Disk Encryption Frequently Asked Questions (continued)

Q Is it possible to stop encrypting the data?
A Utility>Admin>Disk encryption, select the “Off” radio button. The process to unencrypt may take up to 15 minutes.

Q Is there a step I need to take every day to encrypt new data?
A No, the encryption will happen in the background without the need for any additional manual steps.

Q The encryption was done it took nearly 90 minutes, is this going to happen every time the data is encrypted?
A No, after the initial encryption process is completed, new data will be encrypted automatically.

Q How does this protect the patient data?
A The data is unreadable by anyone who attempts to use the system without entering the password or recovery key.

Q I am using the system portable with Power Assistant, do I have to enter the password or recovery key after each exam?
A No, the password or recovery key will only need to be entered at each full boot up.

Q I do not have Power Assistant but I take the system portable occasionally do I need to enter the recovery key or password each time?
A Yes, the recovery key or password must be entered each time the system is turned on. If the USB with Recovery key is connected with each start up you will not need to manually enter the password or recovery key.

Disk Encryption Frequently Asked Questions (continued)

Q The USB recovery key has been lost, how do I unlock the system?
A Manually enter the password or recovery key, then create a new USB key from the Disk Encryption page.

Q The USB recovery key and the password has been lost how do I unlock the disk?
A Contact your service, the system will need a base image and application reload. Create a new encryption key. *Note the patient data on the system is not recoverable from this scenario. Always store patient data to a PACS or backup to external media.

Q If it is not possible to unlock the data can I still scan and what cannot be used?
A Yes: Unless the “Require Pre-Boot PIN/Password” Encryption policy option is selected, Live scan, measurement, “Save As” can be used to store on other media (USB, printer, etc). You can not access patient information, cannot access system Archive, cannot create an exam, cannot store to the hard drive, and DICOM Transfer is not possible.

Audit Report and System Log Server Configuration

Figure 10-94. Audit Report

Table 10-156: Audit Report

Preset Parameter	Description
Report Filter: Specify the following criteria.	
Search Type	Select the type of search.
Date Range	Specify the “From” and “To” date range.
Status	Specify the status.
Anonymize	Indicate whether to anonymize the report (remote patient data).
Generate Report	Press to generate the report.
Report Information: Generated report information.	
Report File Path	The location where to place the generated report.
Report Status	Report status.

Audit Report and System Log Server Configuration (continued)

The Audit Report System Log Server Configuration page allows you to customize where to draw information from for the Audit Report.

You are also able to connect the LOGIQ Totus to a centralized logging database at your institution to monitor for pattern analysis. This way, if your system is compromised, the data can be analyzed for incident response.

This centralizes all the system's data in the customer's data center -- It's like a DICOM connection page, but connects logs to a central location.

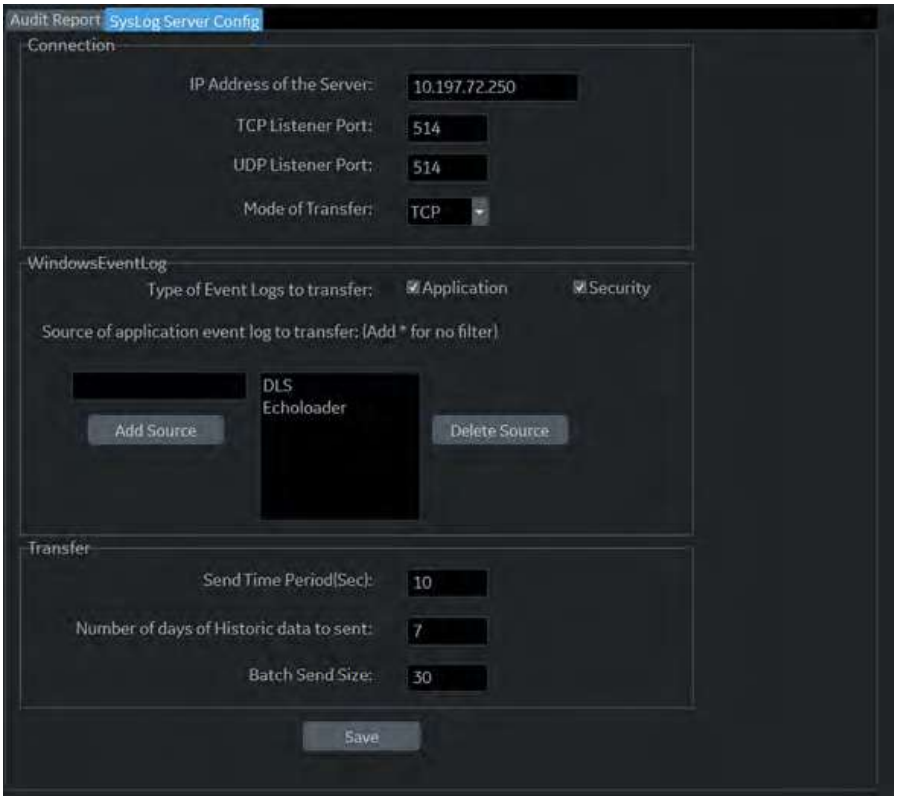


Figure 10-95. System Log Server Configuration

Table 10-157: System Log Server Configuration

Preset Parameter	Description
Connection.	
IP Address of the Server	The Server's IP address
TCP Listener Port	Transfer Control Protocol Listener Port. This is the port which we transfer logging data to use the syslog data protocol. It can be done by UDP or TCP, depending on the configuration of the customer logging server.

Table 10-157: System Log Server Configuration

Preset Parameter	Description
UDP Listener Port	User Datagram Protocol Listener Port. This is the port which we transfer logging data to use the syslog data protocol. It can be done by UDP or TCP, depending on the configuration of the customer logging server.
Mode of Transfer	Mode of transferring the data to the server (UDP, TCP, or TLS).
Windows Event Log	
Type of Logs to transfer	• Application Logs • Security Logs
Source of application event log to transfer: (Add * for no filter)	• Add Source: The user needs to specify where to draw data from for the audit report. • Delete Source: Delete the event log source from the application.
Transfer	
Send Time Period (Sec):	How often the system will attempt to contact the logging server to send logs.
Number of days of Historic data to send:	If logging server connectivity has not been available, how many days of history should be sent when it is restored?
EventLog Batch Send Size	When sending historic data, how much to send in each transaction – this can help manage network traffic and server load, not typically necessary to change this.

Imaging Preset Manager

Overview

The Imaging Preset Manager allows you to:

- Create and Edit User Presets
  - Update User Presets
  - Rename User Presets
  - Delete User Presets
- Arrange presets on the Touch Panel
- Share User Presets across LOGIQ Totus systems
  - Export User Presets
  - Import User Presets
- Configure MyPreset for probe
  - Update MyPreset Config for each probe if desired. Need for each probe separately. See ‘Arranging MyPreset Tab’ on *page 4-29 for more information.*

Creating a User-Defined Application Preset

To create a User-Defined Application Preset,

1. From the Touch Panel, select the ***Probe*** icon at the top of the Touch Panel.
2. Select the ***Application*** you want to use as a basis for the new Application Preset.

