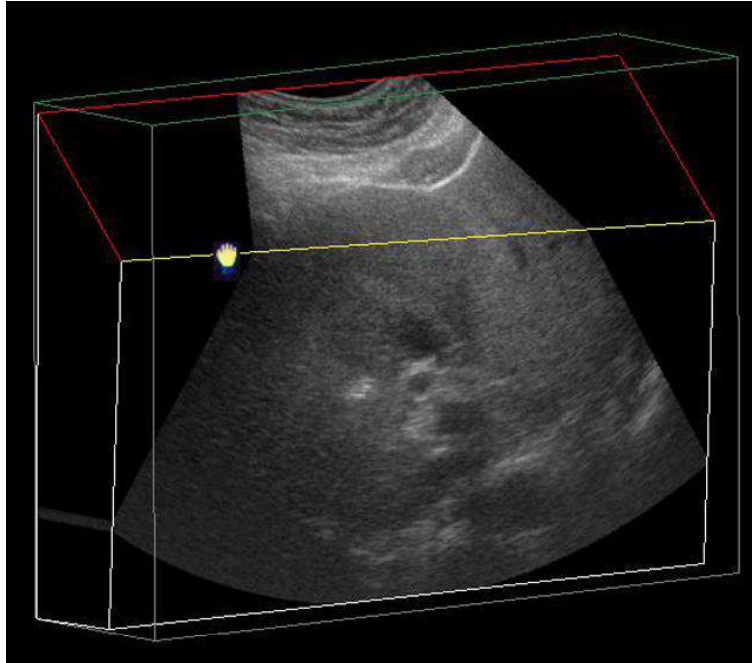
Figure 5-61.   Manipulating the Edge of a 3D Volume of Interest (Yellow Hand)

Pulling Back a Corner of the VOI to View Specific Anatomy

You can pull back a corner to view specific portions of anatomy using the green hand. Press Set when the green pointer finger is positioned on the green box. Move the closed green hand to manipulate the 3D VOI.

NOTE: *A green hand appears only when the pointer is on a corner of the VOI.*
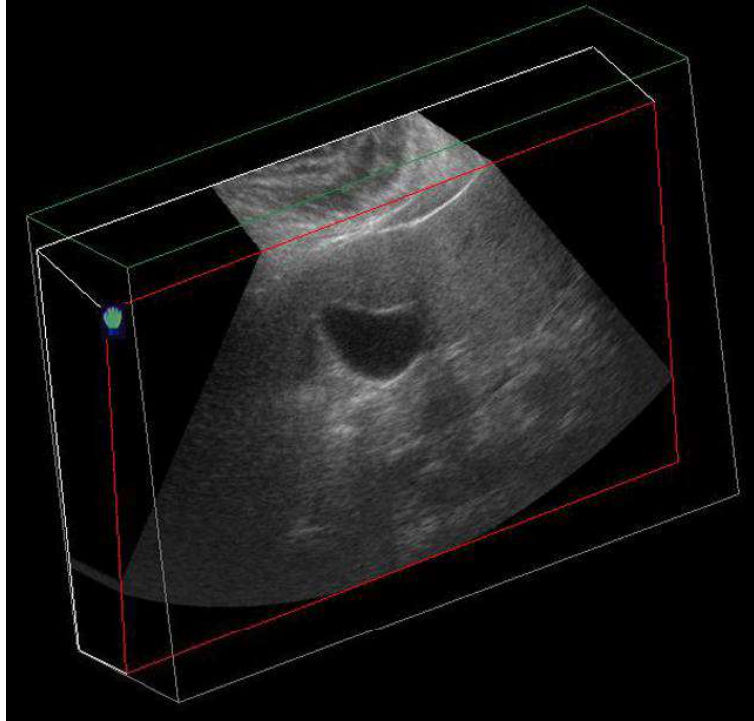
Figure 5-62.   Manipulating a Corner of the 3D Volume of Interest (Green Hand)

3D Acquisition Parameter Description

Table 5-11:   3D Acquisition Description and Instructions for Use

3D Parameter	Description
App(Application) Presets	Selections: None, OB - Baby Face **None**. No application preset applied. **OB - Baby Face.** After having scanned in this mode, certain rendering parameters are set automatically. The gray surface mode is activated and the texture mode is switched off. The gray surface mode values for opacity and threshold are set automatically according to the datasets histogram. **User1, User2, User3.** User defined preset.
Acquisition Mode	Selections: Sensorless Parallel, Sensorless Sweep **Sensorless Parallel**. In this mode the probe must be moved during 3D data acquisition without angling it. You should scan the object you want to render in 2-4 seconds. The speed at which you scan should be constant. No sensor is mounted on the probe. • Since the time for post-processing depends on the acquired number of frames, it is recommended that you check the frame rate. Low frame rates result in fewer acquired frames for the 3D dataset which results in intensive post-processing (interpolation). Therefore, low frame rate = long post-processing. **Sensorless Sweep**. In this mode the probe must be moved to a position where you can clearly see a middle cut of the object you want to scan and render. Tilt the probe to about 30 degrees until the object you want to scan disappears. Start the acquisition and tilt the probe over a distance of around 60 degrees until the object disappears again. The entire scan time should be around 2-4 seconds. During the sweep, the probe may not be moved parallel, just tilted. No sensor is mounted on the probe. Before starting an acquisition, take care that the transmitter is positioned correctly during data acquisition and that the transmitter cannot move.
Scan Plane	Selections: Front to Back, Side to Side **Front to Back**. After having scanned in this mode, the rendered dataset is shown in a frontal view. For acquiring a fetal face in sagittal cuts, use this mode. **Side to Side**. After having scanned in this mode, the rendered dataset is shown from a side view. For acquiring a fetal face in coronal cuts, use this mode.
3D	Starts the rendering process.
Scan Distance	Adjusts the distance covered during the scan. Depending on the real width of a scan acquired during a sensorless 3D acquisition, the volume of interest's width can be enlarged or reduced. You can adapt the form of a fetal face if the baby's head looks oval instead of round. The assumed default width of a parallel scan is 6 cm; of a sweep scan 60 degrees.
Display Format	Change the layout between 50/50 and only 2D.

Easy 3D (continued)

NOTE: *Selection of user preset shall be effective only while 3D mode is active. Exiting 3D mode and activating again then 3D preset shall be changed to the default, even without New Patient or changing application.*

NOTE: *When 3D image is recalled, no 3D preset shall be active and parameters are recalled from image file.*

NOTE: *Default Scan Distance, Opacity and Threshold may not consistent and change per scan. After User Preset was saved and recalled, Opacity and Threshold are consistent.*

Easy 3D
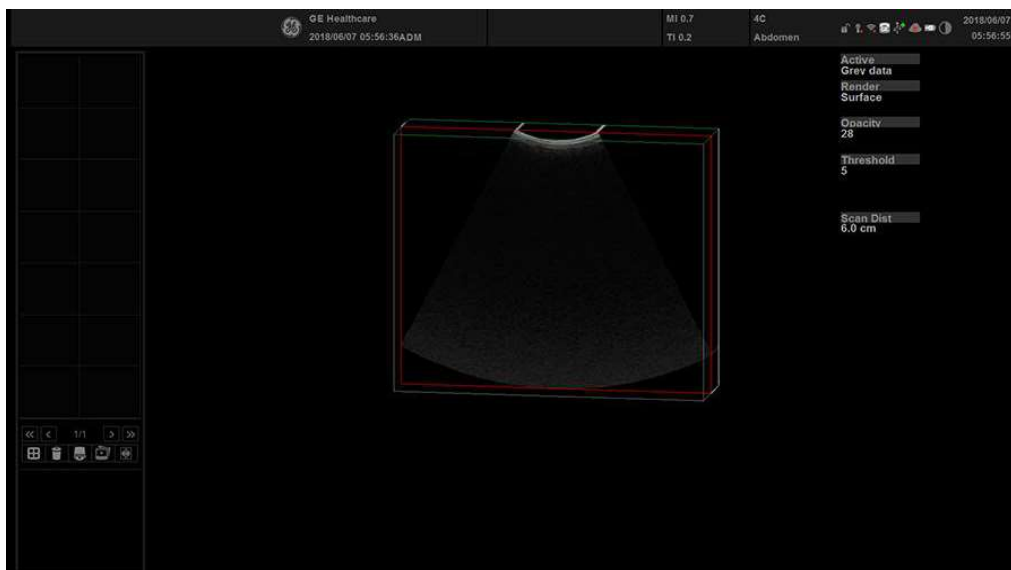
Figure 5-63.   Easy 3D

Descriptions and instructions for using Easy 3D follow:

Table 5-12:   Easy 3D Description and Instructions for Use

3D Parameter	Description
Reset	Resets the 3D volume of interest back to its original orientation.
Utilities	Select Average Off, Average Light, Average Medium, or Average Strong.
Undo	Undoes any manipulation you have done to your 3D dataset.
Auto Movie	Initializes the calculation and display of a 3D movie. A rotation of 30 degrees left and right around the actual image position (either the default position after acquisition or the position that was manually defined by manipulating the 3D volume of interest) is shown. For this 60 degree rotation, eleven images in steps of 6 degrees are calculated.
Scalpel	Structures, for example a part of the placenta hiding the view to a fetal face, can be cut out in a rendered image. All visible structures can be cut out. The option of 'erase inside' deletes all structures inside the marked region. The option of 'erase outside' deletes all structures outside the marked region. The region in the rendered image is marked with the Set key. To define the contour of the region, press the S et key for each vertex. To close the contour, double click the Set key. As long as a contour is not closed, it can be traced back with the Cursor key. The cut out process can be undone by the Undo Last function. As soon as the Apply button is pressed, a new dataset is generated.

Table 5-12:   Easy 3D Description and Instructions for Use (Continued)

3D Parameter	Description
Gray Surface	Activates the gray surface rendering mode. It leads to a transparent appearance of the object, generated by displaying only a surrounding shell of structures.
Texture	Activates the texture or photorealistic rendering mode. It creates a photorealistic appearance of the object. The shading depends on the orientation of the surface of the object. If both Texture and Gray Surface mode are switched on, the mixture percentage of both modes can be defined.
Render	Changes between the rendered image view and the view of a volume of interest. The volume of interest shows the acquired ultrasound images transformed into an isotropic rectangular coordinate system. The volume of interest can be manipulated as described above.
Threshold/Opacity	Threshold defines which gray values are used for rendering and which are considered noise. Opacity defines how strict Threshold is used for discrimination. A low opacity value creates a firmer appearance of the surface. A high opacity value leads to a transparent appearance of the rendered image.
Colorize/Contrast	Colorizes the 3D render or adds contrast to the 3D rendered image.
Overwriter User1/User2/ User3	Overwrite the application preset file with the changes you just made.

Orientation Marker	You can now specify/define, then add the following orientation markers while in 3D via the *Orientation Marker* key:
	• TRV Sup to Inf
	  Ant Scan
	  Prb Rt
	• TRV Inf to Sup
	  Ant Scan
	  Prb Rt
	• SAG Lt to Rt
	  Ant Scan
	  Prb Sup
	• SAG Rt to Lft
	  Ant Scan
	  Prb Sup
	• Defined
	    • Superior
	    • Inferior
	    • Left
	    • Right
	    • Anterior
	    • Posterior
	    • Cancel
	• None

Active Data	Manipulations of rendering parameters only have an effect on the data defined as Active Data. After having selected Active Data, a list of data is displayed, Gray Data or Inversion. Choose the data to be manipulated. Active Data is only available when you select both Inversion and Gray Data in Visible Data. Inversion Mode is only available for Black-and-White mode.

Table 5-12:   Easy 3D Description and Instructions for Use (Continued)

3D Parameter	Description
Visible Data	After selecting Visible Data, a list of data is displayed, Gray Data or Inversion. Choose the data you want to display. For example, if only Inversion is chosen, the B-Mode image is switched off in the rendered image and only inversion mode is displayed.

Advanced 3D

Descriptions and instructions for using Advanced 3D follow:

Table 5-13:   Advanced 3D Descriptions and Instructions for Use

3D Parameter	Description
Reset	Resets the 3D volume of interest back to its original orientation.
Contrast	Adjust to increase or decrease the contrast of the image.
Colorize	Colorizes the gray scale image to enhance the eye's discrimination capability.
Utilities	Use smoothed volume for rending the 3D. Strong = Most Smoothing.
Auto Movie	Initializes the calculation and display of a 3D movie. A rotation of 30 degrees left and right around the actual image position (either the default position after acquisition or the position that was manually defined by manipulating the 3D volume of interest) is shown. For this 60 degree rotation, eleven images in steps of 6 degrees are calculated.
Save Preset	Save as a user preset (User1, 2, or 3).
Undo	Undoes any manipulation you have done to your 3D dataset.
Tile	The display can be divided into 1, 2, 4, or 6 windows. Switching to a lower number of windows keeps the images from left to right.
Scalpel	Structures, for example a part of the placenta hiding the view to a fetal face, can be cut out in a rendered image. All visible structures can be cut out. The option of 'erase in' deletes all structures inside the marked region. The option of 'erase out' deletes all structures outside the marked region. The option of 'erase outside' deletes all structures outside the marked region. The region in the rendered image is marked with the Enter key. To define the contour of the region, press the right Enter key for each vertex. To close the contour, double click the Enter key. As long as a contour is not closed, it can be traced back with the Set key. The cut out process can be undone by the Undo Last function. As soon as the Apply button is pressed, a new dataset is generated and the cut is permanent

Table 5-13:   Advanced 3D Descriptions and Instructions for Use (Continued)

3D Parameter	Description
Active Data	Manipulations of rendering parameters only have an effect on the data defined as Active Data. After having selected Active Data, a list of data is displayed, Gray Data or Inversion. Choose the data to be manipulated. Active Data is only available when you select multiple items in Visible Data. *NOTE: Inversion Mode is only available for Black-and-White mode.*
Visible Data	After selecting Visible Data, a list of data is displayed, Gray Data or Inversion. Choose the data you want to display. For example, if only Inversion is chosen, the B-Mode image is switched off in the rendered image and only inversion mode is displayed.
Define Axis	For certain display and measurement modes (Angular Plane Mode, Angular Volume Measurement Mode), an axis in the volume of interest is required. To define the axis, set the start point by using the Trackball to position one end of the axis and pressing the Enter key, then positioning the other end of the axis and pressing the Enter key.
Group Planes	Selections: Off, Main, Parallel **Off**. A VOI or a rendered image is displayed. The Render button changes between the rendered image view and the view of the VOI. The VOI shows the acquired Ultrasound images transformed into an isotropic rectangular coordinate system. **Main**. Three orthogonal cuts (with colored frames) of the acquired VOI are displayed after pressing Main. The VOI shows the acquired ultrasound images transformed into an isotropic rectangular coordinate system. On the left top of the image a complete VOI is displayed. It shows the position of the three orthogonal planes in the VOI. A green point displayed in each plane defines the point of intersection of the three planes. This point can be set to different positions in the planes by double clicking the Enter key. A plane can be moved parallel in the VOI by pressing the Enter key on the position of the green point and moving the Trackball up and down inside the plane. **Parallel.** In this mode all displayed VOIs get the orientation of the last modified volume. Normally four VOIs are displayed. It is possible to display six VOIs by increasing the number of displayed volumes in the Tile area. Between the first and the last VOI, the selected planes are parallel and equidistant. A modification on the plane in one VOI results in a parallel modification of the planes in all other VOIs. To move these planes, press and hold down the Enter key while moving the Trackball.

Table 5-13:   Advanced 3D Descriptions and Instructions for Use (Continued)

3D Parameter	Description
Type 1/2	Defines the rendering modes. Selections: Gray Surface, Texture, Maximum Intensity, Minimum Intensity, Average Intensity, and None. If both Type 1 and Type 2 rendering modes are switched on, the mixture of both modes can be defined. **Gray Surface**. Activates the gray surface rendering mode. It leads to a opaque appearance of the object, generated by displaying only a surrounding shell of anatomical structures. Adjust Threshold and Opacity as well. **Texture**. Activates the texture of photorealistic rendering mode. It creates a photorealistic appearance of the object. The shading depends on the orientation of the surface of the object. Adjust Threshold and Opacity as well. **Maximum Intensity**. Transparent appearance of the object. Generated by displaying the maximum gray values in the VOI. **Minimum Intensity**. The rendered image is generated by displaying the lowest gray values in the VOI that exceed the defined threshold. Dark anatomical structures, like cysts, can be shown in this mode. **Average Intensity**. Transparent appearance of the object. Generated by a summation of the gray values. **None for Type 2**. No second rendering mode is used in addition to the Type 1 rendering mode.
3DLandscape	Shows a combination of 2D slices and a 3D rendered image. After a color acquisition you can combine the 2D B-Mode image slices with a 3D rendered color image. This mode allows stepping through the B-Mode images along a vessel structure. The 2D slice can be moved with the Enter key. The Trackball symbol has to be positioned inside the 2D plane. 3DLandscape is only available with a color acquisition image. 3DLandscape is greyed out in the **Menu Select** pull-down menu with Black-and-White mode acquisition image.
Render	Changes between the rendered image view and the view of a volume of interest. The volume of interest shows the acquired ultrasound images transformed into an isotropic rectangular coordinate system. The volume of interest can be manipulated as described above.

Table 5-13:   Advanced 3D Descriptions and Instructions for Use (Continued)

3D Parameter	Description
Reslice	Selections: Cube, Virtual Rescan, and Cubic Plane. **Cube**. The VOI shows the acquired ultrasound images transformed into an isotropic rectangular coordinate system. This mode allows you to work simultaneously with six cut planes. **Virtual Rescan**. The marked cut planes under Reslice Cube (red border) is displayed without any perspective distortions, e.g., parallel to the screen. This allows you to move through the volume one slice at a time in any direction. **Cubic Plane**. Only one cut plane view is shown in a perspective displayed VOI. The cut plane can be moved freely without any limitations.
Overwrite User1/2/3	Overwrite the application presets defined in 3D Acquisition.
Comments	To initiate the comment mode on the 3D image.

Movie 3D

Descriptions and instructions for using Movie 3D follow

Table 5-14:   Movie 3D Descriptions and Instructions for Use

3D Parameter	Description
Manual	An animated rotation of the rendered image can be calculated and displayed by this function. Using this function, you first need to define the start and end position of the rotation. To define this, move the VOI to the start position, the press Define Start. Move the VOI to the end position and press Define End.
Movie 360	The calculation and display of a complete rotation around the axis, defined by the Axis button, starts in steps of 15 degrees.
Auto Movie	Initializes the calculation and display of a 3D movie. A rotation of 30 degrees left and right around the actual image position (either the default position after acquisition or the position that was manually defined by manipulating the 3D volume of interest) is shown. For this 60 degree rotation, eleven images in steps of 6 degrees are calculated.
Axis	All rotations (Auto Move and Movie 360) are calculated as rotations around the specified axis (X, Y, or Z).
Movie Speed	You can adjust the speed of any 3D rotation.
Pause	Stops and restarts the rotation. As soon as Pause is pressed, the different rotation steps can be displayed by moving the Trackball.
Colorize/Contrast	Colorizes the 3D render or adds contrast to the 3D rendered image.

Using 4D(Option)

4D Introduction

WARNING: Please take extra care on the volume probe surface temperature before and during scanning to avoid heat injury.

When using volume probe for 4D acquiring, end the 4D acquiring once the current exam is complete, or freeze the 4D image when the machine is not in use.

DO NOT keep volume probe working in 4D acquiring mode for a long time, or the probe surface temperature will exceed the normal value.

NOTE: *4D mode is only compatible for Versana Active system with software R1.1.x and R1.2.x.*

NOTE: *Before using 4D mode, make sure Versana Active Advanced Cart is powered by Power Transformer or Cart Battery (battery should have power). Otherwise, the 4D mode doesn't work.*

4D provides continuous, high volume acquisition of 3D images. 4D adds the dimension of "movement" to a 3D image by providing continuous, real-time displays. With 4D, you can apply rendering techniques to smooth out the appearance of an anatomical structure, for example, a baby's spine.

You can perform the following types of volume acquisitions within the 4D feature:

Table 5-15:   4D Package Options

4D Type	Description	Acquisition Mode
4D	Designed for continuous volume acquisition of a 3D image.	B, 4D
Static 3D	Designed for single volume acquisition of a 3D image.	B, 3D

Features supported with 4D

The following features are supported with 4D:

- Most B-Mode controls
- High Detection Speckle Reduction Imaging (SRI-HD)
- Annotations
- Measurements and Calculations

The following post-processing controls are available with 4D:

- CINE

4D Principles of Operation

The acquisition of volume starts with a 2D image using special probes designed for performing 3D sweeps and 4D scans. The volume box defines the region of interest to be used for the volume sweep.

Volume sweep refers to the range of the sweep of the 2D image to be transformed into a rendered, 3D or 4D image. Static 3D acquisition involves a single volume sweep. 4D involves multiple, continuous volume sweeps.
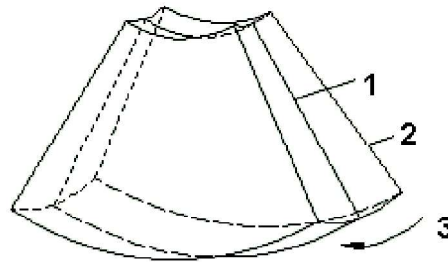
Figure 5-64.   Volume Sweep

1.   Central 2D scan
2.   Start 2D scan
3.   Range of VOI sweep

When you initiate a volume sweep, you can adjust the angle of the volume.

What is Interactive 3D Rendering?

Interactive 3D rendering allows you to visualize certain structures and to view and analyze different sections of the volume.

Region of Interest (ROI) / Render Box

The Region of Interest (ROI) - also referred to as the Render Box in rendering - contains the section of the volume you want to render. Therefore, objects that are not inside of the box are not included in the render process and are cut out (this is important in surface mode to allow a free line of sight). This may or might not be the entire VOI.

You can adjust the view direction of the ROI.
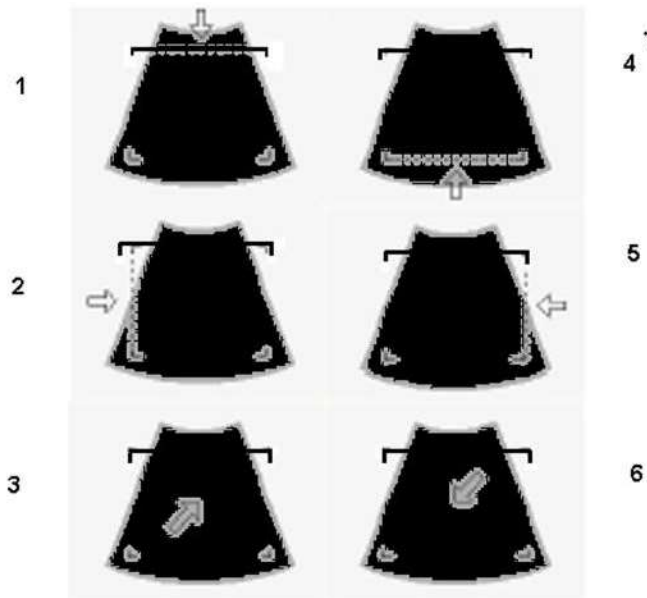
Figure 5-65.   Render View Directions

1. Up/Down
2. Left/Right
3. Front/Back

4. Down/Up
5. Right/Left
6. Back/Front

Region of Interest (ROI) / Render Box (continued)

Render View

In Render view, only the rendered image displays - no reference images.

Figure 5-66.   Monitor Display in Render View - Dual Window Display

Image Orientation

Orientation of Image in Sectional view
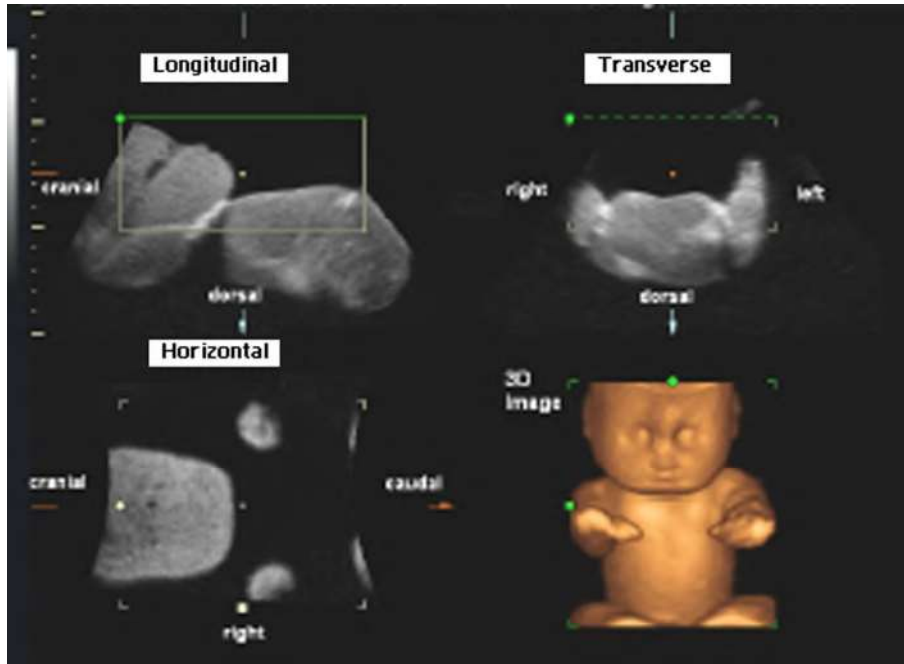
Figure 5-67.   Orientation of Image in Sectional View (the resulting image in read mode)

Principle of Sectional Planes

Sectional planes represent three different planes of the same 3D volume. There are three separate planes, A (Longitudinal), B, (Transverse) and C (Coronal).
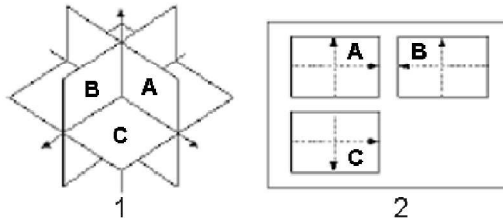
Figure 5-68.   Illustration of Sectional Planes

The intersected lines of each plane is color-coded: AB=blue, AC=red, and BC=yellow.

Table 5-16:   Orientation of intersected lines

Section/Field	A	B	C
Intersection of line AB	V	V	H
Intersection of line AC	H	N	H
Intersection of line BC	N	V	V
V=Vertical, H=Horizontal, N=Normal			

The presentation of three orthogonal sectional planes is different from the conventional patient orientation in 2D sonography.

NOTE: *Whenever you select the usual, longitudinal section of the patient to display in field A, the conventional orientation for longitudinal and transverse sections is valid.*

Reference Images

Reference images are the individual image displays within the corresponding sectional plane. Reference image A represents sectional plane A; reference image B represents sectional plane B, and reference image C represents sectional plane C.
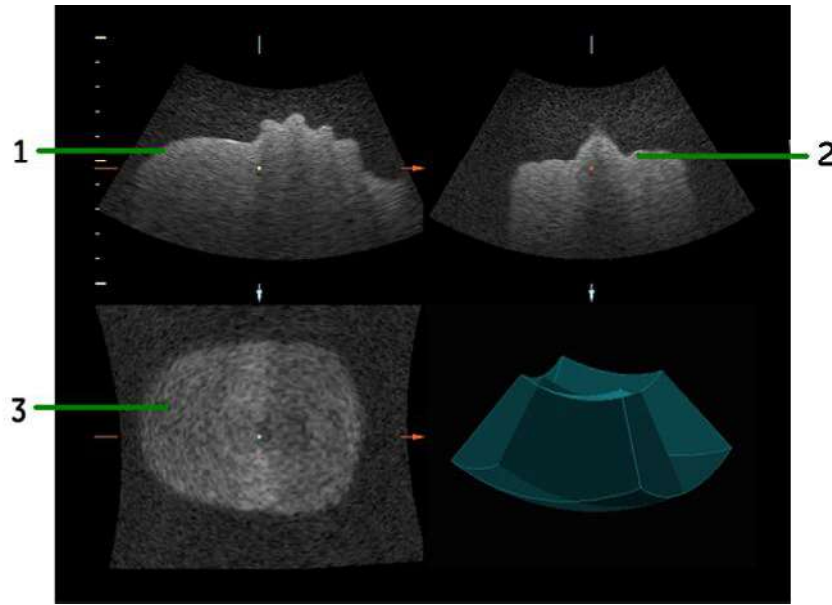
Figure 5-69.   Monitor Display of Reference Images in Sectional View

1.   Reference Image A (Longitudinal)
2.   Reference Image B (Transverse)
3.   Reference Image C (Coronal)

Orientation Help. When you view a 4D image on the display, it's sometimes difficult to recognize the orientation. To help, the system displays a three-dimensional drawing to illustrate the orientation. This drawing displays ONLY in sectional view.

Reference Images (continued)
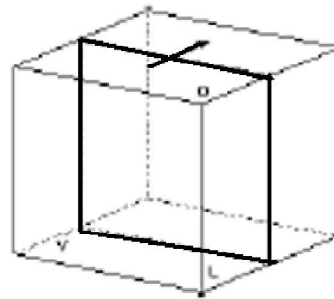
Figure 5-70.   Reference Image A

For Reference image A, the transducer beam migrates from the FRONT to the REAR through the volume body.
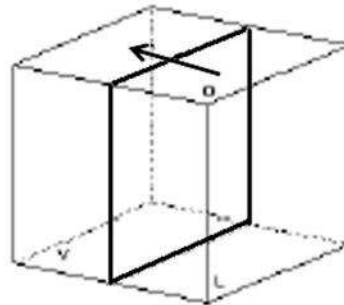
Figure 5-71.   Reference Image B

For Reference image B, the transducer beam migrates from the RIGHT to the LEFT through the volume body.
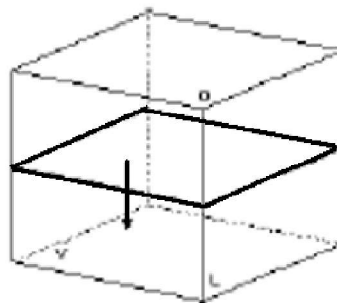
Figure 5-72.   Reference Image C

For Reference image C, the transducer beam migrates from the TOP to the BOTTOM through the volume body.

Reference Images (continued)

Examples of Probe Orientation with Reference Planes
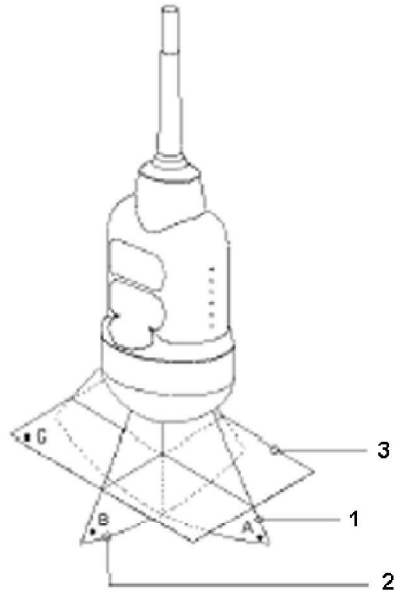
Figure 5-73.   Abdominal Probe Orientation

1.   Image Plane A
2.   image Plane B
3.   Image Plane C

4D Operational Controls

Control Panel Overview

Versana Active supports User defined keys, you can define one key to activate 3D/4D function in *Utility ->System -> User Configurable Key.*
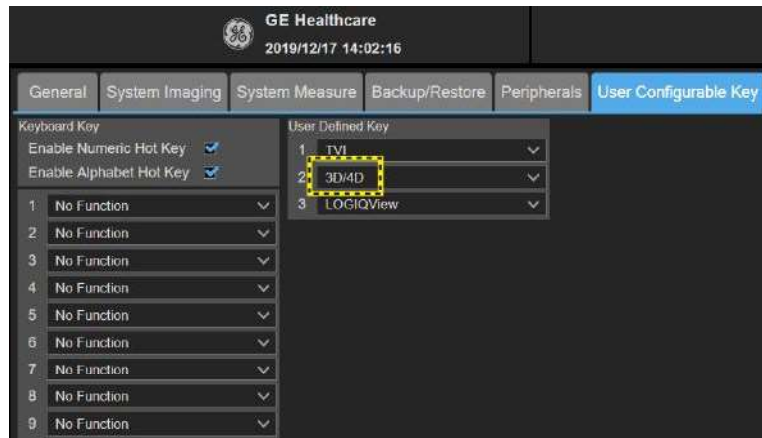
Figure 5-74.   User defined keys for activating 3D/4D

When you enter 3D/4D mode, the behavior of some of the Control Panel buttons changes. For example, in 3D/4D mode, you use the Active button (along with Gain) and Depth button to manipulate the Volume of Interest (VOI).

Control Panel Overview (continued)

Figure 5-75.   Control Panel Buttons

1.   Trackball, used to move and size the VOI
2.   Freeze key, used to freeze a 4D image
3.   Dual key, used to begin a 4D acquisition
4.   Quad key, used to end a 4D acquisition

Control Panel Overview (continued)

5. Active key

    •   Rotate it to adjust Gain.

    •   Or press it twice to enter the X/Y/Z/Parallel Shift.
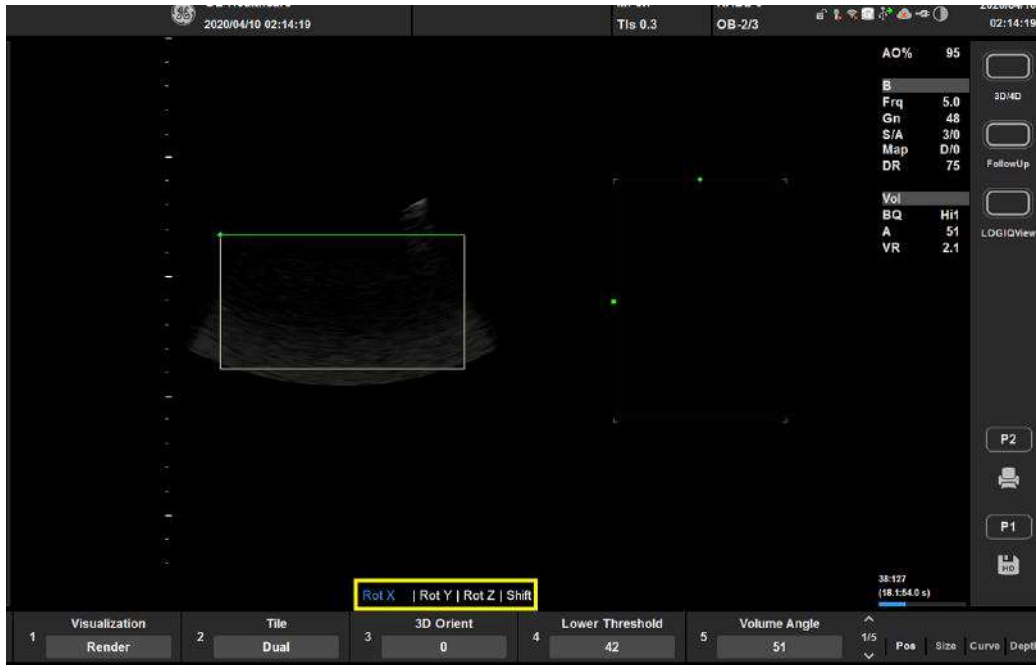
Figure 5-76.   Press Active twice

Control Panel Overview (continued)

Press Active once to adjust X/Y/Z/Parallel Shift sequentially.
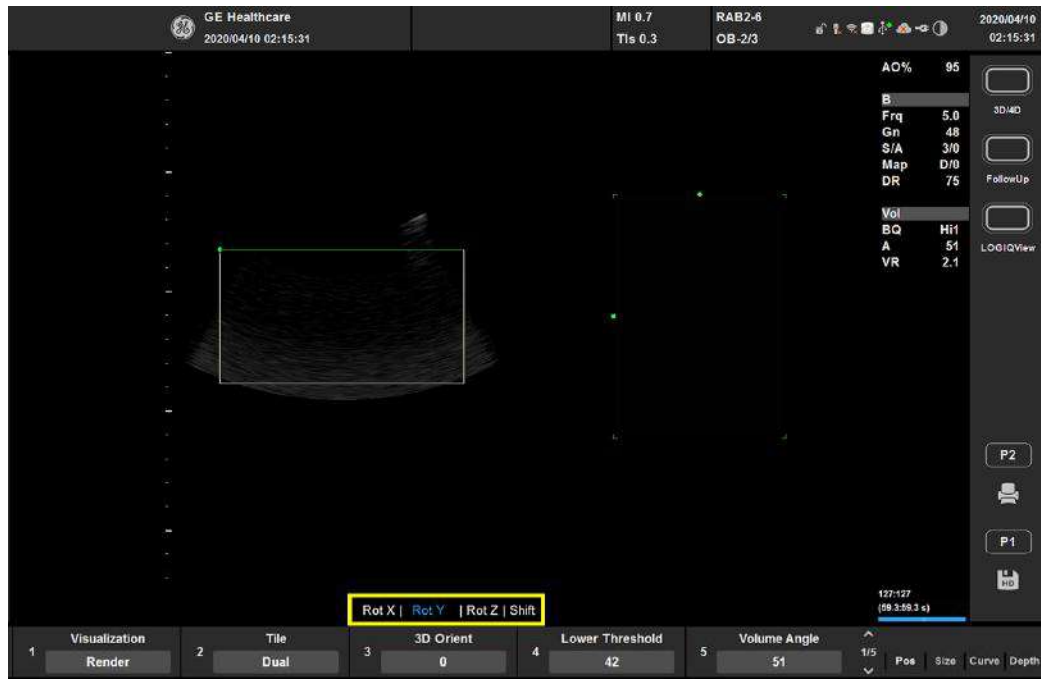
Figure 5-77.   Press Active once

Control Panel Overview (continued)

Press it twice again to quit to Gain adjustment.
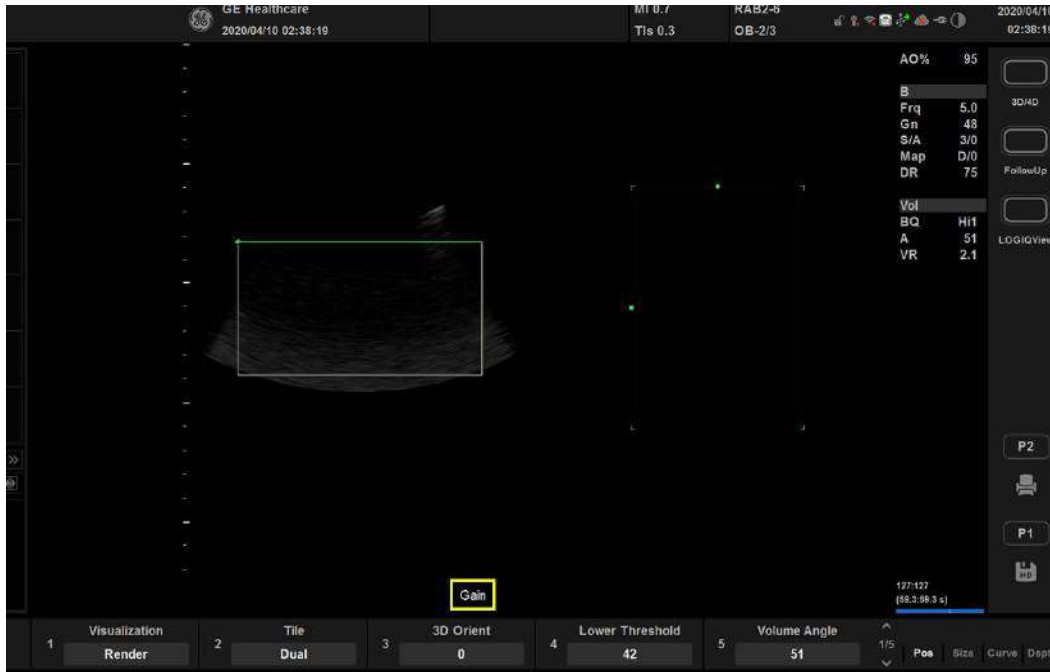
Figure 5-78.   Press Active twice again

4D Monitor Display

Below is an example of a 4D display. Imaging parameters are displayed in the upper right-hand portion of the display. The 4D specific parameters are Quality (Q), Volume Angle (A) and Volume Rate (VR). The Status Bar contains instructions on the tasks you can perform at each stage of the 4D imaging process. Remember to take a look at the Status Bar as needed.

Figure 5-79.   4D Monitor Display

4D Menu Overview

Press **3D/4D** to enter3D/ 4D. Most 4D screens contain some similar controls. Refer to the table below for descriptions of these controls. Controls that are unique to or that contain slightly different functionality are described in their respective sections.

Table 5-17:　Common 4D Controls

Preset Parameter	Description
Tile	You can divide the display into Single, Dual or Quad for Render view and Single or Quad for Sectional view.
Reset Curve	Resets the three-point curve to a straight line.
Direction	Adjusts the view direction of the ROI.
Visualization	Sectional, Render. Render view displays one rendered image, or reference image(s) and rendered image.
Volume Angle	Sets the range of the volume sweep.
B Quality	Balances speed with line density. Max combines the highest density with the slowest speed; Low combines the lowest density with the highest speed.

4D Presets

Real-Time 4D/Static 3D Presets

1. When you enter 3D/4D mode, press 4D user defined key on the control panel.
2. Select one of the preset settings for data acquisition and display. Presets are defined in the preset file and differ by application

Table 5-18:   Preset 4D Controls

Preset Parameter	Description
Over Write	Overwrite the application preset file with the changes you just made.
Create New	Create a new user application preset file based upon the current exam category and application.
User	Used to define new user presets for a given application.

Static 3D Presets

1. When you enter 3D/4D mode, turn on **Static 3D** in the primary menu.
2. Select one of the preset settings for data acquisition and display. Presets are defined in the preset file and differ by application.

Performing a 4D Scan

Visualizations

4D provides two types of views for displaying and working with images: Sectional and Render.

Sectional View

Sectional view contains one display for each sectional plane.
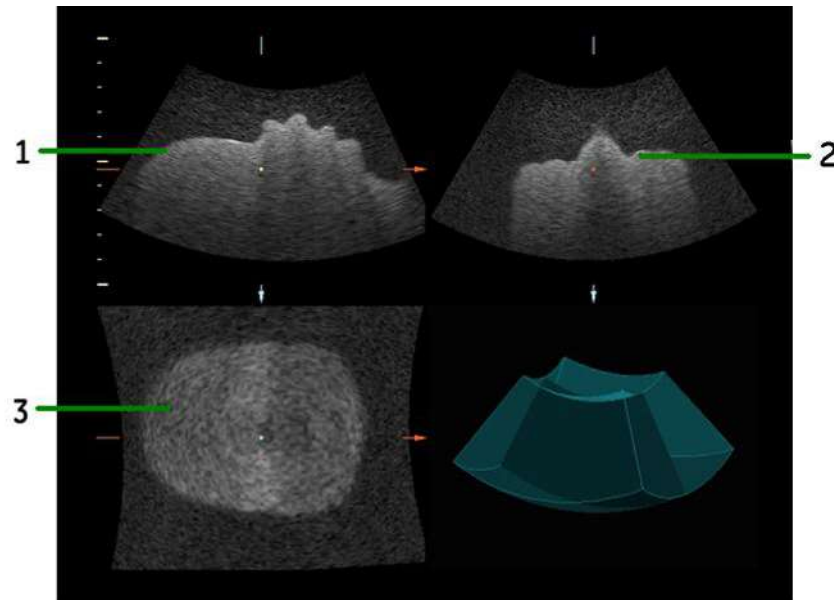
Figure 5-80.   Monitor Display in Sectional View

1. Sectional Image A
2. Sectional Image B
3. Sectional Image C

Visualizations (continued)

Render View

The Versana Active continuously displays the 4D rendered image.

Figure 5-81.   Monitor Display in Single Tile Render View

NOTE: *When the tile selection is single, only the rendered 4D image appears. When the tile selection is quad, the sectional images are located in 3 quadrants with the rendered 4D image in the fourth.*

Render View (continued)
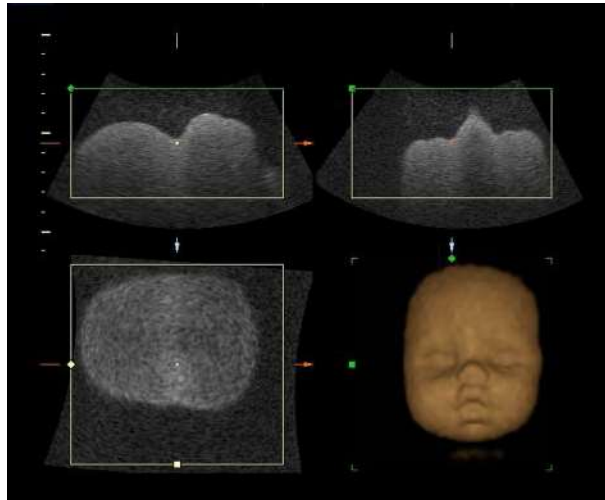
Figure 5-82.   Quad Tile Render View

Orientation Help

When you view a 4D image on the display monitor, it's
sometimes difficult to recognize the orientation. To help, the
system displays a three-dimensional drawing to illustrate the
orientation. This drawing displays ONLY in sectional view.
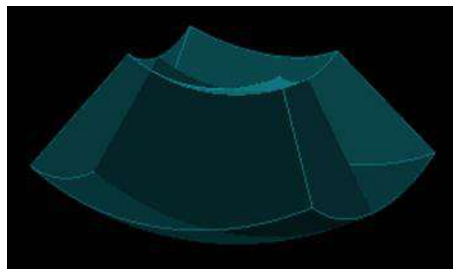
Figure 5-83.   Orientation Help Graphic

Acquiring and Rendering a 4D VOI

4D DP Cable and Probe Connection

1. Shut down the system.

2. Disconnect 3PP probe connector from Versana Active. Follow the guidelines in Chapter 3 for disconnecting the probe.

3. Connect 4D DP cable to the 4D port of Versana Active.
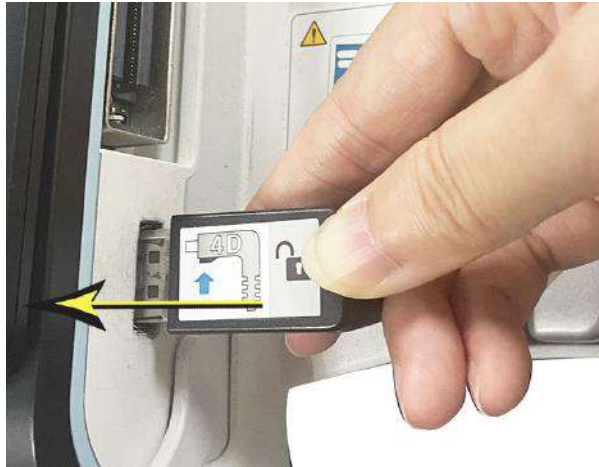
Figure 5-84.   Connect 4D DP cable

⚠ CAUTION   The Versana Active system should be turned off when connecting and plugging out the 4D DP cable.

4. Connect 3PP probe connector to Versana Active. Follow the guidelines in Chapter 3 for connecting the probe.

5. Connect the 4D probe RAB2-6-RS to cart 3-Probe Port and lift the connector locking lever.

6. Power on the system.

Disconnect 4D DP Cable

1. Shut down the system.

2. Disconnect 3PP probe connector from Versana Active.

3. Press the cable clip upwards and disconnect 4D DP cable from the 4D port of Versana Active.

Figure 5-85.   Disconnect 4D DP cable

⚠ CAUTION   The Versana Active system should be turned off when connecting and plugging out the 4D DP cable.

NOTE: *It is not necessary to disconnect 4D DP cable each time you complete 4D scanning. It's recommended that you unplug the 4D DP cable when necessary.*

Starting with a 2D Image

To create a 4D image, you start with an optimized 2D image. The 2D image serves as the mid-line for the resulting 4D image.

1. Connect the 4D probe RAB2-6-RS.

NOTE: *If RAB2-6-RS is not connected, the original 3D menu appears.*

2. Select RAB2-6-RS from the probe indicator.

3. Obtain a 2D image. Optimize the image as usual.

Entering 3D/4D Mode

In 3D/4D mode, you choose the type of scan you want to perform: 4D or Static 3D.