   You are now ready to create your own user preset.

Creating a User-Defined Application Preset (continued)

3. Press ***Save***. A pop-up menu appears: The Create New Application menu appears.

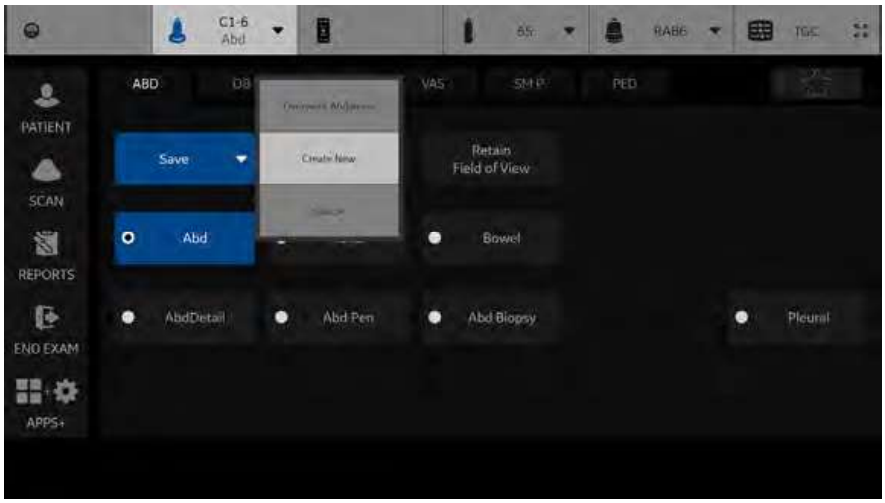


Figure 10-96. Create New User Pop-up Menu

4. Select ***Create New***. The Create New Application menu appears.

NOTE: The new user application is based upon the current exam 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.

NOTE: There is no limit to the number of user-defined application presets you can create for each exam category; you do not need to map all created presets to the Touch Panel.

After you select to create the new preset, the Imaging Preset Manager screen appears. The preset you just created now appears in the Available Imaging Presets column. You'll notice that it has the name you assigned it ("GE HealthCare").

Arranging Presets on the Touch Panel

On this screen, you specify where you want the new user (and existing) presets to appear on the exam's Touch Panel screen.

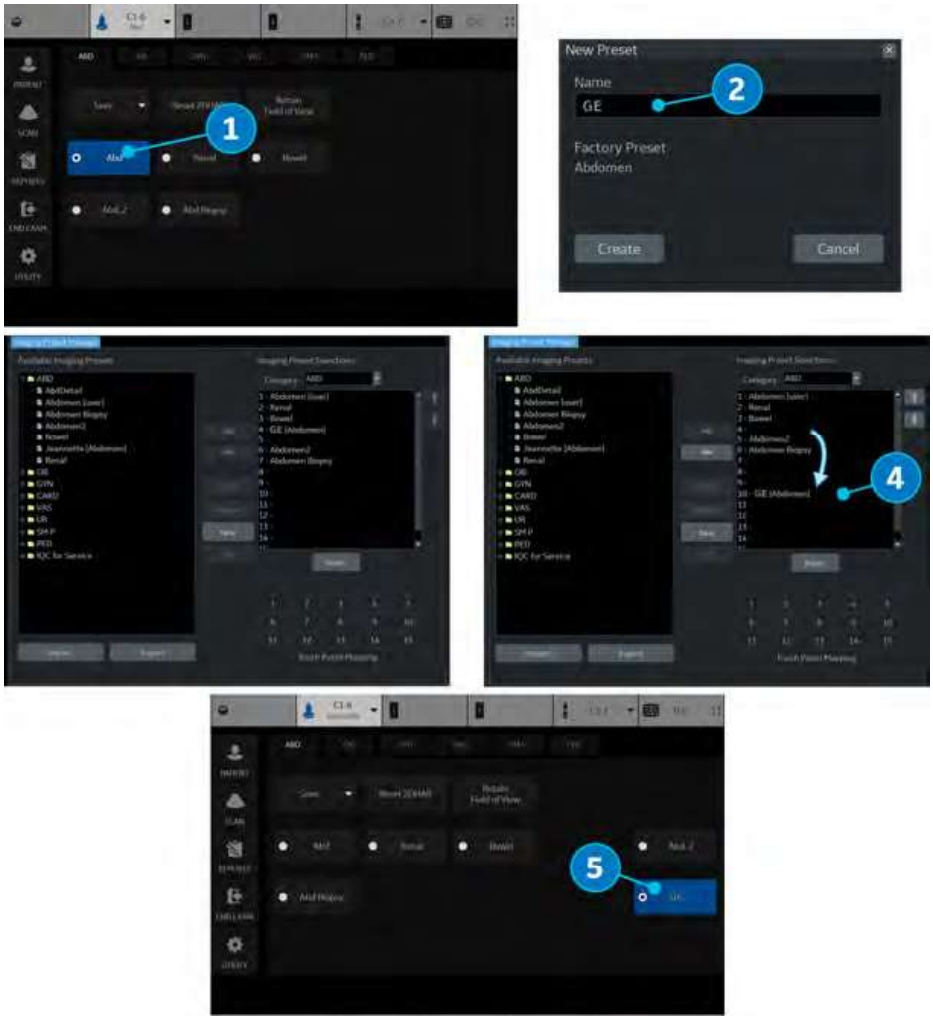


Figure 10-97. Steps to Add a User Preset

You can move the location of where the application appears on the Touch Panel via the Imaging Preset Manager (accessed from the Utility Touch Panel).

To reposition an application on the Touch Panel grid,

1. Select the Application to copy. Right click and select Create New.
2. Provide the new name.
3. The Imaging Preset Manager page appears (number not shown above).
4. Position the new application to appear at the desired Touch Panel location.
5. The new application appears on the Touch Panel.

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 the ***probe*** at the top of the Touch Panel screen.
3. Press ***Save-->Overwrite*** [Preset Name].
4. From the Utility--> Imaging menus.

To view/edit the parameters for the user defined preset

1. Press Utility--> Imaging 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 the ***probe***.
3. Press ***Save-->Overwrite [Preset Name]***.

Renaming a User Preset

To rename a user preset,

1. Press Utility--> Imaging 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 press Rename.

Deleting a User Preset

To delete a user preset,

1. Press Utility--> Imaging 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 press OK.

Sharing User Presets between LOGIQ Totus Systems

You can share the user presets you have created between LOGIQ Totus systems by exporting/importing the preset(s) you want to share.

To move a user preset from one LOGIQ Totus to another LOGIQ Totus 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. Activate the ***Imaging Preset Manager*** from the Utility Touch Panel.
2. Insert the media.
3. Press **Export** (on the bottom).
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.
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 LOGIQ Totus and follow the Importing User Presets instructions below.

Importing User Presets

To import a User Preset,

1. Activate the ***Imaging Preset Manager*** from the Utility Touch Panel.
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 LOGIQ Totus, 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.

Retain Field of View

Selecting Retain Field of View ensures that the Imaging Parameters shown in the table below stay constant over Probe and Preset changes.

Table 10-158: Retain Field of View

Mode	Probe	Retain Field of View Imaging Parameters
B-Mode, Harmonics, Contrast and B-Flow	Convex and Sector	Depth, Tilt, Zoom, Width
	Linear	Virtual Convex, Zoom, Depth, Steer
Color Flow Mode	Convex and Sector	ROI Size/Position
	Linear	ROI Size/Position, CF Virtual Convex, CF Steer
Doppler Mode		Doppler Cursor Position

Backup and Restore

Overview

The Backup/Restore function enables the user to copy and restore system presets, settings and service configurations, and enables the user to configure several units with identical configurations (providing the units have the same software version).

Depending on the system, you can use either a USB Flash Drive, or USB Hard Disk for system backup/restore.

To minimize accidental loss of data, backup system presets, settings and service configurations, **DAILY** to formatted media and/or to the local hard drive (manually or automatically). Presets and service configurations can be restored to the local hard drive using the restore procedure.

NOTE: To perform backup and restore procedures, you must login with administrator privileges.

Backup

Media Backup

1. Insert media into the drive or USB device into a USB port.
2. On the Touch Panel, press ***Utility***.
3. On the Utility Touch Panel, press ***System***.
4. On the monitor display, select **Backup/Restore**.
   The Backup/Restore screen is displayed.

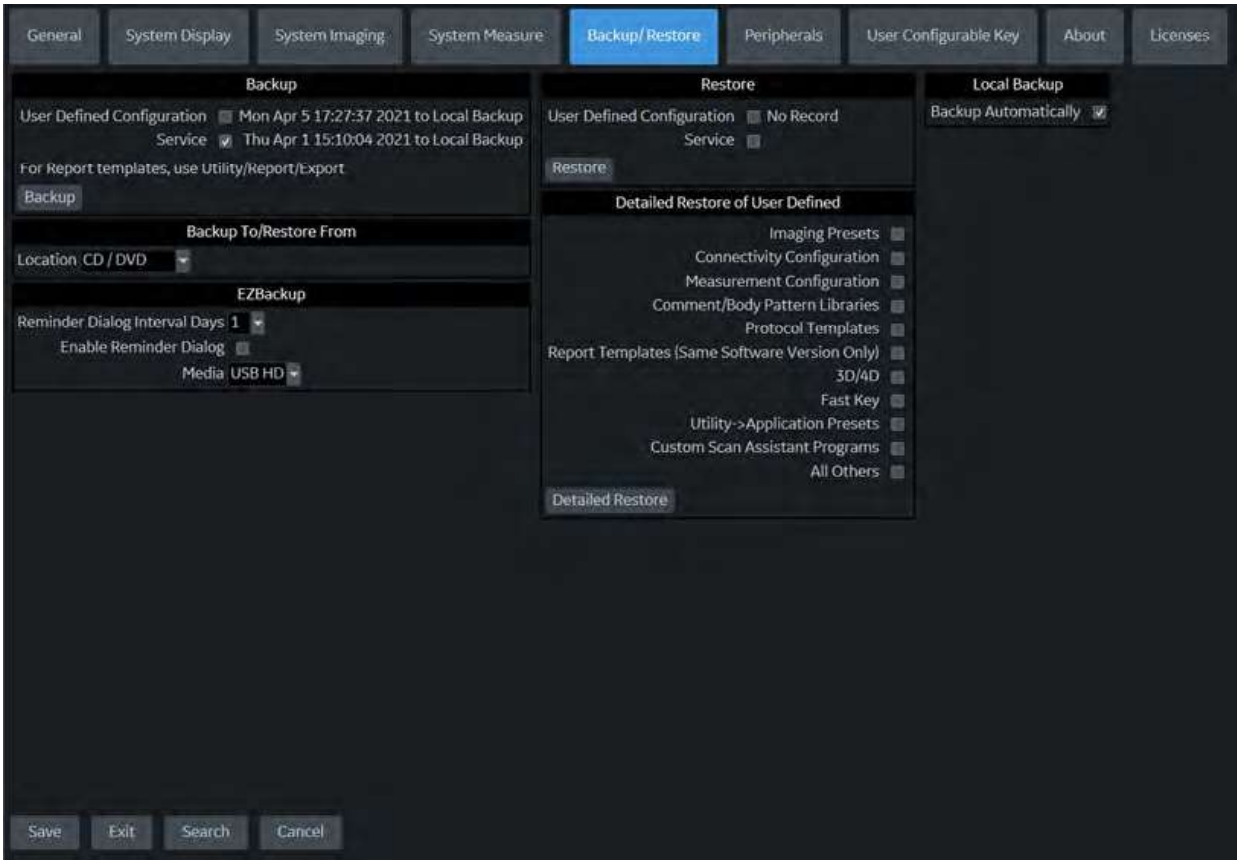


Figure 10-98. System/Backup/Restore Preset Menu

5. In the *Backup* field, select *User Defined Configuration* and/or *Service* to copy system presets, settings and service configurations.
6. Select USB Drive F to save data in the Backup To/Restore From field.

Media Backup (continued)

7. Select ***Backup***.

   The system performs the backup. As it proceeds, status information is displayed on the Backup/Restore screen.

8. At the end of the process, the Backup completed message is displayed on the monitor.

   Press **Eject** (F3) to eject media/disconnect USB device.

9. Make sure to physically label the media. An identification of the system should also be noted on the media and a backup log should be kept.

   Store the media in a safe place.

Local Backup

Select *Backup Automatically* under *Local Backup* to automatically backup User Defined configurations to the system hard drive when the configuration is changed and saved.

Select Manual Backup to manually backup User Defined configurations to the system hard drive.

Backup Automatically

1. Check ***Backup Automatically*** under Local and Cloud Backup.
2. Select ***Local Backup*** under Backup To/Restore From.
3. Press ***Save***.

   User Defined Configuration files are automatically backed up to Local Backup, when configuration is changed and then saved.

Manual Backup

1. Select ***Local Backup*** under Backup To/Restore From.
2. Press ***Backup*** under Backup.

Restore from Media or Local Backup

WARNING

The restore procedure overwrites the existing database on the local hard drive. Make sure to insert the correct media.You cannot restore system presets, settings and service configurations between systems with different software versions. To minimize accidental loss of data, perform backup of the patient archives stored on the local hard drive periodically.

1. On the Touch Panel, press ***Utility***.
2. On the Utility Touch Panel, press ***System***.
3. On the monitor display, select **Backup/Restore**.