1. Press **3D/4D User Define key** to enter 3D/4D mode. The first time you press 3D/4D, the system is in Pre Acq mode.

NOTE: *The location of the number of focal zones might change when you enter 3D/4D mode, since the number of zones is pre-determined by the default ROI.*

For all applications, Static 3D is the default acquisition mode. When you enter pre-mode, an ROI graphic appears on the monitor display that defines the initial ROI (Region of Interest) of the volume.
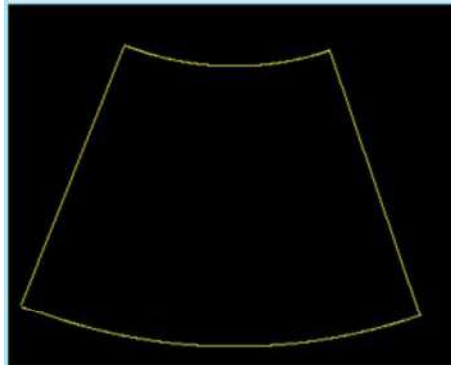
Figure 5-86.   ROI Graphic

2. Preset menu is on the right top of moniter, Select one of the preset settings for data acquisition and display. Presets are defined in the preset file and differ by application.

Quick Acquisition Steps

1. Connect the 4D probe RAB2-6-RS.

2. Select RAB2-6-RS from the probe indicator.

3. Obtain a 2D image. Optimize the image as usual.

4. Press **3D/4D**. An ROI graphic appears. 4D is selected.

5. Define the Volume of Interest (VOI) to be scanned. Make sure **Pos** is highlighted, then move the **Trackball** to position the VOI. Then press **Set** until the **Size** is highlighted, then move **Trackball** to re-size the VOI.

6. Adjust the volume angle.This defines the range of the volume sweep. A small sweep angle results in a lower number of slices with a high volume rate.

7. To begin 4D acquisition, press **Dual** key.

   You DO NOT have to hold the probe steady during data acquisition.

   During data acquisition, you can manipulate the VOI to see different views of the image. To rotate the VOI left/right/forward/backward, use the Direction.

   To return to 3D/4D pre-mode, press **Dual** Key.

NOTE: *If the volume size is too large, the message "Volume Size Too Big - Quality Degraded" displays in the status bar. The system changes the quality automatically to below the upper limit and displays the proper Quality value in the information window.*

8. Set Render to On.

9. To complete the acquisition, press **Freeze**.

10. Store the image.

4D

4D provides continuous, high volume acquisition of 3D images. You can apply rendering techniques to smooth out the appearance of an anatomical structure, for example, a baby face.

4D imaging contains two main viewing modes: Sectional and Render. Sectional mode displays three separate representations of the image: Longitudinal (original 2D image), Transverse (elevational), and Coronal (horizontal). Render mode displays one rendered 4D image.

Acquiring a 4D Volume of Interest (VOI)

Once you have acquired an optimized 2D image, you can perform a 4D scan to acquire the 4D image.

During 4D image acquisition:

- Frame Averaging is disabled.
- You cannot change the transmit frequency.
- To change the position of the focal zone, adjust the depth of the VOI.
- You cannot change the number of focal zones.

To acquire a 4D VOI:

1. Select **4D**.
2. Make sure the VOI is defined appropriately. If necessary, adjust the volume angle. This defines the range of the volume sweep. A small sweep angle results in a lower number of slices with a higher volume rate.

   See Manipulating the Volume of Interest (VOI) for more information.
3. To begin 4D acquisition, press **Dual** key. The system will perform continuous sweeps across the VOI. You do not have to hold the probe steady during a 4D scan.

   To return to 4D pre-mode, press **Dual** key again.
4. Set the Render to On.

Sectional VOI Acquisition

Sectional view provides three separate views of the same image: Longitudinal (original image), Transverse (elevational), and Coronal (horizontal).

1. In the 4D tab, Render defaults to On (Render mode). Change Render to Off for Sectional view.

2. To select a reference image, use the Ref Image control on the control panel. The reference image selected contains the focus for control panel keys, allowing you to manipulate or optimize that image.

Table 5-19:   4D Data Acquisition Parameters

4D Parameter	Description
Restore View	Resets the parameters back to the original values or chosen presets.
Tile	Selections: Single, Dual, Quad. You can divide the display into 1, 2 or 4 windows.
Visualization	Sectional/Render/TUI. Render view displays one rendered image, or reference image(s) and rendered image.
Orientation Help	Displays a three-dimensional drawing to illustrate the orientation. Only displays in sectional view.
Volume Angle	Sets the range of the volume sweep.
B Quality	Selections: Max,Hi2,Hi1, Mid2, Mid1, Low. Used to balance speed with line density. Low combines the lowest density with the highest speed.

Render VOI Acquisition

Rendering allows you to distinguish subtle anatomical detail. You can render all areas of an VOI, or just certain regions of the VOI. The region you define for rendering is referred to as the Render Box.

1. Define the area you want to render. For example, if you have an image of an entire fetus, you might only want the fetal face to be rendered. Therefore, you would define the fetal face as the VOI.

2. Set Render to On.

Figure 5-87.   Example of Rendered 4D Image

Render VOI Acquisition (continued)

Table 5-20:   4D Data Acquisition Parameters - Render Mode

4D Parameter	Description
Restore View	Select to reset the parameters back to the original values or chosen presets.
Tile	Selections: Single, Dual, Quad. You can divide the display into 1, 2, or 4 windows.
Visualization	Sectional/Render/TUI. Render view displays one rendered image, or reference image(s) and rendered image.
3D Orient	When selected, changes the orientation of the image on the monitor display. Selections include: 0 degrees, 90 degrees, 180 degrees, and 270 degrees.
Volume Angle	Sets the range of the volume sweep.
Quality	Selections: Low, Mid1, Mid2, Hi1, Hi2, Max. Used to balance speed with line density. Hi2 combines the highest density with the slowest speed. Low combines the lowest density with the highest speed.
Activate Curve	Define a three-point curved surface for the render window using the Trackball.
Reset Curve	Reset the three-point curve to a straight line.
Mix	Selections: 0-100% in increments of 2. Allows you to mix a Rend Mode 1 mode with a Rend Mode 2 mode. Always select two modes.
Threshold	Selections: 0-255. Sets a lower threshold below which weaker echoes are removed.

Render VOI Acquisition (continued)

1. Select the *Render Setting* tab.

    The Render Setting tab allows you select and combine gray-scale and color rendering modes.

HINTS

If you are using Surface modes, we recommend that you adjust the Lower Threshold to recognize border structures more clearly.

Table 5-21:   4D (Data Acquisition) Render Parameters

4D Parameter	Description
Direction	The ROI determines the region that is rendered during 4D acquisition. You can change the direction in which this ROI is viewed. Selections: **Up/Down**, **Down Up**, **Left/Right**, **Right/Left**, **Front/Back**, **Back/Front**.
Gray Map	Displays the gray map selections on the display monitor. Select maps using the **Trackball**.
Colorize	Displays the tint map selections on the display monitor. Select maps using the **Trackball**.
Render Mode	Select Gray or Inversion. If you select Inversion, inverts the gray values of the rendered image (e.g., image information that was black becomes white and vice versa).

Table 5-21:   4D (Data Acquisition) Render Parameters (Continued)

4D Parameter	Description
Render 1 / Render 2	Allows you to combine render mode values from render mode 1 and render mode 2. Select the render map combination from the upper-left portion of the monitor display. Select map combinations using the **Trackball**. Render Mode 1 Selections: Surface Smooth, Surface Texture, Transp Max, Transp X-ray, Transp Min. **Surface Smooth** - Surface displays in a smoothed texture mode, which means that the gray values of the surface are identical with the gray values of the original 2D scan. **Surface Texture** - Surface displays in texture mode, which means that the gray values of the surface are identical with the gray values of the original 2D scan. **Transp Max.** - Displays the maximum intensity of gray values in the ROI. This is helpful for viewing bony structures. **Transp X-Ray** - Displays all gray values in the ROI. **Trans Min.** - Displays the minimum number of gray values in the ROI. This is helpful for viewing vessels and hollow structures. Render Mode 2 Selections: Surface Smooth, Light, Gradient Light, Transp Max, Transp X-ray, Transp. Min. **Surface Smooth** - Surface displays in a smoothed texture mode, which means that the gray values of the surface are identical with the gray values of the original 2D scan. **Light** - Surface displays in light mode. Structures in the near field are brighter; structures in the far field are darker. **Gradient Light** - Surface displays as if it is illuminated from a spot light source. This is helpful if the displayed surface is surrounded by hypoechoic structures (for example, liquids). **Transp Max.** - Displays the maximum intensity of gray values in the ROI. This is helpful for viewing bony structures. **Transp X-ray** - Displays all gray values in the ROI. **Transp Min.** - Displays the minimum number of gray values in the ROI. This is helpful for viewing vessels and hollow structures.
Adv. Render	**Surface Smooth Plus** - Surface display in more smoothed mode. **Transparence Plus** - Makes the image/information more transparent. **Dynamic light -** Virtual light direction can be real time dynamically adjusted 'Light Horz (horizontal) / Light Vert (vertical)' by user.

Table 5-21:   4D (Data Acquisition) Render Parameters (Continued)

4D Parameter	Description
Transparency	Selections: 20 to 250. Sets the transparency of the image. The higher the number, the more transparent the gray scale information.

Manipulating the Volume of Interest (VOI)

Imagine you are able to manipulate the 4D volume of interest (VOI) in your hand. The 3D/4D ROI is a tangible anatomical object that you can see and manipulate easily using the **Trackball** and other control panel keys.

If the monitor display is in Sectional view, select the desired reference image before you manipulate the image.

Moving through the VOI

To move through the image to view a particular slice, press **Shift**.

This allows a displacement of the center of rotation along the intersection lines of the sectional planes A, B, and C. The displacement of the center of rotation leads to the display of parallel sectional images.

Zooming the Image

Press **Zoom** to zoom on the image.

Moving the VOI Position

To move the position of the VOI, press **Set key** on the control panel until **Pos** is highlighted, then move the **Trackball** left, right, up and down, as needed.

Resizing the VOI

To re-size the VOI, press **Set key** on the control panel until **Size** is highlighted, then move the **Trackball**.

Stopping 4D Image Acquisition

To stop acquiring a 4D image, press **Quad** if you are in Render view or just **Freeze** if you are in Sectional view.

4D VOI Post-Processing

When you press **Freeze**, the system menu may differ, depending on whether you are in Render view or Sectional view.

Volume CINE

The system constantly stores CINE images so you can play back and review those images. CINE is useful for focusing on images during the specific part of the heart cycle or to view short segments of a scan session.

To activate CINE in 4D:

1. Press **Freeze**.
2. Select the **VolCine** tab.

Table 5-22:   4D Cine Parameters

Preset Parameter	Description
Loop Mode	Selections include: One Way, BiDirectional (two-way). **One Way** - plays one loop sequence forward. **BiDirectional** - plays the sequence forward and backward.
First	Displays the first volume in the CINE loop.
Last	Displays the last volume in the CINE loop.
Run/Stop	Starts and stops the CINE loop.
Loop Speed	Values include: 10% - 200%, in increments of 10. Adjust the loop speed of the CINE.
Volume by Volume	Used to select an individual volume in the CINE loop.

3. If you were in Render visualization mode when you entered 4D CINE mode, you can also press **Dual** Key to return to the Pre-Mode.

   If you were in Sectional visualization mode when you entered 4D CINE mode, you can press **Dual** key to return to the Pre-Mode.
4. To re-start real-time 4D acquisition, press **Dual**.

3D Rotation CINE

3D Rotation CINE allows you to view the 3D image from various angles.

To activate rotation CINE in 3D:

1. Press **Freeze**.
2. Select the 3DRot Cine tab.

NOTE: *If you press Run/Stop to start the CINE sequence without changing the Calc Cine Sequence or other parameters, the system calculates a sequence and displays a message that a time-sensitive sequence is being performed.*

Table 5-23:   3D Rotation Cine Parameters

Preset Parameter	Description
Rotational Angle	Sets the rotational angle of the 3D image over which the CINE loop is played. Typical values are 30, 45, 60, 90, 180 and 360 degrees.
Step Angle	Sets the step angle between individual frames in the CINE loop.
Rotation Axis	Sets the axis about which the CINE loop is calculated. Selections X and Y.
Loop Mode	Selections include: One Way, BiDirectional (two-way). **One Way** - plays one loop sequence forward. **BiDirectional** - plays the sequence forward and backward.
First	Displays the first volume in the CINE.
Last	Displays the last volume in the CINE.
Run/Stop	Starts and stops the CINE sequence.
Start Angle	Used to select the starting angle in the CINE loop range. The default Start Image is calculated from the rotational angle as: -1 X Rotational angle / 2 If you adjust the Start Image, the Rotational Angle is re-set to be the value of the adjusted Start Image.
End Angle	Used to select the ending angle in the CINE loop range. The default End Image is calculated from the rotational angle as: Rotational angle / 2 If you adjust the End Image, the Rotational Angle is re-set to be the value of the adjusted End Image.
Image by Image	Used to select an individual image in the CINE loop.

Scalpel

Scalpel allows you to edit/cut sections of a 3D image. Scalpel is available only on a rendered image.

Table 5-24:   Scalpel Parameters

Preset Parameter	Description
Cut Mode	Selections: Inside Contour, Outside Contour, Inside Box, Outside Box, Eraser Big, Eraser Small. **Inside Contour, Outside Contour** - Allows you to trace the portion of the image you want to cut. Trace Outside removes all portions of the image that fall outside your traced region. Trace Inside removes all portions of the image that fall inside your traced region. **Inside Box, Outside Box** - Displays a box you can use to define the portion of the image you want to cut. Outside Box removes all portions of the image that fall outside the box. Inside Box removes all portions of the image that fall inside the box. **Eraser Big, Eraser Small** - Provides a big and small eraser tool you can use to define the portion of the image to cut by hand. Available only if Depth is Full.
Cut Depth	Selections: Full, Define. **Full** -The entire depth of the selected region will be cut. **Define** - Allows you to define the depth to cut using the Depth control panel knob.
Undo Last	Undoes the last cut only.
Redo	Select to redo scalpel.
Undo All	Undoes all cuts since you entered Scalpel mode.
Done	Select when scalpel is complete.

Scalpel (continued)

1. Press **Freeze**.

2. Select **Scalpel**.

3. Select the cut mode.

4. Use the **Trackball** and **Set** key to define the portion of the image to cut. Press **Set** to start, move the **Trackball** to define the region, then press **Set** again to cut the image. The portion is removed.

    To undo the last cut, select *Undo Last*.

    To undo all cuts in the current session, select *Undo All*.

NOTE: *With the cut image displayed, if you attempt to switch to the Static 3D tab to edit the ROI, the following warning message appears: Scalpel changes will be lost. Do you want to continue? [Yes/No].*

Static 3D

You can create a single sweep, single volume static 3D image.

Performing a Static 3D Scan

1. Connect the 4D probe RAB2-6-RS.
2. Select RAB2-6-RS from the probe indicator.
3. Obtain a 2D image. Optimize the image as usual.
4. Press **3D/4D**.
5. Rotate *Static 3D*. Set Render to On.
6. Set the Volume of Interest (VOI) to be rendered. Press **Set** key until the **Pos** is highlighted, then move the **Trackball** to position the VOI. Then press **Set** key until the **Size** is highlighted, then move **Trackball** to re-size the VOI.
7. Adjust the volume angle. This defines the range of the volume sweep. A small sweep angle results in a lower number of slices with a high volume rate.
8. Set the probe down on the patient, making sure the probe is held steady. Press the **Dual** key to start acquisition.

NOTE: *During 3D acquisition, the CW, PW, M, and Depth control panel keys are not available.*

NOTE: *When the 3D acquisition begins, the screen appears blank for a brief moment.*

9. Hold the probe steady until the system stops automatically. You will know the acquisition has stopped when the system menu changes to display the Render Setting, 3D Rotational Cine, and Scalpel tabs.

   To stop the acquisition manually, press **Freeze**.
10. Save the image.
11. To further manipulate the 3D image, Rotate *Static 3D*.

    The system menu that displays depends on the visualization mode selected prior to freeze, Sectional, Render.

Static 3D Render View

Table 5-25:   3D After Acquisition Parameters - Render View - Page 1

Preset Parameter	Description
Edit/Accept ROI	Selections include Edit, Accept. **Edit** - Select to adjust the size of the Region of Interest (ROI). **Accept** - accepts the active 3D image. Returns the cross rodman to its original values
3D Orient	When selected, changes the orientation of the image on the monitor display. Selections include: 0 degrees, 90 degrees, 180 degrees, and 270 degrees.

Static 3D Sectional View

Table 5-26:   3D After Acquisition Parameters - Sectional View

Preset Parameter	Description
Orientation Help	Displays a 3-dimensional drawing to illustrate the orientation. Only displays in sectional view.

Tomographic Ultrasound Imaging (TUI)

Tomographic Ultrasound Imaging (TUI) is a visualization mode which presents data as parallel slices (planes) through the dataset. This method of visualization is consistent with CT and MRI. The distance between the different planes can be adjusted.

1. Select *TUI* as the Visualization mode on the Primary Menu.

2. Start acquisition.

3. If in 4D mode, press *Quad* to end the acquisition. This step is not required in Static 3D.

   The reference image and the number of specified slices appears. The reference image always displays and indicates which slices you are currently viewing as solid lines.

Tomographic Ultrasound Imaging (TUI) (continued)
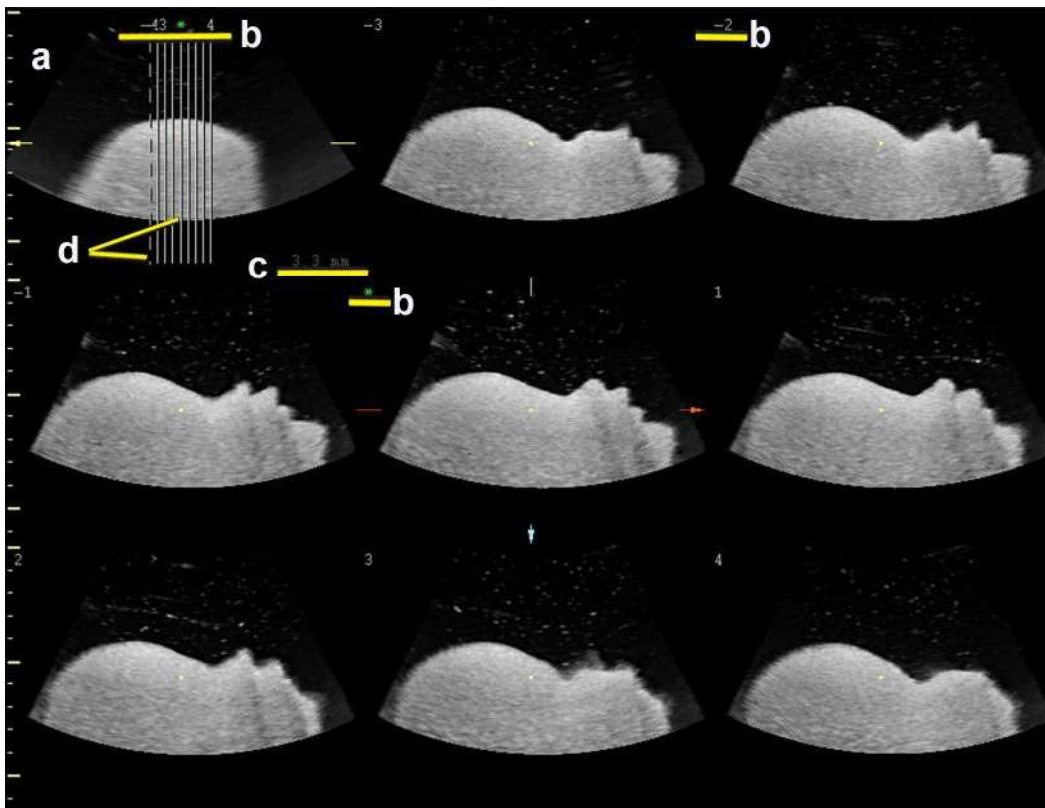
Figure 5-88.   TUI 3x3 Example

a.   The TUI reference image that shows the slice position. This image is orthogonal to the reference image.

b.   The number and green asterisk shows the position of each slice. A green asterisk indicates the center image (A, B or C plane).

c.   Slice distance displays when the slices are in certain intervals.

d.   A solid line indicates the slice appears on the monitor.

A dotted line indicates the slice did not appear on the monitor.

Tomographic Ultrasound Imaging (TUI) (continued)

4. Adjust the number of the slices and slice distance.

You can adjust the number of slices by using the *Slices*.
You can adjust the distance between the slices using the
Slice Distance. Max value is 40mm for 4D and Static 3D.
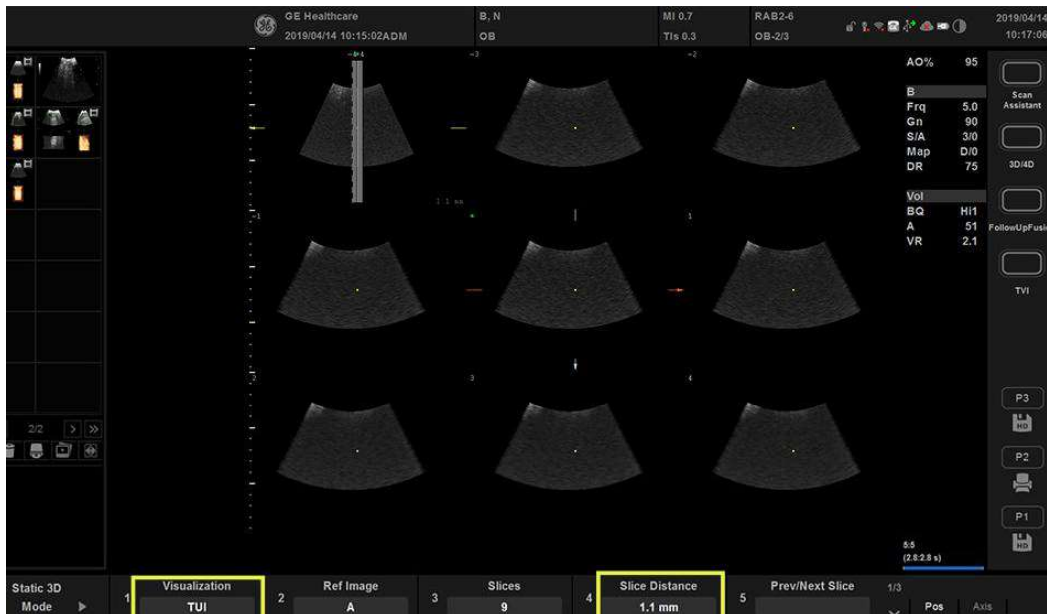
Figure 5-89.   TUI

- Select *Display Format* from 1x1, 1x2, 2x2 and 3x3.
- Change the center image via *Ref. Image* if needed (Reference image A, B or C).
- Move forward/backward through the slices via *Prev./ Next Slice*.
- The following features are supported in TUI: Active (X/ Y/Z/Shift), Trackball (Move the position) and Gain.

Scan Coach (Option)

Before performing Scan Coach function on the system, please read and accept the Statement, Disclaimer and Limitation of liability described as below:

Statement

- Scan Coach IS NOT MEANT TO REPLACE TRAINING, OR TUTORIALS/HANDS-ON. IT IS MERELY A REFRESHER TOOL OF ALREADY RECEIVED EDUCATION AND TRAINING.
- Scan Coach IS AN ON -DEMAND REFRESHER AND REMINDER TOOL WHICH DISPLAYS INFORMATION IN THE FORM OF DICOM IMAGES AND ANIMATIONS; THE PROVIDED REFERENCE MATERIAL MAY HELP USER IN ACQUIRING ULTRASOUND IMAGES.
- Scan Coach DOES NOT PROVIDE A DIAGNOSIS, BUT DOES PROVIDE REFERENCE MATERIAL FOR SOME TYPES OF ACQUISITIONS.
- Scan Coach IS MEANT TO PROVIDE REFERENCE MATERIAL FOR ACQUISITION, BUT IT IS NOT INTENDED TO IDENTIFY DIAGNOSTIC IMAGE QUALITY. ACTUAL IMAGES, INCLUDING IMAGE QUALITY, OF THE DEVICE MAY VARY VERSUS THE PROVIDED REFERENCE MATERIAL.

Disclaimer

Scan Coach AND THE CONTENT AVAILABLE THROUGH IT ARE PROVIDED ON AN "AS IS" AND "AS AVAILABLE" BASIS. YOU EXPRESSLY AGREE THAT USE OF Scan Coach AND/OR ITS CONTENT IS AT YOUR SOLE RISK. TO THE FULLEST EXTENT PERMISSIBLE PURSUANT TO APPLICABLE LAW, GE AND ITS AFFILIATES DISCLAIM ALL WARRANTIES OF ANY KIND, WHETHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT. YOU EXPRESSLY AGREE THAT USE OF Scan Coach, INCLUDING ALL CONTENT, IS AT YOUR SOLE RISK.

ANY RESPONSIBILTY FOR IMAGE ACQUISITION, IMAGE INTERPRETATION, IDENTIFICATION OF ANATOMICAL PARTS, ANATOMICAL MEASUREMENTS AND CLINICAL DIAGNOSIS LIES WITH YOU, THE ULTRASOUND USER.

TO THE FULLEST EXTENT PERMISSIBLE PURSUANT TO APPLICABLE LAW, GE AND ITS AFFILIATES DISCLAIM ALL LIABILTY AND RESPONSIBILITY FOR ANY DAMAGES SUFFERED BY A USER, OR PATIENT OF A USER INCLUDING, BUT NOT LIMITED TO, DAMAGES ARISING OUT OF LOSS OR INACCURACY OF CONTENT OF Scan Coach.

IT IS THE RESPONSIBILTY OF YOU, THE ULTRASOUND USER, TO UNDERTAKE ALL NECESSARY AND CUSTOMARY TRAINING, AND TO MEET ALL OTHER REQUIREMENTS OF APPLICABLE LAWS AND REGULATIONS, BEFORE USING THE ULTRASOUND DEVICE.

Limitation of Liability

UNDER NO CIRCUMSTANCES, INCLUDING, WITHOUT LIMITATION, NEGLIGENCE, SHALL GE OR ITS PARENTS, SUBSIDIARIES, AFFILIATES, OFFICERS, DIRECTORS, EMPLOYEES, AGENTS, OR SUPPLIERS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES ARISING FROM OR IN CONNECTION WITH THE USE OF OR THE INABILITY TO USE Scan Coach.

Introduction

Scan Coach displays information which helps user acquire the right scan plane. The reference image indicates how the scan plane image for a given step should look like. The probe/beam anime image shows the corresponding probe placement, or beam formation for getting the correct scan plane. The schema anime shows the key anatomical structures to be visualized in two dimensional mode.

Scan Coach can be used as an on-demand refresher/reminder tool in live scanning.

Scan Coach Description
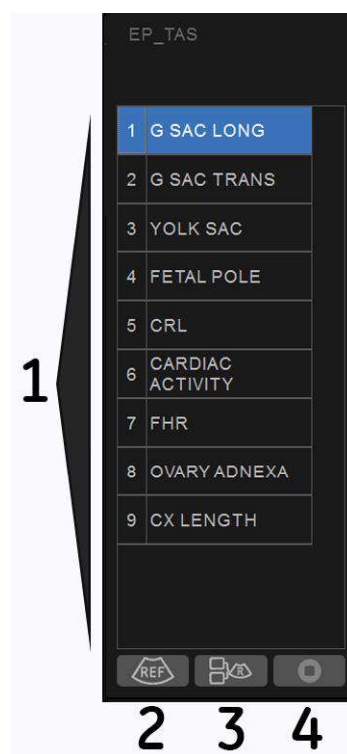
Figure 5-90.   Scan Coach Display Description

1.   Program step number and step name

NOTE: *The user is also able to select the program step by pressing the Up/Down key on the AN keyboard.*

2.   Select this icon to activate Reference image.

3.   Select this icon to activate Animation and Reference image.

4.   Select to Restart, Exit or Edit Scan Coach.

Setting up Scan Coach

Go to Utility -> Scan Coach -> Scan Coach Manager to create, import/export and manage the Scan Coach programs.
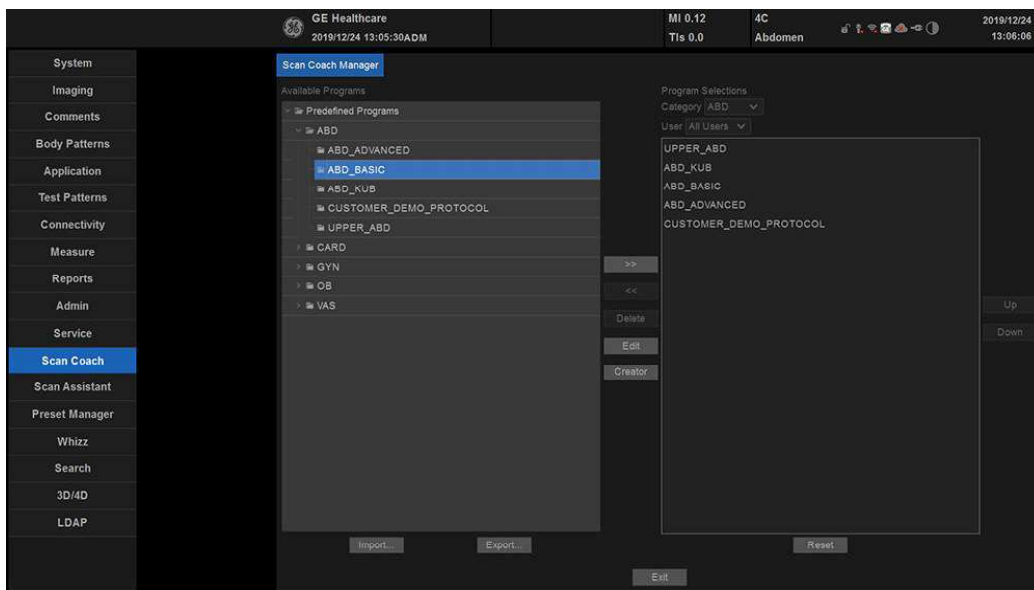
Figure 5-91.   Setting up Scan Coach

Using Scan Coach

1. Go to Utility -> Scan Coach-> Scan Coach Manager, select the protocol from the left column, move it to the **Program Selections** column. Then select **Exit** to the Scanning page.
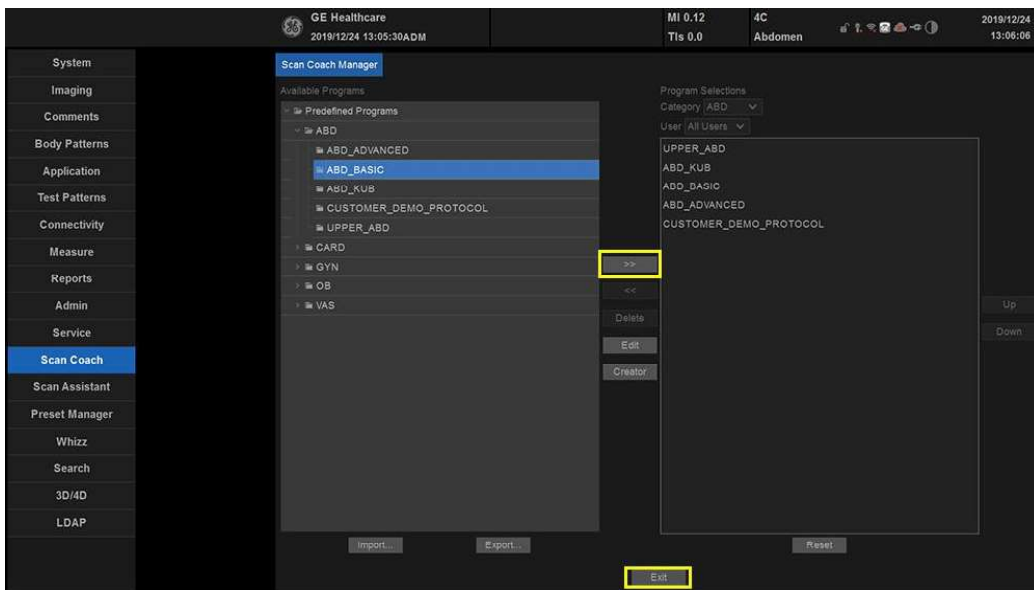
Figure 5-92.   Select Scan Coach Protocol

Using Scan Coach (continued)

2. Press **Scan Coach** key on the control panel to activate the Scan Coach function. The Scan Coach addendum displays, refer to 'Statement' on *page 5-231* for detailed information. Select **Acknowledge** to continue.
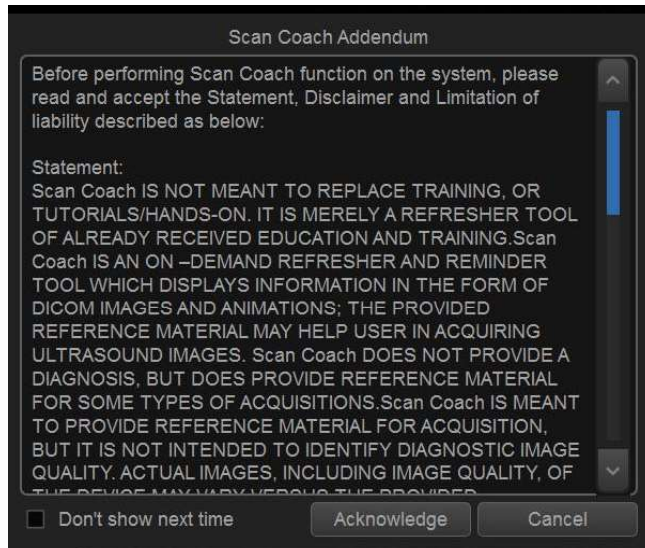
Figure 5-93.   Scan Coach Addendum

Or select **Cancel** not to start Scan Coach.

Check the box before **Don't show next time** and the Scan Coach addendum won't display next time.

3. Select the protocol from the pull-down menu, and then select **Start**.

NOTE: *If there is only one program in the current application, the system will display the Scan Coach screen directly. This step is only available when there are two or more programs.*
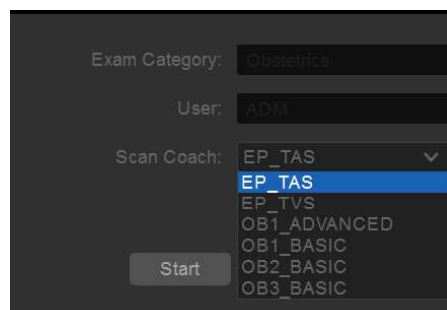
Figure 5-94.   Scan Coach Start

Using Scan Coach (continued)

4. If **Always Use Protocol Preview** is selected in **Utility** -> **System** -> **General**, the system will display a demo for the programs. It helps the user understand the workflow of Scan Coach.

NOTE: *Uncheck **Always Use Protocol Preview** and the system will not show the program preview.*
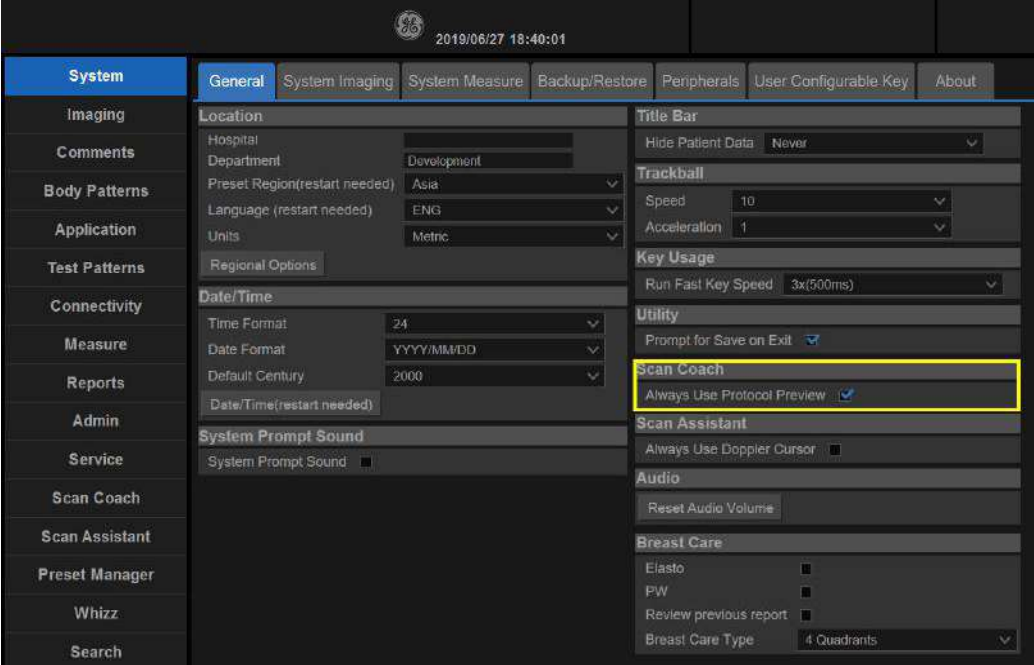
Figure 5-95.   Utility->System->General

Using Scan Coach (continued)
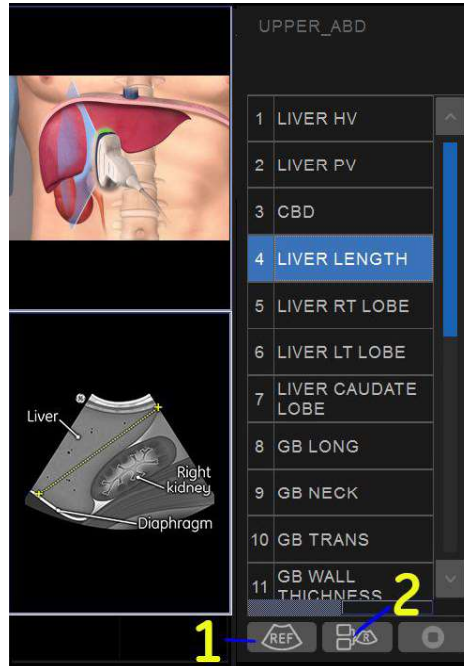
Figure 5-96.   Scan Coach Preview

5.   Select program, for example, LIVER LENGTH, then select the button **1** on Figure 5-96 to review the reference image.
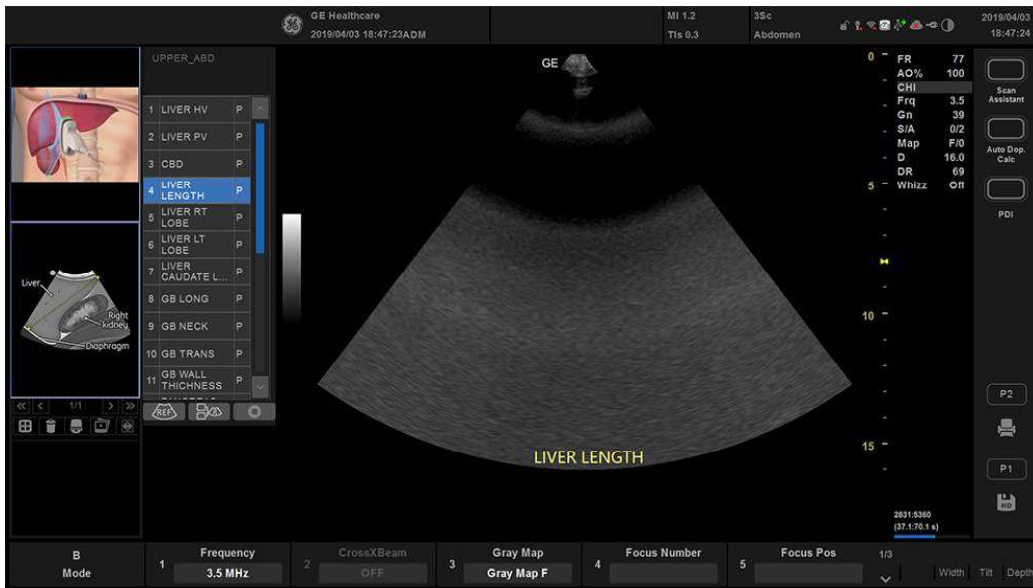
Figure 5-97.   Using Scan Coach

Using Scan Coach (continued)

6. The reference image is displayed. Then select the button **2** on Figure 5-96 to view the probe position and schema also.

    You can also press the button 1 to return to the program step list.
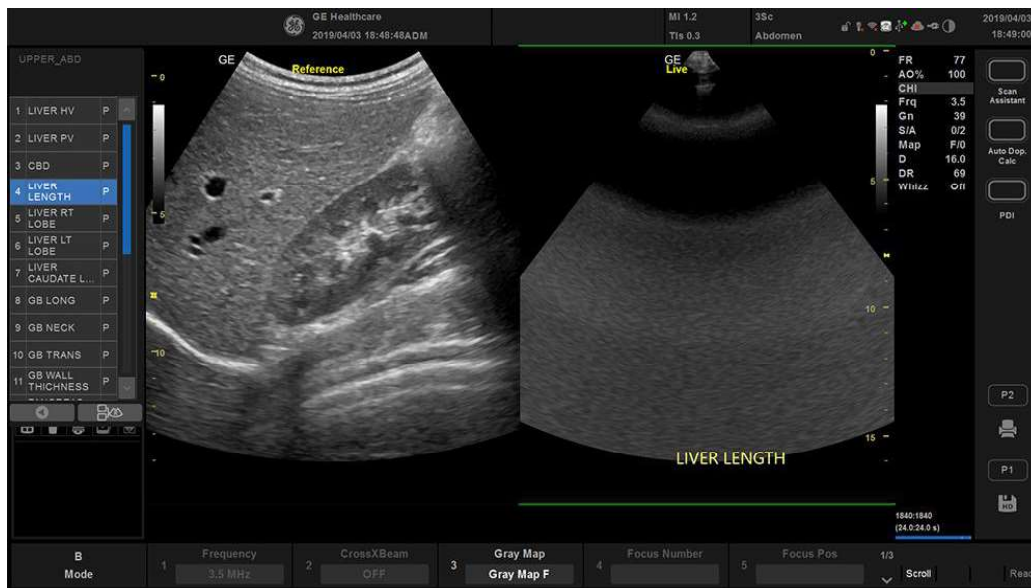
Figure 5-98.   Using Scan Coach Reference

Using Scan Coach (continued)

7. It displays reference image, probe position and schema to guide the user acquire the right scan plane.

Select the button 1 to stop/restart the video that demonstrates the probe position.
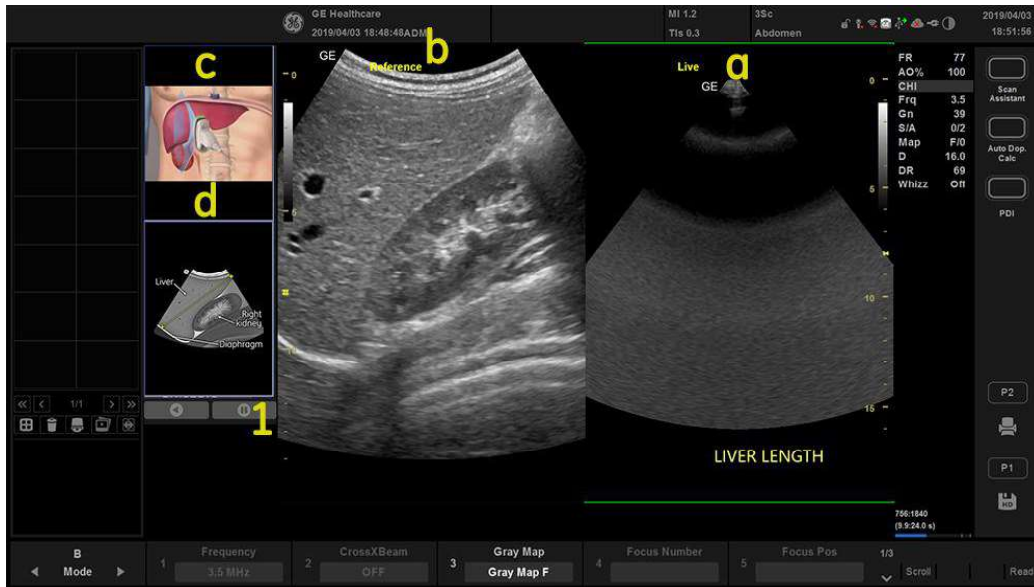
Figure 5-99.   Using Scan Coach Animation

a. live scan image

b. reference image

c. probe position

d. two dimensional schema of the current scan plane

Edit Scan Coach Protocol

1. To edit Scan Coach protocols, go to Utility -> Scan Coach ->
   Scan Coach Manager and select **Creator**.
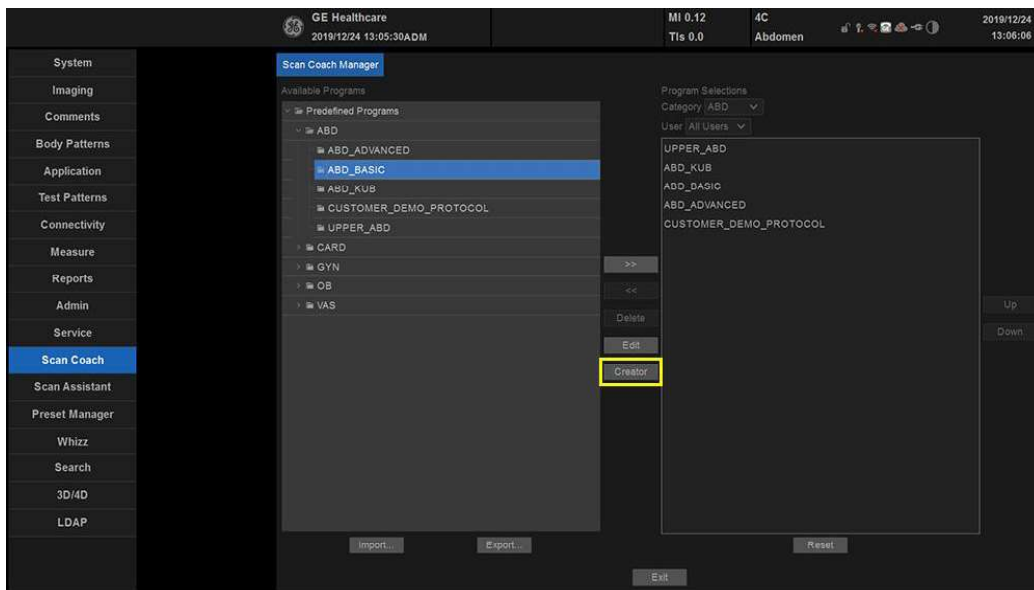
Figure 5-100.   Scan Coach Manager

Edit Scan Coach Protocol (continued)

Or Select the button marked as 4 in the program list.
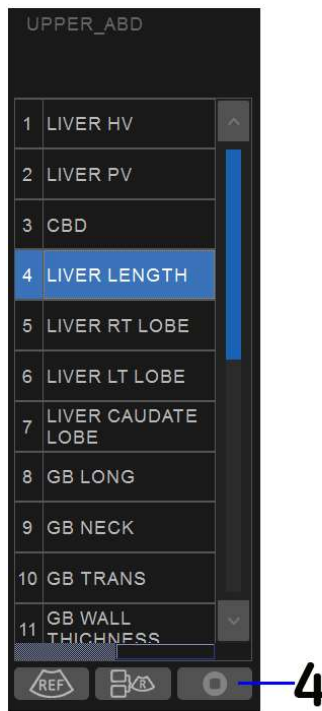
Figure 5-101.   Program List

Then select [✏] and the system will lead to the Scan Coach Edit page.
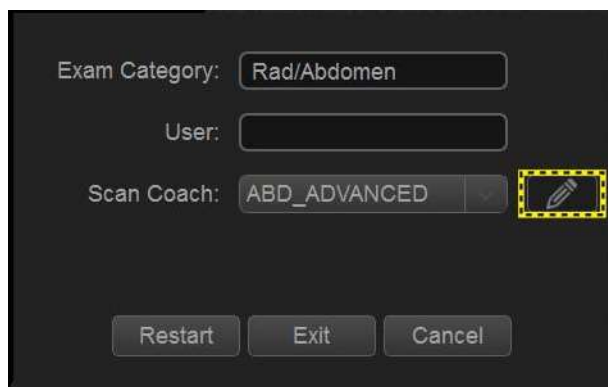
Figure 5-102.   Edit the Protocol

Edit Scan Coach Protocol (continued)

2. The Scan Coach Creator is used to build customized programs that can be imported onto the Versana Active. Select **Scan Coach** on the tool bar to display the Scan Coach edit page.
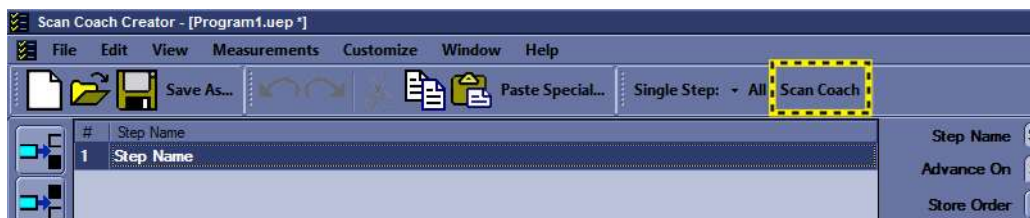
Figure 5-103.   Scan Coach Creator

3. Select the Scan Plane. Select **Browse** to upload the reference image.
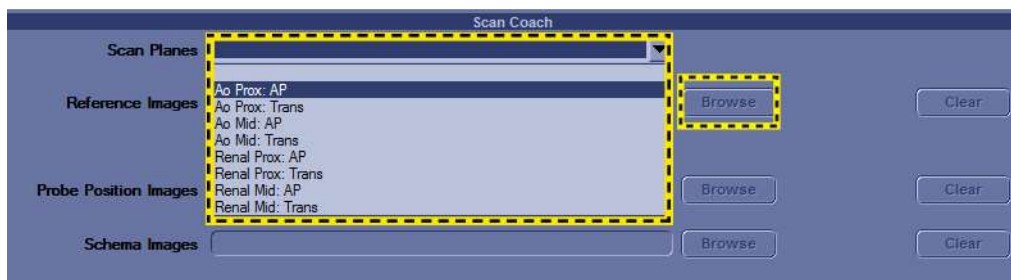
Figure 5-104.   Select Scan Plane

Edit Scan Coach Protocol (continued)

4. Select **Upload** to Upload the reference image from the folder called "Reference Images" of the corresponding application. Then select **Close** after the upload is complete.