   The Backup/Restore screen displays. (See Figure 10-98 *on page 10-190*.)
4. In the *Restore* list, select *User Defined Configuration* and/or *Service* to restore system presets, settings and/or service configurations.
5. **If restoring from Media:** Ensure the appropriate source device is selected in the *Media* field and select ***Restore from Media***.

   If restoring from Local Backup: Select ***Restore from Local Backup***.

   The system performs the restore. As it proceeds, status information displays on the Backup/Restore screen.
6. The LOGIQ Totus restarts automatically when Restore is done.

Preset Synchronization Using Media

The procedure for preset synchronization of several scanners using media is as follows:

1. Make a backup of the user-defined configurations on a removable media from a fully configured LOGIQ Totus system.
2. Restore user-defined configurations from the removable media to another LOGIQ Totus system (you can restore all the user-defined presets or select specific presets to restore via Detailed Restore).

NOTE: User Defined Configurations are compatible with LOGIQ E10, E10s and Fortis, EXCEPT for Imaging preset.

Search

Utility Parameter Search

Opens up a search window to find a parameter on the utility pages.

To search for a utility parameter,

1. Press ***Search*** from the Utility Touch Panel or from another Utility page.
2. Type in the search string. For instance, if you're searching for Zoom you would just type 'zoom'.
3. A list of possible matches appears to the right. Select the correct match.

NOTE: You cannot perform a search on the Measure, Reports, Imaging Preset Manager, Scan Assistant, or Service Utility pages.

Chapter 11

Probes and Biopsy

This chapter consists of the information of each probe and describes some special concerns, biopsy kits and accessories as well as basic procedures for attaching a biopsy guide to the different types of probes.

Probe Overview

Ergonomics

Probes have been ergonomically designed to:

- Handle and manipulate with ease
- Connect to the system with one hand
- Be lightweight and balanced
- Have rounded edges and smooth surfaces.
- Stand up to typical wear by cleaning and disinfectant agents, contact with approved gel, etc.

Cables have been designed to:

- Connect to system with appropriate cable length

Supported Probes

Introduction

The LOGIQ Totus supports the following types of probes:

- Matrix Array probes
- Convex Array probes
- Linear Array probes
- Micro Convex Array probes
- Sector Phased Array probes
- Split Crystal
- Volume Probes (4D)

CAUTION

Probes for transvaginal and transrectal applications require special handling. Transvaginal/transrectal examinations and probe insertions should be performed only by personnel with adequate training. Refer to the user documentation enclosed with these probes.

Probe Description

Table 11-1: Probe Applications and Features

Probe	Clinical Applications	Capabilities and Features	Illustration
C1-6-D	• Abdomen (incl. Pleural) • OB/GYN • Pediatric • Peripheral Vascular • General musculoskeletal	• Easy3D/Avanced3D • Tru3D • PDI • M-Mode • Anatomical M-Mode • LOGIQView • Contrast • B-Flow/Hybrid B-Flow • CrossXBeam • Shear Wave and Strain Elastography • UGAP • MVI/Contrast MVI • Biopsy	
C1-6VN-D		• Easy3D/Avanced3D • Tru3D • V-Nav • PDI • M-Mode • Anatomical M-Mode • LOGIQView • Contrast • B-Flow/Hybrid B-Flow • CrossXBeam • Shear Wave and Strain Elastography • UGAP • MVI/Contrast MVI • Biopsy	

Table 11-1: Probe Applications and Features (Continued)

Probe	Clinical Applications	Capabilities and Features	Illustration
C2-7-D	• Abdomen • Pediatric	• Easy3D/Avanced3D • PDI • M-Mode • Anatomical M-Mode • LOGIQView • CrossXBeam • Contrast • B-Flow • Biopsy	
C2-7VN-D		• Easy3D/Avanced3D • PDI • M-Mode • Anatomical M-Mode • LOGIQView • CrossXBeam • Contrast • V-Nav • Tru3D • B-Flow • Biopsy	
C3-10-D	• Neonatal • Pediatric • Neonatal transcranial • Peripheral Vascular • Small Parts • Abdomen	• Easy3D/Avanced3D • PDI • M-Mode • Anatomical M-Mode • LOGIQView • CrossXBeam • Contrast • B-Flow • V-Nav • Tru3D	
IC5-9-D	• OB/GYN • Urology	• Easy3D/Avanced3D • PDI • M-Mode • Anatomical M-Mode • LOGIQView • Contrast • Shear Wave and Strain Elastography (GYN and Urology only) • V-Nav • Tru3D • Biopsy	

Table 11-1: Probe Applications and Features (Continued)

Probe	Clinical Applications	Capabilities and Features	Illustration
9L-D	• Peripheral Vascular • Abdomen (incl. Pleural) • OB/GYN • Small Parts • Pediatrics • Neonatal • Neonatal transcranial • General musculoskeletal • Superficial musculoskeletal • Breast	• Easy3D/Avanced3D • PDI • M-Mode • LOGIQView • Virtual Convex • Contrast • CrossXBeam • B-Flow/Hybrid B-Flow • MVI/Contrast MVI • Shear Wave and Strain Elastography • V-Nav • Tru3D • Biopsy	
L6-24-D (May not be available in all countries.)	• Musculoskeletal • Small Parts • Neonatal Abdomen • Neonatal Transcranial • Breast • Peripheral Vascular • Abdomen	• LOGIQView • Virtual Convex • CrossXBeam • B-Flow/Hybrid B-Flow • MVI • PDI	
L3-12-D	• Vascular • Abdomen (incl. Pleural) • OB • Small Parts • General musculoskeletal • Superficial musculoskeletal • Neonatal • Neonatal transcranial • Pediatrics • Breast	• Easy3D/Avanced3D • PDI • M-Mode • LOGIQView • Virtual Convex • Contrast • CrossXBeam • B-Flow/Hybrid B-Flow • MVI/Contrast MVI • Strain and Shear Wave Elastography • Biopsy	

Table 11-1: Probe Applications and Features (Continued)

Probe	Clinical Applications	Capabilities and Features	Illustration
ML6-15-D	• Abdomen • Small Parts • Peripheral Vascular • Pediatrics • Neonatal • Neonatal transcranial • General musculoskeletal • Superficial musculoskeletal • Breast	• Easy3D/Avanced3D • PDI • M-Mode • LOGIQView • Virtual Convex • Contrast • CrossXBeam • B-Flow/Hybrid B-Flow • MVI/Contrast MVI • Shear Wave and Strain Elastography • V-Nav • Tru3D • Biopsy	
M5Sc-D	• Adult cardiac • Pediatric cardiac • Adult cephalic • Abdomen (incl. Pleural)	• Easy3D/Avanced3D • PDI • M-Mode • Anatomical M-Mode • Curved Anatomical M-Mode • Color M • LOGIQView • Virtual Convex • Contrast • Anatomical M-Mode • B-Flow • CW • TVI/TVD • V-Nav • Tru3D • Biopsy	
6S-D	• Pediatric cardiac • Pediatric abdomen (incl. Pleural)	• Easy3D/Avanced3D • PDI • M-Mode • Anatomical M-Mode • Curved Anatomical M-Mode • Color M • LOGIQView • Virtual Convex • CW • TVI/TVD	