NOTE: *The reference image only supports *.dcm file.*
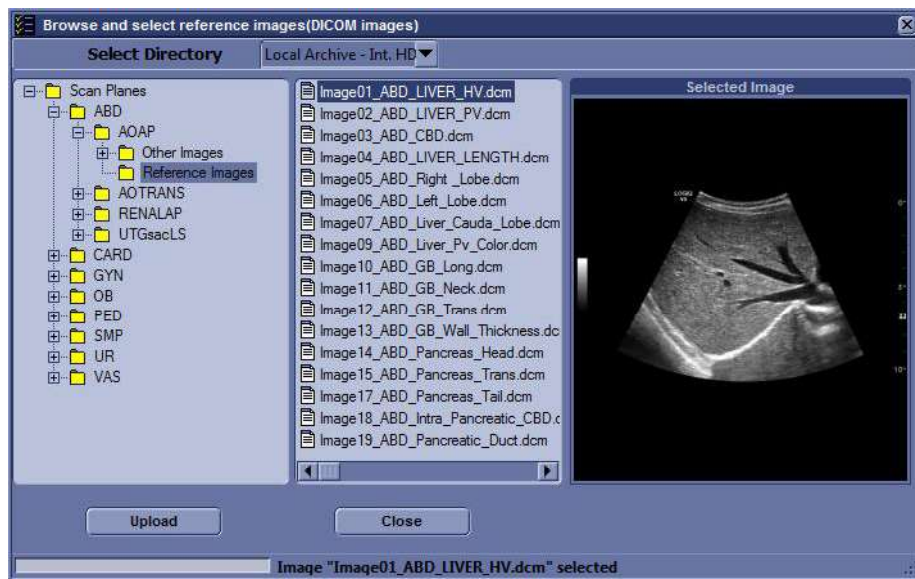
Figure 5-105.   Upload Reference Image

Edit Scan Coach Protocol (continued)

The reference image can also be uploaded from external USB stick/HDD/CD/DVD. Select the correct directory from the pull-down menu, and then select the appropriate image to upload.
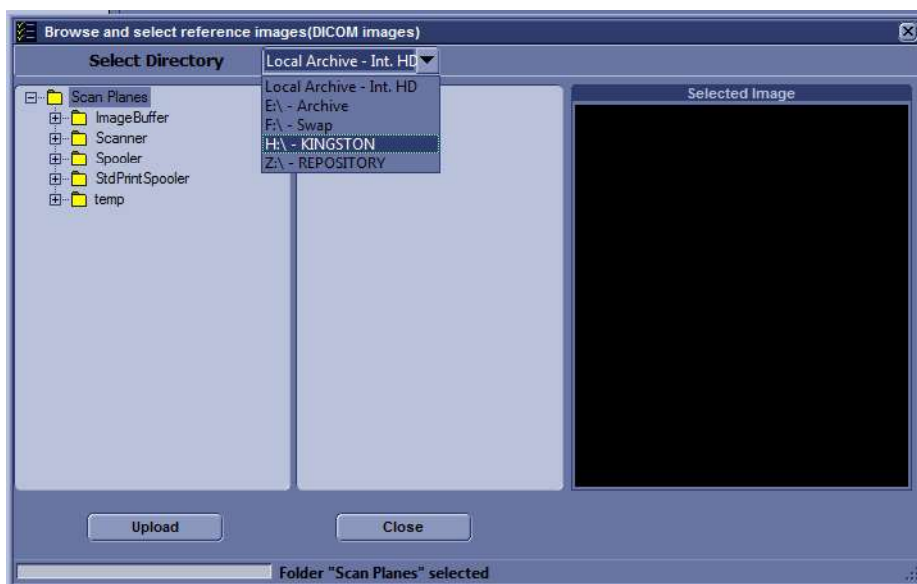
Figure 5-106.   Upload Reference Image 2

5. Upload Probe Position Image and Schema Image from the folder called "Other Images" of the corresponding application, or from the external devices.

NOTE: *A protocol can be created without uploading the reference image, but the protocol without reference image do not display in **Scan Coach Manager**. It can be found via **Utility** ->**Scan Assistant** ->**Scan Assistant Manager** -> **Predefined Programs**.*

Scan Assistant

Introduction

Scan Assistant provides an automated exam script that moves you through an exam step-by-step. This allows you to focus on performing the exam rather than on controlling the system and can help you to increase consistency while reducing keystrokes. The system automatically invokes the correct mode and imaging parameters, advances to the next step in an exam, annotates the image, initiates measurements, and assigns the measurements to the worksheet/report.

Availability

The following additional imaging parameters and preferences are available for use in a Scan Assistant program: CW Doppler, Dual on Freeze, Depth, Color Scale, PW Doppler Scale, PW Sample Volume size, and Flow Model Selection.

You can initiate one or more manual Doppler measurements/calculations.

Body Patterns are available for use during a Scan Assistant program. You can turn a Body Pattern on/off, select a particular Body Pattern graphic, and specify the position of the probe mark on the Body Pattern graphic.

The footswitch can be used with Scan Assistant. You can map Pause/Resume, Previous Step, and Next Step to the footswitch.

The "Always Use Doppler Cursor" preset, available on the Utility --> System --> General page, allows all PW Doppler steps to start with full screen 2D image plus mode cursor. You can specify the Store Order in Scan Assistant to set the Reading Order for the radiologist. The Learn Probe attribute can be set to learn and change the probe for the user in the middle of the exam.

Scan Assistant Definitions

Scan Assistant definitions:

- **Scan Assistant Manager**. Available via the Utility -> Scan Assistant page to import/export Programs created via the Scan Assistant Creator and to assign Programs to a user/ exam category.
- **Import**. Used to load Programs created via the Scan Assistant Creator on to the Versana Active.
- **Export**. Used to move Programs from one Versana Active system to another Versana Active.
- **Scan Assistant Creator**. Used to create Scan Assistant Programs.

Scan Assistant Description
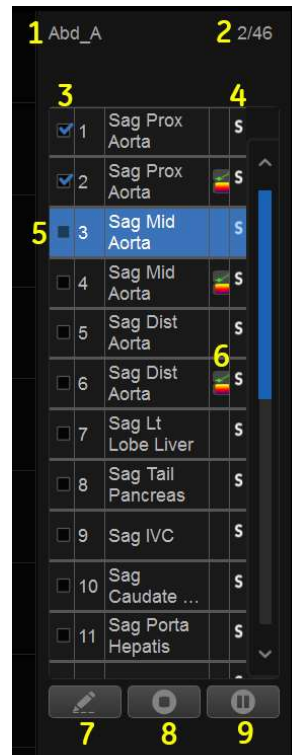
Figure 5-107.   Scan Assistant Display Description

1.   Program name.

2.   Completed steps/out of total number of steps, and step description area.

3.   Program step status (Complete/Incomplete), step number, step name. A checkmark indicates that this step has been completed. You can also manually check the box to bypass this step.

4.   This column indicates that the action moves the Program to the next step.

5.   Active step The box is green when the program is active or yellow when it is paused.

6.   This column indicates the mode or when a measurement needs to be made.

7.   Edit (Pencil Icon).

8.   Stop. Stop also allows the program to be stopped, restarted, or a new program selected.

9.   Pause/Resume.

Setting up Scan Assistant

To set up Scan Assistant,

1. Import the Scan Assistant Program created using the Scan Assistant Creator or exported from another Versana Active program.

    a. Insert the media with the saved Program from the Scan Assistant Creator or exported program from another Versana Active.

    b. Press **Utility** -> **Scan Assistant**.

    c. Select Import from the Scan Assistant Manager page.
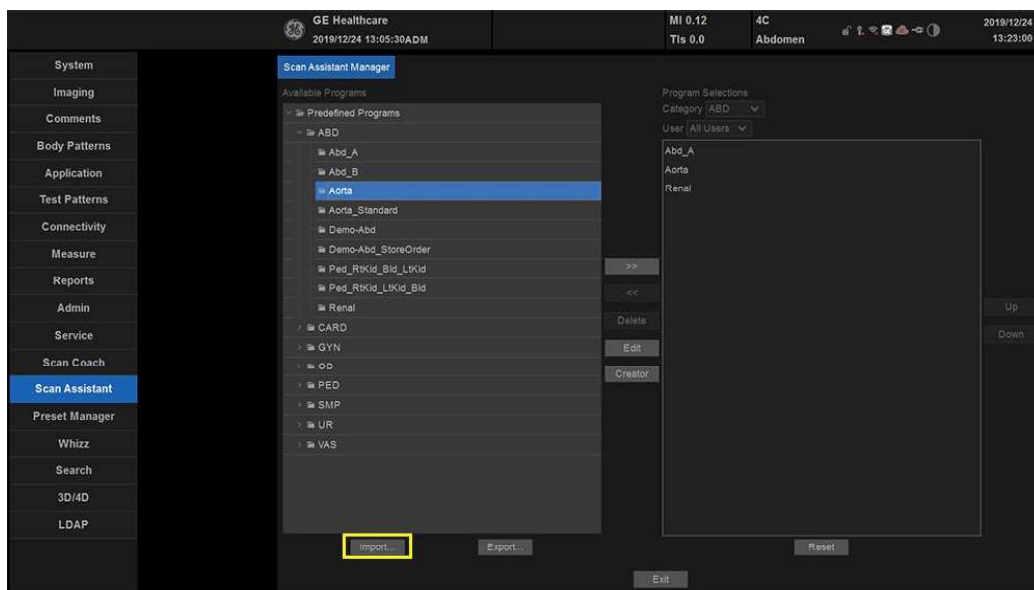
Figure 5-108.   Import Programs

    d. In the Source field at the top of the Import Programs pop-up, select the media that the Program is stored on.

Setting up Scan Assistant (continued)

e. Select the Program(s) to be imported. If a folder is selected, all programs in the folder will be imported.
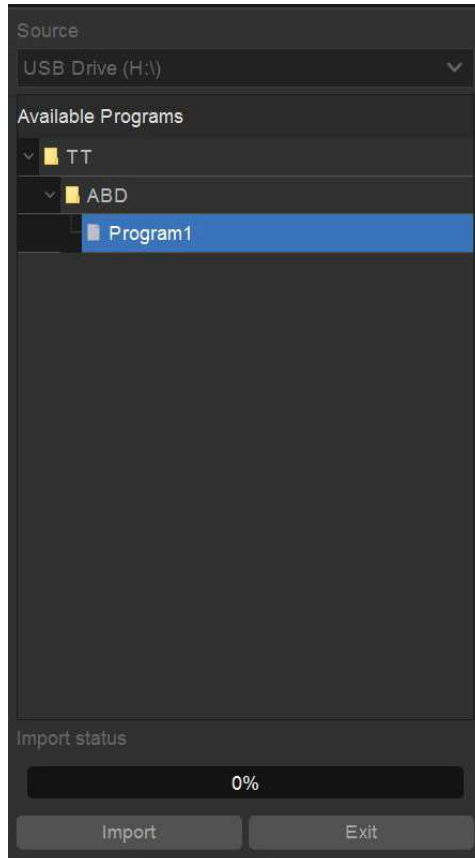
Figure 5-109.   Import Programs

Setting up Scan Assistant (continued)

      f.   Select Import. The Program(s) you selected are stored to the Versana Active. You can add it to the exam category and user.
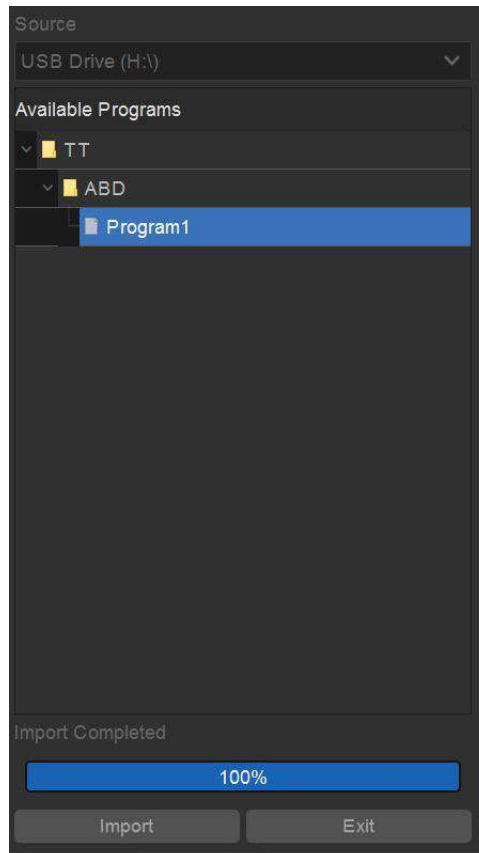
Figure 5-110.   Import Completed

Setting up Scan Assistant (continued)

2. Assign the imported Program to the exam category and user. Under Program Selections on the right-hand side of the Scan Assistant Manager page, specify the Exam Category and User for this Program. You can select All Users, or a specific user. If you specify All Users, all users will have the ability to use this Program while in the specified exam category, unless the user has his/her own list defined.

3. Select the imported Program from Available Programs -> Custom Programs on the left-hand side of the page. Then move the imported Program to the exam category and user selected above.

Figure 5-111.   Add Program

Versana Active – Basic User Manual
                                        Direction 5840764-100 English Rev. 10
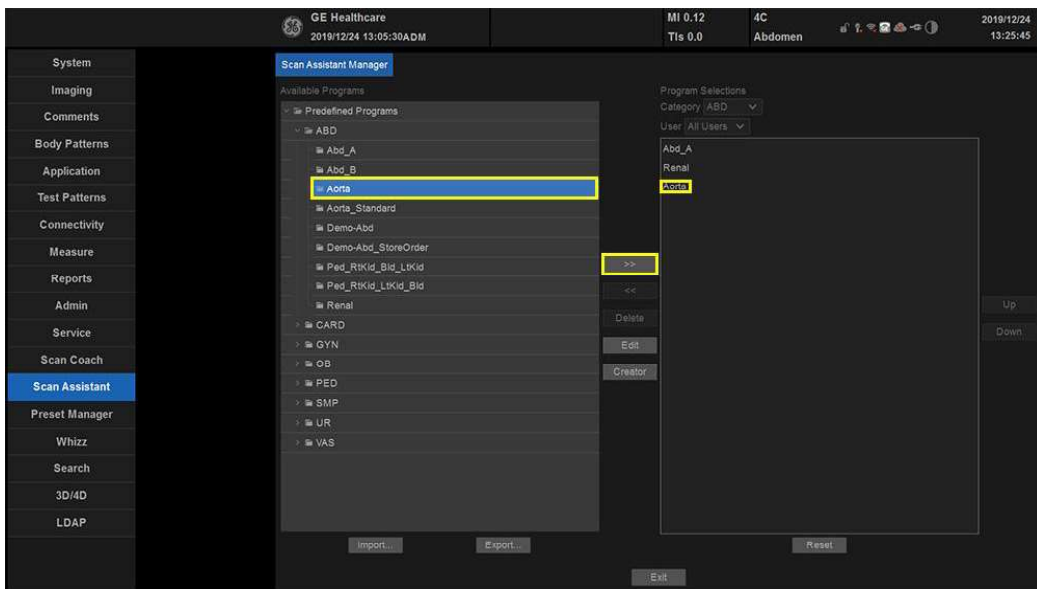
Setting up Scan Assistant (continued)

You can access the Scan Assistant Creator to edit the exam's program from the imaging display via the Creator Icon located at the bottom of the Scan Assistant Program monitor on the display. You can activate the Scan Assistant Creator from the image screen, make edits, and then run Scan Assistant to test your changes.

NOTE: *If you edit the program after you have already stored several images, and your edits change the number of program steps, you are prompted to Restart or Continue the Scan Assistant program.*

NOTE: *If you edit the program after you have already completed several steps, checkmarked steps remain checkmarked, even if you insert a new step between checkmarked steps. If this is not correct, you can edit the checkmarks or restart the program.*

Using Scan Assistant

After you have set up Scan Assistant, the Program is active when you exit the Patient menu. The Program is located on the left-hand side of the display and as you can see in the example below, the annotation for the first step has been automatically noted on the image, ready for you to scan the specified anatomy.

Figure 5-112.   Scan Assistant Display

Using Scan Assistant (continued)

1. Follow the steps indicated in the Program: image/measure the appropriate anatomy.

2. Perform the indicated trigger to move to the next step in the Program.

NOTE: *The footswitch can be used with Scan Assistant. You can map Pause/Resume, Previous Step, and Next Step to the footswitch.*

3. To pause or unpause Scan Assistant, press the pause button on the display.

4. To stop or restart a Program, press the Stop icon at the bottom of the Scan Assistant Program. A dialog pops up. This dialog lets you restart the current Program, start another Program, or stop Scan Assistant.

5. To skip a step or move to a certain step, press the up/down arrows on the keyboard or select the step you want to move to using the Trackball and Set key.

Exporting Scan Assistant Programs

Exporting Scan Assistant Programs allows them to be imported to another Versana Active or to be edited offline with the Scan Assistant Creator tool. To export a Program,

1. Insert the media to save the Program.

2. Press Utility -> Scan Assistant.

3. Select Export from the Scan Assistant Manager page.

4. In the Source field at the top of the Export Programs pop-up, select the media that the Program is to be stored on.

5. Specify the Program Directory using the drop-down menu if the desired Program Directory already exists on the media. If not, or if you want to export the Program to a new Program Directory, type a new Program Directory name in the field.

6. Select the Program(s) to be exported. If a folder is selected, all programs in the folder will be exported.
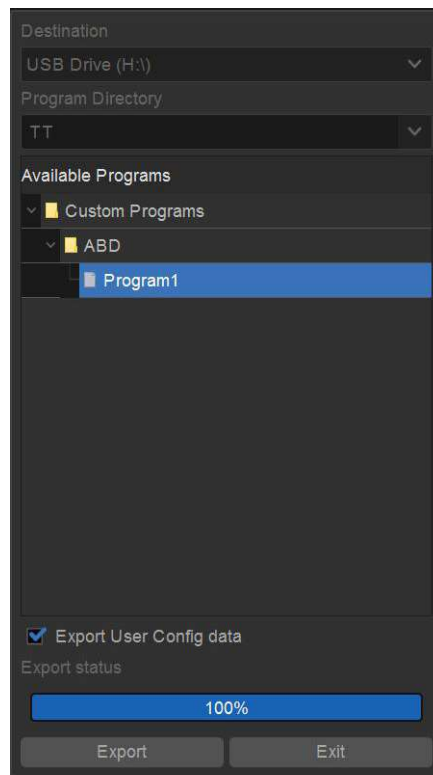
Figure 5-113.   Export Programs

7. Select Export. The Program(s) you selected are stored to the media. You can now import it to a new Versana Active.

SonoBiometry (AFB)

SonoBiometry (AFB)

SonoBiometry (AFB) is an alternative to the common fetal biometry measurements. It provides system suggested measurements for AC, BPD, FL, HC and HL which need to be confirmed by the user or can be changed manually.

NOTE: *SonoBiometry is only applicable for Hadlock.*

Table 5-27:   List of Abbreviations

Abbreviation	Full Form	Definition
AC	Abdominal Circumference	Abdominal Circumference of the baby's abdomen
BPD	Biparietal Diameter	Transverse distance between the protuberances of the two parietal bones of the skull
FL	Femur Length	The length in centimeters of the developing baby's femur (the femur is the long bone in the human thigh)
HC	Head Circumference	Head Circumference of the baby's head
HL	Humerus Length	The length of the Humerus

SonoBiometry (AFB) (continued)

Using SonoBiometry (AFB)

1. Press *Utility* and then select System.

2. Select System Measure.

3. Check the desired boxes under SonoBiometry (AFB) Option Selection to enable system suggested measurements.
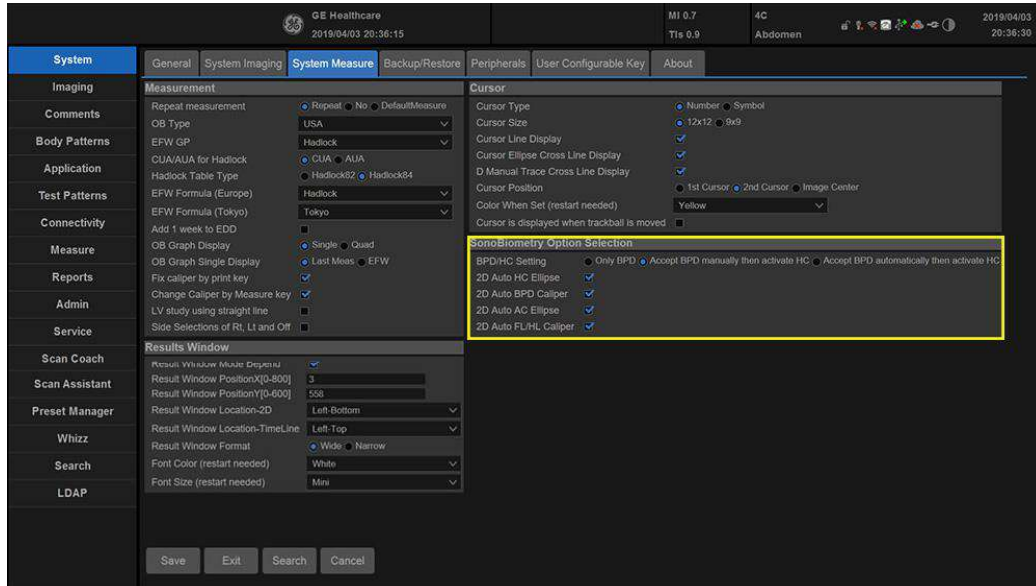
Figure 5-114.   SonoBiometry (AFB) checkboxes

Using SonoBiometry (AFB)

- Select OB.
- Press **Measure**.
- Select BPD/HC/AC/FL/HL.
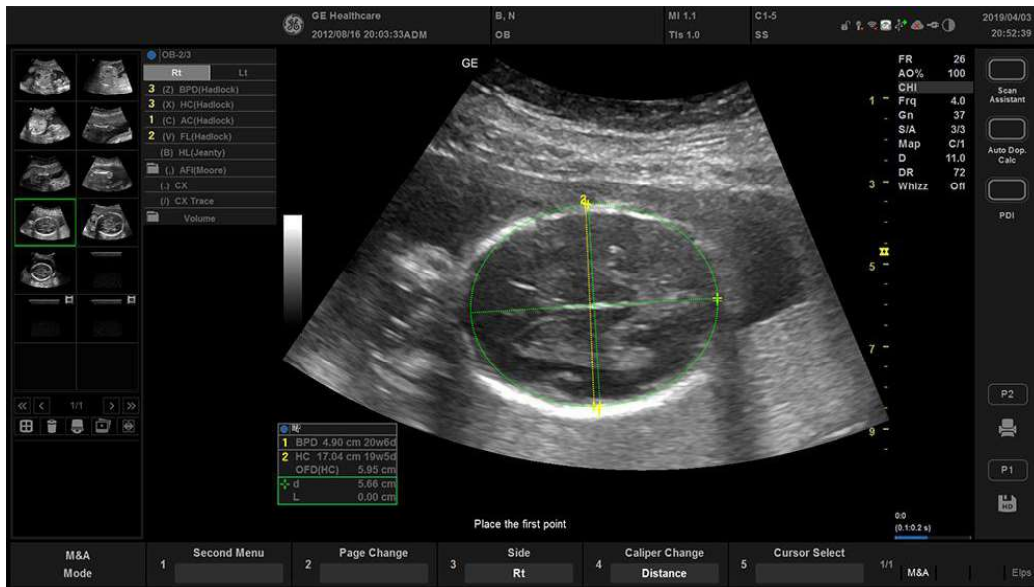
Figure 5-115.   SonoBiometry (AFB) option

NOTE: *SonoBiometry (AFB) measurements are supported on only recalled raw DICOM images and frozen images.*

Using SonoBiometry (AFB) (continued)

You can not use SonoBiometry (AFB) measurements on the following images:

- Images displayed in Dual/Quad view. In these views, an SonoBiometry (AFB) measurement will change to manual measurement automatically.
- Zoomed image.
- Rotated image.

NOTE: *If a particular scanned image does not have valid fetus data, a warning message appears: "Auto measurement failure. Adjust calipers manually ...".*

NOTE: *If a particular image is not supported for SonoBiometry (AFB) measurement, a warning message appears: "Auto measurements do not operate on DICOM images. Using manual measurement ...".*

Chapter 6

Scanning/Display Functions

Describes additional ways in which to adjust the image. In addition, describes additional ways to get useful information electronically.

Zooming an Image

Introduction

Zoom is used to magnify a zoom region of interest (ROI). The system adjusts all imaging parameters accordingly. You can also zoom frozen images.

To zoom an image, rotate **Zoom/Ellipse** clockwise. A reference image appears in the lower, left-hand section of the display.

To exit zoom, press **B**-Mode or rotate **Zoom** counterclockwise until the reference zoom image is removed.

Reference Image is the small un-zoomed image displayed next to the zoomed image.

Bioeffect

Write Zoom an image changes the frame rate which tends to change thermal indices. The position of the focal zones may also change which may cause the peak intensity to occur at a different location in the acoustic field. As a result, the MI (TI) may change.

Acoustic Output Hazard

Observe the output display for possible effects.

Read vs. Write Zoom

Read Zoom

To activate Read Zoom, turn the **Zoom** button.

Read Zoom magnifies the display of the data without making any changes to the ultrasound image data that is acquired.

Available in a live, frozen, cine, or recalled raw data image.

Write Zoom

To activate Write Zoom, press the **Zoom** button.

With Write Zoom, the Ultrasound line density and/or sampling frequency increases, giving a better resolution.

Available only in pre-processing.

NOTE: *Write zoom window size (height and width) can be set via Utility ->Imaging -> B-Mode.*

NOTE: *The difference between Read Zoom and Write Zoom can be described in relation to photography. With a photograph, Read Zoom manipulates the negative and enlarges the picture; whereas Write Zoom uses a telephoto lens to bring the image closer before taking the picture.*

HINTS   First use the Read Zoom (turn button) to get to the area of interest, then use Write Zoom (press button).

Split Screen

Overview

Versana Active supports the following multiple image format:

- Dual (split the window area into 2 areas)
- Wide Dual (split the window area into 2 areas, but wider than the normal dual)
- Quad (split the window area into 4 small areas)
  This is useful, for example, when measuring AFI.
- Simultaneous

Dual/Quad

To activate a dual split screen, press **Dual**. To activate a quad display, press **Quad**.

When you activate Split Screen by pressing **Dual**, the single image is placed on the left side.

To switch between active images, press **Dual**.

To deactivate, press **B**.

NOTE: *To put a copy of the image on the opposite side when entering dual split screen, use the "When Entering Dual Image..." preset via Utility --> Application --> Settings.*

Simultaneous mode

While using CFM or PDI, press the **Dual** and **Quad** keys simultaneously to display B and B+CFM, or B and B+PDI in real-time on the left and right side.

It is useful to observe the ROI in B-Mode.

Dual Caliper

In split screen, you can draw a caliper, area, ellipse, or spline trace on both the left and right image at the same time. Whichever side of the screen that you annotate is called the "Original" graphic. The copy is called the "Shadow" graphic.

This feature is available in the following modes:

- B-Mode
- Color Flow Mode
- Simultaneous Mode.

NOTE: *Dual Caliper IS NOT available in PW Mode or M Mode, or with different probes.*
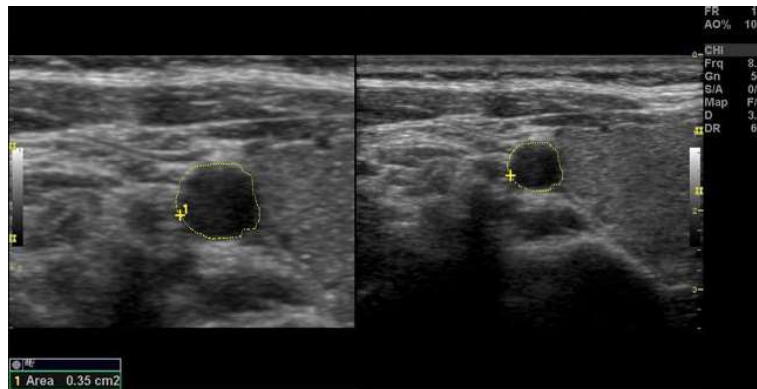
Figure 6-1.   Original (Left), Shadow (Right)

Dual Caliper (continued)

NOTE: *Only the Original graphic contains the graphic numbering. In this way you can always distinguish between the original and the Shadow graphic.*

NOTE: *You can only edit the Original graphic; however, when you do edit the Original graphic, the Shadow graphic is also edited at the same time.*

NOTE: *If you delete either graphic, both are deleted.*

NOTE: *When a measurement is selected without Dual B-Mode images or with different probe images, a warning message is displayed on the status bar and the selected measurement is cancelled.*

NOTE: *If the first point of the original graphic is out of the shadow image area, then the warning message displays on the status bar and the shadow graphic is not drawn.*

NOTE: *The Trackball move area is limited to the narrow area of both images.*

NOTE: *You cannot take a measurement across dual images.*

NOTE: *The 2D Dual measurement tool cannot be copied.*

Dual Caliper (continued)

Dual caliper for 2D image

2D Dual Caliper / 2D Dual Area / 2D Dual Ellipse / 2D Dual Spline Trace / 2D Dual Circle are not available through the factory default. To enable these measurements, add a new measurement using "2D Dual Caliper", "2D Dual Area", 2D Dual Ellipse", "2D Dual Spline Trace" or "2D Dual Circle" tool in the Utility--> Measure--> M&A preset menu.

1. Select Blank from Add measurement.

Figure 6-2.   Add Measurement

2. Select appropriate dual caliper tool from Tool drop-down menu.
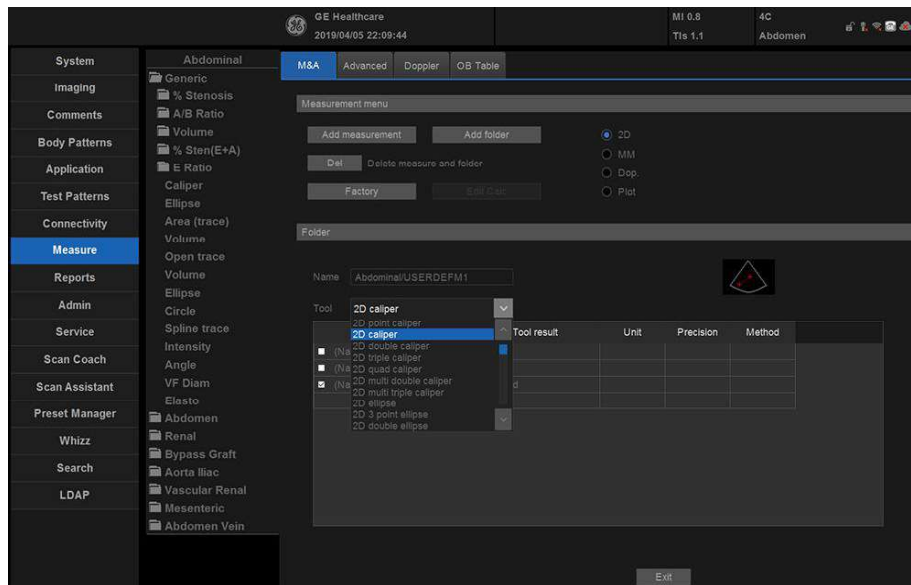
Figure 6-3.   Drop-down menu

Using Voice Comment

Introduction

Voice comment is used for saving voice comments on scan or cine loop.

Using Voice Comment

To use voice comment during scanning,

1. Connect the Microphone to the system.
2. Press **Comment** key on the key board.
    Then press **Voice Record** on the primary menu.
3. Press the icon again to complete and save the comments.

To play or review the voice comment,

1. Press **Voice Play** on the primary menu. The system will play the voice comments.

Freezing an Image

Introduction

Freezing a real-time image stops all movement and allows you to measure and print the image.

NOTE: *While the image is frozen, all Power Output is suspended.*

NOTE: *Selecting a new probe unfreezes the image.*

Freezing an image

To freeze an image,

1. Press **Freeze**. The Freeze key backlight turns green. Image is on freeze mode (Frozen image).

If you are in a mixed mode, both screen formats stop immediately. Deactivating Freeze restarts both modes and places a black bar on the trace to indicate the time discontinuity.

To reactivate the image,

1. Press **Freeze** again. The Freeze key backlight is turned off (unfreeze). Image is on real time scan mode (Live image).

NOTE: *Deactivating Freeze erases all measurements and calculations from the display (but not from the report).*

Use the Trackball to start CINE after pressing Freeze.

Post processing

You can use the following controls to process a frozen B-Mode image.

- Revert
- Zoom
- Rejection
- SRI-HD
- Dynamic Range
- Colorize
- Gray Map
- Rotation
- Biopsy Kit
- Edge Enhance

You can use the following controls to process a frozen Color Flow or Doppler Mode image.

- Invert
- Threshold
- Map
- Transparency Map
- Biopsy Kit
- Baseline
- Map Compress
- SRI-HD
- Rejection
- Colorrize
- Revert
- Edge Enhance
- Gray Map
- Rotation
- Dynamic Range

Using CINE

Introduction

CINE images are constantly being stored by the system and are available for playback or manual review via CINE.

Timeline data is continually stored at four times the display width of time line data (and updates the corresponding B-Mode images).

You can view CINE as a continuous loop via CINE Loop or manually review CINE images frame by frame via the Trackball.

Data in CINE is available until new data is acquired. CINE is stored on the system's memory and can be archived as well.

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

Activating CINE

To activate CINE,

1. Press **Freeze**.
2. Move the Trackball.

Cine gauge and Monitor Display

The Cine gauge (located on the right-hand side of the monitor) indicates which frame you are viewing of the whole loop (62:123), as well as the time at which this frame occurs within the loop (1.6:3.2 s).

NOTE: *The CINE gauge turns green when a Prospective CINE Clip is pending.*

Using CINE

Table 6-1:   Cine Mode Menu description

Parameter	Description
Loop Speed	Adjust the CINE Loop playback speed.
Cycle Select	Select the heart cycle to review.
Start Frame	Select the start frame.
End Frame	Select the last frame.
Frame by Frame	Review the CINE image frame by frame manually.
Select All	Select all frames of the cineloop.
Sync Mode	Phase synchronizes multiple CINE Loops.
First	Move to the first frame of cineloop.
Last	Move to the last frame of cineloop.
Run/Stop	Start/Stop the cineloop review.
Enhancement	Adjust the Enhance state.
Cine Capture	Enter QAnalysis.
Num Cycles	Control the number of heart cycles to be included in the CINE Loop.

Cine Loop Start/Stop

1. Press **Freeze**.
2. Rotate the **Trackball** horizontally to display the CINE Loop.
3. Select *Run/Stop* to playback the loop.
4. Select *Run/Stop* again to stop the CINE Loop.

Select the start/end frame

1. Adjust **Start Frame** to select the start frame.
2. Adjust **End Frame** to select the end frame.

Storing / Recalling CINE Loops

To store a CINE Loop, press Run, then press the assigned print key. CINE Loops stored on the Clipboard are indicated with a movie strip icon.

To recall a CINE Loop, double click on the loop on the clipboard.

Synchronize CINE Loops

1. Recall stored cine loop to right side of dual screen.
2. Recall same cine loop to left side of dual screen.
3. Change visualization of left side image
4. Select *Sync mode* to start the synchronization.

Cine Mode Selection

To scroll the CINE Loop only, toggle the Trackball key.

Velocity Scale with B-Mode Only

If you review the B-Mode CINE Loop while in Doppler Mode with the Timeline using Scroll B, the Velocity Scale displayed with the Timeline is for the time phase of the currently-displayed B-Mode image, NOT for the time phase of the acquired Doppler Spectrum.

Check the velocity value with the measurement function if you review the CINE Loop using Scroll B. Note that there may be a discrepancy between the velocity scale displayed and the velocity measured using the measurement function.

Preview

Loop Preview can now be enabled independently for Time -Based Store and Mark CINE. This is useful for setting preview preferences based on the application.

Annotating an Image

Introduction

The comment function provides the capability to type the comments of free text and/or insert the pre-defined comments from the comment library. It also provides the user with arrow markers to point to parts of the image.

Pressing the **Comment** key or any keys on the alphanumeric keyboard initiates the comment mode. This assigns the trackball function to controlling the cursor and displays the comment library on the menu area.

In comment mode, text can be added by using the comment library or by typing from the alphanumeric keyboard.

Comments can be erased by powering down, when you press *Clear* or *End Exam*, or when preset via Utility -> Comments.

Introduction (continued)

In addition, the display's home position can be changed (preferred comment area) for each display so that all subsequent comments begin in the same spot.

Pressing the *F7 (Cursor Home)* key returns to the user specified position or factory default position.

A new cursor home position is established by placing the cursor in the desired position and pressing *Shift+F7.*

Comment Mode is activated by pressing the *Comment* key. Comment Mode can also be automatically activated by typing from the alphanumeric keyboard.

NOTE: *In this case, the cursor begins at the same location where the comment mode was exited.*

After activating the comment mode, a vertical bar type cursor appears on the screen. Use the *Trackball* to move the cursor.

The factory default color for comments is yellow. The color selection can be changed to any of the colors available on the system. The choices are white, yellow, bright red, orange, etc.

NOTE: *The user cannot change the Font Family.*

To indicate a specific comment or text group is selected, the color turns to green. Once the comment is set or fixed, the color returns to yellow or to the user selected color.

NOTE: *If selected "Automatically Set Text" in Utility -> Comments -> Comments, the system sets the comment at the cursor position automatically when text entry is complete.*

To delete comments by character, press the *Backspace* key.

To delete all comments and arrow marks, press the *Clear* key twice immediately after entering the comment mode.

To exit the Comment/Library Comment function, press the next function you wish to do.

To move by words or by text group, press the *Tab* key.

Adding Comments to an Image

Comment Retention

Comments from the B-Mode images are retained and carried over when switching to multi-image format or duplex mode.

The position of the comments is adjusted so that it is at the same relative position with respect to the display window in the new format as it was in the single image format.

NOTE: *Comments may not be retained when the image is switched to M-Mode image format depending on the preset.*

Arrow Pointers

Arrow pointers can be used by activating the *F2 (Arrow)* key on the keyboard. When the pointer comes up, it is a GREEN color, indicating it is active and can be moved.

- Move the pointer using the **Trackball** to any place on the screen. The pointer head direction can be controlled by movement of the Trackball or *Arrow Rotate*.

- To readjust the length and thickness of the pointer, use the **Arrow Width** or **Arrow Length**. The default for the pointer size can be preset.

- Press **Set** to fix the place of the pointer and direction of the pointer head. The GREEN color turns to YELLOW (or the default color if changed).

- To delete the arrow marks, press the *Clear* key right after pressing the *F2 (Arrow)* key.

NOTE: *To erase all comments as well as arrows, press and hold the Clear key.*

NOTE: *To prevent the Trackball from changing the arrow angle, select the "Keep Arrow Angle" preset at Utility -> Comments -> Comments.*

Text Overlays

There are 2 layers of the text in comments, which can be selected by toggling the *F8 (Text1/Text2)* key on the keyboard. Text1 is the default choice.

By using this function, users can perform a HIDE TEXT/SHOW TEXT, allowing the users to save or print an image without clearing the typed text.

You can specify to display text 1, text 2, or both. This allows you to have some comments that do not change during the exam while allowing you to change the other comment. Toggle the *F8* key to cycle through the three Text 1/Text 2 states:

1. Text 1 Only -- Only Text 1 displays.
2. Text 2 Only -- Only Text 2 displays.
3. Text 1 and Text 2 -- Both displayed; only Text 2 comments editable. Only Text 2 comments erased by Clear key. Word Delete only deletes Text 2 comment. Both Text 1 and Text 2 comments erased with new patient, new exam, or probe change.

To preset the Text Overlay Sequence, go to *Utility -> Comments-> Comments* and select either **Text 1 and Both** or **Text 1 and Text 2 and Both**.

The font color for the Text1 and Text2 overlays can be set separately. Go to *Utility -> Comments-> Comments* and specify the text color for Text 1 Color and Text 2 Color.

NOTE: *If you check "Erase when image is unfrozen" in the Utility menu, only the editable text plane erases when you unfreeze the image.*

Annotating an image with typed words

- Press **Comment** and type the comments where the cursor is currently located (the display's home position) and use the **Trackball** to further place the comment cursor in the desired location.

- Press *Enter* to move to the next line.

NOTE: *Comments wrap to the next line when they are within one character of the right margin if Word Wrapping is selected in the Text Boundary preset. See 'Comments Libraries/Comments Preset Menu' on page 16-53 for more information.*

The word wrap starts one line below the start of that comment.

Comments appear on all prints, photos, DVR or CINE loops.
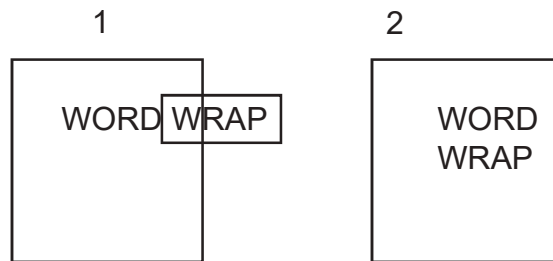
Figure 6-4.   Next Line Word Wrap

1. Before   2. After

If the cursor appears at the right edge of the lowest line, or a word cannot be completed in the lower right corner, word wrap cannot be executed.

NOTE: *The same word wrap principles apply for library scripts as typed comments.*

Annotating an image using the library

To reduce the amount of time spent annotating an image, store frequently-used comments in the Comment Library. As many as 6 libraries are available per study. One of the selected libraries is designated as the default and its entries shall be displayed on the menu the comment mode is activated for that study.

Press **Comment** and move the comment cursor location using the **Trackball**.

Select the desired comment from the menu.

To program your system with specific comments, see 'Comments Libraries Presets' on *page 16-50* for more information.

Moving Texts

You have the ability to move comments already on the screen and place them in different locations.

- Place the cursor on the desired text or text group and press *Set*.
- The selected text color turns to green.
- Use the *Trackball* to move the selected text and press *Set*.

Editing while annotating

Backspace over any error(s) made. Blank spaces take the place of the letter(s) that were there. Continue typing the comment after backspacing over all incorrect letters.

To delete previous character(s):

- Press *Backspace* as many times as necessary to make the deletion.
- Once all texts within the selected text group are deleted, then the cursor will find another text group to delete to the upper left direction.
- If there is no more text to delete, the cursor will be located at home position.

To move through the text a word at a time:

- Press *Tab* to move to the right by text group (Preset Keyboard Tab = Word)

NOTE: *Press Shift + Tab to move to the left.*

To activate the last text group typed or selected from the Library:

- Press *F9 (Grab Word)* key. The selected comment will be highlighted.
- To increase/decrease the area of the highlighted selection, adjust **Highlight**.

NOTE: *Once the text is highlighted, typing comments or choosing them from the library replaces the highlighted text.*

NOTE: *To select all text groups, Press Shift + F9 (Grab Word) key.*

To cancel the last action:

- Select **Undo**.

When the text reaches the limitation of the annotation input, the system will provide a message "The annotation text is max". More text is not allowed to be added.

Body Patterns

An additional way to annotate the image display is with body patterns. Body patterns are a simple graphic of a portion of the anatomy that is frequently scanned. The body pattern and probe marker can serve as a reference for a patient and probe positioning when im ages are archived or scanned.

Press the **Body Pattern** key on the control panel to enter into body pattern mode. A series of body pattern packages are displayed according to exam category and preset. See 'Body Pattern Libraries/Applications Preset Menu' on *page 16-60 for more information.*

The body pattern packages may be customized to accommodate user preference. Up to 30 individual body patterns in the packages can be changed. See 'Body Pattern Libraries/Libraries Preset Menu' on *page 16-56 for more information.*

Figure 6-5.   Displays of Body Pattern - example

Body Patterns (continued)

Select the desired body pattern and the selected body pattern is displayed on the monitor.

• Select **Move Pattern** on the primary menu to reposition the body pattern with the **Trackball** and **Set** controls.

• Move the body pattern to the desired location.

• A probe mark is associated with the body patterns and illustrates the probe position on the body pattern. This marker can be placed with the **Trackball** and rotated with probe.

• The probe mark type is selectable by adjusting **Probe Type**. There are different choices available with one being a blank selection.

• To clear the body pattern, press the *Body Pattern* button to activate body patterns and then select the *Clear* key.

Notes for Body pattern (Probe mark)

• Probe Type is the type of probe mark displayed on the body pattern. It can be saved only for each body pattern on the screen while body pattern is activated, but not in the Utility preset menu. Therefore, Probe Type cannot be saved as an Application or System Preset.

To save the Probe Type,

a. Activate the **Body Pattern**.

b. Select a Body Pattern.

c. Select a type of probe mark with *Probe Type*.

d. Place the probe mark at the proper location.

e. Select **Set** on the control panel to save the body pattern.

• When a Body Pattern is selected and no Probe Mark has been saved on it, the latest used Probe Mark is carried over to the Body Pattern.

Body Patterns (continued)
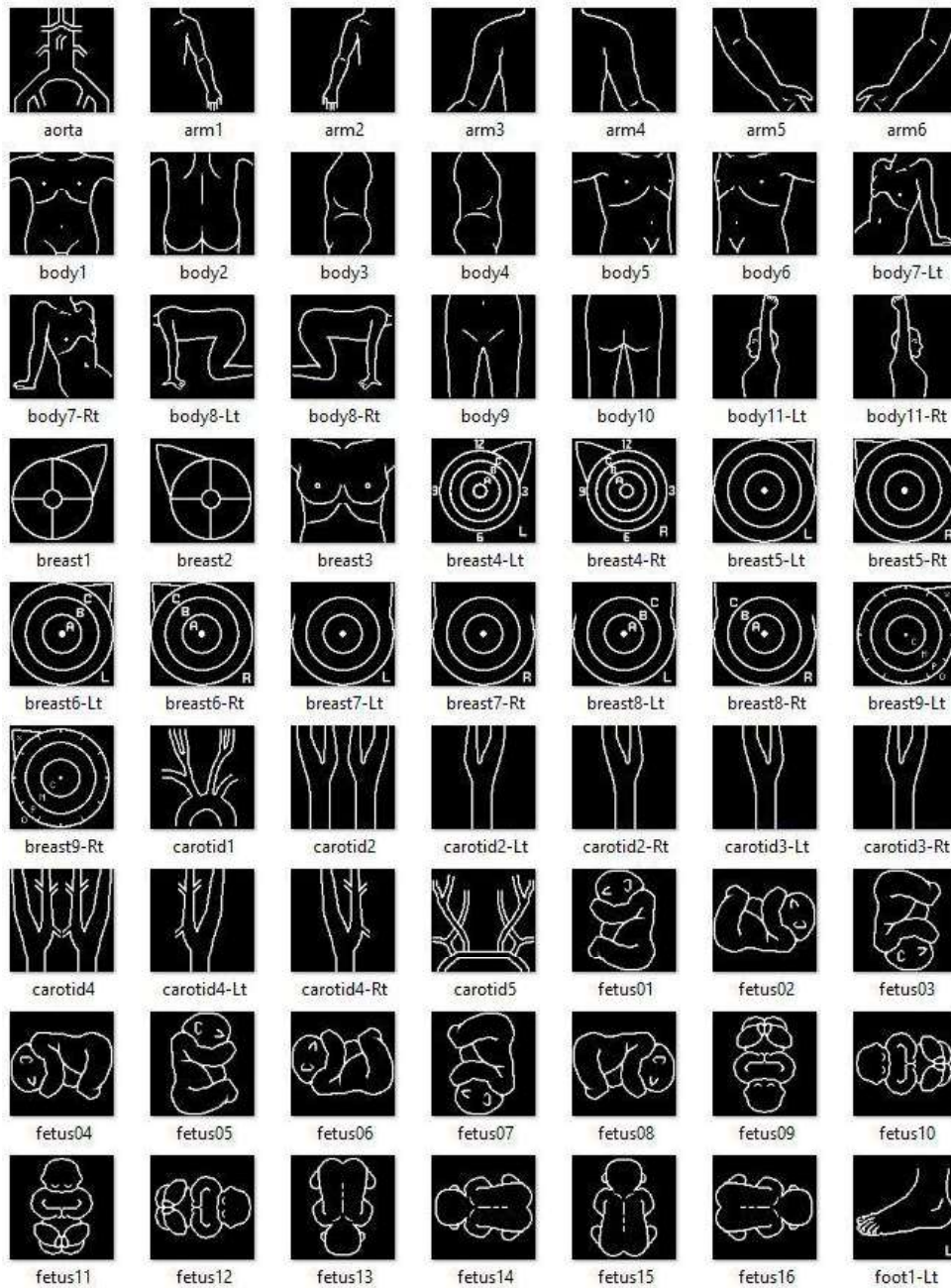
Figure 6-6.   Body Patterns Available

Body Patterns (continued)
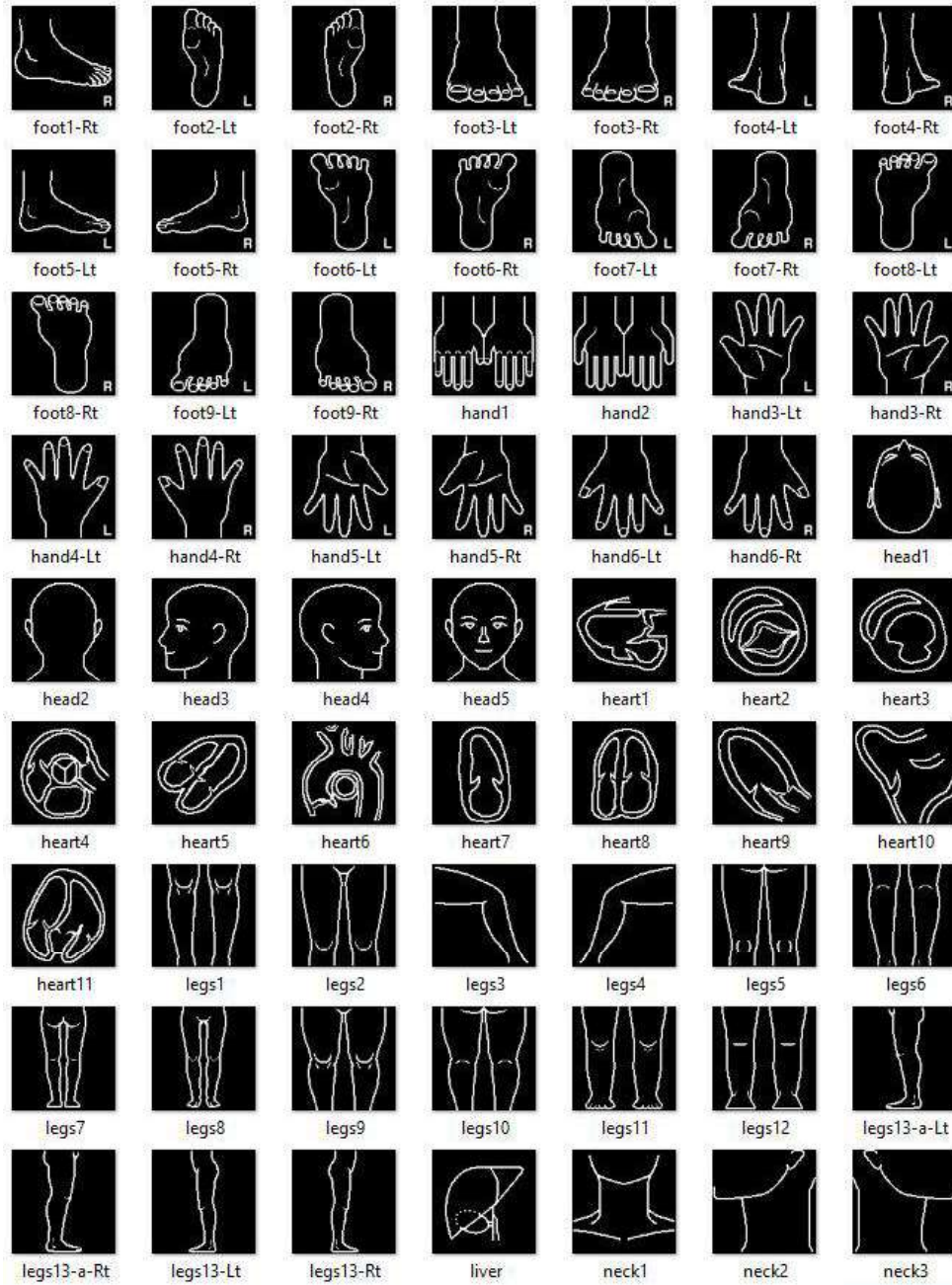
Figure 6-7.   Body Patterns Available (continued)

Body Patterns (continued)

Figure 6-8.   Body Patterns Available (continued)

Using the Fast Key

Overview

A keyboard Fast Key is available to record and run a sequence of often-run keystrokes.

NOTE: *Ensure that you have a patient selected prior to running the Fast Key operation.*

Create a Fast Key

1. Press the **F5** key. The "Select OK to create a new Fast Key" dialog displays. Select OK to continue, refer to Figure 6-9 *on page 6-27*
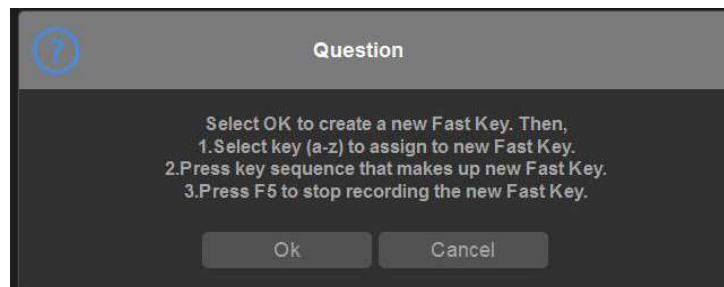
Figure 6-9.   Fast Key

2. Select a key to assign a Fast Key to (a-z, 0-9).

    If you select any key besides a-z or 0-9, a warning dialog displays and the procedure is cancelled.

NOTE: *Assign Fast Key Function to Key 0 - 9 in Utility -> System -> User Configurable Key before you create a Fast Key.*

NOTE: *There is no distinction between capital and small letters.*

NOTE: *The key code is the same in Russian and Greek (a-z, 0-9).*

Create a Fast Key (continued)

3. If the selected key is already assigned to a Fast Key, a warning dialog displays.

    Select **Yes** to continue. The Fast Key macro file is overwritten.

    Select **No** to cancel the Fast Key macro setup.

4. Input the key sequence to be assigned.

NOTE: *It is impossible to save a power cycle sequence or any input from outside of the system.*

NOTE: *The warning dialog displays due to the limitations of the number of key sequences. Press F5 to finish and retry.*

5. Press the **F5** key to complete a Fast Key macro setup. The information dialog displays. Select **OK**.

Start a Fast Key

1. Press the **F6** key to start a Fast Key. The message "Select the key which the Fast Key is assigned to" displays on the status bar.

NOTE: *The F6 key is ignored if another dialog displays on the system.*

NOTE: *If you press F5 after F6, the F6 function cancels and the F5 function is enabled.*

2. Press the key assigned to the Fast Key macro. The message "Fast Key playback is finished" displays on the status bar when the macro is finished.

   To stop the Fast Key macro during the operation, press **F6**. The message "Fast Key playback is cancelled" displays on the status bar.

NOTE: *Select the running speed in the Run Macro Speed preset on Utility -> System -> General.*

Backup and Restore the Fast Key

You can backup/restore the key macro via Utility -> System -> Backup/Restore.

To backup, select User Defined Configuration in the Backup section.

To restore, select User Defined Configuration in the Restore section.

Using InSite ExC

InSite ExC

InSite ExC is your direct link with a GE Online Service Engineer or Applications Support Engineer or a Request for Service via the InSite ExC link at the upper right of the display screen.

Figure 6-10.   InSite ExC Icon

Types of InSite ExC Service

1. **Contact GE**. Opens a service dispatch with GE Service.
2. **Configure Agent**. Use to access InSite ExC Configuration window.
3. **EZ Configuration Wizard**. Use to configure some common system settings.
4. **Temperature And Power**. Use to check the temperature log.
5. **EZ Diagnostic**. Use to analyse the system error automatically..
6. **Versana Club**. Use to enter Versana Club.

Types of InSite ExC Service (continued)

7. **Disruptive and VCO**. Click it and the following window will appear.
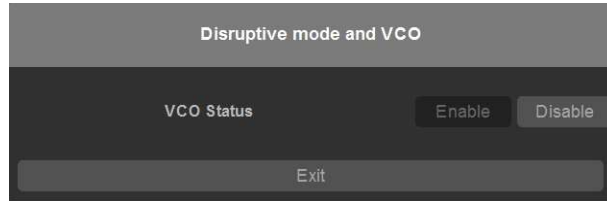
Figure 6-11.   Select Enable

Here is the explaination for current design on "Disruptive mode and VCO" button function:

a. The button is designed to Enable VCO in quick way, so when clicking "Enable", it will enable both "Disruptive mode" and "VCO" (Disruptive mode ON is the prerequisites for VCO ON).

b. When clicking "Disable", it can only disable "VCO", but will not disable the Disruptive mode.

c. The user has to enter CSD to disable the Disruptive mode if he/she wants to do that.

Configure Agent

To access InSite ExC Service configuration window,

1. Click InSite ExC Icon at the upper right of the display screen. Select **Configure Agent** from the list.

Figure 6-12.   Service Menu

2. On configuration window, do the proxy configuration if **Proxy Configuration** is required. Select **Submit**.
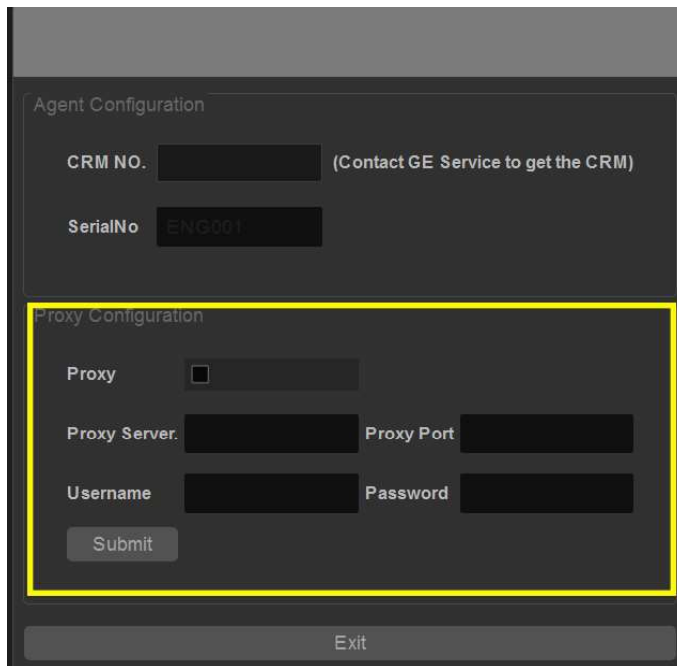
Figure 6-13.   InSite ExC configuration

Initiating a Request for Service (RFS)

To initiate an RFS,

1. Position the Windows pointer on top of the GE InSite ExC icon at the top right of the display.

2. Press **Set** Key, select **ContactGE**. This opens of the RFS screen which sends a service dispatch directly to GE Service after you fill in the following information:
   - Problem Type
   - Problem Area
   - Problem Description
   - First Name
   - Last Name
   - Phone Number
   - Email

3. After you have completed filling in all of this information, press **Submit** to initiate the Request for Service.

Figure 6-14.   Request for Service Contact Information

Initiating a Request for Service (RFS) (continued)

After the request is submit successfully, the following status appears:

✔ **Request submitted successfully. Your RFS request number is:** *03297720*

Figure 6-15.   Request for Service

All requests for service are listed on the **RFS History** for your review.
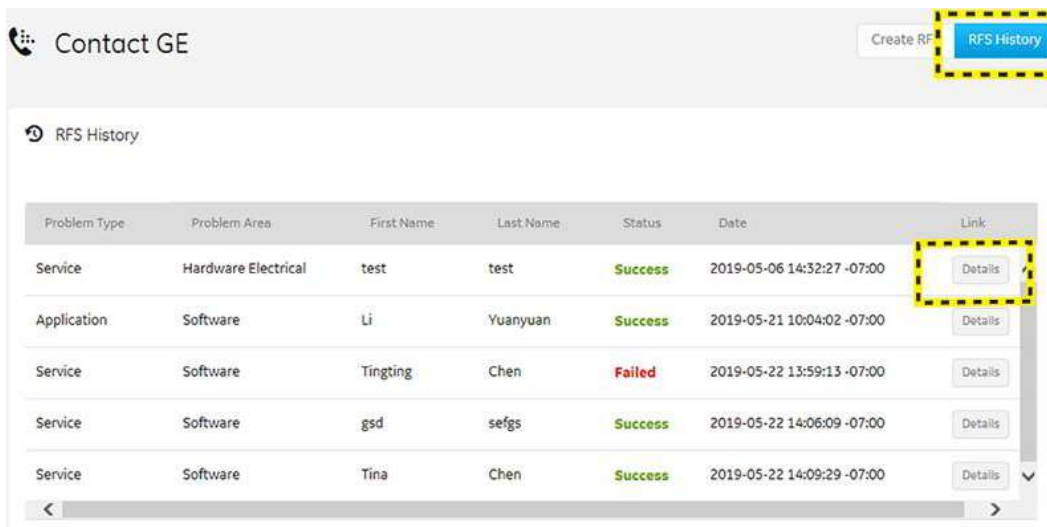
Figure 6-16.   RFS History

Initiating a Request for Service (RFS) (continued)

You can review your RFS details by clicking **Details** on RFS History list, refer to Figure 6-16 *on page 6-34*.

Figure 6-17.   RFS Details

Initiating a Technical or Clinical Support Request

To initiate Technical or Clinical Support,

1. Position the Windows pointer on top of the GE InSite ExC icon at the upper right of the display.

2. Press the Trackball Set Key. This opens the following pop-up:
   - ContactGE
   - ConfigureAgent
   - EZ Configuration Wizard
   - Temperature And Power
   - EZ Diagnostic
   - Versana Club
   - Disruptive and VCO
   - Cancel

NOTE: *When you have contacted the Online Center/Field Engineer (OLC/FE), you may be asked to click on "ContactGE": to increase the polling rate so that the OLC/FE can connect more quickly.*

3. Select ContactGE for Technical Support; select EZ Diagnostic for GE Service Support; or press Cancel to exit.

NOTE: *In addition to contacting a technical/clinical support person, selecting this also changes the polling time from 15 minutes to 15 seconds so that your call can be answered as quickly as possible, as well as allowing disruptive mode.*

Initiating a Technical or Clinical Support Request (continued)

InSite ExC icons appear differently, depending on their state:

Table 6-2:   InSite ExC Icons

Online Center	Non Disruptive	Disruptive
Not Connected	Black and White Icon - InSite ExC activated but system not open for Technical Support access.	Red Icon with Clock - InSite ExC activated and open for Technical Support, but currently not active.
Connected	Yellow Icon - InSite ExC activated and Technical Support can look around on your system, but cannot perform any service-related functions.	Red Icon with GE Logo - InSite ExC activated and Technical Support can look around on your system, run diagnostics, gather logs, and initiate VCO.

InSite ExC Definitions

Here are definitions for the different InSite ExC states:

Virtual Console Observation (VCO). Allows Technical Support to control Versana Active functionality remotely.

Disruptive. Allows GE's Technical Support person to connect to your system via VCO, to run diagnostics directly on your Versana Active system, and to collect system logs. When the system is in Disruptive Mode, the icons are red. There are two disruptive states. If you see a telephone with a clock, then the system is in Disruptive, Not Connected Mode. If you see a telephone with GE, then the system is in Disruptive, Connected Mode.

Non-Disruptive. Allows GE's Technical support person to look around on your system, but cannot perform any service-related functions, depending on whether InSite has connected or not connected. There are two Non-Disruptive states. If you see a black and white icon, InSite ExC is activated, but not open for Technical Support access. If you see a yellow icon, InSite ExC is activated and the Technical Support person can look around on your system, but cannot perform any service-related functions.

Connected. InSite ExC is connected.

Not Connected. InSite ExC is not connected.

NOTE: *When Disruptive mode has been activated or a diagnostic has been run, the message, "Due to Service testing reboot required," appears in red at the bottom of the display. It is recommended that you reboot the system before use. Make sure you disable disruptive mode before rebooting or the message will not be cleared.*

Exiting InSite ExC

To exit InSite ExC,

1. Exit InSite ExC page.
2. Reboot your Versana Active system.

EZ configuration Wizard

EZ configuration wizard is a function to enable the operator to configure some common system settings when turning on the system for the first time after the software installation.

NOTE: *Password setting is required when turning on the system for the first time after the software installation.*

For Versana Active, you can also enter EZ Configuration Wizard by clicking the Insite icon at the top right of the screen.
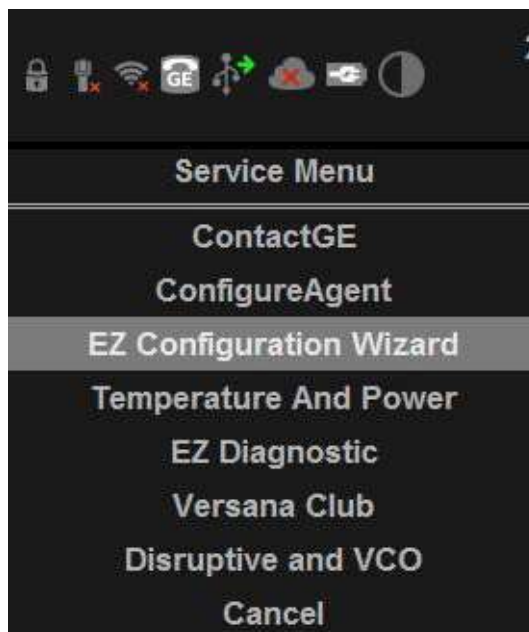
Figure 6-18.   Enter EZ Configuration Wizard

EZ configuration Wizard (continued)

1. Select policy level in **Password Policies** and then press **Next.**

NOTE: *Selecting password policy level is required when turning on the system for the first time or after the software installation.*
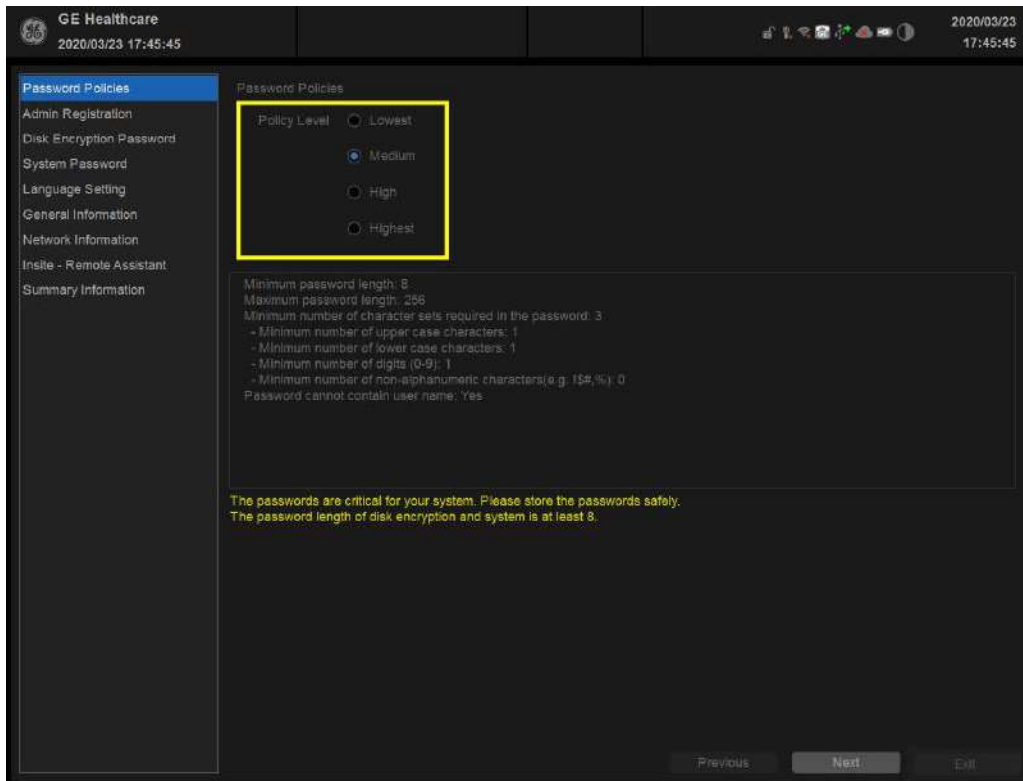
Figure 6-19.   Select password policy level

EZ configuration Wizard (continued)

User can select the option Lowest, Medium, High or Highest for policy level. The complexity of the password will be differed by the policy level you selected:

Table 6-3:   Password Policy Level and Complexity

Policy Level	Complexity
Lowest	Minimum password length: 0 Maximum password length: 256 Minimum number of character sets required in the password: 0 - Minimum number of upper case characters: 0 - Minimum number of lower case characters: 0 - Minimum number of digits (0-9): 0 - Minimun number of non-alphanumeric characters (e.g. !$#,%): 0 Password cannot contain user name: No
Medium	Minimum password length: 8 Maximum password length: 256 Minimum number of character sets required in the password: 3 - Minimum number of upper case characters: 1 - Minimum number of lower case characters: 1 - Minimum number of digits (0-9): 1 - Minimun number of non-alphanumeric characters (e.g. !$#,%): 0 Password cannot contain user name: Yes
High	Minimum password length: 10 Maximum password length: 256 Minimum number of character sets required in the password: 4 - Minimum number of upper case characters: 1 - Minimum number of lower case characters: 1 - Minimum number of digits (0-9): 1 - Minimun number of non-alphanumeric characters (e.g. !$#,%): 1 Password cannot contain user name: Yes
Highest	Minimum password length: 144 Maximum password length: 256 Minimum number of character sets required in the password: 4 - Minimum number of upper case characters: 1 - Minimum number of lower case characters: 1 - Minimum number of digits (0-9): 1 - Minimun number of non-alphanumeric characters (e.g. !$#,%): 1 Password cannot contain user name: Yes

NOTE: Do not use space when creating the password.

NOTE: *If user selects Lowest level in password policies, ADM password can be empty during Admin Registration.*

EZ configuration Wizard (continued)

NOTE: *When user selects Lowest level, a warning message will display to inform that the current security policy will put your system at risk.*
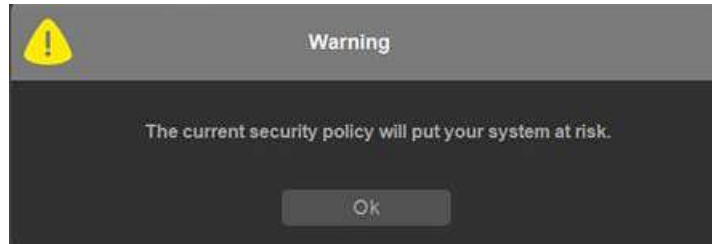
Figure 6-20.   Lowest policy level warning

2. Set ADM password in **Admin Registration**. And then set up 3 password security questions and answers.

    ADM is the administrator of the ultrasound system and has the highest authority for the software. ADM can create other accounts, import and export data and make some sensitive settings.

NOTE: *The passwords are critical for your system. Please store the passwords safely.*

NOTE: *Record your answers for the 3 questions. The answers are required when you need to reset ADM password.*

NOTE: *ADM password and security questions can be empty if password policy level is selected as LOWEST.*

EZ configuration Wizard (continued)
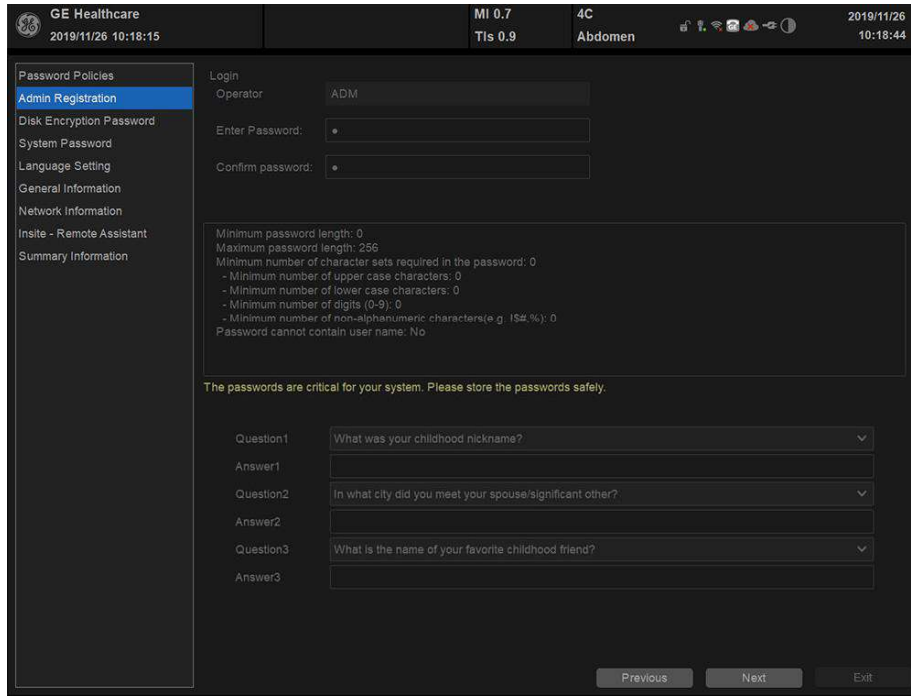
Figure 6-21.   ADM password setting

NOTE: *If you didn't set ADM password during software upgrade*
                 procedure, you could also set operator password later by
                 ***Utility -> Admin -> Users**.*
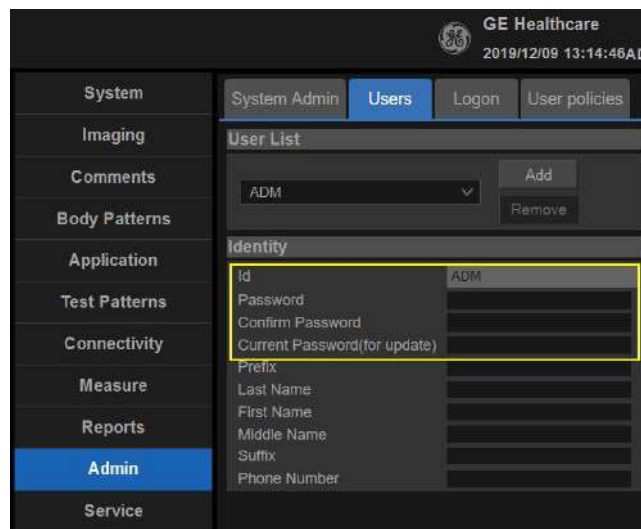
Figure 6-22.   Set ADM password

EZ configuration Wizard (continued)

3. Set Disk Encryption Password for Drive D&E (including Archive of patient information, temp files, user defines, logs). The password is set by user. It is required for reading the data on the hard disk when software is running. System will remember the password automatically.

NOTE: *Disk Encryption Password setting is required when turning on the system for the first time or after the software installation.*

NOTE: *The passwords are critical for your system. Please store the passwords safely.*

NOTE: *When the HDD is removed from the unit, it will need password to decode.*

EZ configuration Wizard (continued)

Set Disk Encryption Password and press **Next**.
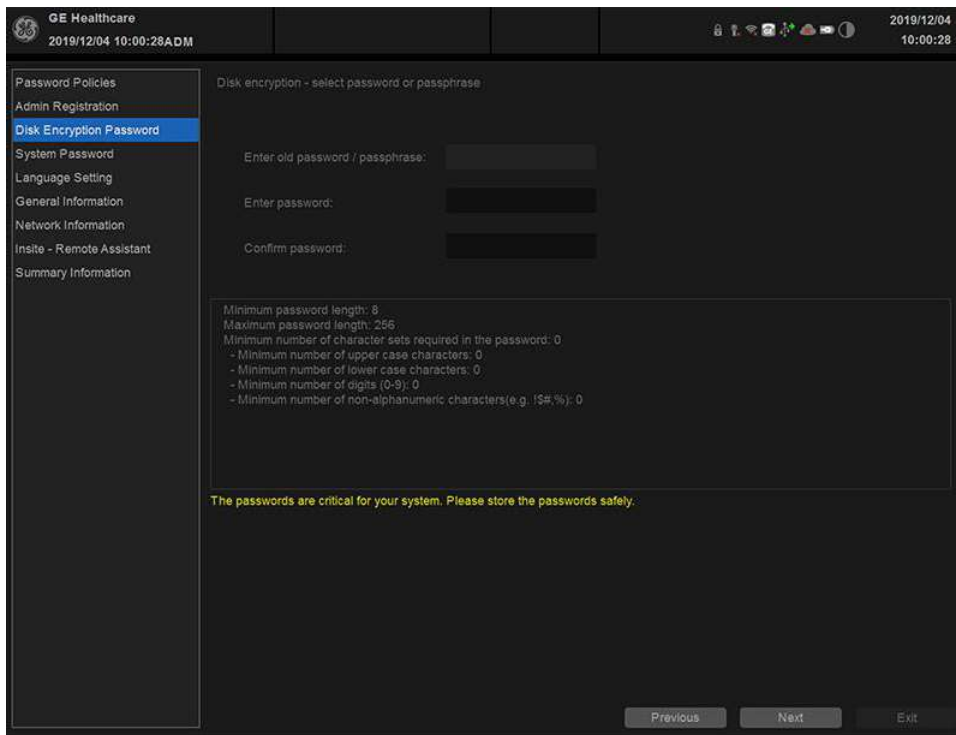
Figure 6-23.   Disk Encryption Password

An information window of Change Password Success will display, press **OK** to continue.
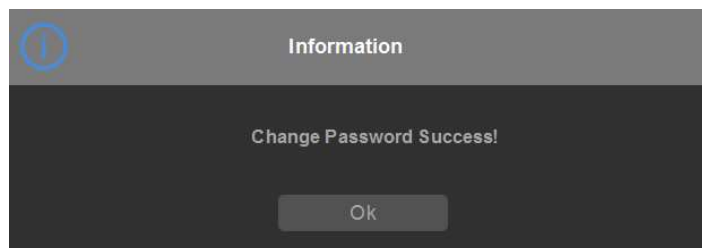
Figure 6-24.   Change Password Success

EZ configuration Wizard (continued)

4. Set **System Password**. System password is the Windows password. User needs to initialize it for logging on the system Windows desktop for the first time.

   Set system password by **Install wizard -> System Password** OR **Utility -> Admin -> System Admin -> Change System Password**.

NOTE: *System password setting is required when turning on the system for the first time or after the software installation.*

NOTE: *The passwords are critical for your system. Please store your passwords safely.*

EZ configuration Wizard (continued)

Set System Password and press **Next**.
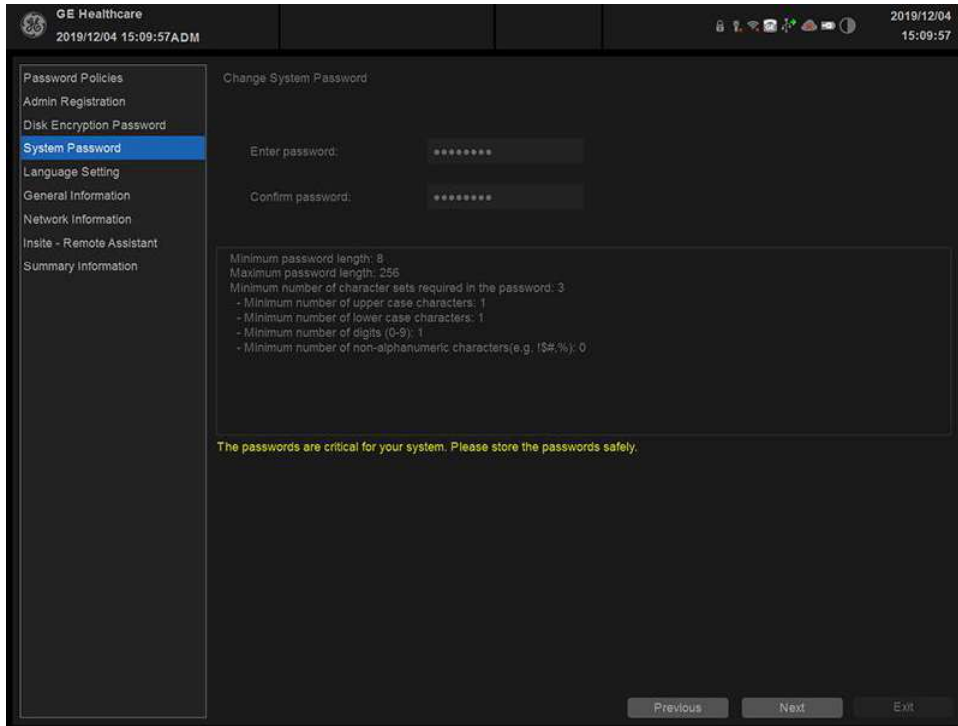
Figure 6-25.   System Password Setting

An information window of Change Password Success will display, press **OK** to continue.
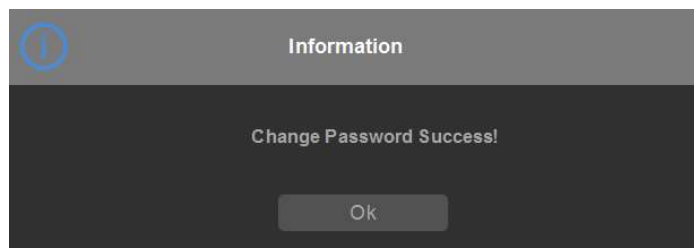
Figure 6-26.   Change Password Success

EZ configuration Wizard (continued)

5. Select the appropriate language for system language and keyboard language from the drop-down list.
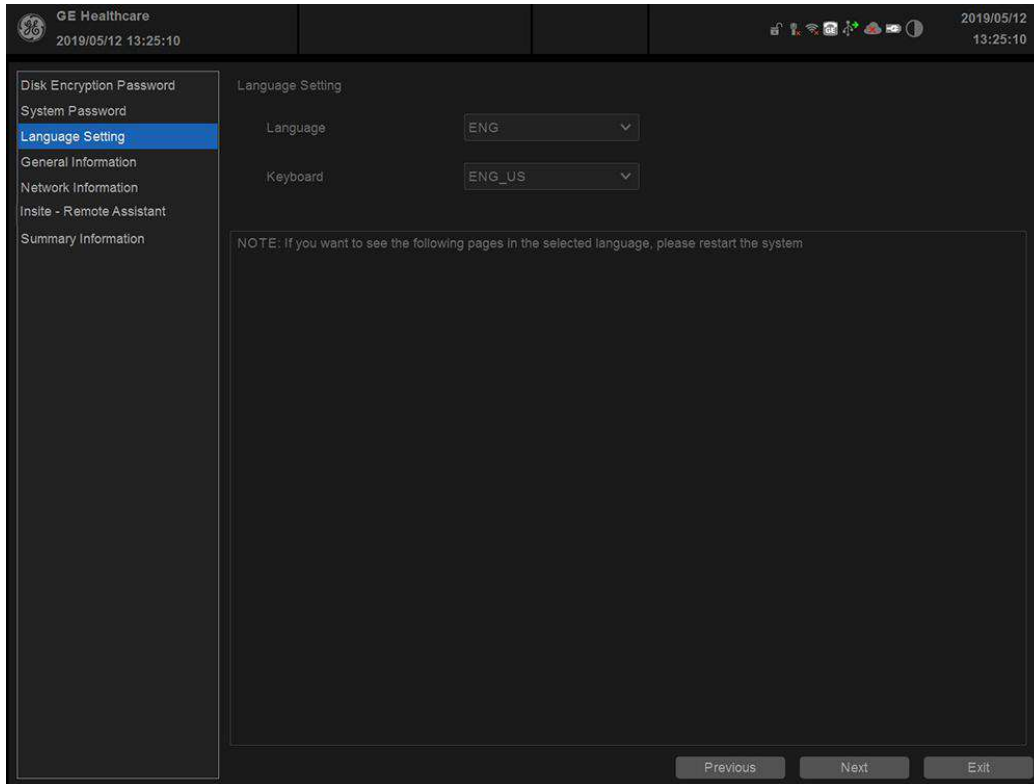
Figure 6-27.   System Language Setting

NOTE: *If you select **Exit**, you will exit the installation wizard.*

•   If you do not change the language, press **Next** to continue.

EZ configuration Wizard (continued)

- If you change the language setting and press **Next,** a window will pop out. Under Formats select desired language and select **Cancel**.
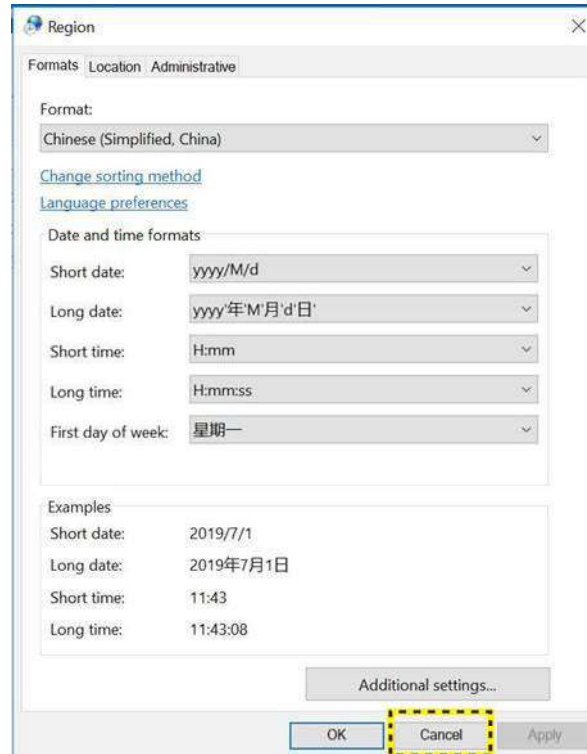
Figure 6-28.   Formats selection

Click **Ok** to restart the system.
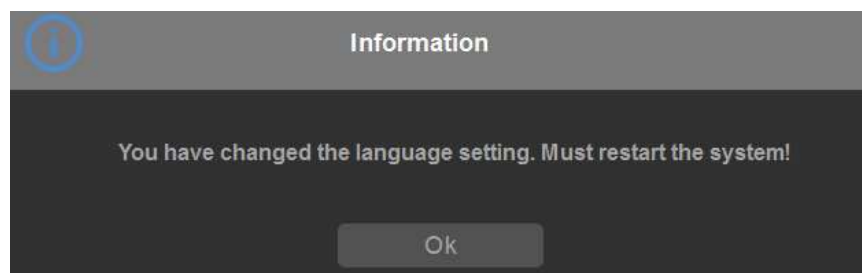
Figure 6-29.   System Language settings (2)

NOTE: *If you press **Previous**, you will go to the previous page.*

EZ configuration Wizard (continued)

6. This screen shows the hospital and time information, and you can set the system date and time here.
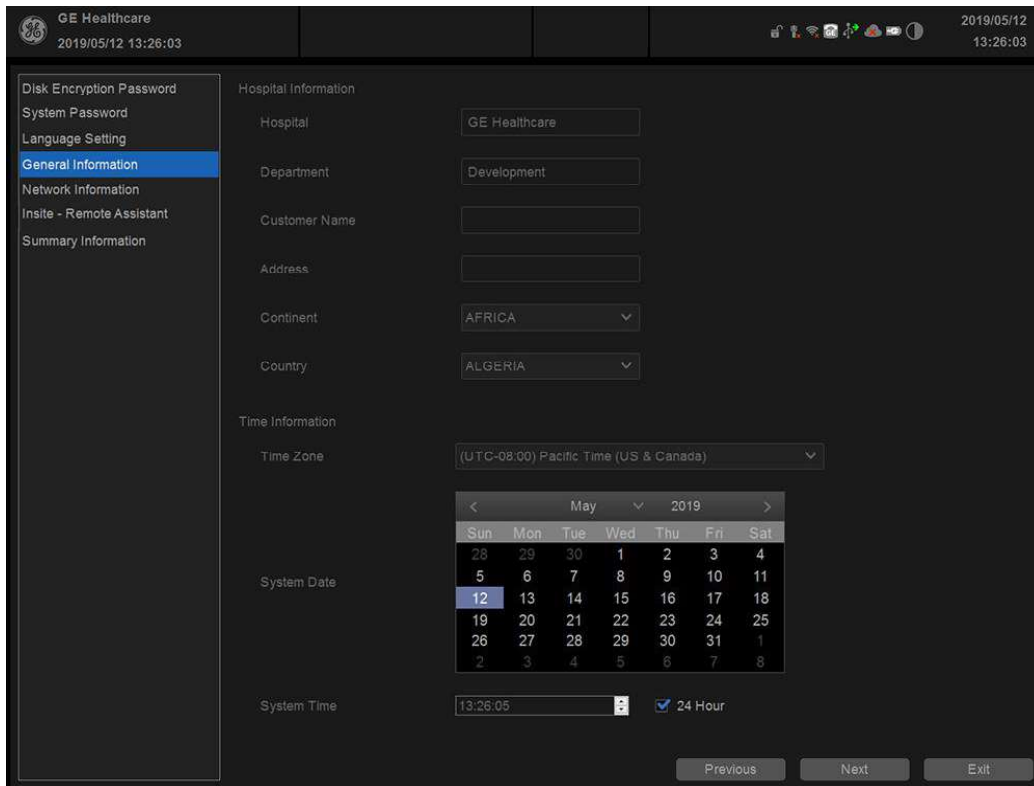
Figure 6-30.   General Information

7. Press **Next** to continue.

EZ configuration Wizard (continued)

8. The **Network Information** screen shows the configuration of wireless and local network:
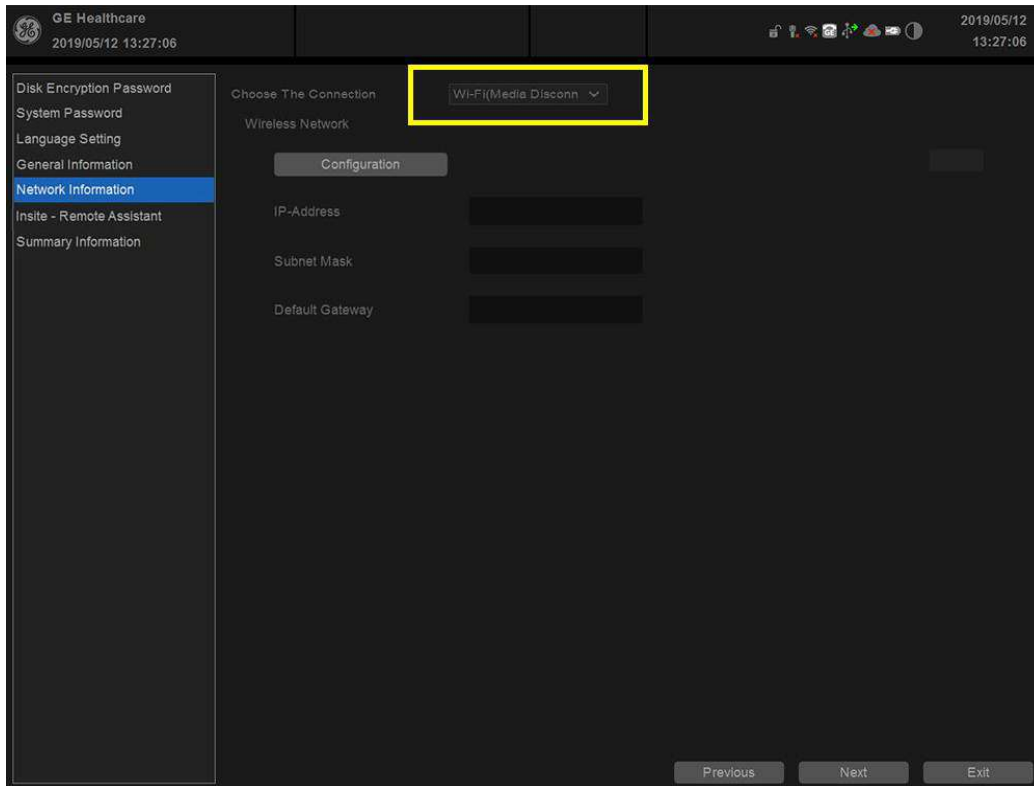
Figure 6-31.   Wireless Network Information

EZ configuration Wizard (continued)
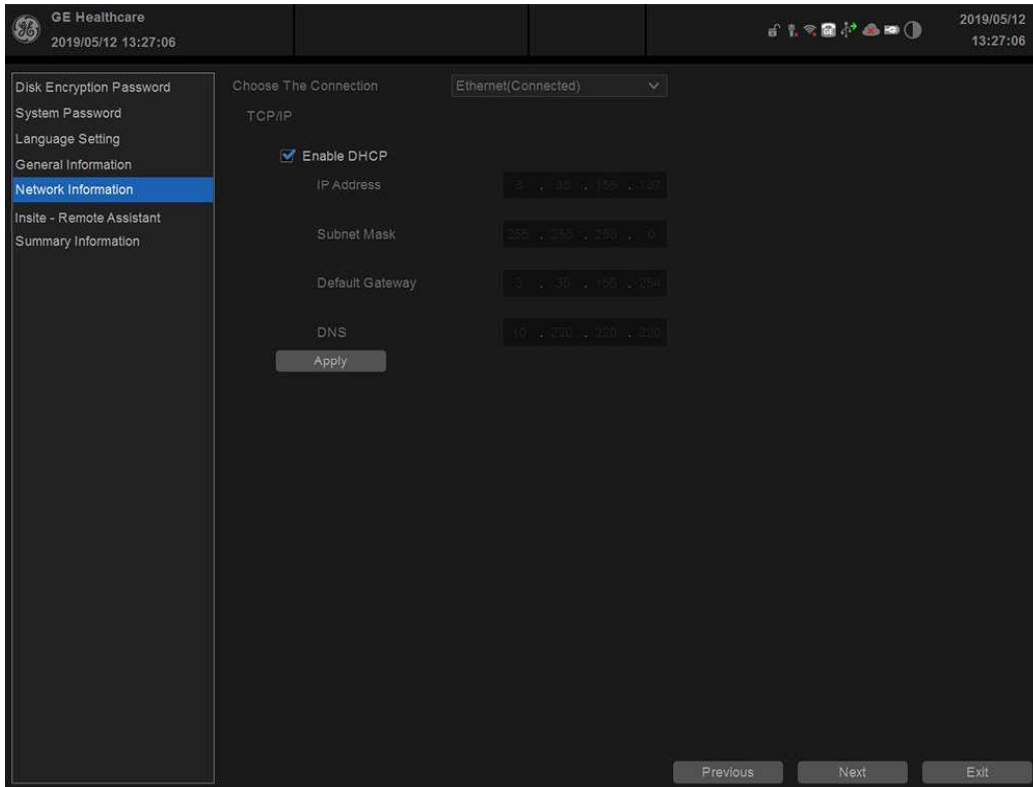
Figure 6-32.   Local Network Information

Table 6-4:   Network settings

Preset Parameter	Description
Enable DHCP	Select to set TCP/IP.