Table 11-1: Probe Applications and Features (Continued)

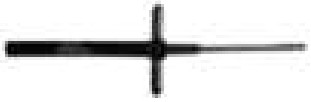
Probe	Clinical Applications	Capabilities and Features	Illustration
RAB6-D	• OB/GYN • Abdomen • Pediatric • Neonatal	• PDI • M-Mode • Anatomical M-Mode • LOGIQView • Contrast • CrossXBeam • Realtime 4D • Static3D • Biopsy	
RIC5-9-D	• OB/GYN • Urology	• PDI • M-Mode • Anatomical M-Mode • LOGIQView • Contrast • CrossXBeam • Realtime 4D • Static3D • BetaView • Biopsy	
12S-D	• Pediatrics • Pediatric cardiac • Neonatal cardiac	• CW • Virtual Convex • PDI • M-Mode • Anatomical M-Mode • Curved Anatomical M-Mode • Color M • TVI/TVD • Easy3D/Advanced3D	
P2D	• Adult cardiac • Pediatric cardiac • Peripheral vascular • Adult cephalic	• CW	
P6D	• Adult cardiac • Pediatric cardiac • Peripheral vascular • Adult cephalic	• CW	

Table 11-1: Probe Applications and Features (Continued)

Probe	Clinical Applications	Capabilities and Features	Illustration
Vscan Air CL (Curved array transducer)	• Abdomen • Cardiac • MSK • OB • Vascular • Lung	• B-Mode • Color Folw • Easy3D • LOGIQView	
Vscan Air CL (Linear array transducer)	• Vascular • Nerves • Small Parts • MSK • Lung • Neo Head	• B-Mode • Color Folw • Easy3D • LOGIQView	

Beta View

Beta View enables you to steer the probe head in elevation direction without moving the probe. This feature is available on the 4D RIC5-9-D probe during live scanning and is especially useful during an endovaginal or neonatal head exams.

The Beta View Touch Panel control appears on the B-Mode Touch Panel when you select either of these two probes. You can adjust the Beta View control Right/Left or Up/Down. When you press down on the Beta View control, the probe head re-centers itself.

Beta View is not available while the image is Frozen, during an image Recall, during a Biopsy procedure, or during Volume Navigation. When these controls are selected, the Beta View Touch Panel control is hidden and unavailable.

Probe orientation

Each probe is provided with an orientation marking. This mark is used to identify the end of the probe corresponding to the side of the image having the orientation mark on the display.

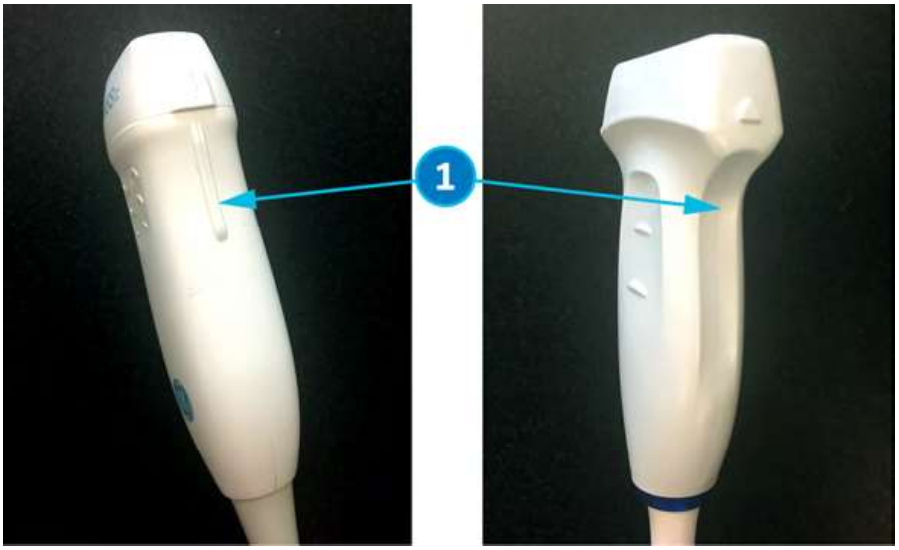


Figure 11-1. Orientation Marking on Probe (Example)

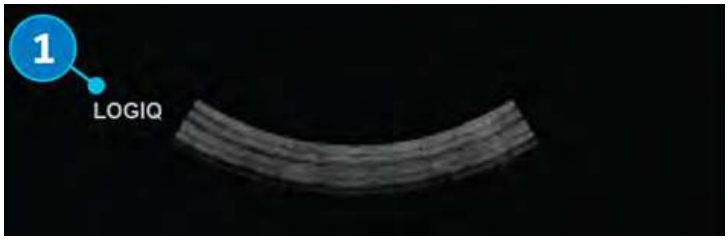


Figure 11-2. Probe orientation marker on the display

1. Orientation Mark

Probe Naming Conventions

Table 11-2: Probe Naming Convention

Real Time 4D	Type	Application	Frequency	Connector Type
“R”	C=Convex L=Linear M=Matrix S=Sector	AB=Abdominal IC=Intracavitary	“1-5”	D=DLP RS= RS Connector with RS-DLP Adapter LC=Long Cord

Probe Safety

Care and Handling

The following recommendations help to reduce preventable probe damage.

WARNING Failure to follow the precautions listed in the Probe Care Recommendations table can result in serious injury and/or equipment damage.

WARNING 3D/4D probes should not be used for continuous scanning for more than 25 minutes. Continuous scanning is defined as scanning without freezing the image. 3D/4D probes can be used for more than 25 minutes during an exam in cases where imaging is periodically frozen.

NOTE: If 3D/4D probes are operated in continuous 4D mode for an unusually extended period of time, the surface temperature of the handle might get warm and exceed the limit specified in IEC60601-1. The temperature of the applied part will stay within the limits according to IEC60601-2-37.

Table 11-3: Probe Care Recommendations

Do:	Don't Do:
Handle all probes with extreme care.	DO NOT drop or knock the probe or probe lens. Impacting the probe lens face can cause fractures of the crystal elements leading to failure.
Ensure that connected probes are placed in the probe holder yoke when not in use. Be sure to utilize the endocavitary probe holder and the probe inserts for the 3D and small aperture probes that were provided at delivery.	DO NOT leave probes in places where they may be knocked over or dropped.
Use wall-mounted probe holders with lens facing upward.	Ultrasonic cleaning IS NOT approved for GE HealthCare probes.