9.   Press **Next** to continue.

EZ configuration Wizard (continued)

10. The **Insite - Remote Assistant** screen shows the configuration of Agent and Proxy.

Figure 6-33.   InSite - Remote Assistant

Table 6-5:   Agent and Proxy Configuration

Element	DESCRIPTION
CRM No	Customer Relationship Management (CRM) number. System identifier assigned to the customer unit by the service region. CRM is pre-populated by adding Versana Premier to the CRM number. The CRM number of the Versana Premier is editable.
Serial No	Serial number of the agent (read-only). If the agent is not registered with a serial number, this field is populated with the serial number of the Versana Premier. The serial number of the agent is tied to the serial number of the Versana Premier.
Proxy Server	When Enable Proxy is selected, name of the proxy server IP.
Proxy Port	When Enable Proxy is selected, number of the proxy server port.
Username	When **Proxy** is selected, name of the user.
Password	When **Proxy** is selected, password for the user.

EZ configuration Wizard (continued)

After InSite - Remote Assistant has been successfully configured, these elements will have the corresponding values:

• **Agent Registered** will be **Yes**

• **Agent Quarantine** will be **No**

• **Agent CRM Verified** will be **Yes**

The information on **System Information** is available to all service class licenses.

To access **System Information**, navigate to **Utility > Service > Home**.
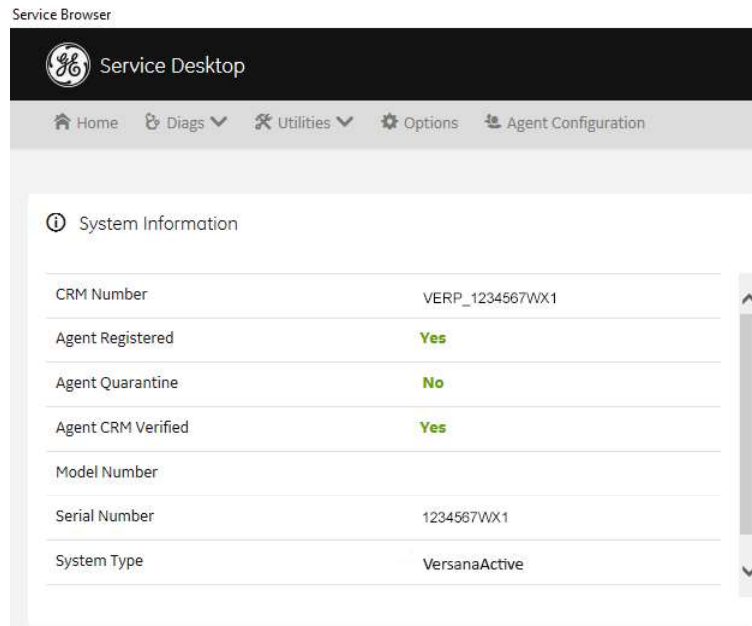
Figure 6-34.   System Information

11. After having set the InSite - Remote Assistant, press **Next** to continue.

EZ configuration Wizard (continued)

12. This screen shows the report of the previous settings. You can export it to the database.
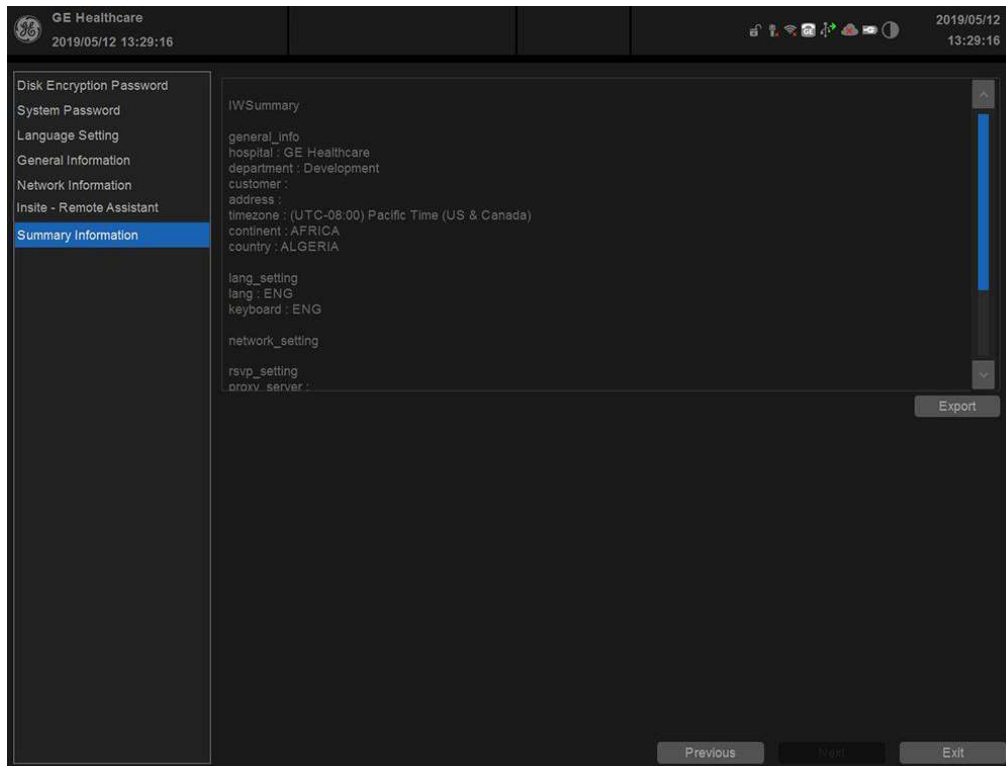
Figure 6-35.   Summary Information

Press **Export** and select **OK** to store the report.
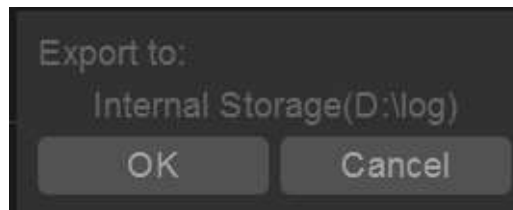
Figure 6-36.   Export Summary

13. Press **Exit** to exit Installation Wizard.

Electronic Documentation

Documentation Distribution

Documentation is being provided via:

- Hardcopy
    - User Guide (translated)
    - Release Notes (translated)
    - Advanced Reference Manual
    - AIUM Acoustic Output Booklet (USA only, hard copy)

- Electronic media. You can view user documentation (all languages) on a PC or on the Ultrasound Scanner via the Customer Documentation media, which includes:
    - Basic User Manual (English only)
    - Advanced Reference Manual (English only)
    - User Guide (translated)
    - Release Notes and Workarounds (translated. optional)
    - Basic Service Manual (English only)

Using Online Help Via F1

Online Help is available via the F1 key. After pressing F1, Help appears. The Help screen is divided into three sections: navigational tools on the top, left portion of the screen (Hide, Back, Forward), help book navigational tools on the left portion of the screen (Contents, Index, Search, Favorites), and the content portion on the right side of the screen where help topics are displayed.
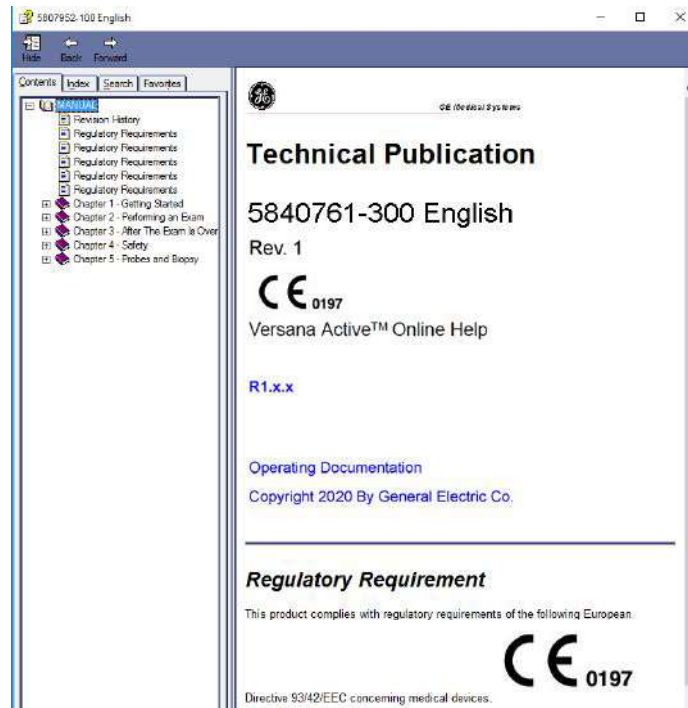
Figure 6-37. Opening Online Help Screen

NOTE: If the cursor disappears due to misoperation while using Online Help, restore the Help screen by clicking **Utility** key and then pressing the F1 key.

Navigating through the Help Book

Online Help is organized like a manual, with individual chapters, sections, and pages. Click on the plus (+) sign next to MANUAL to open up the book. Click on the plus sign next to the chapter you want to view to open up that chapter. Click on the plus sign next to the section you want to view to open up that section. Open up the page to view that page's information.
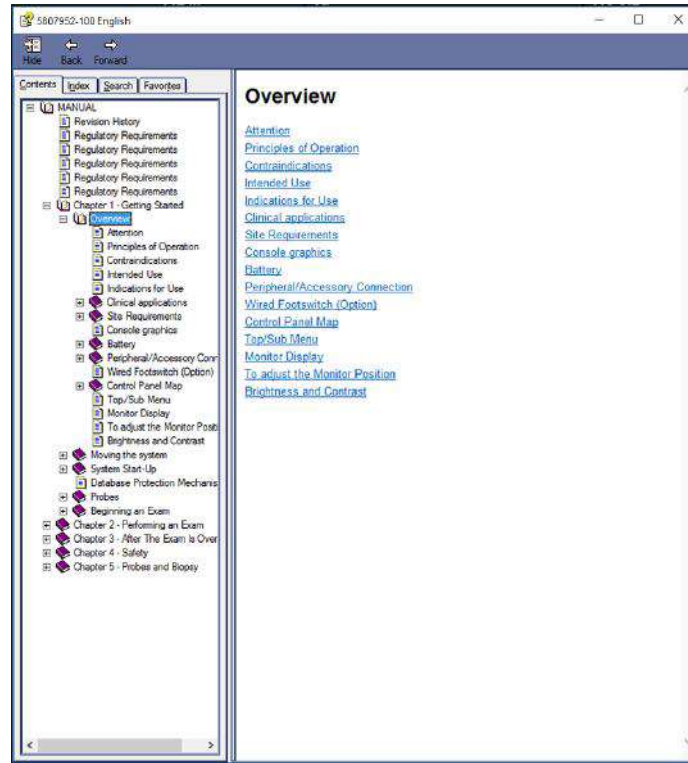
Figure 6-38.   Sample Online Help Topic

The blue, underlined text links you to related topics. Click on the link to move to the new topic.

Links

After you click on a blue, underlined portion of text, the screen updates with this link's content. To go back to the previous screen, press Back. To return to the link, press Forward.
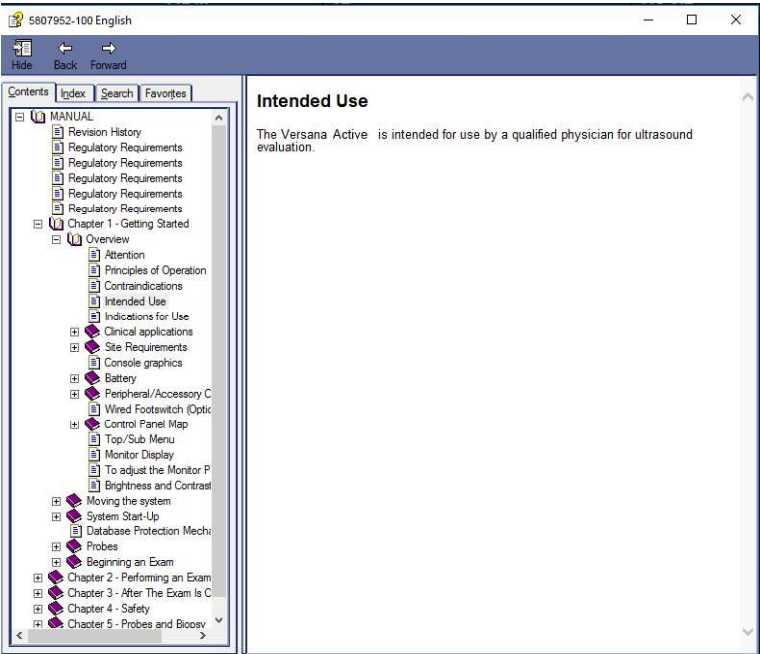
Figure 6-39.   Topic Link

Searching for a Topic

To search for a specific topic, click on the Search tab in the left portion of the screen. Type in the topic name in the *Type in the keyword to find:* field. Topics with the word or phrase you typed appear in the *Select Topic to display: area*. Either double click on the topic you want to view or highlight the topic and press the Display button to view this topics.
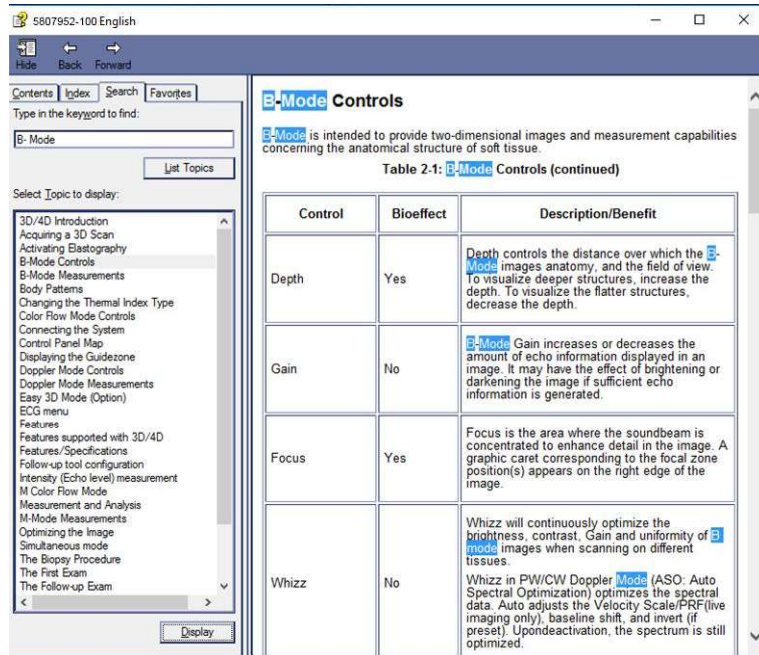
Figure 6-40.   Search Result

Versana Active – Basic User Manual
                                    Direction 5840764-100 English Rev. 10

Saving Favorite Topics

You may find that there are topics you need to refer to often. In this case, it's a good idea to save these topics as Favorites. To save a topic as a favorite, press the Favorites tab, highlight the topic in the Topics window, and press the Add button. You can now view this topic quickly by going to the Favorites help tab.
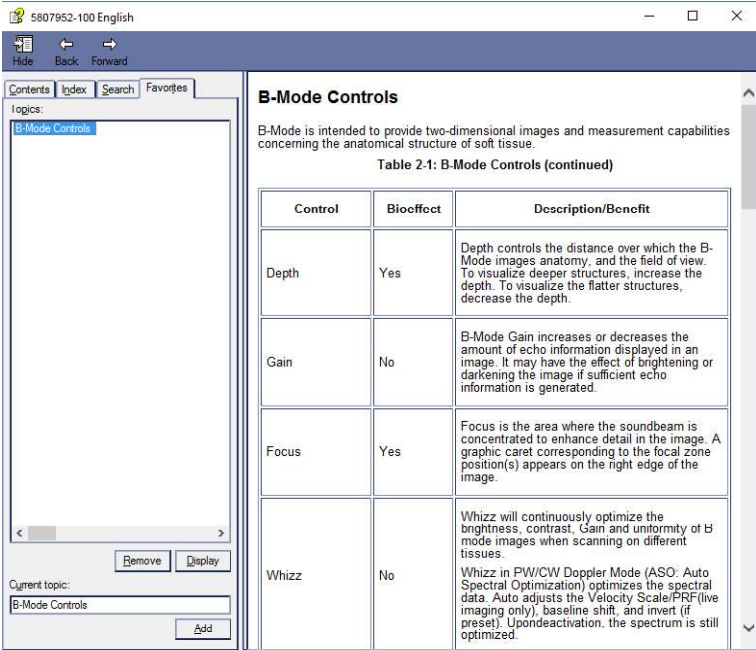
Figure 6-41.   Adding Favorites

Using the Index

Or, you can look for topics by using the Index. Press the Index tab, then use the scroll bar to look up a topic.
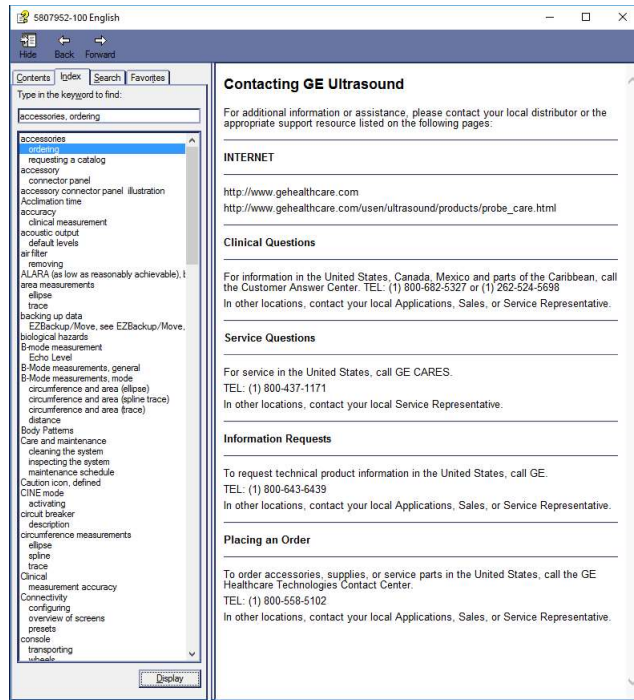
Figure 6-42.   Index

Other Help Features

To hide the left side of the screen, press the Hide icon at the upper, left-hand portion of the screen. To view the left side of the screen again, press the Show icon at the upper, left-hand portion of the screen.

To size the Help window, position and hold down the cursor at the corner of the screen while moving the Trackball.

To move the Help window, position and hold down the cursor at the very top of the Help window while moving the Trackball on the control panel.

Exiting Online Help

To exit Online Help, press the 'X' in the upper, right-hand corner of the Online Help window.

Electronic media

Accessing Documentation Via a PC

To view user documentation on a PC,

1. Insert the media into the media drive.
2. Open the media drive on your desktop.
3. Select and open the item you want to view.

To close the window, click on the 'X' in the upper, right-hand corner of the browser window.

NOTE: *If your PC does not have Adobe Reader, a free download is available on the Adobe web site at http://www.adobe.com.*

My Trainer

Overview

My Trainer provides a quick guide to operate the system.

To access My Trainer,

1. Press Alt + H to enter My Trainer.
    Or,
    Press Utility -> System -> User Configurable Key. Check
    Enable Keyboard Key, then set **My Trainer** in the Keyboard
    Key or User Defined Key.
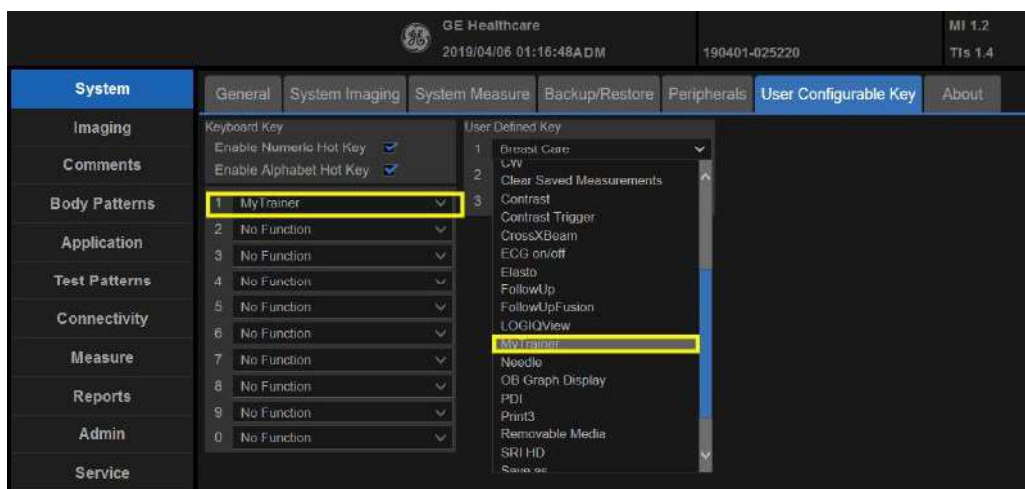
Figure 6-43.   Set My Trainer

2. Press defined key to access My Trainer.

Overview (continued)

There are four sections in My Trainer. The four sections are displayed on the left side of the My Trainer interface.

Figure 6-44.   Sections display

1.   Getting Started: Probe Connection

2.   System Setting: EZ Configure, Enable Options Check, Enable Option Key Activation Workflow, Numeral Key Conf, User Defined Keys Conf, Create Preset, Preset Archive and Restore, Patient Archive and Restore, Images Archival, My Preset, Back-up/Restore the Patient Preset, System Software Update, Standby Mode, Software Version

3.   Peripheral Connection: Back Panel Ports, Wired Connectivity, Wireless Connectivity, Bluetooth Connectivity, Connect to Thermal Printer, Connect to Network Printer, DICOM Worklist Setting, DICOM Image Storage

4.   Maintenance: Contact GE service, Configure Insite Agent for Remote Service, Log Export, Trackball Cleaning, Air Filter Replacement, AN Key Film, Isolation USB Connection, Keycaps

Overview (continued)

Figure 6-45.   Interface Illustration

The interface of the My Trainer includes below information:

1. The product name of the system.
2. Sections. Select the button to expand the section to show the list of subsections.
3. Subsections.
4. The highlighted subsection shows this subsection is currently opened and displayed on the right side.
5. Exit. Press this button to exit this interface.
6. The left number shows the current page of the subsection. The right number shows the total pages of the subsection.
7. Illustration with graphic.
8. Previous, Next, Home, End icons.

Table 6-6:   Page turning

<	Select the arrow to go to the previous page.
>	Select the arrow to move to the next page.

Table 6-6:   Page turning

≪	Select the arrow to go to the home page.
≫	Select the arrow to go to the end page.

9.   Step Description

Chapter 7

General Measurements and Calculations

Describes how to perform general measurements and calculations.

Introduction

Measurements and calculations derived from ultrasound images are intended to supplement other clinical procedures available to the attending physician. The accuracy of measurements is not only determined by system accuracy, but also by the use of proper medical protocols by the user. When appropriate, be sure to note any protocols associated with a particular measurement or calculation. Formulas and databases used within the system software that are associated with specific investigators are so noted. Be sure to refer to the original article describing the investigator's recommended clinical procedures.

⚠ WARNING   The system provides calculations (e.g. estimated fetal weight) and charts based on published scientific literature. The selection of the appropriate chart and clinical interpretation of calculations and charts is the sole responsibility of the user. The user should consider contraindications for the use of a calculation or chart as described in the scientific literature. The diagnosis, decision for further examination, and medical treatment must be performed by qualified personnel following good clinical practice.

Overview

This section provides information about taking measurements and describes calculations available in each mode. It includes the following topics:

- Exam workflow
- Location of measurement controls
- Description of calipers
- List of generic measurements
- General information about taking measurements
- Mode Measurements: Step-by-step instructions for taking specific measurements, organized by mode
- Basic steps to view and edit reports

Exam workflow

For each patient, the system organizes information by exam category, study, and measurement. The definitions of these terms are as follows:

- **Exam Category** – categories include the following:
  - Abdomen
  - Obstetrics
  - Gynecology
  - Cardiology
  - Vascular
  - Urology
  - Small Parts
  - Pediatrics
  - MSK
  - Thoracic

- **Study/Preset** – after you choose an exam category, the system allows you to select a study. For example, when you choose the Obstetrics exam category, you can choose one of the following studies:
  - Generic
  - OB-1
  - OB-2/3
  - OB-General
  - Fetal Heart
  - OB/GYN Vessel

- **Measurement** – the measurements and calculations needed to analyze an item of anatomy. For example, a femur length is a measurement. A measurement can include several pieces of measurement data. For example, to calculate the area of a gestational sac, you need to measure width, length, and depth.

For details on how to start a new patient, 'Beginning an Exam' on *page 4-2*.

Location of Measurement Controls

Figure 7-1. Locating Measurement Controls

1. **Clear**. During a measurement sequence, erases the measuring caliper and measurement data from the display. When not performing a measurement sequence, clears all calipers and measurements from the display.

2. **Measure**. Activates a measurement caliper and the calculation package associated with the currently selected preset.

3. **Depth/Zoom/Ellipse**. **Ellipse** activates the area/ellipse measurement function. During the ellipse adjustment, use the **Trackball** to increase or decrease the size of the ellipse. Select *Cursor Select* to adjust the measurement calipers.

4. **Set**. **Set** fixes the caliper for measurements and completes the measurement sequence.

5. **Trackball**. Moves the measurement calipers, selects the measurement on the Summary Window.

Description of calipers

While you are making a measurement, the measurement caliper is either active (open plus sign) or fixed (closed plus sign). An active caliper is green and a fixed caliper is yellow.

The system allows you to identify measurements by number or by unique symbol. If you choose Number as the Cursor Type, after you complete a measurement, it is assigned a number. If you choose Symbol as the Cursor Type, after you complete a measurement, the caliper symbol changes to one of the nine shown below. The symbols are used in sequence as listed. The first symbol is used for the first measurement, the second symbol for the second measurement, and so on. The numbers or symbols also identify measurements in the Results Window.

Figure 7-2. Fixed Caliper Symbols

For information about how to choose Cursor Type of Number or Symbol, See 'System/System Measure Preset Menu' on *page 16-16 for more information.*

Measurement line display

While you are making a measurement, the system displays a dotted line to show the measurement. After you press **Set** to complete the measurement, the dotted line remains on the display if the Cursor Line Display, found on the System -> System Measure screen, is selected. If Cursor Line Display is not selected, the system erases the dotted line and only the measurement calipers with a number or symbol are displayed.

List of general measurements

The following types of general measurements are available when you press **Measure** but do not choose a specific calculation. The type of measurement depends on the current scan mode.

After pressing Measure, rotate between various measurement types with the adjusting of **Caliper Change**.

B and CF Modes

- Dist (Caliper)
- Trace
- Spline
- Intensity
- Open Trace
- Open Spline

NOTE: *You can preset the sequence of B and CF area measurements in the Measure Key Sequence (B/CF) preset in the Utility -> Measure -> Advanced screen. See the "M&A Advanced Preset" section for more information.*

Doppler Mode

- Velocity
- Trace
- Time

M-Mode

- Caliper
- Distance

General Instructions

You can take measurements in all modes and image formats, including real-time, frozen, CINE. After you select an exam category, the available calculations are displayed.

Measurement and calculation results

As you take measurements, each measurement is given a sequential number on the display and in the Results Window. The system can display nine measurements on the screen at one time.

While you are taking a measurement, the value in the Results Window updates until you complete the measurement.

Once the Results Window has nine measurements, if you make any further measurements, the system erases the first measurement and adds the new measurement ("first in, first out").

Measurement graphics are kept while in cine scroll. The measurement graphic is redisplayed on the frame where it is taken, if preset on the Advanced M&A page.

Selecting a calculation

When you take measurements, you can select the calculation before you take the measurement or after you take it. For example, in Obstetrics, if you select the calculation before you take the measurement, the estimated fetal age is displayed as you take the measurement. If you select the calculation after you take the measurement, the estimated fetal age is displayed after you complete the measurement.

NOTE: *After you take a measurement, if you select a calculation and the measurement is not applicable for the calculation, then the system assumes you want to start the calculation. The system then uses the calculation for the next measurement.*

If there is a measurement listed in the Results Window that has not been assigned a calculation, to assign the measurement:

1. Press **Measure**.
2. To select the measurement in the Results Window, move the **Trackball** to the measurement.

   The measurement is highlighted.
3. Press **Set**.

   The system displays a list of applicable calculations. For example, if it is a distance measurement, the list includes all distance calculations for the current study.
4. To select an item in the list, move the **Trackball** to highlight the item and press **Set**.

   The system assigns the calculation to the measurement.

Selecting a measurement in a different application

While scanning a patient, you may find that you want to measure an item that is not in the current application. To select a calculation from a different application:

1. Press **Measure**.
2. Press **Second Menu**, the exam category menu is displayed.
3. Select the exam category that has the calculation you want to make.

    The system displays the selected exam category.
4. Select the study and the desired measurement.
5. After you complete the measurement, to return to the original application, repeat steps 1–4.

NOTE: *This measurement **DOES NOT** appear on the original application report.*

Moving the Results Window

You may want to change where the Results Window is positioned on the monitor display. There are two ways to move the Results Window:

1. Move the cursor to the "Move Results Window Icon". Press and hold down **Set** key meanwhile moving the Trackball to position the Results Window at the desired position, then release **Set** key.
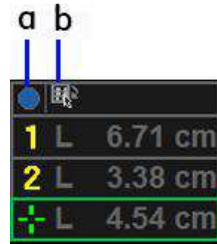
Figure 7-3. Results Window Icons

a. Minimize Results Window Icon

b. Move Results Window Icon

2. Select Utility -> System -> System Measure. In the Results Window portion, you can position the window on the screen. The display can be moved into the following locations:

   • Left Top
   • Left Bottom
   • Right Top
   • Right Bottom
   • Extreme Right Top
   • Extreme Right Bottom

Minimize/Maximize the Results Window

Move the arrow pointer by Trackball to the top-left icon in the Result Window and press **Set**. The Window is minimized and displays only the icons. Press **Set** again to maximize the display.

Erasing measurements

The following actions erase measurements from the system's memory:

HINTS

- If you adjust the Trackball, unfreeze the image, or press Clear, the system erases all completed measurements and calculations on the display. Measurements and calculations, however, remain on the reports.
- If you select **End Exam**, the system erases all measurements and calculations on the display and clears the reports.
- If you make a new measurement that exceeds the maximum number of allowable measurements, the system erases the first (oldest) measurement and adds the new measurement.
- If the second caliper is active, to erase the second caliper and activate the first caliper, press **Clear**.

General Instructions (continued)

The following are actions you can take while performing measurements.

HINTS

- Before making measurements, to stop the acquisition of image data, press **Freeze**.
- For measurements such as distance, to make fine adjustments before completing the measurements, adjust **Measure** to toggle between active calipers.
- Before completing the measurement sequence, to erase the active measuring caliper and the current data measured, press **Clear**.
- After the sequence is complete, to erase all data that has been measured to this point, but not data entered on report pages, press **Clear**.
- When there are several measurements on the display, to rotate through and activate previously fixed calipers, adjust **Cursor Select**. After a cursor is activated, you can change the measurement.

  NOTE: If you want to change a trace measurement, you must erase it and trace again.

- To repeat any measurement, select that measurement again.

Calculation formulas are available in the *Advanced Reference Manual*.

Measurement and Calculation Setup

Measurements and studies are organized for typical work flows. If you want, you can change this set up. You can specify which studies are in each exam category, and which measurements and calculations are in each study. You can change the measurements that are available. The Versana Active allows you to quickly and easily set up your system so that you can work most efficiently.

This section describes how to:

- Change a study to include different measurements
- Add a new study or measurement
- Remove a study from an exam category
- Change measurement parameters
- Create a measurement formula to correctly handle unit conversions
- Edit user-defined calculations
- Define application-specific measurement parameters
- Specify the default manual calc measurements for a selected study or folder

Starting Study and Measurement SetUp

You can make changes to studies and measurements in the Measurement & Analysis screen. To open the screen:

1. Enter **Utility**-> **Measure** .

2. On the monitor display, select **M & A** tab.

   The system displays the Measurement & Analysis screen on the monitor display.
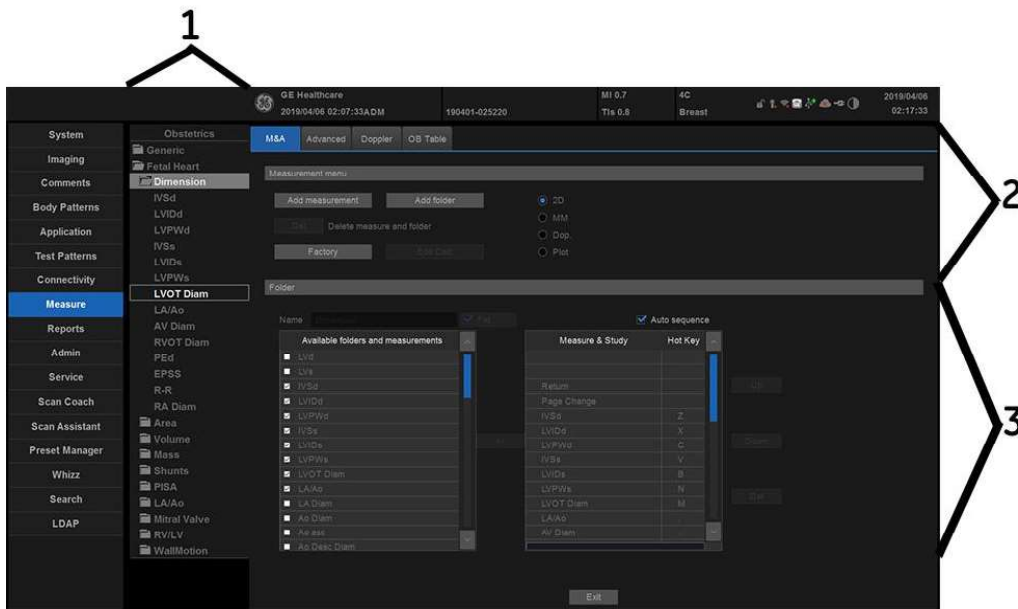
Figure 7-4.   Measurement & Analysis screen

1. **Selection menu**: select exam category, study, or measurement.

2. **Measurement menu**: add and delete studies (folders) and measurements; select mode.

3. **Folder or measurement**: define studies and measurements. This section changes between Folder and Measurement, depending on what you select in the Selection menu.

NOTE: *In the Measure menu, the navigational tabs across the top may differ from system to system but the functionality is the same.*

Selecting an exam category

When you open the Measurement & Analysis screen, it displays the exam category that was last used on the system. To select the exam category you want to work with:

1. Move the **Trackball** to highlight the exam category at the top of the Selection menu.

2. Press **Set**.

   The system displays a list of exam categories.

3. Move the **Trackball** to highlight the exam category you want.

4. Press **Set**.

The Selection menu lists studies and measurements for the selected exam category.
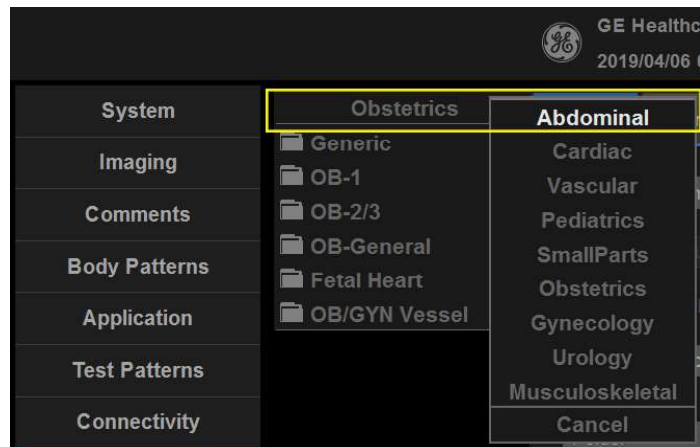
Figure 7-5.   Select Exam Category

Selecting the measurement mode

In the Measurement menu section of the Measurement & Analysis screen, select one of the following:

- 2D (B-Mode)
- MM (M-Mode)
- Dop. (Doppler Mode)
- Plot (Plot Mode—The measurement on the plot graph of the QAnalysis)

The Selection menu lists studies and measurements for the selected mode.
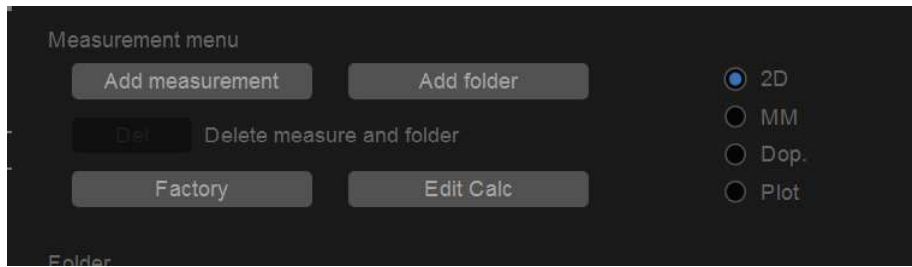
Figure 7-6.   Select Mode

Selecting a study or measurement

To work with a folder or measurement, you must first select it in the Selection menu. The Selection menu lists the studies and measurements for an exam category. The studies and measurements are organized in a hierarchy. The following example shows the highest level of the Obstetrics exam category, with the OB studies listed.
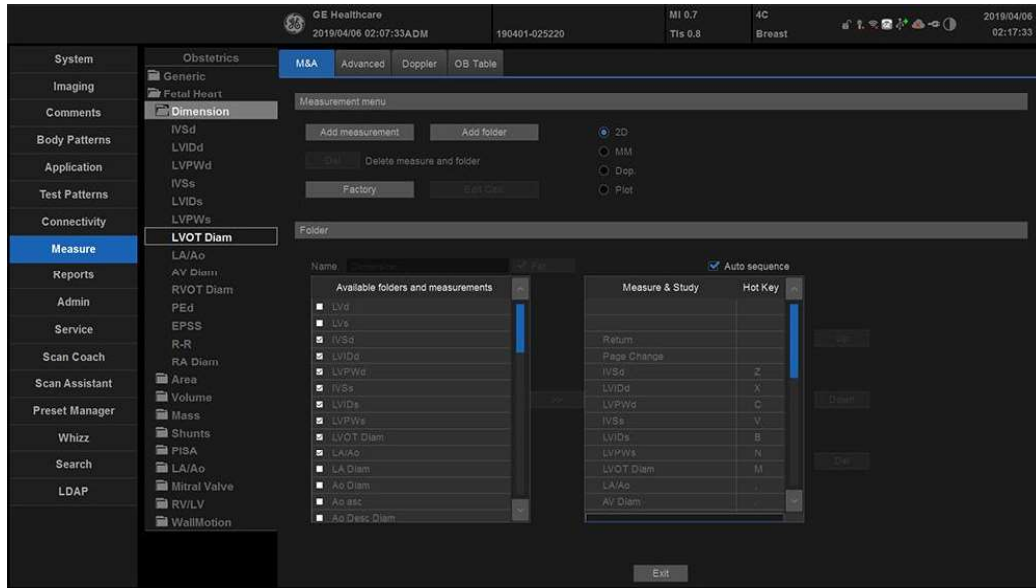
Figure 7-7.   Selection Menu: Exam Studies

Selecting a study or measurement (continued)

After you select a study, the Selection menu shows all folders and measurements in the study. The Folder section of the Measurement & Analysis screen changes, and lists the measurements. The Selection menu shows all measurements for the OB-1 exam category.
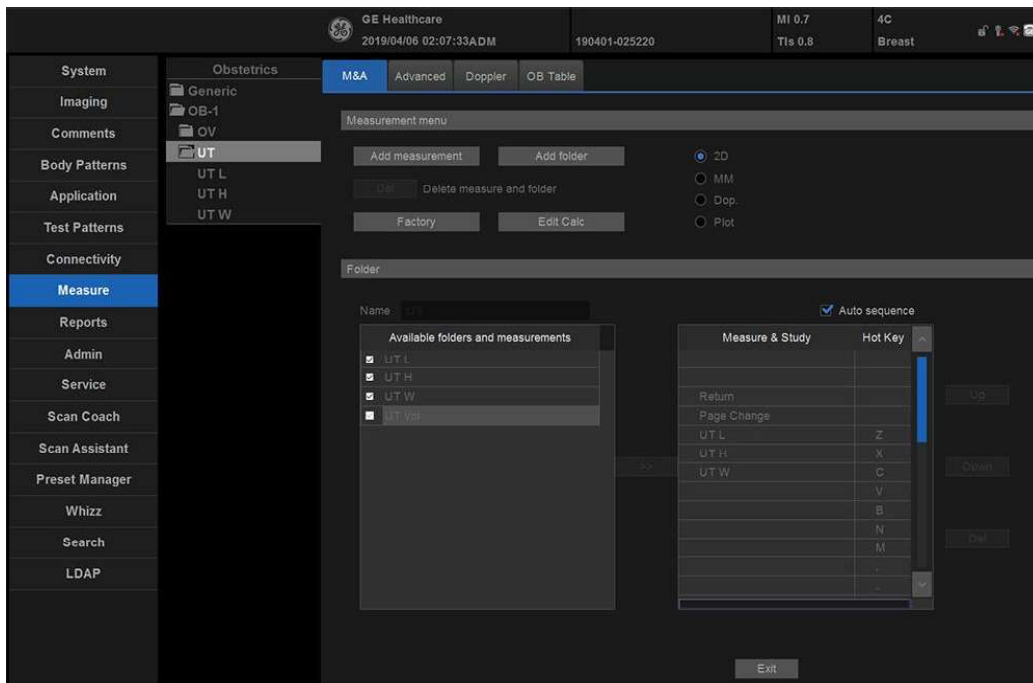
Figure 7-8.   Selection Menu: OB-1 Exam Category

Selecting a study or measurement (continued)

The following example shows the Selection menu after the BPD measurement is selected. The Measurement section is now displayed, with information about the BPD measurement.
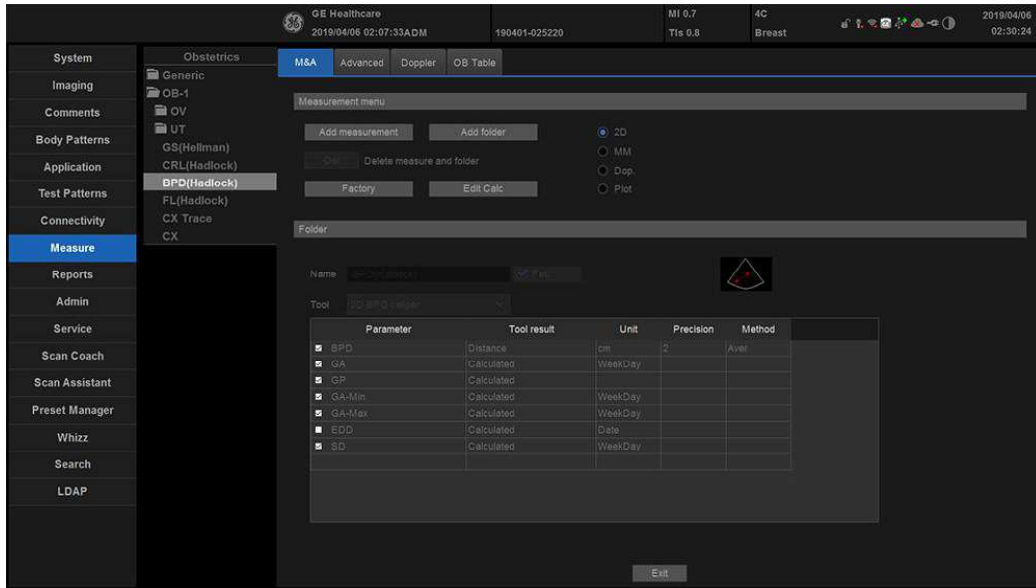
Figure 7-9.   Selection Menu: BPD Measurement

Selecting a study or measurement (continued)

To select a folder or measurement:

1. Move the **Trackball** to the Selection menu and highlight the folder or measurement.

2. Press **Set**.

   • If you selected a folder, the system displays the folder in the Folder section of the Measurement & Analysis screen.

   • If you selected a measurement, the system displays the measurement in the Measurement section of the Measurement & Analysis screen.

NOTE: *Items must be selected in the Available folders and measurements list to be in the Selection menu. To move or change an item that is in the Available folders and measurements list but not in the Selection menu, move the* **Trackball** *to the check box for the item, and press* **Set***. The item is now listed in the Selection menu.*
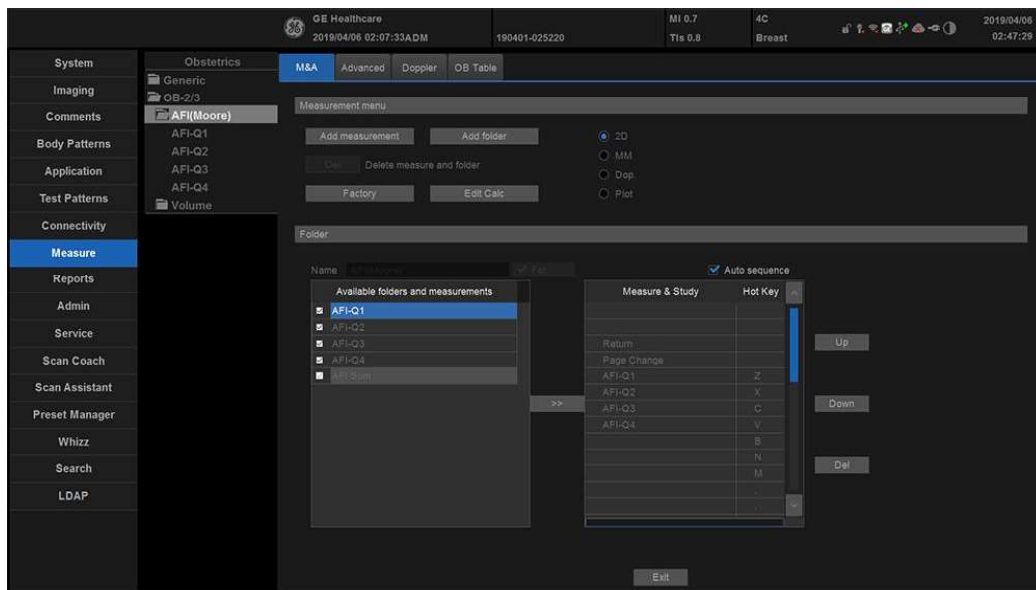
Figure 7-10.   Available folders and measurements check boxes

Using folders

When you select a folder in the Selection menu, the system displays all folders and measurements that are in the folder. A folder can indicate a study, or can indicate a measurement group that contains related measurements. For example, a calculation such as OB Amniotic Fluid Index (AFI) requires four measurements, one of each quadrant. The AFI folder contains four measurements.
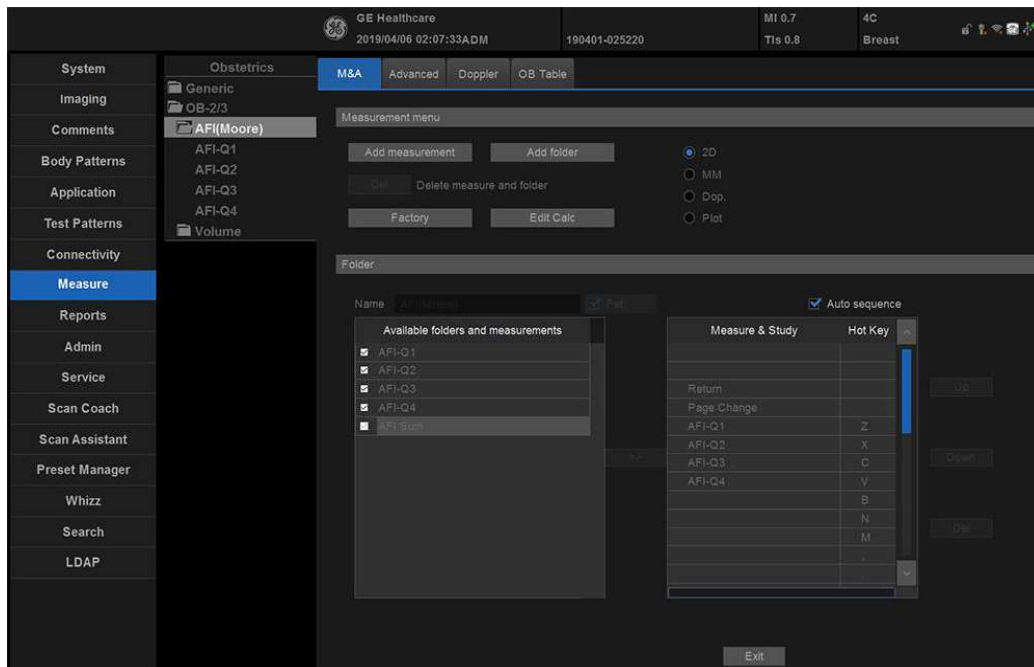
Figure 7-11.   AFI Folder

Specifying Which Measurements Go in a Study or Folder

The Folder section of the Measurement & Analysis screen has two lists of folders and measurements. This is where you specify which items go in a study or folder.

- **Available folders and measurements.** The left list contains all possible folders and measurements for the selected study or folder.

- **Measure & Study.** The right list has all folders and measurements currently selected for the study or folder. These are selected from the Available folders and measurements list. These are the folders and measurements you see when you are scanning and choose an exam category. This also defines the order the folder or measurement is located, based on the number in this list.

Specifying Which Measurements Go in a Study or Folder (continued)

To add an item to the Measure & Study list:

1. In the Measure & Study list, move the **Trackball** to highlight which folder you want to put the item in, and press **Set**.
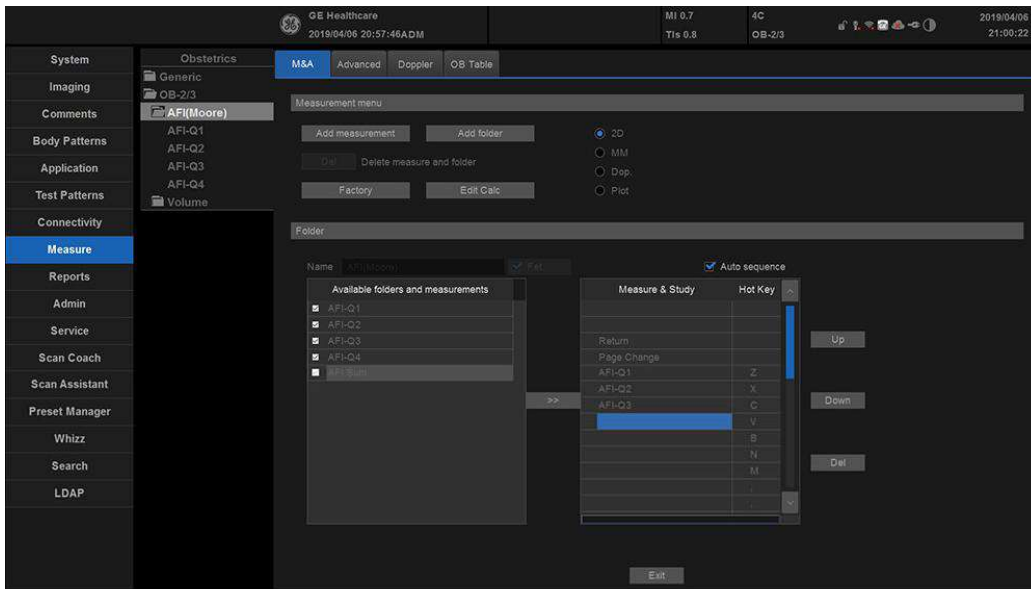
Figure 7-12.   Measure & Study list: Selecting item and position

2. Move the **Trackball** to highlight an item in the Available folders and measurements list, and press **Set**.

Specifying Which Measurements Go in a Study or Folder

(continued)

3. Select the arrow between the lists. The item is copied to the Measure & Study list.
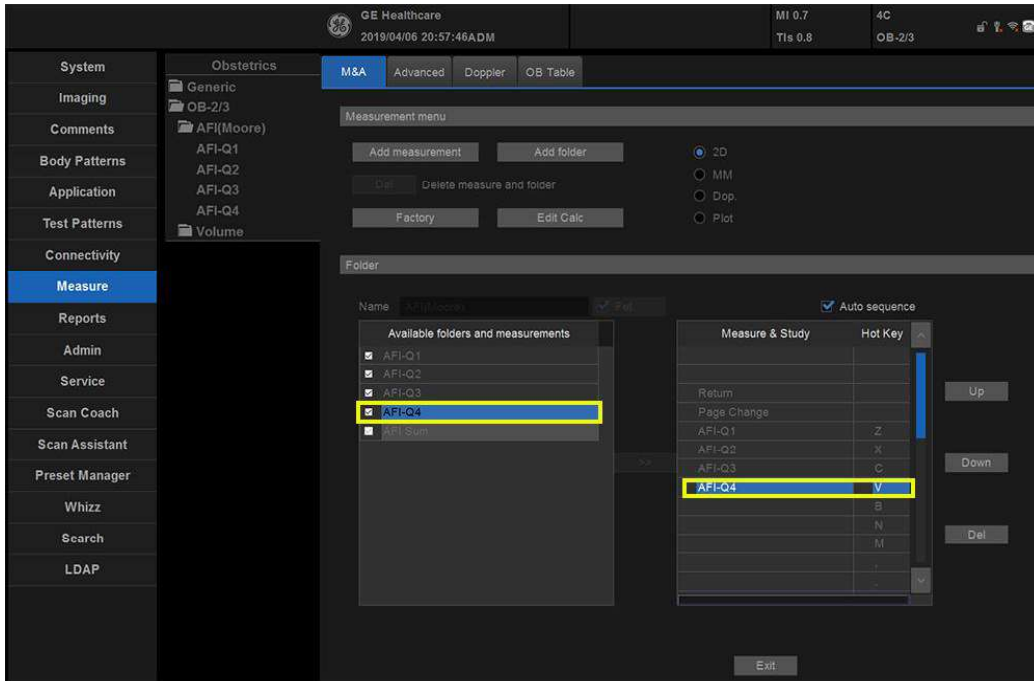
Figure 7-13.   Measure & Study list: New item added

The selected item is now displayed in the Measurement Summary Window.

NOTE: *If an item is already in the Measure & Study list, the system does not allow you to add it again. To move an item within the Measure & Study list, See 'Moving items in the Measurement Summary Window' on page 7-26 for more information.*

Specifying Which Measurements Go in a Study or Folder (continued)

Measurement Summary Window

The figure below shows the OB menu area and a portion of the Measurement and Analysis screen for OB.
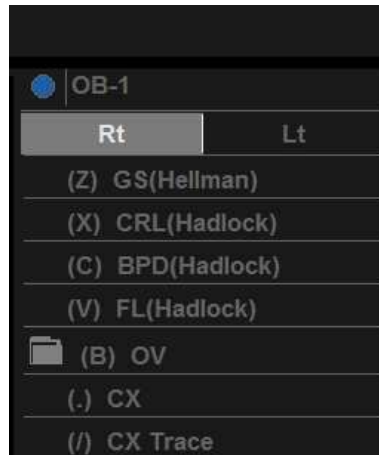
Figure 7-14.　Measurement Summary Window

Moving items in the Measurement Summary Window

To move items that are displayed in the system menu, you move them in the Measure & Study list.

1. Move the **Trackball** to highlight an item in the Measure & Study list.

2. Select the up or down arrow.

   The item is displayed at the selected position in the system menu.

Removing items from the System Menu

To remove an item from the Selection menu:

1. Move the **Trackball** to move to the item in the Available folders and measurements list.

2. To clear the check box for the item, move the **Trackball** to the check box and press **Set**.

   The system removes the item from the Selection menu, the Measure & Study list, and from the System Menu. It is also not listed in the Summary Window.

Setting up an automatic measurement flow

In some cases, related measurements are put in a measurement folder. This allows you to logically organize measurements. It also allows you to specify that the system automatically start each measurement in a folder, one after the other. This is the automatic sequence feature. To use this feature:

1. In the Selection menu, select the folder that contains the measurements you want.

    The system displays the folder and lists the measurements.

2. In the Folder section of the Measurement & Analysis screen, select Auto sequence. For OB-1 measurements, Uterine Volume measurements are put in the Uterine folder.
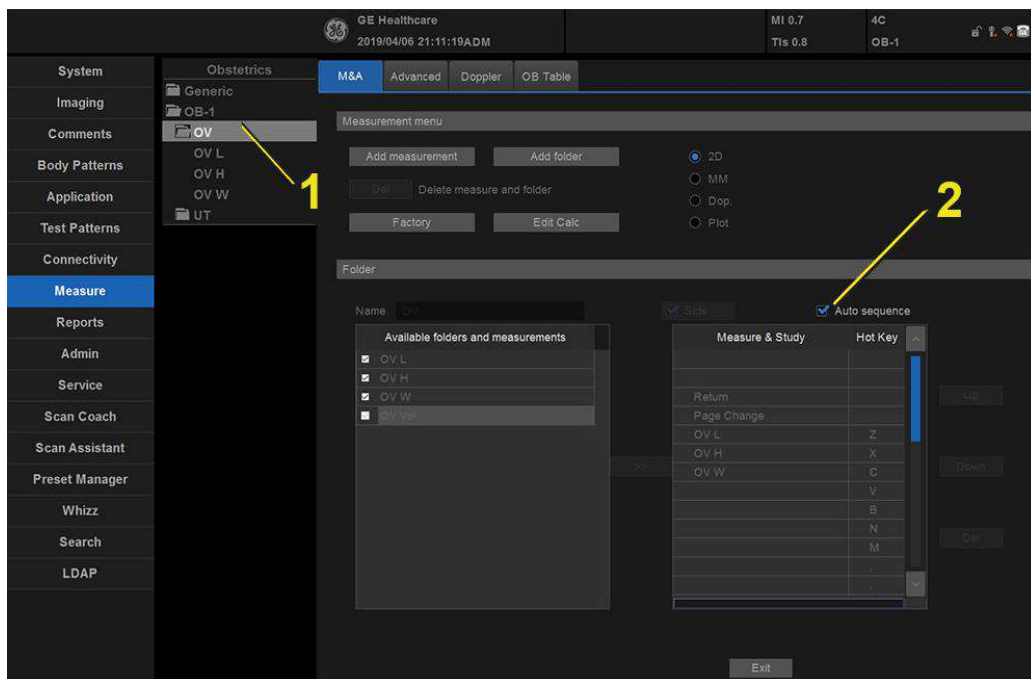
Figure 7-15.   Measurement & Analysis screen: Auto sequence

1. Selection Menu   2. Auto Sequence

Changing Measurements

You can make changes to some of the measurements. For example, Head Circumference can be measured with an ellipse, a trace, or two distances. You can specify which measurement type you want the system to use as the default. You specify the measurement type by selecting the tool to use to make the measurement.

• To change the tool used to make a measurement:

In the Measurement section of the Measurement & Analysis screen, select the desired tool from the Tool list. Select the arrow to display the drop-down list.

NOTE: *If the Tool field is gray, it cannot be changed.*

After you choose the tool, this is what the system expects when you scan and choose this measurement.

NOTE: *The diagram to the right of the Tool list shows the measurement type. In the following example, ellipse is selected and the diagram shows an ellipse.*
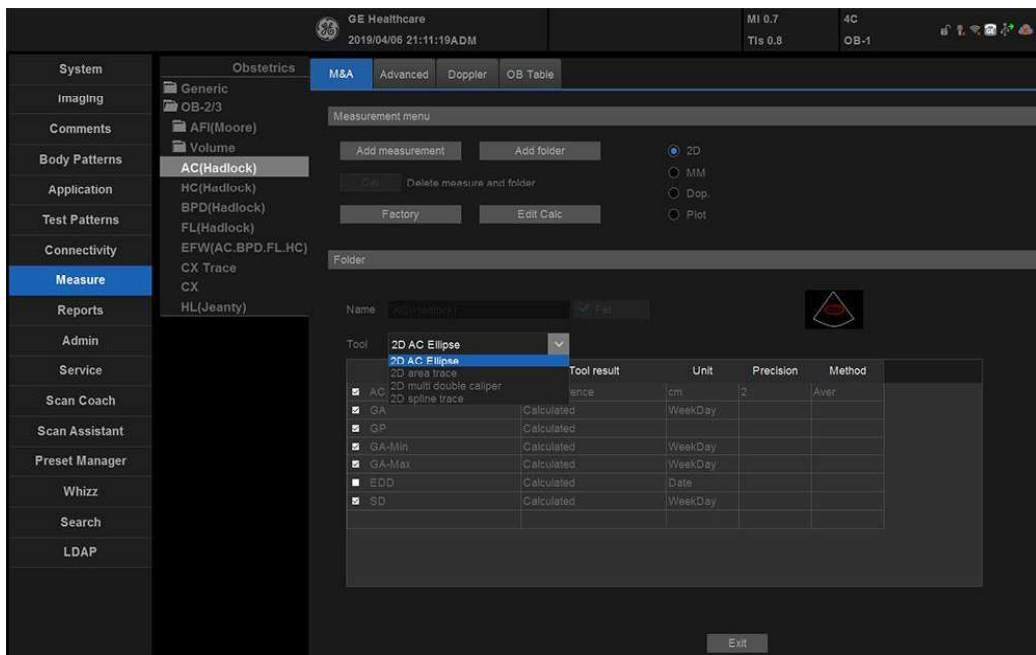
Figure 7-16.   Measurement & Analysis screen: Change measurements

Adding Folders and Measurements

Adding a folder

When you add a folder, it can be a study, or a measurement folder that includes related measurements.

1. In the Selection menu, select the study or folder where you want to add the folder.

2. In the Measurement menu section, select Add folder.

   • If you select Blank, the system adds a folder with a name such as USERDEFS1. It is listed in the Selection menu.

   • If you want to use an existing folder, select Insert, and then select a folder from the list. The list includes all folders defined for the current exam category and selected mode. You cannot edit this folder.
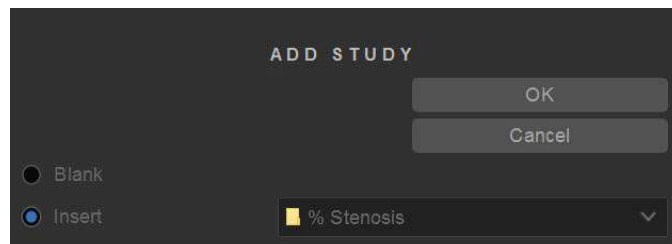
Figure 7-17.   Add folder Window

3. Select the user-defined folder in the Selection menu.

   The system displays the new folder in the Folder section of the Measurement & Analysis screen.

4. To name the folder, move the **Trackball** to highlight the Name field, press **Set** twice, and type the name.

NOTE: *DO NOT use "single quotes" for a parameter name, a measurement name, a folder name or an author name.*

5. To add measurements to the folder, See 'Adding a user-defined measurement' on *page 7-31 for more information.*

Adding a folder (continued)
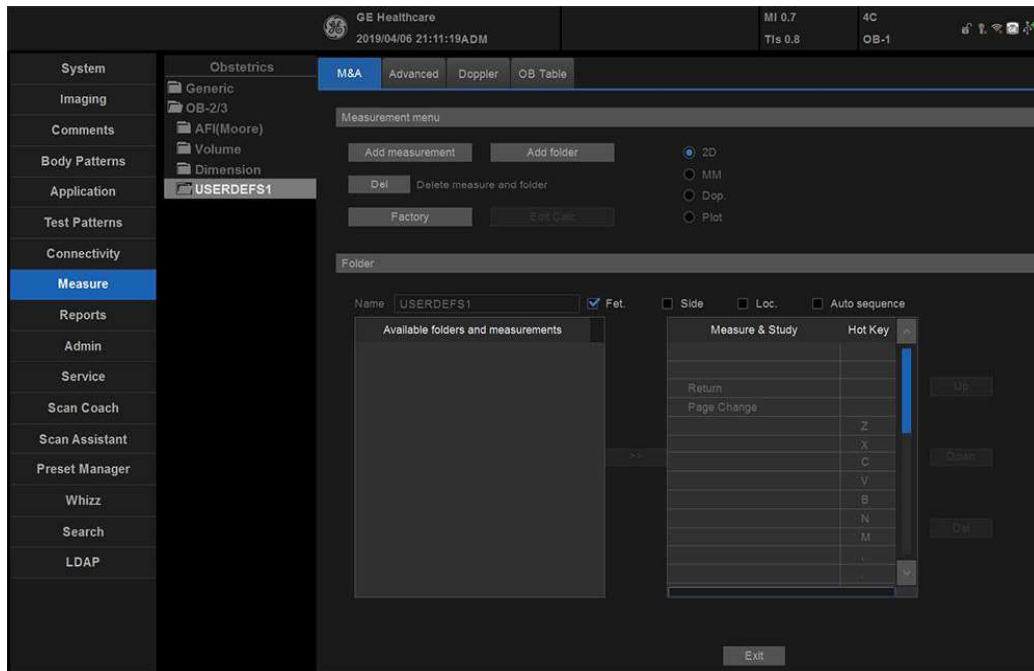
Figure 7-18.   Measurement & Analysis: Add folder

Adding a user-defined measurement

⚠ WARNING Please remember that you are responsible for confirming the correctness and accuracy of the user input formula that is added to your system on your behalf.

You can create a user-defined measurement in a system-defined folder or in a folder you created.

NOTE: *DO NOT use "single quotes" for a parameter name, a measurement name, a folder name or an author name.*

1. In the Selection menu, select the study or folder where you want to add the measurement.

2. In the Measurement menu section, select **Add Measurement**.

   The system displays the Add Measurement window.
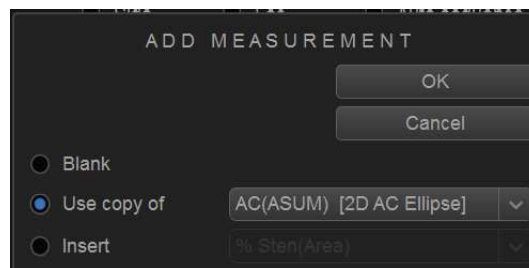
Figure 7-19.   Add Measurement window

3. Do one of the following:

   • If you want to create this measurement from a copy of an existing measurement, select **Use copy of**, and then select a measurement from the list. The list includes all measurements defined for the current exam category and selected mode.

NOTE: *This only applies to OB and Cardiac.*

   • If you want to use an existing formula, select **Insert**, and then select a measurement from the list. The list includes all measurements defined for the current exam category and selected mode. You cannot edit this formula.

   • If you want to create a blank new measurement, select **Blank**.

Adding a user-defined measurement (continued)

4. Select *OK*.

    •   If you created a blank measurement, the system adds a measurement with a name such as USERDEFM1.

    •   If you created a measurement from a copy of an existing measurement, the system lists the measurement and its parameters in the Measurement section.

5. When you create a new measurement, the measurement name is automatically highlighted. Type a name for the new measurement. You can change the name of a measurement you created from a copy.
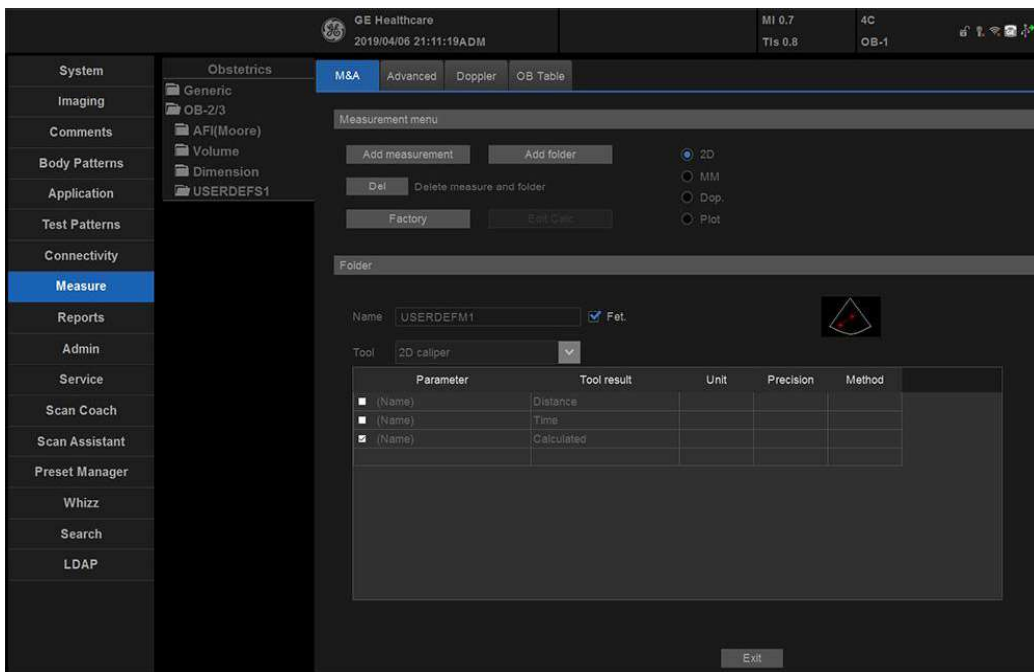
Figure 7-20.   Measurement & Analysis: Add measurement

Adding a user-defined measurement (continued)

> *NOTE:* *2D Dual Caliper, 2D Dual Area, 2D Dual Ellipse, and 2D Dual Spline Trace are not available through the factory default. To enable these measurements, add a new measurement using "2D Dual Caliper", "2D Dual Area", "2D Dual Ellipse", or "2D Dual Spline Trace" tool.*

Defining measurement parameters

After you add a measurement, you can add parameters. You may also want to change parameters if you copied an existing measurement. See 'Changing or adding measurement parameters' on *page 7-33 for more information.*

Changing or adding measurement parameters

You can make changes to measurement parameters and you can add measurement parameters.

Changing measurement parameters

To change a measurement parameter:

1. In the Selection menu, select the measurement.

2. For the factory default measurement, you are not allowed to change the name of the Parameter. For the user-defined measurement, to change the name of the Parameter, move the **Trackball** to the parameter name and press **Set**. Type a name for the parameter.

3. To change the Unit/Precision/Method, move the **Trackball** to position the cursor and press **Set**. Then select the desired parameter from the drop-down list.

For a description of other measurement changes, See 'Changing Measurements' on *page 7-28 for more information.*

Editing Calculations

To modify user-defined calculations:

1. In the Measurement menu section, select **Edit calc**.
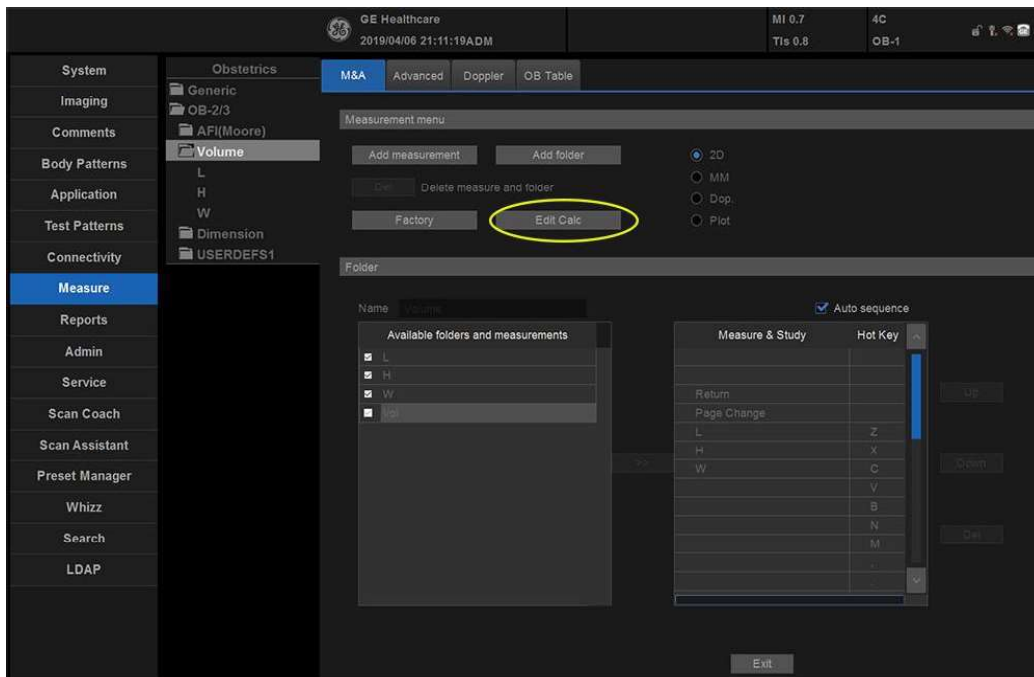
Figure 7-21.   Edit Calc

The Modify User CALC window displays.

Editing Calculations (continued)

2. In the User Defined list, select the calculation that you want modified, then select **OK**.
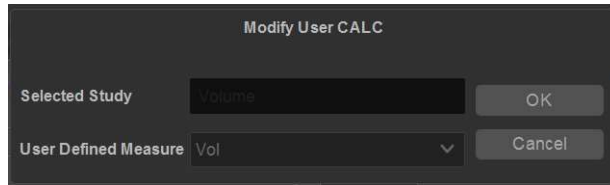
Figure 7-22.   Modify User CALC window

3. The Measure tab for user-defined calculations displays. Double click on the equals sign symbol under Tool Result for the desired parameter.

4. Edit the formula as needed and select **OK**.

Deleting a Folder or Measurement

NOTE: *You can only delete user-defined folders or measurements. You cannot delete default system folders or measurements.*

1. Select the folder or measurement in the Selection menu.

2. In the Measurement menu section, select the Del next to Delete measure and folder.

M&A Advanced Preset

The system allows you to specify application-specific values for certain parameters. You specify the parameter values on the Advanced tab of the Measurement & Analysis screen.

1. Enter *Utility*->**Measure**.

2. On the monitor display, select the Advanced tab.
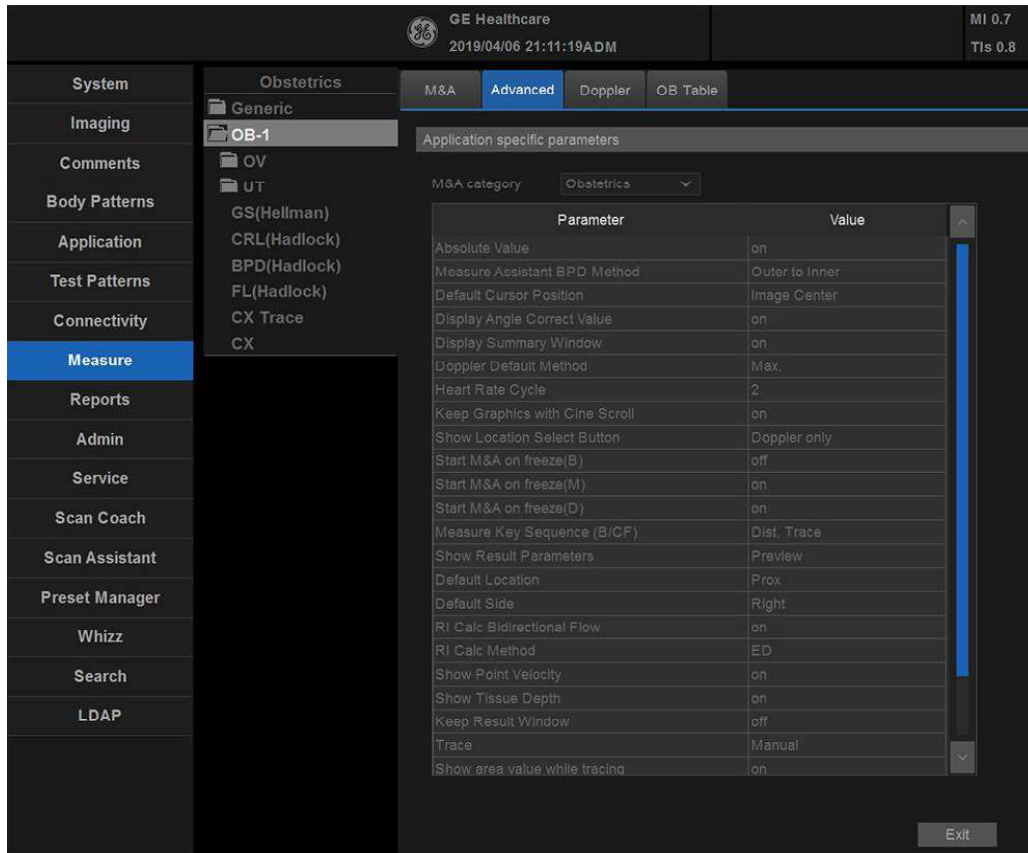
Figure 7-23.   M&A Advanced Preset Menu

M&A Category: Display and select current exam category.

Parameter: Lists application specific parameters.

Value: Select the value for a parameter.

3. To select an exam category, select it from the M&A category list.

The Parameters list displays parameters for the selected category.

M&A Advanced Preset (continued)

4. To select a value for a parameter, select it from the Value list.

NOTE: *The parameters that appear are category dependent.*

Table 7-1:   M&A Advanced

Preset Parameter	Description
Absolute Value	Displays the absolute value of the Doppler Velocity measurement (On or Off)
Display Angle Correct Value	On or Off
Display Summary Window	On or Off
Doppler Default Method	Avg, Max, Min or Last
Heart Rate Cycle	1, 2, 3, 4, 5, 6, 7, 8, 9, or 10 *NOTE: For Cardiac, you can select only "1".*
Keep Graphics with Cine Scroll	If you select "On", the measurement graphics remain while in CINE scroll. The measurement graphic redisplays on the frame where the measurement was taken in B-Mode.
Start M&A on a Freeze (B) Start M&A on a Freeze (M) Start M&A on a Freeze (D)	Off: Select measurement manually on Freeze On: Measurement menu appears automatically on Freeze. Caliper: Measurement menu and caliper appear automatically on Freeze.
Measure Key Sequence (B/CF)	2 Sequences: Dist, Trace; Dist, Spline 2 Sequences: Dist, Open Trace: Dist, Open Spline 3 Sequences: Dist, Trace, Spline; Dist, Spline, Trace; Dist, Spline, Intensity; Dist, Trace, Intensity; Dist, Trace, Open Trace; Dist, Spline, Open Trace 4 Sequences: Dist, Trace, Spline, Intensity; Dist, Spline, Trace, Intensity; Dist, Spline, Trace, Open Trace; Dist, Trace, Open Trace, Spline
Show Result Parameters	Preview or After Set cursor: Preview: Displays while taking the measurement. After Set Cursor: Displays after completing the measurement.
Default Location	Off, Prox, Mid or Dist
Default Side	Left, Right or Off
RI Calc Bidirectional Flow	On or Off
RI Calc Method	MD or ED
Show Location Select Button	Both on B and Doppler, Doppler only or No Display NOTE1: Only Abdominal, Vascular, Obstetrics and Gynecology have this preset. NOTE2: For Obstetrics and Gynecology, you can select only Doppler only or No Display.

Table 7-1:   M&A Advanced (Continued)

Preset Parameter	Description
Show BM Folder Name on Worksheet	On or Off
Show Measure Name on Worksheet	On or Off
Show Point Velocity	On or Off
Show Tissue Depth	On or Off
Keep Result Window	Auto, On or Off
Trace	Auto or manual
Vol Flow Method	TAMEAN or TAMAX
Vol Flow Compensation with TAMAX	If you select TAMAX as the volume flow method, then you MUST specify the coefficient to use. Select from 0.5 to 1.0.
Worksheet Default Display	Mode/Expand (Abdominal, Small Parts, Obstetrics, Gynecology, Urology and Pediatrics) or Worksheet Summary (Vascular)
Doppler AutoCalc Velocity Unit	Velocity, Hz, Both or Auto
WMS Freeze Loop at ES	On or Off
WMS Segment Model	16 segments or 18 segments
WMS Initial Scoring	Undefined or Normal
WMS Scoring Legend	ASE, European or Asian
Hip Orientation	Cranial-left or Caudal-left
Show area value while tracing	On or Off

Manual Calcs Presets

The system allows you to preset the parameters for manual calculations. You specify the parameter values on the Doppler tab of the Measurement & Analysis screen.

1. Enter Utility -> Measure -> Doppler .
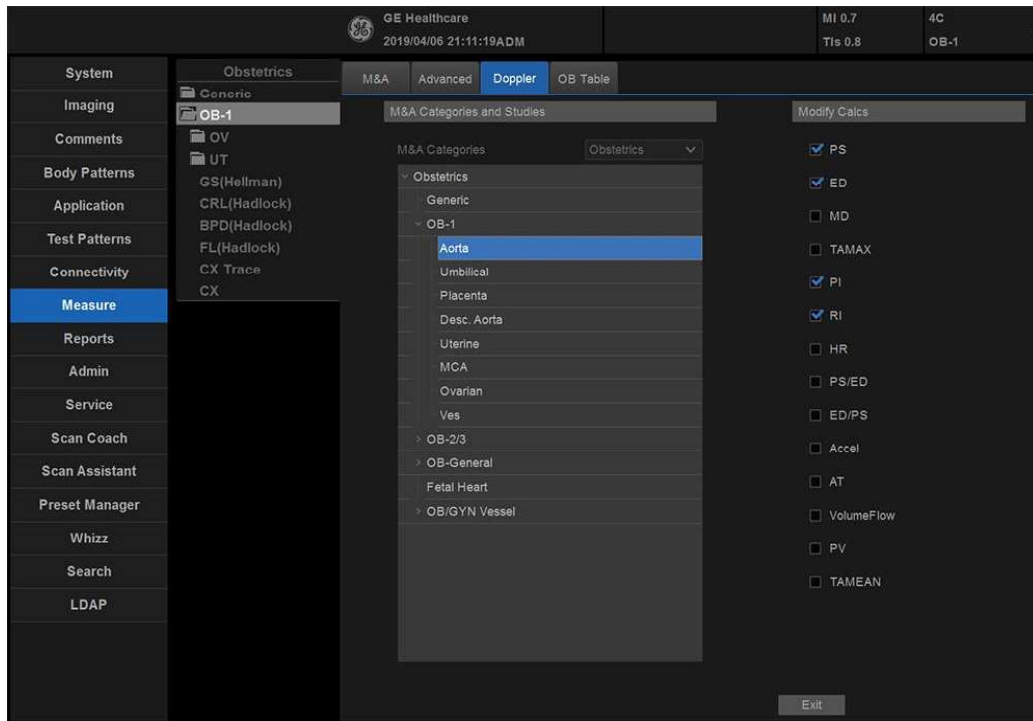
Figure 7-24.   M&A Doppler Preset Menu

M&A Category: Display and select current exam category.

Manual Calcs Presets (continued)

2. To select an exam category, select it from the M&A category list.

   The system displays a hierarchical view of the exam category and the studies and folders in the category.

3. In the hierarchical view, select a study or folder.

4. In the Modify Calcs column, select the measurements that you want to the system to show for manual calcs for the selected study or folder.

5. Select **Exit**.

Application Measurement Preset

The Application Measurement presets allow different calculation packages to be available under different application presets.

The presets allow you to configure the Measurement Categories and Measurement Exam Calcs. These presets are found on the Utility -> Application -> Measurements screen.
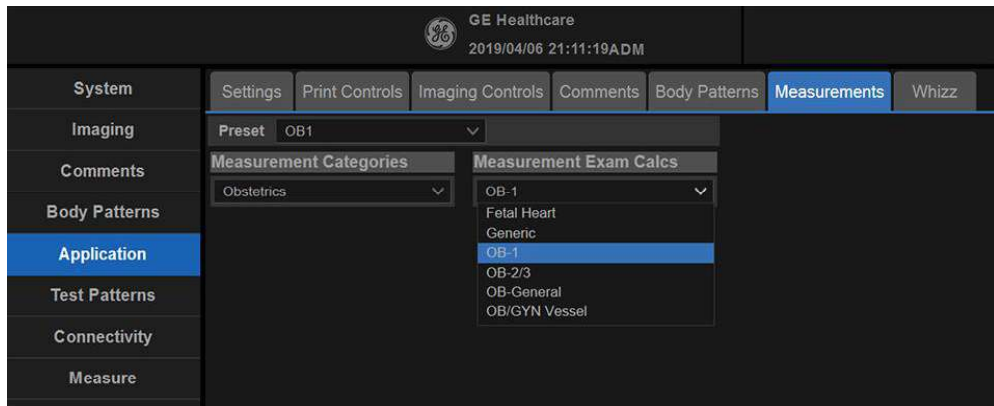
Figure 7-25.   Application Measurement

Mode Measurements

B-Mode Measurements

Two basic measurements can be made in B-Mode.

- Distance
- Circumference and Area

    - Ellipse Method
    - Trace Method
    - Spline Method

NOTE: *The following instructions assume that you first scan the patient and then press* **Freeze***.*

Distance measurement

To make a distance measurement:

1. Press **Measure**.
2. To position the active caliper at the start point, move the **Trackball**.
3. To fix the start point, press **Set**.

   The system fixes the first caliper and displays a second active caliper.
4. To position the second active caliper at the end point, move the **Trackball**.

   A dotted line connects the measurement points, if preset accordingly.
5. To complete the measurement, press **Set**.

   The system displays the distance value in the Results Window.

The following hints can help you to perform distance measurements:

HINTS

- **Before** you complete a measurement:
  - To toggle between active calipers, adjust **Cursor Select**.
  - To erase the second caliper and the current data measured and start the measurement again, press **Clear** once.

- **After** you complete the measurement:
  - To rotate through and activate previously fixed calipers, adjust **Cursor Select**.
  - To erase all data that has been measured to this point, but not data entered onto reports, press **Clear**.

Circumference and area (ellipse) measurement

You can use an ellipse to measure circumference and area. To measure with an ellipse:

1. Press **Measure**.
2. To position the active caliper, move the **Trackball**.
3. To fix the start point, press **Set**. The system fixes the first caliper and displays a second active caliper.
4. To position the second caliper, move the **Trackball**.
5. Rotate the **Ellipse** control; an ellipse with an initial circle shape displays.
6. To position the ellipse and to size the measured axes (move the calipers), move the **Trackball**.
7. To increase the size, rotate the **Ellipse** control in a clockwise direction. To decrease the size, rotate the **Ellipse** control in a counterclockwise direction.
8. To toggle between active calipers, adjust **Cursor Select**.
9. To complete the measurement, press **Set**. The system displays the circumference and area in the Results Window.

HINTS

Before you complete the ellipse measurement:

- To erase the ellipse and the current data measured, press **Clear** once. The original caliper is displayed to restart the measurement.
- To exit the measurement function without completing the measurement, press **Clear** a second time.

Circumference and area (trace) measurement

Trace

To trace the circumference of a portion of the anatomy and calculate its area:

1. Press **Measure** key to enter Measure mode.
2. Adjust **Caliper Change** in the primary menu to **Trace**.
3. To position the caliper at the start point, move the **Trackball**.
4. To fix the trace start point, press **Set**. The caliper changes to an active caliper.
5. To trace the measurement area, move the **Trackball** around the anatomy. A dotted line shows the traced area.
6. To complete the measurement, press **Set**. The system displays the circumference and the area in the Results Window.

Circumference and area (trace) measurement (continued)

Open Trace

To trace the circumference of a portion of the anatomy and calculate its length:

1. Press **Measure** key to enter Measure mode.
2. Adjust **Caliper Change** in the primary menu to **Trace**.
3. To position the caliper at the start point, move the **Trackball**.
4. To fix the trace start point, press **Set**. The caliper changes to an active caliper.
5. To trace the measurement area, move the **Trackball** around the anatomy. A dotted line shows the traced area.
6. To complete the measurement, press **Set**. The system displays the circumference and the length in the Results Window.

HINTS

Before you complete the trace measurement:

*   To erase the line (bit by bit) back from its current point, move the **Trackball** or adjust the **Ellipse** control counterclockwise.
*   To erase the dotted line but not the caliper, press **Clear** once.
*   To clear the caliper and the current data measured, press **Clear** twice.

Circumference and area (spline trace) measurement

To trace the circumference of a portion of the anatomy and calculate its area:

1. Press **Measure**.

2. Adjust **Caliper Change** in the primary menu to **Spline**.

3. To position the first caliper at the start point, move the **Trackball**.

4. To fix the trace start point, press **Set**. The first caliper turns yellow. The second caliper appears at the same position as the first caliper and is green.

NOTE: *When pressing the **Clear** key once, the second caliper disappears and the first caliper is activated.*

   *If **Clear** is pressed again, the first caliper disappears and the Spline trace is cancelled.*

5. To position the second caliper, move the **Trackball** and press **Set**. The third caliper appears at the same position.

NOTE: *The **Clear** key functionality is the same as noted in the previous step.*

   The spline trace requires at least three points to draw the trace. Continue setting the points of the trace until the desired points are set.

6. Press **Set** again after the last caliper is fixed to finalize the spline trace. All points are removed from the line and the spline trace turns yellow.

   Press **Set** twice to finish this measurement.

   If **Clear** is pressed twice when more than 3 points exist on the trace, all points are removed and the first caliper again displays.

NOTE: *Spline trace is not available through the factory default. The system defaults to trace. To enable spline trace, modify the Measure Key Sequence preset found in Utility -> Measure -> Advanced preset.*

Circumference and area (spline trace) measurement (continued)

Edit the spline trace

1. Select *Cursor Select*. The spline trace changes to green and all points appear on the trace as yellow.

   A pick-caliper appears on the center of the image and the message "Edit spline trace" displays at the bottom of the screen.

NOTE: The pick-caliper is used to select and move the trace points.
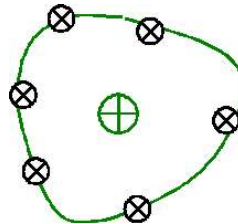
Figure 7-26.   Edit spline trace

Select *Cursor Select* again. The trace is deactivated (changes to yellow) and all points, including the pick-caliper, are removed.

If the previous/next fixed caliper exists on the image, it is activated.

*NOTE: Pressing **Clear** at this time removes all points and the trace graphic.*

2. Move the pick-caliper to the desired point and press **Set**. The point is activated and turns green.

3. Move the point to the desired position and press **Set**. The point is fixed and turns yellow. The pick-caliper appears on the center of the image.

NOTE: The spline trace is updated at run time.

*NOTE: To remove a point, press **Clear** while moving the point. The trace turns green and the remaining points continue to be shown as yellow. If there are less than three points, the spline trace is removed.*

4. Press **Set** again. All points are removed from the trace and the trace is shown as yellow.

Intensity (Echo level) measurement

To make an echo level measurement:

1. Press **Measure** key to enter Measure mode.
2. Adjust **Caliper Change** in the primary menu to **Intensity**.
3. To position the caliper at the start point, move the **Trackball**.
4. To fix the trace start point, press **Set**. The caliper changes to an active caliper.
5. To trace the measurement area, move the **Trackball** around the anatomy. A dotted line shows the traced area.
6. To complete the measurement, press **Set**. The system displays the echo level in the Results Window.

NOTE: *The echo level measurement is only available on a frozen image, not on a B-paused image.*

NOTE: *Echo Level is not available through the factory default. To enable echo level, modify the Measure Key Sequence preset, found in the Utility -> Measure -> Advanced preset.*

2D Dual caliper

NOTE: *2D dual caliper / 2D dual area / 2D dual ellipse / 2D dual spline trace / 2D dual circle are not available through the factory default. To enable these measurements, add new measurement using "2D dual caliper", "2D dual area", "2D dual ellipse", "2D dual splinetrace" or "2D dual circle" tool in the Utility -> Measure -> M&A preset menu.*

You can take a measurement on dual images with B and B mode, on dual images with B and CF mode, with simultaneous mode or on dual images with live image with 2D dual measurements.

1. Select an added measurement from the menu area to enable the appropriate measurement. A caliper displays.

NOTE: *When the measurement is selected without dual B images or with different probe images, warning message is displayed on the status bar, and the selected measurement is canceled.*

2. To position the caliper at the start point, move the **Trackball**.

You can use both images as an original image.

NOTE: *If the first point of the original graphic is out of the shadow image area, then the warning message displays on the status bar and the shadow graphic is not drawn.*

3. To fix the start point, press **Set**. The caliper changes to an active caliper.

NOTE: *Only original graphic has graphic numbering to distinguish between original image and shadow image.*

NOTE: *The trackball move area is limited to the narrow area of both images.*

NOTE: *Only the original graphic can be edited. When the original graphic is edited, the shadow graphic is also updated*

4. To complete the measurement, press **Set**. The system displays the measurement result in the Results Window.

NOTE: *It's impossible to take a measurement across dual images.*

NOTE: *2D Dual measurement tool can not be copied.*

NOTE: *When one of them (original and shadow) is deleted, then both graphic are deleted.*

Doppler Mode Measurements

Basic measurements can be made in Doppler Mode.

- Velocity
- TAMAX and TAMEAN (Manual or Auto Trace)
- Two Velocities with the Time Interval and Acceleration between them
- Time Interval
- Volume Flow

NOTE: *The following instructions assume that you do the following:*

1. In the B-Mode part of the display, scan the anatomy you want to measure.
2. Go to the Doppler Mode part of the display.
3. Press **Freeze**.

Velocity

To measure velocity:

1. Press **Measure** key to enter Measure mode.

   Adjust **Caliper Change** in the primary menu to **Velocity**.

   An active caliper with a vertical and horizontal dotted line displays.
2. To position the caliper at the desired measurement point, move the **Trackball**.
3. To complete the measurement, press **Set**. The system displays the velocity measurement in the Results Window.

Slope (Velocity, Time Interval and Acceleration)

To measure two velocity values, the time interval (ms), and acceleration (m/s^2):

1. Press **Measure** key to enter Measure mode.

   Adjust **Caliper Change** in the primary menu to **S/D Caliper**.

   An active caliper with a vertical and horizontal dotted line displays.

2. To position the caliper at the start point, move the **Trackball**.

3. To fix the start point, press **Set**. The system fixes the first caliper and displays a second active caliper.

4. To position the second caliper at the end point, move the **Trackball**.

5. To complete the measurement, press **Set**. The system displays the two peak end point velocities, the time interval, and the acceleration in the Results Window.

Time interval

To measure a horizontal time interval:

1. Press **Measure** key to enter Measure mode.

   Adjust **Caliper Change** in the primary menu to **S/D Time**.

   An active caliper with a vertical and horizontal dotted line displays.

2. To position the active caliper at the start point, move the **Trackball**.

3. To fix the start point, press **Set**. The system fixes the first caliper and displays a second active caliper.

4. To position the second caliper at the end point, move the **Trackball**.

5. To complete the measurement, press **Set**. The system displays the time interval between the two calipers in the Results Window.

TAMAX and TAMEAN

Manual Trace

The value measured depends upon the Vol Flow Method preset. The two selections available are: Peak (TAMAX) and Mean (TAMEAN).

To do a manual trace of TAMAX or TAMEAN:

1. Press **Measure** key to enter Measure mode.

   Adjust **Caliper Change** in the primary menu to **S/D Trace**.

   Enter Utility -> Measure -> Advanced preset menu, set **Trace** preset to **Manual**.

2. To position the caliper at the trace start point, move the **Trackball**.

3. To fix the start point, press **Set**.

4. To trace the maximum values of the desired portion of the spectrum, move the **Trackball**.

   NOTE: To edit the trace line, move the **Trackball**.

5. To complete the measurement, press **Set**. The system displays the measurement values in the Results Window.

TAMAX and TAMEAN (continued)

Auto Trace

The value measured depends upon the Vol Flow Method preset. The two selections available are: Peak (TAMAX) and Mean (TAMEAN).

To do an auto trace of TAMAX or TAMEAN:

1. Press **Measure** key to enter Measure mode.

   Adjust **Caliper Change** in the primary menu to **S/D Trace**.

   Enter Utility -> Measure -> Advanced preset menu, set **Trace** preset to **Auto**.

2. To position the caliper at the trace start point in the Doppler spectrum, move the **Trackball**.

3. To fix the start point, press **Set**.

4. To position the vertical caliper at the end point, move the **Trackball**.

5. To complete the measurement, press **Set**. The system automatically fixes both calipers and traces the maximum value between the two points. The system displays this value in the Results Window.

NOTE: *When you set the Auto Trace for Both (above and below), the system picks up the maximum power of the signal, NOT the maximum velocity. If the maximum velocity is not the maximum power, the system may not trace accurately. If you want to use maximum velocity, select either Above or Below.*

Edit Trace

Auto Trace can be edited after taking an Auto Trace measurement.

1. After taking an Auto Trace measurement, select the measurement result on the result window. The Edit Trace (Edit Peak or Edit Mean) menu window appears.

NOTE: *If the system cannot take the trace data correctly from the image, Edit Trace does not work.*

2. Select **Edit Trace**. The first caliper (manual trace caliper) appears on the center of the image. Use the **Trackball** to move the caliper on the trace line to the start point.

NOTE: *To cancel Edit Trace at this time, press **Clear, Scan,** or **Freeze**.*

3. Press **Set** to fix the first caliper. The second caliper appears. Edit the trace manually using the second caliper.

   The Ellipse control is used to edit the trace.

NOTE: *When pressing the **Clear** key once at this time, the second caliper disappears and the first caliper appears in the center of the image.*

NOTE: *If you press **Scan** or **Freeze** at this time, the caliper is automatically fixed and the result window updates.*

4. Press **Set** to fix the second caliper. The trace and the result window update. The trace data (TAMAX and TAMEAN) are updated, though the other points (e.g. PS, ED) are not updated by trace. The points can be edited with **Cursor Select**.

NOTE: *While in Edit Trace, Cursor Select is disabled.*

5. Repeat Edit Trace as needed.

Doppler Auto Calc Average Cycle

When using Auto Calc, a selection is available to average a number of cycles automatically. There is also a preset selection in the Utility Imaging PW page for this feature. When using average cycle:

- Selected cardiac cycle lines display on the image. Point calipers are not displayed.