Table 11-3: Probe Care Recommendations (Continued)

Do:	Don't Do:
Visually inspect probes and cables for damage prior to connecting them to the LOGIQ Totus. If a probe appears to be damaged, discontinue use and notify your GE HealthCare Customer Service Representative. Possible damage may include, but is not limited to: • Bent or broken probe pins • Cable cuts or splitting • Surface cracks • Exposed wires or shielding • Fluid leaks	DO NOT drop probes into holders or into disinfectant containers with the probe's lens face down. Even a short drop can damage a probe.
Disconnect probes from the system prior to cleaning or disinfecting the probe.	DO NOT let probe cables dangle loosely from the LOGIQ Totus where they might be caught in the wheels/casters while moving.
Ensure you follow the chemical manufacturer recommendations regarding the use and handling of the chemical.	DO NOT immerse probes deeper than permissible levels. NEVER immerse the connector or adapter into any liquid.
Clean and disinfect all probes following the procedures contained in this manual.	DO NOT kink, tightly coil, or apply excessive force on the probe cable or TEE shaft. Insulation failure may result.

Handling precautions

DANGER

Ultrasound probes are highly sensitive medical instruments that can easily be damaged by improper handling. Use care when handling and protect from damage when not in use. DO NOT use a damaged or defective probe. Failure to follow these precautions can result in an increase probability of disease progression, injury and equipment damage.

CAUTION

Endocavity probes require a special handling. Refer to the user documentation enclosed with these probes.

Electrical shock hazard


Electrical Hazard

The probe is driven with electrical energy that can injure the patient or user if live internal parts are contacted by conductive solution:

- **DO NOT** immerse the probe into any liquid beyond the level indicated by the immersion level diagram. Refer to the immersion illustration in the Probe Cleaning Process section. Never immerse the probe connector or probe adaptors into any liquid.
- **DO NOT** drop the probes or subject them to other types of mechanical shock or impact. Degraded performance or damage such as cracks or chips in the housing may result.
- Prior to each use, visually inspect the probe lens and case area for cracks, cuts, tears, and other signs of physical damage. **DO NOT** use a probe which appears to be damaged until you verify functional and safe performance. You must perform a more thorough inspection, including the cable, strain relief, and connector, each time you clean the probe.
- Before inserting the connector into the probe port, inspect the probe connector pins. If a pin is bent, do not use the probe until it has been inspected and repaired/replaced by a GE HealthCare Service Representative.
- **DO NOT** kink, tightly coil, or apply excessive force on the probe cable. Insulation failure may result.
- Electrical leakage checks should be performed on a routine basis by GE HealthCare Service or qualified hospital personnel. Refer to the service manual for leakage check procedures.

Special handling instructions

Using protective sheaths

WARNING

Protective barriers may be required to minimize disease transmission. Probe sheaths are available for use with all clinical situations where infection is a concern. Use of legally marketed, sterile probe sheaths is mandatory for intra-cavitary and intra-operative procedures. Failure to follow these instructions could lead to exposure to infectious agents.

WARNING

Devices containing latex may cause severe allergic reactions in latex sensitive individuals. Refer to FDA's March 29, 1991 Medical Alert on latex products.

WARNING

DO NOT use an expired probe sheath. Before using probe sheaths, verify whether the term of validity has expired. Failure to follow these instructions could lead to exposure to infectious agents.

CAUTION

Do not use pre-lubricated condoms as a sheath. In some cases, they may damage the probe. Lubricants in these condoms may not be compatible with probe construction.

Instructions. Custom made sheaths are available for each probe. Each probe sheath kit consists of a flexible sheath used to cover the probe and cable and elastic bands used to secure the sheath.

Sterile probe sheaths are supplied as part of biopsy kits for those probes intended for use in biopsy procedures. In addition to the sheath and elastic bands, there are associated accessories for performing a biopsy procedure which are included in the kit. Refer to the biopsy instructions for the specific probes in the Discussion section of this chapter for further information.

Reordering. To reorder sheaths, please contact your local distributor or the appropriate support resource.

Endocavitary Probe Handling Precautions

If the disinfectant solution comes out of the endocavitary probe, please follow the cautions below.

WARNING

Sterile/sanitary sheaths are to be used on the probe during its actual use with patients. Wearing gloves protects the patient and operator. Failure to follow these instructions could lead to exposure to infectious agents.

WARNING

Disinfectant Exposure to Patient (e.g., Cidex)—Contact with a disinfectant to the patient's skin or mucous membrane may cause an inflammation. If this happens, refer to the disinfectant's instruction manual.

Disinfectant Exposure from Probe Handle to Patient (e.g., Cidex)—DO NOT allow the disinfectant to contact the patient. Only immerse the probe to its specified level. Ensure that no solution has entered the probe's handle before scanning the patient. If disinfectant comes into contact with the patient, refer to the disinfectant's instruction manual.

Disinfectant Exposure from Probe Connector to Patient (e.g., Cidex)—DO NOT allow the disinfectant to contact the patient. Only immerse the probe to its specified level. Ensure that no solution has entered the probe's connector before scanning the patient. If disinfectant comes into contact with the patient, refer to the disinfectant's instruction manual.

Endocavitary Probe Point of Contact—Refer to the disinfectant's instruction manual.

Failure to follow these instructions could lead to inflammation of skin or mucous membrane.

NOTE: Sporadically, silicone grease can leak in small amounts from the probes' cable bushing. This leakage is not a failure and is not harmful to the human body. Silicone grease does not contain any hazardous substances and is only use to seal the cable bushing. In the case of a leakage, wipe the grease with a cloth.

Probe handling and infection control

WARNING

ALWAYS clean and disinfect the probe according to the probe specific instructions, including probe compatible chemicals between patients to the level appropriate for the type of examination and use FDA-cleared probe sheaths where appropriate. Failure to follow these instructions could lead to exposure to infectious agents.

WARNING

Adequate cleaning and disinfection are necessary to prevent disease transmission. It is the responsibility of the equipment user to verify and maintain the effectiveness of the infection control procedures in use. Always use sterile, legally marketed probe sheaths for intra-cavitary and intra-operative procedures.

WARNING

To minimize the risk of infection from blood-borne pathogens, you must handle the probe and all disposables which have contacted blood, other potentially infectious materials, mucous membranes, and non-intact skin in accordance with infection control procedures. You must wear protective gloves when handling potentially infectious material. Use a face shield and gown if there is a risk of splashing or splatter.

This information is intended to increase user awareness of the risks of disease transmission associated with using this equipment and provide guidance in making decisions directly affecting the safety of the patient as well as the equipment user.

Diagnostic ultrasound systems utilize ultrasound energy that must be coupled to the patient by direct physical contact. Depending on the type of examination, this contact occurs with a variety of tissues ranging from intact skin in a routine exam to recirculating blood in a surgical procedure. The level of risk of infection varies greatly with the type of contact.