- When changing the number of cycles from 1 to >1, all the data is reacquired from the image, recalculated and updated.

- When multiple cycles are selected in AutoCalc, the average values calculate and display automatically.

- When selecting Peak Value (PV), average cycle is not available.

NOTE: *You cannot edit the lines while in Average Cycle. Cursor Select is not available at that time.*

NOTE: *Average Cycle data is acquired from the display image area only, for both live and frozen. The average cycle data fails if the setting for the number of cycles is larger than the number of image cycles.*

Volume Flow - Manual Calc

You perform a manual Volume Flow measurement using the TAMAX plus a Volume Flow coefficient compensation.

1. To perform the Volume Flow measurement using the TAMAX plus a Volume Flow coefficient compensation, in Utility-->Measure-->Advanced, select the following:
   - Trace = Manual
   - Vol Flow Method = TAMAX [you MUST also select a Volume Flow coefficient for use with TAMAX.]
   - Vol Flow Compensation with TAMAX = [select value from 0.5 to 1.0]

2. Set Auto Calcs to *Off* via Doppler Mode-->Modify Auto Calcs-->Off.

3. Select a folder in Doppler Mode-->select a calculation folder-->select Show All.

4. Select Volume Flow. You'll notice that TAMAX is automatically selected.

NOTE: *Ensure that you have placed the caliper in the spectral window when selecting the Volume Flow measurement.*

5. Trace the TAMAX. The system prompts you to "Mark the first point on the spectral doppler." Press **Set**.

6. The system prompts you to "Trace the velocity spectrum boundary." Press **Set**.

NOTE: *You can back up while tracing the TAMAX by using the Trackball.*

7. Trace the vessel diameter. The system prompts you to "Mark first point of vessel diameter for volume flow calculation." Press **Set**.

8. The system prompts you to "Mark last point of vessel diameter for volume flow calculation." Press **Set**.

9. The Volume Flow is calculated in ml/min.

Volume Flow - Auto Calc

You can perform an automatic Volume Flow measurement using TAMEAN or using the TAMAX and a Volume Flow coefficient.

1. To perform the Volume Flow measurement using the TAMEAN, in Utility-->Measure-->Advanced, select the following:
   - Trace = Auto
   - Vol Flow Method = TAMEAN

   OR, to perform the Volume Flow measurement using the TAMAX plus a Volume Flow coefficient compensation, select the following:
   - Trace = Auto
   - Vol Flow Method = TAMAX [if you use TAMAX, you MUST also select a Volume Flow coefficient for use with TAMAX.]
   - Vol Flow Compensation with TAMAX = [select value from 0.5 to 1.0]

2. Set Auto Calcs to *Live* via Doppler Mode-->Modify Auto Calcs-->Live.

3. Perform the scan.

4. Select Volume Flow via Doppler Mode-->Modify Auto Calcs-->VOLUME FLOW. The system prompts you through the measurement.

5. Take vessel diameter for volume flow calculation. Set the first cursor.

6. Mark last point of vessel diameter for volume flow calculation. Press **Set**.

7. The calculation automatically completes the Volume Flow measurements as ml/min.

NOTE: *If you change the TAMAX coefficient, the Volume Flow is automatically adjusted when in Auto Calcs (but not in Manual Calcs).*

Flow Volume (FV)

Flow Volume estimates the volume of blood that flows through a vessel per unit time. It is derived from a vessel's cross-sectional diameter obtained from the B-Mode portion of the image and the mean velocity of flow in the vessel obtained from the Doppler portion of the image. It is measured in milliliters. When the FV measurement is made, FVO is automatically calculated.

To measure flow volume:

1. Select **FV** from Doppler menu.

2. Place the dotted horizontal line caliper at each of the time base on the Doppler spectrum.
   - If Trace Auto is selected, the waveform is automatically traced.
   - If Trace Auto is not selected, manually trace the desired portion of the waveform.

     The caliper moves to the B-Mode area.

3. Use the Ellipse or Trace method to measure the circumference and area of the vessel.

   The flow volume (FV) is calculated and displayed in milliliters. The flow volume output (FVO) is also calculated and displayed in milliliters/minute.

Flow Volume Output (FVO)

This measurement is used to measure the flow volume output in a vessel on the Doppler spectrum. It is measured in milliliters/minute. When the FVO measurement is made, FV is automatically calculated.

M-Mode Measurements

Basic measurements that can be taken in the M-Mode portion of the display are:

- Tissue Depth (Distance)
- Time Interval
- Time Interval and Velocity

NOTE: *The following instructions assume that you do the following:*

1. In the B-Mode part of the display, scan the anatomy you want to measure.
2. Go to the M-Mode part of the display.
3. Press **Freeze**.

Tissue depth

Tissue depth measurement in M-Mode functions the same as distance measurement in B-Mode. It measures the vertical distance between calipers.

1. Press **Measure** key to enter Measure mode.

   Adjust **Caliper Change** in the primary menu to **MM Distance**.

   An active caliper with a vertical and horizontal dotted line displays.
2. To position the active caliper at the most anterior point you want to measure, move the Trackball.
3. To fix the start point, press **Set**.

   The system fixes the first caliper and displays a second active caliper.
4. To position the second caliper at the most posterior point you want to measure, move the Trackball.
5. To complete the measurement, press **Set**.

   The system displays the vertical distance between the two points in the Results Window.

Time interval

To measure a horizontal time interval and velocity:

1. Press **Measure** key to enter Measure mode.

    Adjust **Caliper Change** in the primary menu to **MM Time**.

    An active caliper with a vertical and horizontal dotted line displays.

2. To position the caliper at the start point, move the **Trackball**.

3. To fix the first caliper, press **Set**. The system fixes the first caliper and displays a second active caliper.

4. To position the second caliper at the end point, move the **Trackball**.

5. To complete the measurement, press **Set**. The system displays the time interval between the two calipers in the Results Window.

Slope (Time interval and Velocity)

To measure time and velocity between two points:

1. Press **Measure** key to enter Measure mode.

    Adjust **Caliper Change** in the primary menu to **MM Slope**.

    An active caliper with a vertical and horizontal dotted line displays.

2. To position the active caliper at the start point, move the Trackball.

3. To fix the start point, press **Set**.

    The system fixes the first caliper and displays a second active caliper.

4. To position the second caliper at the end point, move the Trackball.

5. To complete the measurement, press **Set**.

    The system displays time(s) and slope between the two points in the Results Window.

Viewing and Editing Worksheets

NOTE: *Worksheets are not saved if the system crashes.*

As you complete measurements, the system puts measurement data in the appropriate worksheets.

To view a worksheet

To view a worksheet, select **Report** on the control panel.

The system displays the worksheet for the current study.
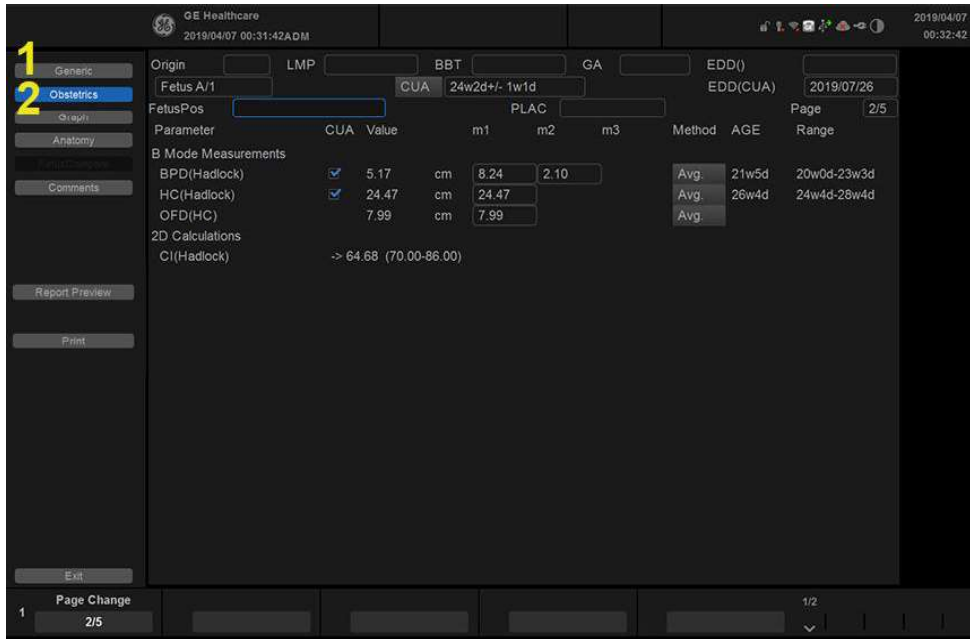
Figure 7-27. OB B-Mode Report

To view a worksheet (continued)

1. **Generic**: Select to view the generic measurements worksheet.
2. **Obstetrics**: Select to view a particular exam categories worksheet.

If a worksheet has more data on a second page, to view the next page, adjust the **Page Change** control on the primary menu.

To return to scanning, do one of the following:

- Select *Report*.
- Press *Esc*.
- Select the *Exit* button.

To edit a worksheet

To change data on a worksheet:

1. Move the **Trackball** to the field you want to change.
2. Press **Set**.
3. Type the new data in the field. The new data is displayed in blue to indicate that it was manually entered.

To delete or exclude data on a worksheet:

1. Move the **Trackball** to the field you want to delete or exclude, press the **Cursor**. The field is highlighted.
2. Do one of the following:

    - To delete the field, select *Delete Value*.
    - To exclude the field, select *Exclude Value*.

      The data in the field is not visible and is not included in report calculations.
    - To include a value that you previously excluded, select *Include Value*.

To edit a worksheet (continued)

To type a comment on a report:

1. Select **Comments**. The Comments window opens.
2. Type comments about the exam.
3. To close the Comments window, select other Menu.

To turn the volume measurement value off:

- Select the method type **Off**. The value field becomes blank.

Parameter	Value		m1	m2	m3	m4	m5	m6	Method
B Mode Measurements									
L		cm	2.74						Off
C	6.59	cm	6.59						Avg.
A	3.45	cm2	3.45						Avg.
d1	2.10	cm	2.10						Avg.
d2	2.10	cm	2.10						Avg.

Figure 7-28.   Volume Parameter Off

HINTS

Some fields on the report are view only, and others you can change or select. To easily see which fields you can change or select, move the **Trackball**. As the cursor moves over a field that you can change or select, the field is highlighted.

Delete All Worksheet Values

You can delete all measurement values on a worksheet.

1. When the worksheet is displayed on the monitor, press the **Clear** key; the following warning message appears:
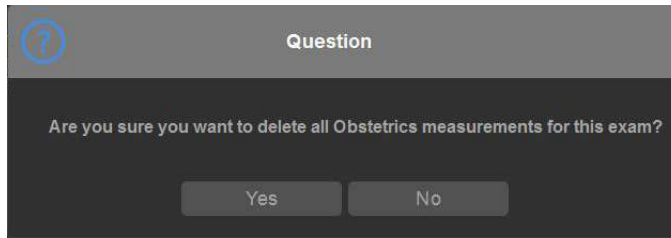
Figure 7-29.   Delete Warning Message

2. Select *Yes* to delete all.

Select *No* to cancel the deletion.

Wide Dual Screen Measurements

To preform the measurements in wide dual screen, select the measurement item from primary menu.

1. Press the **Dual** key on the control panel to enter wide dual screen.

NOTE: *Ensure that the "Dual Screen" has been selected in the Automitic Wide Screen... portion of the Utility -> System -> System Imaging.*

2. Press **Measure** on the control panel. The Result window displays at the left bottom of the screen. To perform measurement, select measurement item from left measurement list or select measurement item from the primary menu at the bottom of the screen. To switch to a different mode measurement package, press the Left/right arrow keys on the Alphanumeric keyboard.

NOTE: *The location of the Result Window and measurement item while in wide dual screen is different than when in single and dual screen.*

Figure 7-30.   Wide Dual screen measurements

Generic Measurements

Overview

Each exam category has a Generic study. The Generic studies provide you quick access to measurements such as volume, angle, A/B ratio, and % stenosis. The particular measurements available in each Generic study vary, depending on the exam category and the mode. This section describes generic measurements, organized by mode.

To access Generic studies:

1. On the Control Panel, press **Measure**.
2. Select **Second Menu** on the primary menu.
3. Select the *Generic* folder in the story menu.

Calculation formulas are available in the *Advanced Reference Manual*.

Assign a name to the generic measurement

> *NOTE:*   *Available for any linear and circumference measurement.*

1. Move the cursor over the measurement result window and press **Set**.

2. Select *User Name* from the menu. The dialogue window displays.
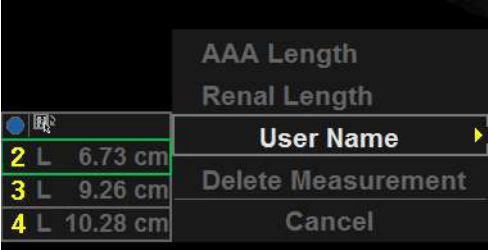
Figure 7-31.   Users Name Menu

3. Enter the appropriate name and select OK.
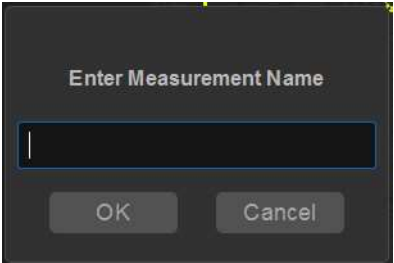
Figure 7-32.   Enter new parameter

B-Mode Measurements

In B-Mode, the Generic study includes the following measurements:

- % Stenosis
- Volume
- Angle
- A/B Ratio

Figure 7-33.   B-Mode Generic Study

NOTE: *The following instructions assume that you first scan the patient and then press* **Freeze**.

% Stenosis

You can calculate % Stenosis by diameter or by area, depending on the mode.

NOTE: *The Versana Active automatically activates the % Stenosis with the default selection. If another method is preferred, select it from the Primary Menu Key.*

Diameter

NOTE: *When you use diameter to calculate the %stenosis, always take the measurement from a cross-sectional view of the vessel.*

To calculate percent stenosis by diameter:

1. From Generic, select **% Stenosis**.
2. Select **%sten(Diam)**.

   The system displays an active caliper.
3. Make a distance measurement of the inner area of the blood vessel.

   The system displays an active caliper for the second distance measurement.
4. Make a distance measurement of the outer area of the blood vessel.

   The system displays each distance measurement and the% Stenosis in the Results Window.

For details on how to make a distance measurement, See 'Distance measurement' on *page 7-42 for more information.*

NOTE: *For the diameter calculation, do NOT take a distance measurement from a longitudinal view. This may lead to an inaccurate assessment of % stenosis.*

% Stenosis (continued)

Area

To calculate percent stenosis by area:

1. From Generic, select **% Stenosis**.
2. Select **%sten(Area)**.

    The system displays a caliper.

3. Make a trace measurement of the inner area of the blood vessel.

NOTE: *To erase an open trace, move the **Trackball**.*

4. Press **Set**.

    The system displays a second caliper.

5. Make a trace measurement of the outer area of the blood vessel.

    The system displays the two area measurements and percent stenosis in the Results Window.

See 'Circumference and area (trace) measurement' on *page 7-44 for more information.*

Ellipse + Area

To calculate percent stenosis by ellipse and area:

1. From Generic, select **% Sten[E+A]** folder.
2. Ellipse is selected by default.

    The system displays a caliper.

NOTE: *You can select the trace at this time.*

3. Make an ellipse measurement of the inner area of the blood vessel.

4. Press **Set**.

    The system displays a caliper.

5. Make a trace measurement of the outer area of the blood vessel.

    The system displays the two area measurements and percent stenosis in the Results Window.

NOTE: *% Stenosis (E+A) is not available through the factory default. To enable %Stenosis (E+A), add "%Steno(E+A)" to the Measure & Study list on the Utility -> Measure -> M&A screen.*

Volume

The volume calculation can be made from any of the following measurements:

- One distance
- Two distances
- Three distances
- One ellipse
- One distance and one ellipse

For details on how to make a distance measurement, See 'Distance measurement' on *page 7-42 for more information.*

For details on how to make an ellipse measurement, See 'Circumference and area (ellipse) measurement' on *page 7-43 for more information.*

NOTE: *IMPORTANT!! If you want to make a volume calculation using one or two distances, you must select **Volume** BEFORE you make the measurements.*

NOTE: *If you select Fix Caliper by Print Key on the Utility --> System --> System Measure, the print key does not function like the Set key, but instead ends the measurement sequence and initiates the volume calculation based on the number of measurements taken so far.*

To make a volume calculation using one or two distances:

1. Select **Volume**.
2. Make one or two distance measurements.
3. Select **Volume**.

   The system displays the distances and the volume in the Results Window.

NOTE: *Use the **Clear** key to erase the green caliper.*

To make a volume calculation using three distances:

1. Make three distance measurements.

NOTE: *Three distances can be done in the dual format mode (side by side images). One measurement is usually made in the sagittal plane and two measurements in the axial plane. To use the dual format mode, press the **Dual** key on control panel.*

2. Select **Volume**.

   The system displays the distances and the volume in the Results Window.

Volume (continued)

To make a volume calculation using one ellipse:

1. Make one ellipse measurement.

2. Select **Volume**.

   The system displays the ellipse measurement and the volume in the Results Window.

To make a volume calculation using one ellipse and one distance:

1. Make one distance measurement and one ellipse measurement.

2. Select **Volume**.

   The system displays the distance and ellipse measurement and the volume in the Results Window.

HINTS
- Volumes are most accurate when measurements are taken in the sagittal and axial scan planes.
- To display sagittal and axial plane images simultaneously, use the side-by-side dual format option.

NOTE: *If you change the parameters or category during the volume measurement, please follow the procedure below before you restart the measurement.*

1. *Check the number of each measurement in the summary window.*

2. *If the numbers are not all the same, it shows that you have the calculation which is not completed. Open the Report and clear that calculation.*

Volume (continued)

Table 7-2:   Volume Calculations

Calc Name	Input Measurements
Volume (spherical)	One distance
Volume (prolate spheroidal)	Two distances, d1>d2
Volume (spheroidal)	Three distances
Volume (prolate spheroidal)	One ellipse: (d1 major axis, d2 minor axis)
Volume (spheroidal)	One distance d1, and one ellipse (d2 major axis, d3 minor axis)
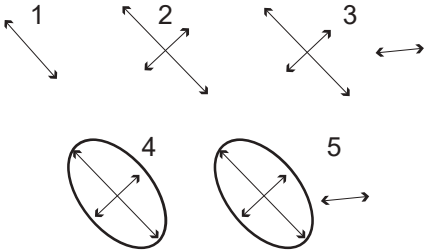
Figure 7-34.   Volume Calculation Examples

1. One distance
2. Two distances
3. Three distances
4. One ellipse
5. One distance and one ellipse

Calculation formulas are available in the *Advanced Reference Manual*.

Volume (continued)

Post-assignment for General Volume

You can input a unique name for the general volume measurement. You can group the general volume measurements for each application.

1. Complete the volume measurement.

2. Move the caliper to the measurement result box (with green frame) and select **Set**.

3. The volume name menu appears. Select Name Volume.
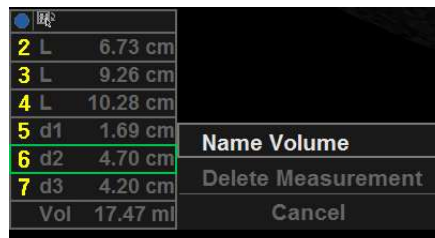
Figure 7-35.   Volume Name menu

4. The dialog box displays. Enter a new name or choose the existing name.
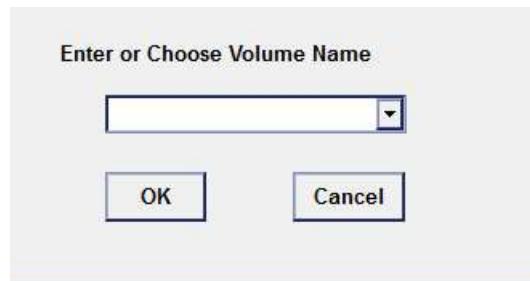
Figure 7-36.   Volume Name Dialog box

NOTE: *The factory default volume name cannot be changed (for example, Renal Volume).*

Angle

This function measures the angle between two intersecting planes.

1. From the Generic, select ***Angle***.

   The system displays an active caliper.

2. To position the caliper, move the **Trackball**.

3. To fix the position of the first caliper, press ***Set***.

   The system displays a second active caliper.

4. To position the second caliper at the apex of the angle, move the **Trackball**.

5. To fix the position of the second caliper, press **Set**.

   The system displays a third active caliper.

6. To position the third caliper, move the **Trackball**.

7. To complete the angle measurement, press **Set**.

   The system displays the angle in the Results Window.

NOTE: *To rotate through and activate previously fixed calipers, adjust the **Cursor Select** control.*

A/B Ratio

In B-Mode, you can calculate A/B ratio by diameter or by area.

NOTE: *The Versana Active automatically activates the A/B Ratio with the default selection. If another method is preferred, select it from the Primary Menu Key.*

Diameter

To calculate A/B ratio by diameter:

1. From Generic, select **A/B Ratio**.
2. Select **Ratio(Diam)**.

   The system displays an active caliper.
3. Make a distance measurement of the first diameter.

   The system displays an active caliper for the second distance measurement.
4. Make a distance measurement of the second diameter.

   The system displays each distance measurement and the A/B ratio in the Results Window.

NOTE: *The first distance is the A diameter. The second distance is the B diameter.*

For details on how to make a distance measurement, See 'Distance measurement' on *page 7-42 for more information.*

Area

To calculate A/B ratio by area:

1. From Generic, select **A/B Ratio**.
2. Select **Ratio(Area)**.

   The system displays a caliper.
3. Make a trace measurement of the A area.

NOTE: *To erase an open trace, move the **Trackball**.*

   The system displays a second caliper.
4. Make a trace measurement of the B area.

   The system displays the two area measurements and the A/B ratio in the Results Window.

For details on how to make a trace measurement, See 'Circumference and area (trace) measurement' on *page 7-44 for more information.*

M-Mode Measurements

In M-Mode, the Generic study includes the following measurements:

- % Stenosis
- A/B Ratio
- HR (Heart Rate)
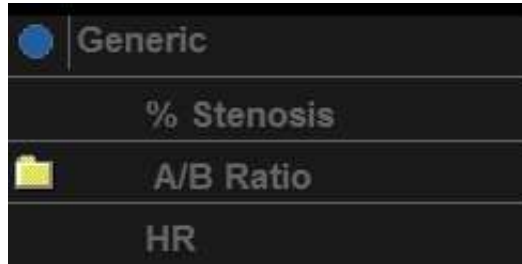
Figure 7-37.   M-Mode Generic Study

% Stenosis

A/B Ratio

In M-Mode you can measure A/B ratio by diameter, time, or velocity.

NOTE: *The Versana Active automatically activates the A/B Ratio with the default selection. If another method is preferred, select it from the Primary Menu Key.*

Diameter

See 'Diameter' on *page 7-76 for more information.*

Time

To calculate A/B ratio by time:

1. Select *A/B* **Ratio**.
2. Select *Ratio(Time)*.

   The system displays an active caliper.
3. To position the caliper at the A point, move the **Trackball**.
4. To fix the measure point, press **Set**.

   The system displays a second active caliper.
5. To position the second caliper at the B point, move the **Trackball**.
6. To complete the measurement, press **Set**.

   The system displays the two time measurements and A/B ratio in the Results Window.

Velocity

To calculate AB ratio by velocity:

1. Select *A/B* **Ratio**.
2. Select *Ratio(Velocity)*.

   The system displays an active caliper with vertical and horizontal dotted lines.
3. To position the caliper at the A velocity, move the **Trackball**.
4. To fix the measure point, press **Set**.

   The system displays a second active caliper.
5. To position the second caliper at the B velocity, move the **Trackball**.
6. To complete the measurement, press **Set**.

   The system displays the two velocity measurements and the A/B ratio in the Results Window.

Heart Rate

To calculate the heart rate from M-Mode:

1. Obtain an image and press Measure. Select *HR*.

   The system displays an active caliper.

2. To position the caliper at a recognizable point in the first cycle, move the **Trackball**.

3. To fix the first caliper, press **Set**.

   The system displays a second active caliper.

4. To position the caliper at the identical point in the next cycle (depending on preset), you need to move the **Trackball**.

NOTE: *In the message bar at the bottom of the display, the system indicates the number of cycles you should measure.*
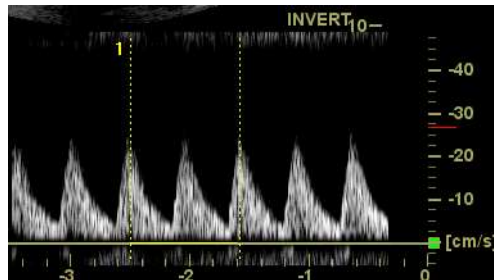
Figure 7-38.   Two Heart Beat Reference (example in Doppler mode)

5. To complete the measurement and transfer the calculation to the report, press **Set**.

Doppler Mode Measurements

In Doppler Mode, the Generic study includes the following measurements:

- PI (Pulsatility Index)
- RI (Resistive Index)
- S/D Ratio or D/S Ratio
- A/B Ratio
- HR (Heart Rate)

Figure 7-39.   Doppler Mode Generic Study

NOTE: *The following instructions assume that you do the following:*

1. In the B-Mode part of the display, scan the anatomy you want to measure.
2. Go to the Doppler Mode part of the display.
3. Press **Freeze**.

Control Assignment

Cancel Transfer

NOTE: *Only for Vascular, Abdomen, OB and GYN.*

After the Auto Vascular calculation results are assigned to a particular vessel, the user can cancel the assignment and assigned parameters are removed from Report page.

When Cancel Transfer occurs, a message appears on the screen to indicate the value was erased from Report page.

Vessel location

If the vessel has a location, you can select one of the following:

- Proximal (***Prox***)
- Middle (***Mid***)
- Distal (***Dist***)

NOTE: *If you do not wish to assign a vessel location, press the lit location, then no location is assigned. Choose the folder you want the value assigned to.*

To select one of the locations, adjust the Primary Menu Key control.

Side Rt/Lt

The system has measurements for the patient's right and left side. To select right or left, adjust the Primary Menu Key.

Pulsatility Index (PI)

For auto trace:

1. Select *PI*.

    The system displays a caliper and a vertical dotted line.

2. Position the caliper at the beginning of the waveform.

3. To fix the start point, press **Set**.

    The system displays a second active caliper.

4. Position the caliper at the end of the waveform.

5. To complete the measurement, press **Set**.

    The system displays peak systole, minimum diastole, end diastole, TAMAX, and PI in the Results Window.

For manual trace:

1. Select *PI*.

    The system displays a caliper and a vertical dotted line.

2. Position the caliper at the beginning of the waveform.

3. To fix the start point, press **Set**.

    The system displays a second active caliper.

4. Manually trace the entire waveform.

5. To complete the measurement, press **Set**.

    The system displays peak systole, minimum diastole, end diastole, TAMAX, and PI in the Results Window.

Resistive Index (RI)

1. From the Doppler Generic, select *RI*.

    The system displays an active caliper with vertical and horizontal dotted lines.

2. To position the caliper at the peak systolic velocity, move the **Trackball**.

3. To fix the measure point, press **Set**.

    The system displays a second active caliper.

4. To position the second caliper at the end diastolic velocity, move the **Trackball**.

5. To complete the measurement, press **Set**.

    The system displays PS, ED, and RI in the Results Window.

PS/ED or ED/PS Ratio

To calculate the Peak Systole/End Diastole ratio or End Diastole/Peak Systole ratio:

1. Select *PS/ED* or *ED/PS*.

    The system displays an active caliper with vertical and horizontal dotted lines.

2. To position the caliper at peak systole (PS) or end diastole (ED), move the **Trackball**.

3. To fix the measure point, press **Set**.

    The system displays a second active caliper.

4. To position the second caliper at end diastole (ED) or peak systole (PS), move the **Trackball**.

5. To complete the measurement, press **Set**.

    The system displays the peak systole, end diastole, and PS/ED or ED/PS ratio in the Results Window.

Heart Rate

To measure heart rate, See 'Heart Rate' on *page 7-79 for more information.* or select any of the following measurements.

A/B Ratio

In Doppler Mode you can measure A/B ratio by velocity, time, or acceleration.

NOTE: *The Versana Active automatically activates the A/B Ratio with the default selection. If another method is preferred, select it from the Primary Menu Key.*

Velocity

See 'Velocity' on *page 7-78 for more information.*

Time

See 'Time' on *page 7-78 for more information.*

Acceleration

To measure A/B ratio by acceleration:

1. Select *A/B Ratio*.
2. Select *Ratio(Acc)*.

    The system displays an active caliper.

3. Make a distance measurement of the A acceleration point.

    a. To position the active caliper at the start point, move the **Trackball**.

    b. To fix the start point, press **Set**.

        The system fixes the first caliper and displays a second active caliper.

    c. To position the second active caliper at the end point, move the **Trackball**.

        A dotted line connects the measurement points.

    d. To complete the measurement, press **Set**.

        The system displays the distance value in the Results Window and displays an active caliper for the second distance measurement.

4. To make a distance measurement of the B acceleration point, repeat steps a–d.

    The system displays the two acceleration measurements and the A/B ratio in the Results Window.

Flow Volume (FV)

Flow Volume estimates the volume of blood that flows through a vessel per unit time. It is derived from a vessel's cross-sectional diameter obtained from the B-Mode portion of the image and the mean velocity of flow in the vessel obtained from the Doppler portion of the image. It is measured in milliliters. When the FV measurement is made, FVO is automatically calculated.

To measure flow volume:

1. Select **FV-D** from Doppler menu.

2. Place the dotted horizontal line caliper at each of the time base on the Doppler spectrum.

    •   If Trace Auto is selected, the waveform is automatically traced.

    •   If Trace Auto is not selected, manually trace the desired portion of the waveform.

        The caliper moves to the B-Mode area.

3. Use the Ellipse or Trace method to measure the circumference and area of the vessel.

    The FV Diameter, TAMAX, Volume and Volume Flow (FV) are calculated and displayed in the result window.

Modify Auto Calcs

When you select **PW** mode and press **Second Menu** on the primary menu, the Modify Calculation menu is displayed as below. In this menu, you select parameters to display in the Auto Vascular Calculation window. Only parameters that can be used by the calculation are displayed.

Select *Save as Default* to save the selected parameters as the default calculations for this application.

Select *Return* to return to the previous scan screen.

If you select *PV*, all selected parameters are turned off. When you deselect *PV*, the system returns to the previously selected calculation.
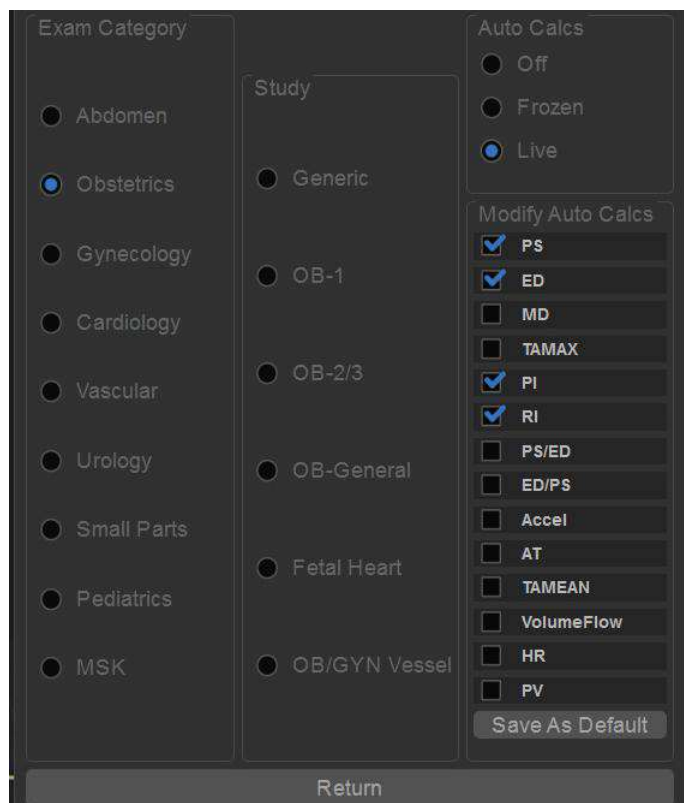
Figure 7-40.　Modify Auto Calculation Menu

Modify Auto Calcs (continued)

Acceleration

1. Select *Accel*.

   The system displays an active caliper with vertical and horizontal dotted lines.

2. To position the caliper at peak systole, move the **Trackball**.

3. To fix the measure point, press **Set**.

   The system displays a second active caliper.

4. To position the second caliper at end diastole, move the **Trackball**.

5. To complete the measurement, press **Set**.

   The system displays the peak systole, end diastole, acceleration time, and acceleration in the Results Window.

Acceleration Time (AT)

1. Select *AT*.

   The system displays an active caliper and a vertical dotted line.

2. To position the caliper at the start point, move the **Trackball**.

3. To fix the first caliper, press **Set**.

   The system displays a second active caliper.

4. To position the caliper at the end point, move the **Trackball**.

5. To complete the measurement, press **Set**.

   The system displays the acceleration time in the Results Window.

Peak Systole (PS), End Diastole (ED), or Minimum Diastole (MD)

To calculate the peak systole, end diastole, or minimum diastole:

1. Select *PS*, *ED*, or *MD*.

   The system displays an active caliper with vertical and horizontal dotted lines.

2. To position the caliper at the measurement point, move the **Trackball**.

3. To complete the measurement, press **Set**.

   The system displays the peak systole, end diastole, or minimum diastole in the Results Window.

Auto vs. Manual Calculations

The same calculations can be performed using either manual or auto calcs.

Manual Calcs

To perform manual calcs:

1. To turn Auto Calcs off and perform manual measurements, choose **Auto Calcs -> OFF** on the PW menu.

2. After obtaining a waveform, press **Measure**. Choose the appropriate vessel folder or calculation. The system walks you through the measurement.

NOTE: *To program which calculations are done under manual calcs when using measurement folders for measuring specific vessels, press the Utility key. Select Measure -> Doppler and program your manual calcs (Auto Calcs OFF). Each vessel must be programmed individually and saved after each change.*

NOTE: *To set the Auto Cals Off - Use the Modify Auto Calcs on the Primary Menu.*

Auto vs. Manual Calculations (continued)

Auto Calcs

To perform auto calcs:

1. Ensure that the auto calcs function is on by choosing ***Modify Auto Calcs -> Frozen*** or ***Live*** on the PW tab of the second menu.

    *   Live: Auto calculation activates when the system in alive state.

    *   Freeze: Auto calculation activates when you press Freeze.

    *   Off

2. After obtaining a waveform, press **Measure**. Choose the appropriate vessel folder, side and location. The measurements that are pre-programmed are performed automatically and entered in the report.

To modify auto calcs:

1. Select ***Modify Auto Calcs*** on the Primary Menu.
2. Choose the measurements to be performed with this preset.
3. To save these measurements:

    *   If this is a temporary change, press ***Return***.
    *   If this is a permanent change, select ***Save as default***.

    The measurements are saved and can be performed with the auto calcs function.

Auto vs. Manual Calculations (continued)

Edit Auto Calcs

Auto Calcs can be edited after taking an Auto Trace measurement.

1. After taking an Auto Calc with a trace, select the measurement result on the result window. The Edit Trace menu window appears.

NOTE: *If the system cannot take the trace data correctly from the image, Edit Trace does not work.*

2. Select Edit Trace. The first caliper (manual trace caliper) appears on the center of the image. Use the **Trackball** to move the caliper on the trace line to the start point.

NOTE: *To cancel Edit Trace at this time, press **Clear, Scan,** or **Freeze**.*

3. Press **Set** to fix the first caliper. The second caliper appears. Edit the trace manually using the second caliper.

    The Ellipse control is used to edit the trace.

NOTE: *When pressing the **Clear** key once at this time, the second caliper disappears and the first caliper appears in the center of the image.*

NOTE: *If you press **Scan** or **Freeze** at this time, the caliper is automatically fixed and the result window updates.*

4. Press **Set** to fix the second caliper. The trace and the result window are updated. The data is retaken from the trace and updated.

NOTE: *While in Edit Trace, Cursor Select is disabled.*

    The trace data (TAMAX and TAMEAN) is updated, but the other selections (e.g. PS, ED) are not updated by trace. The points can be edited using **Cursor Select** if needed.

5. Repeat Edit Trace as needed.

Helpful hints

HINTS

The following hints can help when making a measurement.

- Prior to making measurements, use the Cine function, if necessary, to display the best image.
- As you take measurements, each measurement is given a sequential number on the display and in the Results Window. Nine measurements can be displayed in the Results Window at one time.
- Once the Results Window has nine measurements, if you make any further measurements, the system erases the top (first) measurement and adds the new measurement last ("first in, first out").
- While you are taking a measurement, the value in the Results Window updates until you complete the measurement.

Versana Active – Basic User Manual
Direction 5840764-100 English Rev. 10

Chapter 8

Abdomen and Small Parts

Describes how to perform Abdomen and Small Parts measurements and calculations.

Abdomen/Small Parts Exam Preparation

Introduction

Measurements and calculations derived from ultrasound images are intended to supplement other clinical procedures available to the attending physician. The accuracy of measurements is not only determined by the system accuracy, but also by use of proper medical protocols by the user. When appropriate, be sure to note any protocols associated with a particular measurement or calculation. Formulas and databases used within the system software that are associated with specific investigators are so noted. Be sure to refer to the original article describing the investigator's recommended clinical procedures.

Calculation formulas are available in the *Advanced Reference Manual*.

General Guidelines

New Patient information must be entered before beginning an exam. See 'Beginning an Exam' on *page 4-2 for more information.*

Any measurement can be repeated by selecting that measurement again from the Primary Menu Key.

Abdomen

Overview

Abdominal measurements offer a few different types of measurement studies:
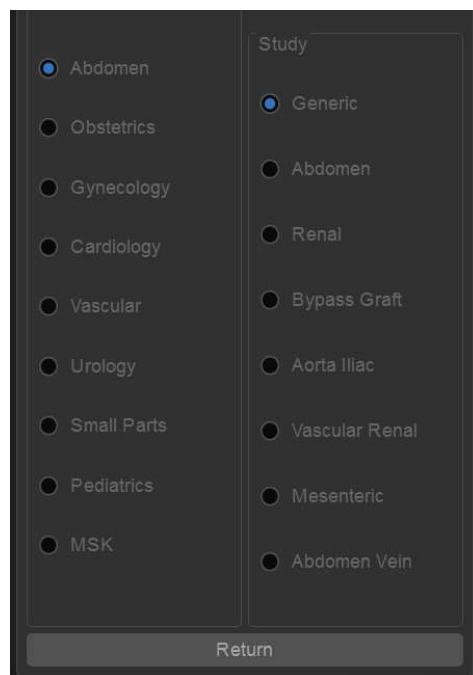
Figure 8-1.   Abdomen Exam Category

- Generic–Common to all applications. See 'Generic Measurements' on *page 7-66 for more information.*
- Abdomen
- Renal

To change a study:

1. Press **Measure**.
2. Press the **Second Menu**, studymenu is displayed.
3. To choose another study, select that desired study.

Small Parts

B-Mode Measurements

The Small Parts exam category includes the following two folders:

- Generic - Common to all applications. See 'Generic Measurements' on *page 7-66 for more information.*
- Thyroid
- Scrotal
- Breast
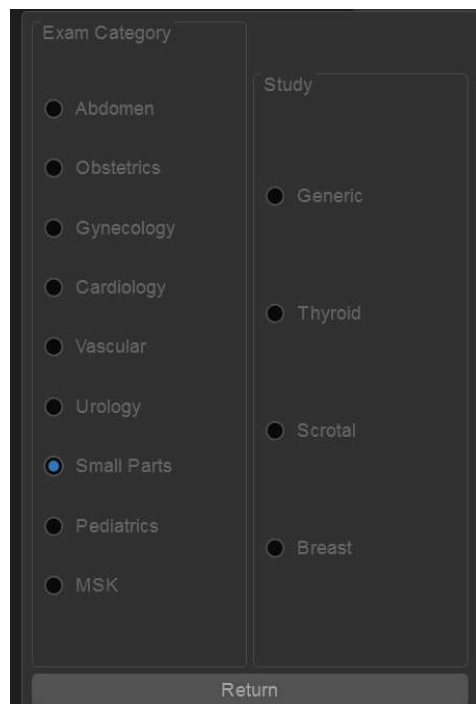
Figure 8-2.   Small Parts Exam Category

Thyroid

Thyroid Left/Right

Each of these is a standard distance measurement. Length and height are typically measured in the sagittal plane. Width is measured in the transverse/axial plane.

To measure thyroid length, width, or height:

1. Press the **Second Menu**, select **Small Parts** and then select *Thyroid*.
2. Select *Lt or Rt Thyroid*. Change the orientation (side), if necessary.
3. Select *Thyroid L*, *Thyroid W*, or *Thyroid H*.

   An active caliper displays.
4. Perform a standard distance measurement:
   a. To position the active caliper at the start point, move the **Trackball**.
   b. To fix the start point, press **Set**.

      The system fixes the first caliper and displays a second active caliper, if preset accordingly.
   c. To position the second active caliper at the end point, move the **Trackball**.

      A dotted line connects the measurement points.
   d. To complete the measurement, press **Set**.

      The system displays the distance value in the Results Window.
5. The system automatically prompts to make the second and third distance measurements.

   After you complete the third distance measurement, the system displays the thyroid volume in the Results Window.

Isthmus AP

To measure the anterior/posterior isthmus tissue, perform a distance measurement.

Scrotal

Scrotal Left/Right

Each of these is a standard distance measurement. Length and height are typically measured in the sagittal plane. Width is measured in the transverse/axial plane.

To measure scrotal length, width, or height:

1. Press the **Second Menu**, select **Small Parts** and then select *Scrotal*.

2. Select *Lt or Rt Testicle*. Change the orientation (side), if necessary.

3. Select *Testicle L*, *Testicle W*, or *Testicle H*.

   An active caliper displays.

4. Perform a standard distance measurement:

   a. To position the active caliper at the start point, move the **Trackball**.

   b. To fix the start point, press **Set**.

      The system fixes the first caliper and displays a second active caliper, if preset accordingly.

   c. To position the second active caliper at the end point, move the **Trackball**.

      A dotted line connects the measurement points.

   d. To complete the measurement, press **Set**.

      The system displays the distance value in the Results Window.

5. The system automatically prompts to make the second and third distance measurements.

   After you complete the third distance measurement, the system displays the scrotal volume in the Results Window.

Epididymis

To measure the epididymis structure, perform a distance measurement.

Breast Options

There are two options related to Breast:

- Measure Assistant Breast - this contains the auto contour feature and auto Height and Length. It also has measurements related to Breast (distance to nipple, ratio)
- Breast Productivity - this includes lesion measurement folders, show features, summary, etc.

This section covers both the Breast M&A Package and Measure Assistant Breast (Auto Contour) features.

Breast Lesion M&A

Breast Lesion M&A allows you to document up to 30 breast lesions for each breast. Lesion Height/Width/Length, Distance to Nipple, and A/B Ratio are available. Distance to Nipple allows you to enter the value. This is not a calculated measurement.

BI-RADS lesion classification can be notated via Show Features and Show Assessment.

The Measure Assistant Breast (Auto Contour) feature can also be used to automatically detect and outline the breast lesion.

Worksheet and Summary Worksheets show all the documented right/left breast lesions.

Breast Lesion M&A (continued)

From the Small Parts Model, select the Breast Application. Next, select the Right/Left Lesion. The following menu appears:
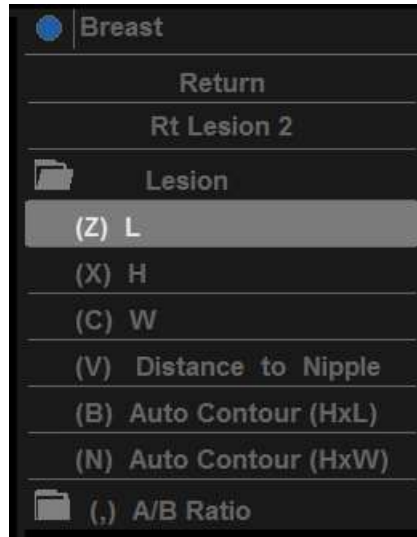
Figure 8-3.   Default Breast Lesion M&A Menu

Table 8-1:   Breast Lesion M&A Parameters

Preset Parameter	Description
Position	Specify the position of the lesion: Clock position 1-12 O'Clock, Areolar, SubAreolar, Axillary, or "-" (default).
Segment	Specify A, B, C, None, or "-" (default).
Show Features	Press to activate the Show Features notations. To add notations for each feature, position the trackball to the right of each feature and press Set. This brings up the available notations. Move the Trackball to highlight a notation and press Set to select a notation. The notation will then appear next to the feature. If a Feature has an asterisk next to it (*), then you can select multiple notations -- select all that apply and then select 'Done.' These features are displayed on the Below is a list of each Feature with its possible notations: • Shape: Oval, Round, Irregular, None (-) • Orientation: Parallel, Not Parallel, None (-) • Margin: Circumscribed, Indistinct, Angular, Microlobulated, Spiculated, None (-) • Boundary: Abrupt Interface, Echogenic Halo, None (-) • Echo Pattern: Anechoic, Hyperechoic, Complex, Hypoechoic, Isoechoic, None (-) • Posterior Features: No posterior features, Enhancement, Shadowing, Combined Pattern, None (-) • Surrounding Tissue*: Duct changes, Cooper's ligament changes, Edema, Architectural distortion, Skin thickening, Skin retraction/irregularity, None (-) • Calcifications*: Macrocalcifications, Microcalcifications out of mass, Microcalcifications in mass, None (-) • Special Cases*: Clustered microcysts, Complicated cysts, Mass in or on skin, Foreign body, Lymph nodes-intramammary, Lymph nodes-axillary, None (-) • Vascularity: Not Present or not assessed, Present in Lesion, Adjacent to Lesion, Diffuse in surrounding tissue, None (-)
Show Assessment	Specify the BI-RADS Assessment: None (-), 0, 1, 2, 3, 4a, 4b, 4c, 5, 6. A comment field is available directly below the BI-RADS Assessment.
Return	Press to return to the previous screen.
Lesion #	Indicates which lesion you are viewing (Lesion # of Total Number of Lesions). Press the left/right arrow to move from lesion to lesion.
L	Lesion Length
H	Lesion Height
W	Lesion Width
Distance to Nipple	Used to manually enter the distance the lesion is from the nipple.
Auto Contour (HxL)	Press to activate the Auto Contour feature, using the height and length.
Auto Contour (HxW)	Press to activate the Auto Contour feature, using the height and width.
Rt or Lt A/B Ratio	Right or Left Lesion A/B Ratio, measured by Area or Diameter.
Composition	Specify the composition of the lesion: None (-), Solid, Systic, or Complex.
Delete Lesion	Press to delete this lesion.

Worksheet and Summary Worksheets

Worksheets and Summary Worksheets are provided for all documented Breast Lesions.

Figure 8-4.   Breast Lesion Worksheet

Worksheet and Summary Worksheets (continued)

To move to the next page, select Page Change on the primary menu.
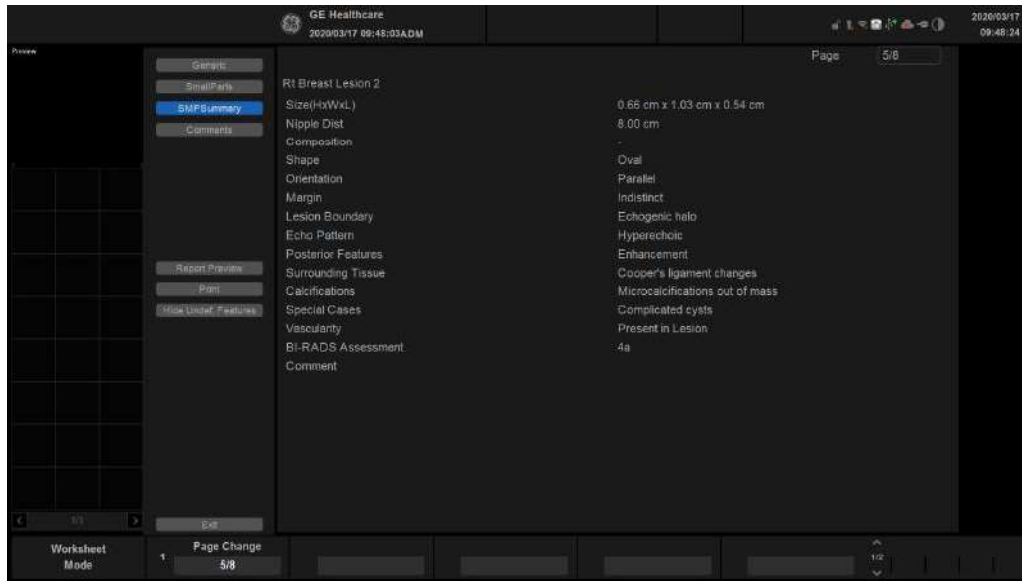
Figure 8-5.   Breast Lesion Summary

Measure Assistant Breast (Auto Contour)

You can request that the system trace/outline the border of a breast lesion using Measure Assistant Breast (Auto Contour). You do this by setting the Region of Interest (ROI) around the lesion; the system can then measure the lesion by drawing the contour around it.