One of the most effective ways to prevent transmission between patients is with single use or disposable devices. However, ultrasound transducers are complex and expensive devices that must be reused between patients. It is very important, therefore, to minimize the risk of disease transmission by using barriers and through proper processing between patients.

Care and Maintenance

Before first use

- Inspect the probe
- Clean the probe
- Disinfect the probe

Inspecting probes

WARNING

If any damage is found, do not use the probe until it has been inspected and repaired/replaced by a GE HealthCare Service Representative. Failure to follow these precautions can result in injury and equipment damage.

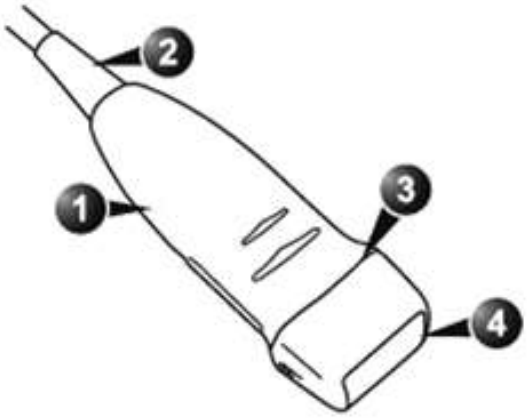


Figure 11-3. Probe parts

1. Casing
2. Strain relief
3. Seal
4. Lens

Visual Inspection

Housing, connection, operating elements, display facilities, labels, accessories, user manual.

Perform After Each Use

Inspect the probe's lens, cable, casing, and connector. Look for any damage that would allow liquid to enter the probe.

NOTE: Keep a log of all probe maintenance, along with a picture of any probe malfunction.

Probe Reprocessing

Probe Care Cards

The Probe Care Card contains a list of chemicals that have been tested for compatibility with GE HealthCare Ultrasound probes. The reprocessing instructions provided in this document have been validated with the chemicals specified in Table 11-6 *on page 11-36*.

Additional requirement to the already available reprocessing Instruction (5661328): Each probe shall be cleaned and disinfected before initial use.

The Probe Care Card is supplied with every probe and may also be downloaded from:

Table 11-4: Documentation Web Site

Support Documentation Web Site
https://www.gehealthcare.com/documentation

Adequate cleaning and disinfection between patient cases are necessary to prevent transmission of disease. All probes must be thoroughly cleaned prior to disinfection. The level of disinfection required is based on patient contact.

- To verify probe chemical compatibility, a full list of chemicals tested is available at the GE HealthCare Probe website Table 11-5 *on page 11-19*.
- Probes that contact mucosal or non-intact skin require cleaning followed by High-Level Disinfection either soaking or use of a trophon® EPR or trophon2.
- Probes that contact intact skin require cleaning followed by Intermediate-Level Disinfection (wipe or spray).

Table 11-5: Probe Web Site

Ultrasound Probe Web Site
https://www.gehealthcare.com/transducers

Probe Pre-Treatment at the Point of Use (Required for All Probes)

The pre-treatment step is for removal of gel and gross contamination.

1. After each use, remove protective sheath from the probe and remove the coupling gel by wiping from the strain relief to the lens with a soft, low-lint cloth.

CAUTION

DO NOT use abrasive products or brushes when cleaning or wiping a GE HealthCare Ultrasound probe. The use of abrasive wipes can damage the soft lens (acoustic window). To extend the life of the probe lens, pat dry only.

2. Wipe the cable with one of the wipes listed in probe compatibility website from the strain relief to the connector. Wipe the cable with a low-lint cloth dampened with potable water to remove chemical residue. Dispose of the cloth, wipe and gloves in the clinical trash.

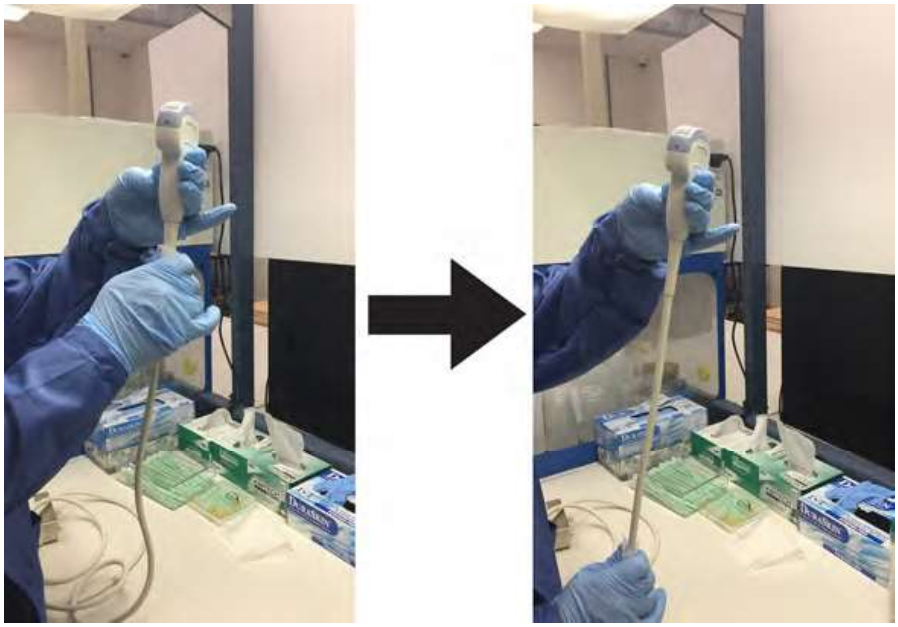


Figure 11-4. Cleaning the Probe Cable

NOTE: Use of wipes listed in the Ultrasound Probe website may result in discoloration of the cable.

Probe Pre-Treatment at the Point of Use (Required for All Probes) (continued)

CAUTION

Use caution when cleaning the connector. This cable connector should only be cleaned with a slightly dampened cloth or wipe. Exposure to excessive moisture will result in damage to the probe and possibly the ultrasound console. DO NOT wet the connector/console interface surface or labels.

3. After each use, inspect the lens, cable, and housing of the probe. Look for any damage that would allow liquid to enter the probe.

DANGER

If the probe is damaged, do not place it into any liquid (e.g. for disinfection) and do not use it until it has been inspected and repaired/replaced by a GE HealthCare Service Representative.