The system can store up to 30 breast lesions. The system tracks these by numbering the lesions consecutively.

To automatically detect the breast lesion on the display,

1. Press **Measure**.
2. Press **Auto Contour (HxW)**.
3. Place the Cursor in the center of the lesion and press Set. Size the ROI around the lesion. Use the Trackball to resize the ROI.
   - To increase the size of the circle, move the Trackball down and to the right.
   - To decrease the size of the circle, move the Trackball upand to the left.

NOTE: *Include the entire lesion, even if additional surrounding tissue is included.*

4. Press **Set**. A trace appears around the lesion.
5. Size the trace via the Trackball.
6. Press **Set**. The contour around the breast lesion is generated.

NOTE: *Multiple breast lesion traces may be generated by the system.*

Measure Assistant Breast (Auto Contour) (continued)

7. Inspect the generated contour for accuracy. If edits are necessary, excecute steps 8-10 to edit the contour prior to accepting the measurement.Otherwise, skip to step 11.

8. To cycle through the generated contours, press **Cursor Select**.

9. To edit the selected contour, move the Trackball to appropriately size the edit region and then press **Set**.

10. The blue portion of the contour can be edited by moving the Trackball to the portion of the contour you want to edit.

NOTE: *The Caliper closest to the cursor enables editing.*

NOTE: *To limit the horizontal/vertical editing capabilities, you can set a preset via Utility--> Measure--> Advanced--> Small Parts--> Restrict Breast Contour Caliper Edit.*

11. After you have completed your edits, press P1 to accept the measurement.

Thyroid Productivity Package (Option)

A Thyroid Productivity Package is now available.

The Thyroid Productivity Package is only available when the Thyroid Productivity Option is activated.
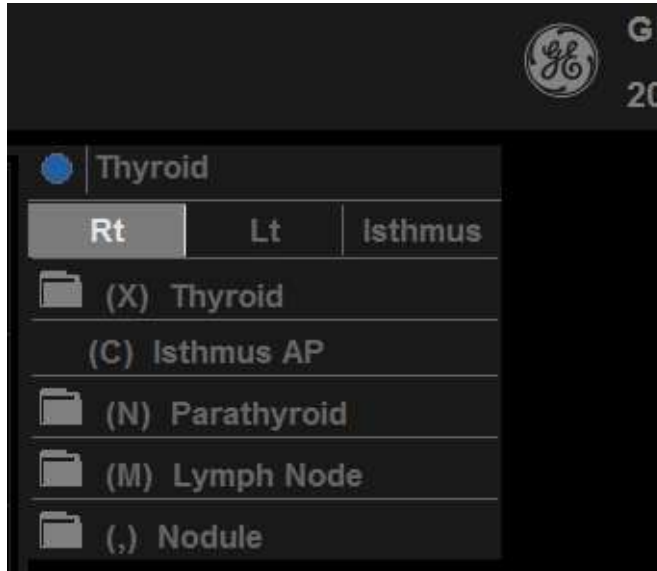
Figure 8-6.   Thyroid/Parathyroid/Lymph Node Menu

Table 8-2:   Thyroid/Parathyroid/Lymph Node Parameters

Preset Parameter	Description
Side	Specify the side: **Right, Left, Isthmus**.
Worksheet/Summary	Select to view the Worksheet/Summary Worksheet.
Add#1, Add#2, etc.	Cycles through the available lesions, or adds a new lesion/node/nodule, etc.
Rt/Lt Thyroid Rt/Lt Parathyroid Rt/Lt Lymph Node Rt/Lt Nodule	When measuring the Left/Right Thyroid/Parathyroid/Lymph Node/Nodule, these folders highlight on the screen. Length, Height, and Width are available for all thyroid measurements. The Cortical Thickness measurement is available for the Lymph Node. Show Features is available for all thyroid measurements.
Location	Parathyroid: Specify Upper Gland or Lower Gland Lymph Node: Supraclaviculoar fossa, Lower cervical, Middle cervical, Uppercervical, Parotid, Submandibular, Submental, Posterior triangle Nodule -- Use Up/Down Toggle to adjust. • Location A: Upper, Lower, Mid, None • Location B: Lateral, Medial, Mid, None

Table 8-2:   Thyroid/Parathyroid/Lymph Node Parameters

Preset Parameter	Description
Isthmus Lymph Node Isthmus Nodule	When measuring the Isthmus Lymph Node/Nodule, these folders highlight on the screen. Length, Height, and Width are available for all isthmus measurements. The Cortical Thickness measurement is available for the Lymph Node. Show Features is available all isthmus measurements.
Show Features - Overall Thyroid	Press to activate the Show Features notations. To add notations for each feature, position the trackball to the right of each feature and press Set. This brings up the available notations. Move the Trackball to highlight a notation and press Set to select a notation. The notation will then appear next to the feature and on the Summary Worksheet. Below is a list of each Feature with its possible notations by measurement type: • Overall Thyroid • Resected: Totally, Partially, None (-) • Appearance: Within normal limits, Abnormal, Symmetric, Asymmetric R>L, Asymmetric L>R, None (-) • Comment
Show Features - Lt/Rt Thyroid / Parathyroid / Lymph Node / Nodule	Press to activate the Show Features notations. To add notations for each feature, position the trackball to the right of each feature and press Set. This brings up the available notations. Move the Trackball to highlight a notation and press Set to select a notation. The notation will then appear next to the feature and on the Summary Worksheet. Below is a list of each Feature with its possible notations by measurement type: • Lt/Rt Thyroid • Resected: Totally, Partially, None (-) • Echogenicity: Homogeneous; Coarse; Heterogeneous; Hashimoto, Classic; Hashimoto, Probable; None (-) • Vascularity: Normal, Increased, Decreased, None (-) • Size: Normal, Enlarged, Small, None (-) • Comment • Isthmus Comment • Lt/Rt Parathyroid -- Upper/Lower Gland • Visibility: Visualized, Not Visualized, None (-) • Comment • Lt/Rt Lymph Node • Appearance: Within normal limits, Suspicious, Pathologic, None (-) • Composition: Cystic, Complex, Solid, None (-) • Vascularity: Normal, Increased hilar, Increased non-hilar, None (-) • Comment • Lt/Rt Nodule • Shape: Round, Oval, Irregular, Lobulated, None (-) • Margin: Well Defined, Well Defined with halo, Well Defined with partial halo, Well Defined with complete halo, Poorly defined, Irregular, None (-) • Composition: Solid, Cystic, Mixed, Complex, Heterogeneous, None (-) • Vascularity: Normal, Increased, Decreased, Central Vasc (Avascular, Hypovascular, Isovascular, Hypervascular, Severely Hypervascular), None (-) • Calcification: No Calcification, Coarse central, Coarse rim, Punctate scattered, Punctate clumped, Colloid, Mixed, None(-) • Comment

Table 8-2:   Thyroid/Parathyroid/Lymph Node Parameters

Preset Parameter	Description

Show Features - Isthmus	Press to activate the Show Features notations. To add notations for each feature, position the trackball to the right of each feature and press Set. This brings up the available notations. Move the Trackball to highlight a notation and press Set to select a notation. The notation will then appear next to the feature.
	Below is a list of each Feature with its possible notations by measurement type:
	• Isthmus Lymph Node
	  • Appearance: Within normal limits, Pathologic, None (-)
	  • Composition: Cystic, Complex, Solid, None (-)
	  • Vascularity: Normal, Increased, None (-)
	  • Comment
	• LIsthmus Nodule
	  • Shape: Round, Oval, Irregular, Lobulated, None (-)
	  • Margin: Well Defined, Well Defined with halo, Well Defined with partial halo, Poorly defined, Irregular, None (-)
	  • Composition: Solid, Cystic, Mixed, Complex, Heterogeneous, None (-)
	  • Vascularity: Normal, Increased, Central Vasc (Avascular, Hypovascular, Isovascular, Hypervascular, Severely Hypervascular), None (-)
	  • Calcification: Coarse central, Coarse rim, Punctuate scattered, Punctuate clumped, Colloid, Mixed, None (-)
	  • Comment

Return	Press to return to the previous screen.
H	Height
W	Width
L	Length
Isthmus AP	Used to measure the Isthmus height distance.
Cortical Thickness	Cortical thickness of the lymph node.
Delete	Press to delete this anatomy.

TI-RADS (ACR)

The ACR (American College of Radiology) TI-RADS (Thyroid Imaging, Reporting and Data System) is designed to help the physician in the assessment and systematic documentation of Thyroid nodules based on the peer reviewed published literature, ACR Thyroid Imaging, Reporting and Data System (TI-RADS): White Paper of the ACR TI-RADS Committee by Franklin N. Tessler, MD, CM, Jenny K. Hoang, MBBS, William D. Middleton, MD, Edward G. Grant, MD, Michael D. Beland, MD, Lincoln L. Berland, MD, Sharlene A. Teefey, MD, John J. Cronan, MD, Ulrike M. Hamper, MD, Terry S. Desser, MD, Mary C. Frates, MD, Lynwood W. Hammers, DO, A. Thomas Stavros, MD, Jill E. Langer, MD, Carl C. Reading, MD, Leslie M. Scoutt, MD, A. Thomas Stavros, MD published on Journal of the American College of Radiology Volume 14, Issue 5, May 2017, Pages 587-595.

The ACR TI-RADS uses standard terminology to document the features of the nodules. Points are given for all the ultrasound features in a nodule, with more suspicious features being awarded additional points. When assessing a nodule, the user selects one feature from each of the first four categories and all the features that apply from the final category and sums the points. The point total determines the nodule's ACR TI-RADS level, which ranges from TR1 (benign) to TR5 (high suspicion). No recommended action is provided by the system to the user. In the ACR TI-RADS publication, recommendations for FNA or ultrasound follow-up are based on a nodule's ACR TI-RADS level and its maximum diameter.

TI-RADS (ACR) is Thyroid Imaging Reporting and Data System (from ACR). ACR TI-RADS could provide guidance regarding management of thyroid nodules on the basis of their ultrasound appearance.

TI-RADS (ACR) (continued)

To activate TI-RADS on the system:

1. The operator selects the appropriate probe and Thyroid preset.

2. The operator selects Nodule in Measure Menu.
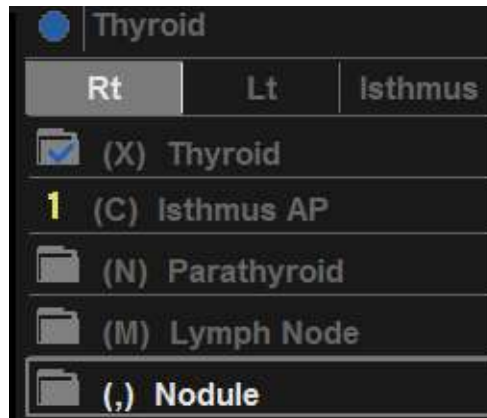
Figure 8-7. Select Nodule

3. The operator measures Nodule L*H*W* manually or Auto Contour(HxL)/(HxW).

TI-RADS (ACR) (continued)

4. The operator selects **TI-RADS(ACR)** in the primary menu. Then TI-RADS(ACR) menu appears. The operator selects each category for the Nodule. All points will be sumed up automatically.
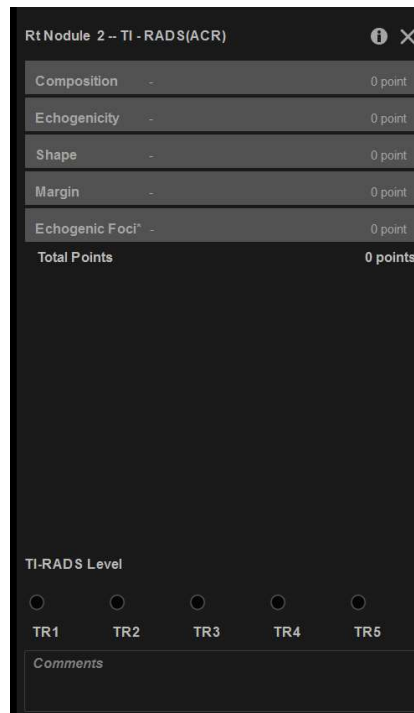
Figure 8-8.   TI-RADS(ACR) Menu

TI-RADS (ACR) (continued)

5. The operator clicks ❶ icon at the right corner of TI-RADS(ACR) menu, a user prompt window will appear. The window has two display modes.

    •   Place the cursor on the icon, the window will display a summarized introduction for ACR TI-RADS.
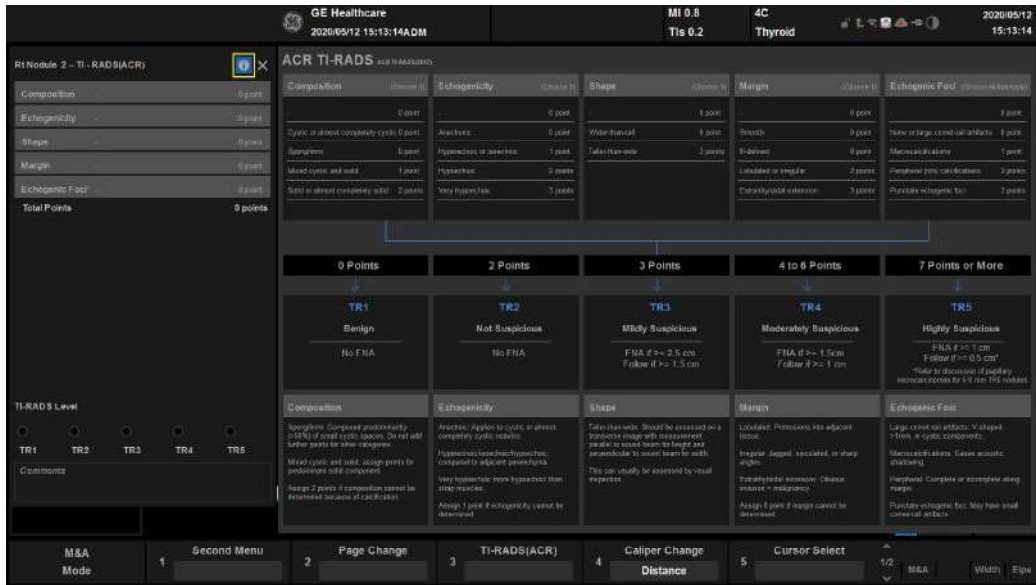
Figure 8-9.   Summarized User Prompt Window

TI-RADS (ACR) (continued)

- Move the cursor to the category, the window will display a detailed introduction for the selected catrgory.
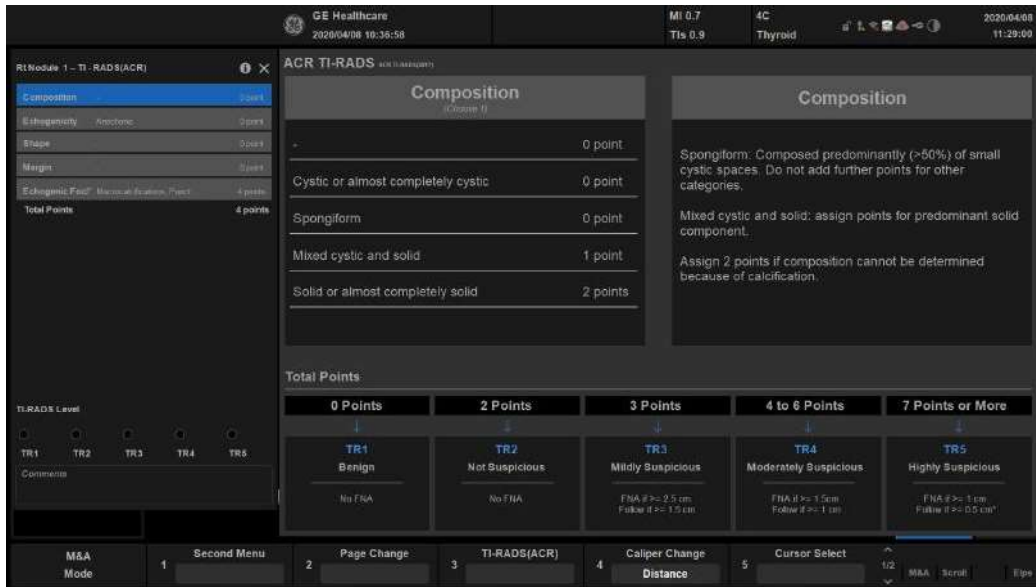
Figure 8-10.   Detailed User Prompt Window

The operator clicks 🛈 icon again to exit the user prompt window.

6.   The operator marks TI-RADS Level TRx manually.

NOTE: *The determine definitive diagnosis depends on FNA (fine needle aspiration).*

7.   After the completion, the operator presses **Report** key to check all the measurements and TI-RADS in the Worksheet.

Worksheet and Summary Worksheets

Worksheets and Summary Worksheets are provided for all documented Thyroid anatomies.

Figure 8-11.   Thyroid Worksheet

To move to the next page, select Page Change on the primary menu.

Worksheet and Summary Worksheets (continued)
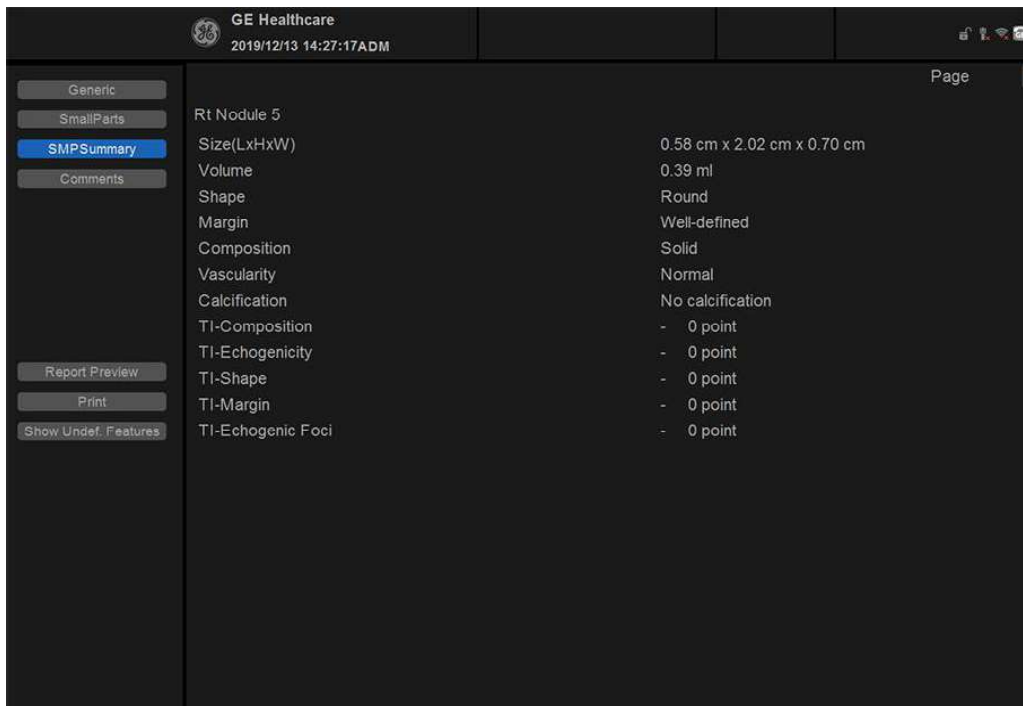
Figure 8-12.   Thyroid Summary Report

NOTE: *To exit back to the previous measurement screen, press Set on exit.*

NOTE: *To exit back to the scan screen, press Report on the control panel.*

Measure Assistant Thyroid (Auto Contour)

You can request that the system trace/outline the border of a nodule using Measure Assistant Thyroid (Auto Contour). You do this by setting the Region of Interest (ROI) around the nodule; the system can then measure the nodule by drawing the contour around it.

To automatically detect the nodule on the display,

1. Press **Measure**.
2. Press **Auto Contour (HxL)** or **Auto Contour (HxW)** .
3. Place the Cursor in the center of the nodule and press **Set**. Size the ROI around the nodule. Use the Trackball to resize the ROI.
   - To increase the size of the circle, move the Trackball down and to the right.
   - To decrease the size of the circle, move the Trackball upand to the left.

NOTE: *Include the entire nodule, even if additional surrounding tissue is included.*

4. Press **Set**. A trace appears around the nodule.
5. Size the trace via the Trackball.
6. Press **Set**. The contour around the nodule is generated.

NOTE: *Multiple nodule traces may be generated by the system.*

Measure Assistant Thyroid (Auto Contour) (continued)

7. Inspect the generated contour for accuracy. If edits are necessary, excecute steps 8-10 to edit the contour prior to accepting the measurement.Otherwise, skip to step 11.

8. To cycle through the generated contours, press **Cursor Select**.

9. To edit the selected contour, move the Trackball to appropriately size the edit region and then press **Set.**

10. The blue portion of the contour can be edited by moving the Trackball to the portion of the contour you want to edit.

NOTE: *The Caliper closest to the cursor enables editing.*

11. After you have completed your edits, press P1 to accept the measurement.

Chapter 9

OB/GYN

Describes how to perform obstetric and gynecology measurements and calculations, and how to use OB graphs and reports.

OB Exam

Exam Preparation

Prior to an ultrasound examination, the patient should be informed of the clinical indication, specific benefits, potential risks, and alternatives, if any. In addition, if the patient requests information about the exposure time and intensity, it should be provided. Patient access to educational materials regarding ultrasound is strongly encouraged to supplement the information communicated directly to the patient. Furthermore, these examinations should be conducted in a manner and take place in a setting which assures patient dignity and privacy.

• Prior material knowledge and approval of the presence of nonessential personnel with the number of such personnel kept to a minimum.

• An intent to share with the parents per the physician's judgement, either during the examination or shortly thereafter, the information derived.

• An offer of choice about viewing the fetus.

• An offer of choice about learning the sex of the fetus, if such information becomes available.

Ultrasound examinations performed solely to satisfy the family's desire to know the fetal sex, to view the fetus, or to obtain a picture of the fetus should be discouraged.

Acoustic Output Considerations

General warning

The Versana Active system is a multi-use device which is capable of exceeding FDA Pre-enactment acoustic output (spatial peak-temporal average) intensity limits for fetal applications.

⚠️ CAUTION   It is prudent to conduct an exam with the minimum amount and duration of acoustic output necessary to optimize the image's diagnostic value.

Concerns surrounding fetal exposure

Always be aware of the acoustic output level by observing the Acoustic Output Display. In addition, become thoroughly familiar with the Acoustic Output Display and equipment controls affecting output.

Training

It is recommended that all users receive proper training in fetal Doppler applications before performing them in a clinical setting. Please contact a local sales representative for training assistance.

To Start an Obstetrics Exam

NOTE: *Calculation formulas are listed in the Advanced Reference Manual.*

To begin an Obstetrics exam, you enter patient data or, if the patient data from a previous exam is saved in the system, find the patient information.

1. Press **Patient** on the control panel.

2. To choose an Obstetrics exam, move the **Trackball** to highlight Obstetrics, then press **Set**.

   The obstetric fields are listed in the Exam Information section of the Patient Data Entry screen.

3. Do one of the following:

   • If the patient data is already stored in the system, search for the data. Use the search fields in the bottom section of the Archive screen. For information about how to search for patient data, See 'Changing Patient Information or an Exam' on *page 4-26 for more information.*

   When the correct patient data is listed in the search list, move the **Trackball** to highlight the patient name and press **Set**. The system displays the patient data.

NOTE: *To change patient data, use the **Trackball** to move the cursor to the field and press **Set**. Press **Backspace** to delete the data, and then type the correct data.*

   • If the patient data is not stored in the system, enter the data. To enter data in a field, move the **Trackball** to highlight the field and then press **Set**. Use the **Tab** key to move between fields. Obstetric patient fields are listed in the following table.

NOTE: *For information about entering general patient data such as Patient ID and name, See 'Beginning a New Patient' on page 4-10 for more information.*

To Start an Obstetrics Exam (continued)

Table 9-1:   Obstetric fields

Field	Description
LMP	Last Menstrual Period; enter the date that the patient started her last menstrual period. You must enter 4 digits for the year. When you type the month and day, the system fills in the /. The Date Format preset chosen in Utility -> System -> General determines the required format.
BBT	Basal Body Temperature.
EDD by LMP	Estimated Delivery Date by LMP; the system fills in the date after you enter the LMP.
GA by LMP	Gestational Age by LMP; the system fills in the age after you enter the LMP.
Gravida	Number of pregnancies.
Para	Number of births.
AB	Number of abortions.
Ectopic	Number of ectopic pregnancies.
Fetus #	Number of fetuses; default is 1. Can be 1-4.
Operator	The person (not a physician) who performs the scan. Choose from the list.
Exam Description	Describe the type of exam.
Accession #	Exam number used with hospital information system (DICOM). This is a tracking number from the worklist.
Perf Physician	The physician who performs the exam. Choose from the list or type the name.
Ref. Physician	The physician who requested the exam. Choose from the list or type the name.

To Start an Obstetrics Exam (continued)

After you complete the patient information, you can begin the scan.

1. To change from the Patient Data Entry screen to the Scan screen, do one of the following:
    *   Select *Scan* on the **Patient** screen.
    *   Select **Freeze** on the control panel.
    *   Press the **B-Mode** key on the control panel.

        The system displays the scan screen.
2. To choose the appropriate probe, select the probe on the **Probe** screen.
3. Scan the patient.
4. On the Control Panel, press *Measure*.

    The default Obstetrics study is displayed.

Figure 9-1.   OB-General Study

OB Type change

The Versana Active system includes measurements for the following studies: USA, Europe, Tokyo, Osaka and ASUM.

Select OB Type in Utility -> System -> System Measure. See 'System/System Measure Preset Menu' on *page 16-16 for more information.*

NOTE: *ASUM studies include the following measurements:*

- ASUM: AC, BPD, and CRL
- ASUM 2001: AC, BPD, CRL, FL, HC, HL, and OFD

OB Measurements and Calculations

Introduction

Measurements and calculations derived from ultrasound images are intended to supplement other clinical procedures available to the attending physician. The accuracy of measurements is not only determined by the system accuracy, but also by use of proper medical protocols by the user. When appropriate, be sure to note any protocols associated with a particular measurement or calculation. Formulas and databases used within the system software that are associated with specific investigators are so noted. Be sure to refer to the original article describing the investigator's recommended clinical procedures.

Introduction (continued)

When you make measurements, you can select the calculation before you make the measurement or after you make it. If you select the calculation before you make the measurement, the Results Window shows the estimated fetal age as you make the measurement. If you select the calculation after you make the measurement, the estimated fetal age is displayed after you complete the measurement. The measurements steps in this section tell you to select the calculation before you make the measurement.

The following pages describe how to make OB measurements and calculations. The measurements are organized by mode, and within mode are listed in alphabetical order.

Out of Range – If the system indicates that a measurement is out of range (OOR), it means one of the following:

•   The measurement is out of the normal range based on the gestational age that is calculated from the LMP. The system determines OOR from the ultrasound age compared to the gestational age. The gestational age is calculated from the last menstrual period or the estimated delivery date.

•   The measurement is outside of the range for the data used in the calculation. That means that the measurement is either less than or more than the range of measurements used to determine fetal age based on the measurement.

NOTE: *Calculation formulas are listed in the Advanced Reference Manual.*

B-Mode Measurements

This section describes all B-Mode measurements that you typically find in OB studies. Additional OB measurements follow the typical ones.

Abdominal Circumference (AC)

USA Europe Tokyo Osaka ASUM
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To calculate abdominal circumference, you make an ellipse, trace, spline trace or two distance measurements.

Ellipse

1. Select *AC*; an active caliper displays.
2. To position the active caliper, move the **Trackball**.
3. To fix the start point, press **Set**.

   The system fixes the first caliper and displays a second active caliper.
4. To position the second caliper, move the **Trackball**.
5. Adjust the **Ellipse** control; an ellipse with an initial circle shape displays.
   - To position the ellipse and to size the measured axes (move the calipers), move the **Trackball**.
   - To increase the size, adjust the **Ellipse** control in a clockwise direction.
   - To decrease the size, adjust the **Ellipse** control in a counterclockwise direction.
   - To toggle between active calipers, select **Cursor Select** key.
6. To complete the measurement, press **Set**.

   The system displays the circumference in the Results Window.

HINTS

Before you complete the ellipse measurement:

- To erase the ellipse and the current data measured, press **Clear** once. The original caliper is displayed to restart the measurement.
- To exit the measurement function without completing the measurement, press **Clear** a second time.

Abdominal Circumference (AC) (continued)

Trace

1. Select *AC*; an active caliper displays.
2. To position the caliper, move the **Trackball**.
3. To fix the trace start point, press **Set**.

    The caliper changes to an active caliper.
4. To trace the measurement area, move the **Trackball** around the anatomy.
5. To complete the measurement, press **Set**.

    The system displays the circumference in the Results Window.

HINTS

*   Before you complete the ellipse measurement:
    *   To erase the line (bit by bit) back from its current point, move the **Trackball** or adjust the **Ellipse** control counterclockwise.
    *   To clear the caliper and the current data measured, press **Clear** once.
*   To rotate through and activate fixed calipers from other measurement, adjust **Cursor Select**.

Abdominal Circumference (AC) (continued)

Spline Trace

1. Select *AC*; an active caliper displays.

2. If necessary, select *Spline*.

3. To position the caliper, move the **Trackball**.

4. To fix the trace start point, press **Set**. The second caliper appears at the same position.

5. To position the second caliper, move the **Trackball** and press **Set**. The third caliper appears at the same position.

6. To position the third caliper, move the **Trackball** and press **Set**.

NOTE: *The spline trace requires at least 3 points to draw a trace. Continue setting the points of the trace until the desired points are set (by moving the Trackball to the appropriate position and pressing Set).*

7. To finalize the spline trace, press **Set** twice at the last caliper position.

   The system displays the circumference in the Results Window.

Abdominal Circumference (AC) (continued)

Two distances

1. Select *AC*; an active caliper displays.

2. To make the first distance measurement:

   a. To position the active caliper at the start point, move the **Trackball**.

   b. To fix the start point, press **Set**.

      The system fixes the first caliper and displays a second active caliper.

   c. To position the second active caliper at the end point, move the **Trackball**.

      A dotted line connects the measurement points, if preset accordingly.

   d. To complete the measurement, press **Set**.

      The system displays the distance value in the Results Window. After the first measurement, the system displays an active caliper.

3. To make the second distance measurement, repeat steps a–d above.

   The system displays the abdominal circumference in the Results Window.

HINTS

- Before you complete a measurement (press **Set**):

  - To toggle between active calipers, select **Measure**.

  - To erase the second caliper and the current data measured and start the measurement again, press **Clear** once.

- To rotate through and activate fixed calipers from other measurements, adjust **Cursor Select**.

- After you complete the measurement, to erase all data that has been measured to this point, but not data entered onto reports, press **Clear**.

Biparietal Diameter

USA Europe Tokyo Osaka ASUM
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To measure biparietal diameter, make one distance measurement:

1. Select *BPD*; an active caliper displays.

2. To position the active caliper at the start point, move the **Trackball**.

3. To fix the start point, press **Set**.

   The system fixes the first caliper and displays a second active caliper.

4. To position the second active caliper at the end point, move the **Trackball**.

   A dotted line connects the measurement points.

5. To complete the measurement, press **Set**.

   The system displays the biparietal diameter in the Results Window.

Crown Rump Length

USA Europe Tokyo Osaka ASUM
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To measure crown rump length, make one distance measurement:

1. Select *CRL*; an active caliper displays.

2. To position the active caliper at the start point, move the **Trackball**.

3. To fix the start point, press **Set**.

   The system fixes the first caliper and displays a second active caliper.

4. To position the second active caliper at the end point, move the **Trackball**.

   A dotted line connects the measurement points.

5. To complete the measurement, press **Set**.

   The system displays the crown rump length in the Results Window.

Femur Length

USA Europe Tokyo Osaka ASUM
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To measure femur length, make one distance measurement:

1. Select *FL*; an active caliper displays.

2. To position the active caliper at the start point, move the **Trackball**.

3. To fix the start point, press **Set**.

    The system fixes the first caliper and displays a second active caliper.

4. To position the second active caliper at the end point, move the **Trackball**.

    A dotted line connects the measurement points.

5. To complete the measurement, press **Set**.

    The system displays the femur length in the Results Window.

Gestational Sac

USA Europe Tokyo Osaka ASUM
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To calculate the gestational sac, you make three distance measurements in two scan planes. To display two scan planes, press the **Dual** key. Get an image in each scan plane and press **Freeze**.

1. Select *GS*; an active caliper displays.

    a. To position the active caliper at the start point, move the **Trackball**.

    b. To fix the start point, press **Set**.

        The system fixes the first caliper and displays a second active caliper.

    c. To position the second active caliper at the end point, move the **Trackball**.

        A dotted line connects the measurement points.

    d. To complete the measurement, press **Set**.

        The system displays the distance value in the Results Window and displays an active caliper.

2. To make the second and third distance measurement, repeat steps a–d.

    After you complete the third distance measurement, the system displays the gestational sac measurement in the Results Window.

USA Europe Tokyo Osaka ASUM
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You can calculate the gestational sac by one distance measurement.

1. Select *GS*; an active caliper displays.

    a. To position the active caliper at the start point, move the **Trackball**.

    b. To fix the start point, press **Set**.

        The system fixes the first caliper and displays a second active caliper.

    c. To position the second active caliper at the end point, move the **Trackball**.

        A dotted line connects the measurement points.

    d. To complete the measurement, press **Set**.

        After you complete the measurement, the system displays the gestational sac measurement in the Results Window.

Head Circumference (HC)

To calculate head circumference, you make an ellipse, trace, spline trace or two distance measurements.

USA Europe Tokyo Osaka ASUM

Ellipse

1. Select *HC*; an active caliper displays.
2. To position the active caliper, move the **Trackball**.
3. To fix the start point, press **Set**.

   The system fixes the first caliper and displays a second active caliper.
4. To position the second caliper, move the **Trackball**.
5. Adjust the **Ellipse** control; an ellipse with an initial circle shape displays.
   - To position the ellipse and to size the measured axes (move the calipers), move the **Trackball**.
   - To increase the size, adjust the **Ellipse** control in a clockwise direction.
   - To decrease the size, adjust the **Ellipse** control in a counterclockwise direction.
   - To toggle between active calipers, select **Measure**.
6. To complete the measurement, press **Set**.

   The system displays the circumference in the Results Window.

HINTS   Before you complete the ellipse measurement:

- To erase the ellipse and the current data measured, press **Clear** once. The original caliper is displayed to restart the measurement.
- To exit the measurement function without completing the measurement, press **Clear** a second time.

Head Circumference (HC) (continued)

Trace

1. Select *HC*; an active caliper displays.
2. To position the caliper, move the **Trackball**.
3. To fix the trace start point, press **Set**.

   The caliper changes to an active caliper.
4. To trace the measurement area, move the **Trackball** around the anatomy.
5. To complete the measurement, press **Set**.

   The system displays the circumference in the Results Window.

HINTS
Before you complete the ellipse measurement:

- To erase the line (bit by bit) back from its current point, move the **Trackball** or adjust the **Ellipse** control counterclockwise.
- To clear the caliper and the current data measured, press **Clear** once.

Head Circumference (HC) (continued)

Spline Trace

1. Select *HC*; an active caliper displays.

2. If necessary, select ***Spline*** from popup menu.

3. To position the caliper, move the **Trackball**.

4. To fix the trace start point, press **Set**. The second caliper appears at the same position.

5. To position the second caliper, move the **Trackball** and press **Set**. The third caliper appears at the same position.

6. To position the third caliper, move the **Trackball** and press **Set**.

NOTE: *The spline trace requires at least 3 points to draw a trace. Continue setting the points of the trace until the desired points are set (by moving the Trackball to the appropriate position and pressing Set).*

7. To finalize the spline trace, press **Set** twice at the last caliper position.

   The system displays the circumference in the Results Window.

Head Circumference (HC) (continued)

Two distances

1. Select *HC*; an active caliper displays.
2. To make the first distance measurement:
    a. To position the active caliper at the start point, move the **Trackball**.
    b. To fix the start point, press **Set**.

        The system fixes the first caliper and displays a second active caliper.
    c. To position the second active caliper at the end point, move the **Trackball**.

        A dotted line connects the measurement points, if preset accordingly.
    d. To complete the measurement, press **Set**.

        The system displays the distance value in the Results Window. After the first measurement, the system displays an active caliper.
3. To make the second distance measurement, repeat steps a–d above.

    The system displays the abdominal circumference in the Results Window.

HINTS
*   Before you complete a measurement (press **Set**):
    *   To toggle between active calipers, select **Measure**.
    *   To erase the second caliper and the current data measured and start the measurement again, press **Clear** once.
*   To rotate through and activate fixed calipers from other measurements, adjust **Cursor Select**.
*   After you complete the measurement, to erase all data that has been measured to this point, but not data entered onto worksheets, press **Clear**.

Amniotic Fluid Index (AFI)

USA Europe Tokyo Osaka ASUM

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To calculate the amniotic fluid index, you make measurements of the four quadrants of the uterine cavity. The system adds these four measurements together to calculate the Amniotic Fluid Index.

NOTE: *The four quadrants can be measured with distance (caliper) or circumference (circle) measurements. Select the appropriate AFI quadrant key to show the popup menu to select caliper or circle.*

1. Select **AFI**.

   The first distance measurement, AFI-Q1, is already selected.

2. Make a standard distance measurement for the first quadrant:

   a. To position the active caliper at the start point, move the **Trackball**.

   b. To fix the start point, press **Set**.

      The system fixes the first caliper and displays a second active caliper.

   c. To position the second active caliper at the end point, move the **Trackball**.

      A dotted line connects the measurement points.

   d. To complete the measurement, press **Set**.

      The system displays the distance value in the Results Window.

3. When the measurement of the first quadrant is completed, unfreeze and move to the second quadrant.

4. After you obtain the image, press **Freeze** and then **Measure**.

   The system prompts you to continue with the AFI measurements. Make sure that the next quadrant has been selected.

Amniotic Fluid Index (AFI) (continued)

5. Perform a standard distance measurement for the second, third, and fourth quadrants (see step 2).

   When all four quadrants have been measured, the system calculates the AFI total and displays it in the Results Window.

HINTS

- If you unfreeze the image after doing an AFI measurement, the system does not delete the previous measurements. Unfreeze and change scan planes as necessary.
- To specify that an unassigned distance measurement be used for an AFI measurement:
  - Select *AFI*.
  - Press **Measure**.
  - Move the **Trackball** to highlight the unassigned distance measurement in the Results Window.
  - Select the AFI measurement on the menu.
- If the fluid in a pocket is zero, set the second caliper on top of the first one to give it a zero value.
- You can measure an AFI quadrant that is zero (0) by pressing **Set** twice.

A/B Ratio

In B-Mode you can calculate A/B ratio by diameter or by area. See 'A/B Ratio' on *page 7-76 for more information.*

Angle

See 'Angle' on *page 7-75 for more information.*

Antero-Postero Trunk Diameter & Transverse Trunk Diameter (APTD-TTD)

USA Europe Tokyo Osaka ASUM
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Make two distance measurements, one of the antero-postero trunk diameter and one of the transverse trunk diameter.

1. Select *APTD_TTD*; an active caliper displays.

2. Make a distance measurement of the antero-postero trunk diameter:

    a. To position the active caliper at the start point, move the **Trackball**.

    b. To fix the start point, press **Set**.

        The system fixes the first caliper and displays a second active caliper.

    c. To position the second active caliper at the end point, move the **Trackball**.

        A dotted line connects the measurement points.

    d. To complete the measurement, press **Set**.

        The system displays the distance value in the Results Window and displays an active caliper.

3. To make a distance measurement of the transverse trunk diameter, repeat steps a–d above.

    The system displays the antero-postero trunk diameter and the transverse trunk diameter in the Results Window.

Antero-Postero Trunk Diameter by Transverse Trunk Diameter (AxT)

USA Europe Tokyo Osaka ASUM
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Make two distance measurements, one of the antero-postero trunk diameter and one of the transverse trunk diameter.

1. Select *AxT*; an active caliper displays.

2. Make a distance measurement of the antero-postero trunk diameter:

   a. To position the active caliper at the start point, move the **Trackball**.

   b. To fix the start point, press **Set**.

      The system fixes the first caliper and displays a second active caliper.

   c. To position the second active caliper at the end point, move the **Trackball**.

      A dotted line connects the measurement points.

   d. To complete the measurement, press **Set**.

      The system displays the distance value in the Results Window and displays an active caliper.

3. To make a distance measurement of the transverse trunk diameter, repeat steps a–d above.

   The system displays the antero-postero trunk diameter, the transverse trunk diameter, and AxT in the Results Window.

Cardio-Thoracic Area Ratio (CTAR)

USA Europe Tokyo Osaka ASUM
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To calculate cardio-thoracic area ratio, you make two ellipse measurements.

1. Select *CTAR*; an active caliper displays.
2. Make an ellipse measurement of the cardiac area:

    a. To position the active caliper, move the **Trackball**.

    b. To fix the start point, press **Set**.

        The system fixes the first caliper and displays a second active caliper.

    c. To position the second caliper, move the **Trackball**.

    d. Adjust the **Ellipse** control; an ellipse with an initial circle shape displays.

    •   To position the ellipse and to size the measured axes (move the calipers), move the **Trackball**.

    •   To increase the size, adjust the **Ellipse** control in a clockwise direction.

    •   To decrease the size, adjust the **Ellipse** control in a counterclockwise direction.

    •   To toggle between active calipers, adjust Cursor Select.

    e. To complete the ellipse measurement, press **Set**.

        The system displays the cardiac area measurement in the Results Window

3. To make an ellipse measurement of the thoracic area, repeat steps a–e.

    The system displays the cardio-thoracic area ratio in the Results Window.

Estimated Fetal Weight (EFW)

USA Europe Tokyo Osaka ASUM
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To measure estimated fetal weight, you make several OB measurements. These measurements can vary, based on how your system is set up. Measurements can include biparietal diameter, fetal trunk area, femur length, antero-postero trunk diameter and transverse trunk diameter, abdominal circumference, head circumference and spinal length.

1. Select *EFW*.

    The system displays the required measurements.

2. Make each measurement.

    The system displays each measurement in the Results Window. The estimated fetal weight is displayed in the Results Window only with Tokyo or Osaka OB type.

NOTE: *For a description of any of the required measurements, refer to that measurement.*

Fetal Trunk Area (FTA)

To measure fetal trunk area, you make an ellipse, trace, spline trace or two distance measurements.

Ellipse

1. Select *FTA*; an active caliper displays.
2. To position the active caliper, move the **Trackball**.
3. To fix the start point, press **Set**.

   The system fixes the first caliper and displays a second active caliper.
4. To position the second caliper, move the **Trackball**.
5. Adjust the **Ellipse** control; an ellipse with an initial circle shape displays.
   - To position the ellipse and to size the measured axes (move the calipers), move the **Trackball**.
   - To increase the size, adjust the **Ellipse** control in a clockwise direction.
   - To decrease the size, adjust the **Ellipse** control in a counterclockwise direction.
   - To toggle between active calipers, adjust Cursor Select.
6. To complete the measurement, press **Set**.

   The system displays the measurement in the Results Window.

HINTS

Before you complete the ellipse measurement:

- To erase the ellipse and the current data measured, press **Clear** once. The original caliper is displayed to restart the measurement.
- To exit the measurement function without completing the measurement, press **Clear** a second time.

Fetal Trunk Area (FTA) (continued)

Trace

1. Select *FTA*; a caliper displays.
2. If necessary, select *Trace* from popup menu.
3. To position the caliper at the start point, move the **Trackball**.
4. To fix the trace start point, press **Set**.

   The caliper changes to an active caliper.
5. To trace the measurement area, move the **Trackball** around the anatomy.

   A dotted line shows the traced area.
6. To complete the measurement, press **Set**.

   The system displays the measurement in the Results Window.

HINTS

Before you complete the trace measurement:

- To erase the line (bit by bit) back from its current point, move the **Trackball** or adjust the **Ellipse** control counterclockwise.
- To clear the caliper and the current data measured, press **Clear** once.

Fetal Trunk Area (FTA) (continued)

Spline Trace

1. Select *FTA*; an active caliper displays.

2. If necessary, select *Spline* from popup menu.

3. To position the caliper, move the **Trackball**.

4. To fix the trace start point, press **Set**. The second caliper appears at the same position.

5. To position the second caliper, move the **Trackball** and press **Set**. The third caliper appears at the same position.

6. To position the third caliper, move the **Trackball** and press **Set**.

NOTE: *The spline trace requires at least 3 points to draw a trace. Continue setting the points of the trace until the desired points are set (by moving the Trackball to move to the appropriate position and pressing Set).*

7. To finalize the spline trace, press **Set** twice at the last caliper position.

    The system displays the circumference in the Results Window.

Fetal Trunk Area (FTA) (continued)

Two distances

1. Select *FTA*; an active caliper displays.

2. Make the first distance measurement:

    a. To position the active caliper at the start point, move the **Trackball**.

    b. To fix the start point, press **Set**.

       The system fixes the first caliper and displays a second active caliper.

    c. To position the second active caliper at the end point, move the **Trackball**.

       A dotted line connects the measurement points, if preset accordingly.

    d. To complete the measurement, press **Set**.

       The system displays the distance value in the Results Window and displays an active caliper.

3. To make the second distance measurement, repeat steps a–d above.

   The system displays the measurement in the Results Window.

HINTS

- Before you complete a measurement:
    - To toggle between active calipers, adjust Cursor Select.
    - To erase the second caliper and the current data measured and start the measurement again, press **Clear** once.

- To rotate through and activate previously fixed calipers, adjust **Cursor Select**.

- After you complete the measurement, to erase all data that has been measured to this point, but not data entered onto reports, press **Clear**.

Foot Length

To measure foot length, make one distance measurement:

1. Select *Ft*; an active caliper displays.

2. To position the active caliper at the start point, move the **Trackball**.

3. To fix the start point, press **Set**.

   The system fixes the first caliper and displays a second active caliper.

4. To position the second active caliper at the end point, move the **Trackball**.

   A dotted line connects the measurement points.

5. To complete the measurement, press **Set**.

   The system displays the foot length in the Results Window.

Humerus Length

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To measure humerus length, make one distance measurement:

1. Select *HL*; an active caliper displays.
2. To position the active caliper at the start point, move the **Trackball**.
3. To fix the start point, press **Set**.

    The system fixes the first caliper and displays a second active caliper.
4. To position the second active caliper at the end point, move the **Trackball**.

    A dotted line connects the measurement points.
5. To complete the measurement, press **Set**.

    The system displays the humerus length in the Results Window.

Nuchal Translucency (NT)

To measure nuchal translucency, make one distance measurement:

1. Select *NT*; an active caliper displays.
2. To position the active caliper at the start point, move the **Trackball**.
3. To fix the start point, press **Set**.

    The system fixes the first caliper and displays a second active caliper.
4. To position the second active caliper at the end point, move the **Trackball**.

    A dotted line connects the measurement points.
5. To complete the measurement, press **Set**.

    The system displays the nuchal translucency in the Results Window.

NOTE: *Nuchal Translucency is not available through the factory default. To enable Nuchal Translucency, add NT to the measurement folder in Utility -> Measure -> M&A -> Add measurement (Insert).*

Occipitofrontal Diameter

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To measure occipitofrontal diameter, make one distance measurement:

1. Select *OFD*; an active caliper displays.

2. To position the active caliper at the start point, move the **Trackball**.

3. To fix the start point, press **Set**.

   The system fixes the first caliper and displays a second active caliper.

4. To position the second active caliper at the end point, move the **Trackball**.

   A dotted line connects the measurement points.

5. To complete the measurement, press **Set**.

   The system displays the occipitofrontal diameter in the Results Window.

% Stenosis

In B-Mode, you can calculate % Stenosis by diameter or by area. See '% Stenosis' on *page 7-69 for more information.*