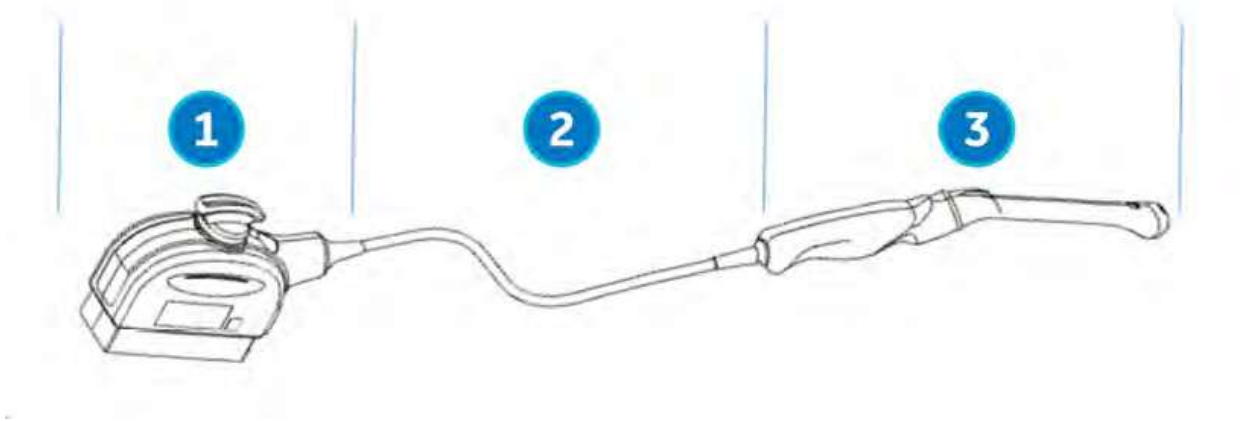


Figure 11-5. Inspect the Lens, Cable, and Probe House After Each Use

1. Cleaning only portion
2. Cleaning only or cleaning and disinfection portion
3. Cleaning followed by appropriate level of disinfection

Probe Manual Cleaning Instructions

Thorough cleaning is a mandatory first step to allow adequate subsequent disinfection or sterilization. **Choose the most convenient method, either the wipe or enzymatic soak.**

WARNING

DO NOT clean the probe in an automated washer-disinfector, due to the possible damage of the connector/console interface.

Use necessary precautions (e.g., gloves, face screen and gown), as directed by your facility.

Cleaning with Wipes

1. Hold the probe by the handle near the cable strain relief. **DO NOT** suspend or hold the probe by the cable as this may damage the probe.
2. Dispense a cleaning wipe from the wipe canister.
3. Gently wipe the probe with a cleaning wipe from the cable strain relief to the acoustic lens (i.e. from cleanest to dirtiest area). Gently wipe the probe's acoustic lens.

NOTE: ***Pay special attention to acoustic lens, edges, and crevices, removing all gel, product, and body fluids.***

4. Turn the probe and continue wiping until the entire surface of the probe has been wiped. As the wipe becomes visibly soiled, discard the wipe into clinical trash and dispense fresh wipes as needed.
5. As needed for additional focused cleaning to crevices, wrap a clean wipe around a soft nylon bristle brush or other suitable instrument to access crevices, such as biopsy notches.
6. Visually inspect the probe for any remaining soil and, if necessary, repeat steps 3 through 5 until the probe is visibly clean.
7. Thorough dry the probe using a clean, low-/non-linting, soft cloth or wipe. Pat dry acoustic lens.

NOTE: *Clean the probe holder of the ultrasound system before returning the probe back to the system. (Refer to the probe holder cleaning instruction in ultrasound system user manual for details).*

Cleaning with Enzymatic Detergent

1. Ensure the probe has been disconnected from the console. Replace gloves and fill a sink or basin with warm potable water (30 - 40°C) to a level allowing immersion of the probe up to the immersion line shown in the user manual.
2. Prepare the cleaning solution in accordance with the detergent manufacturer's instructions.
3. Immerse the probe in the prepared cleaning solution up to the immersion line and ensure no air bubbles are trapped on the surface.

CAUTION

DO NOT submerge probe beyond the immersion line shown in the Ultrasound console's user manual.

NOTE: For IC5-9-D, E8C and E8C-RS, see Figure 11-12 on page 11-32 for special immersion instructions.

NOTE: Over-exposing ultrasound probes to cleaning solution may damage the ultrasound probe.

4. Brushing with a clean, soft, nylon bristle brush from the base of the cable strain relief to the distal tip is critical to ensure cleaning and disinfection efficacy.

Figure 11-6. Cleaning the probe using a brush

CAUTION

Do not use the brush on the probe lens.

Cleaning with Enzymatic Detergent (continued)

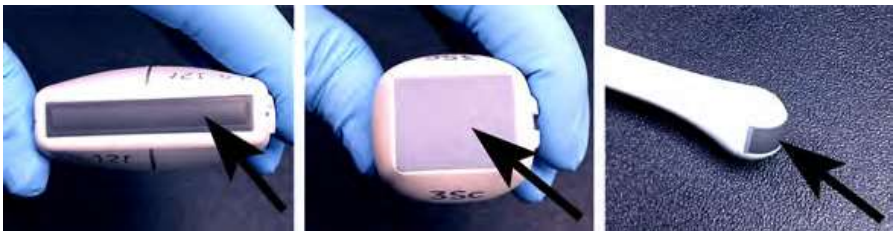


Figure 11-7. Probe Lens Examples

5. Continue brushing the probe for not less than the minimum contact time listed on the detergent manufacturer's label.
6. Visually inspect the probe for soil. Repeat Steps 3 through 5 until all visible soil has been removed from the surface of the probe.
7. Rinse the probe under running warm potable water (30 - 40°C) for not less than 2 minutes. Scrub the surface of the probe with a clean, soft, nylon bristle brush from the base of the cable strain relief to the distal tip.

CAUTION

DO NOT use the brush on the probe lens.

NOTE: Discard solutions and rinse waters in accordance with local regulations.

8. Visually inspect the device in a well-lit area to ensure all surfaces are free from residual cleaning solution. Repeat Step 7 if visible cleaning solution is observed.
9. Thoroughly dry the probe using a clean, low-lint, soft cloth or wipe. Pat dry lens.

CAUTION

DO NOT use a twisting motion or abrasive paper products when wiping the probe as this may damage the soft lens. To extend the life of the probe lens, pat dry only.

NOTE: Clean the probe holder of the ultrasound system before returning the probe back to the system. (Refer to the probe holder cleaning instruction in ultrasound system user manual for details).

Cable and Connector Manual Cleaning

The connector can be cleaned with a wipe dampened with alcohol. Use caution when cleaning the connector, wring wipe to remove excess of liquid before wiping the connector. Prevent introduction of foreign objects in the system connector assembly. Do not apply excessive force on any component of the system connector

WARNING

Exposure to excessive moisture will result in damage to the probe and possibly the ultrasound console. DO NOT wet the connector/console interface surface or labels (Refer to red circles in picture below). DO NOT clean the probe in an automated washer-disinfector.

Figure 11-8. Connector/console interface surface and label

The cable should be processed using cleaning/disinfectant wipes. If the cable has been in contact with risk factors, such as blood and/or mucous, cleaning should be followed by disinfection.

1. Dispense a cleaning/disinfectant wipe from the wipe canister

2. Wipe the cable with a cleaning/disinfectant wipe from the handle strain relief to the connector strain relief. As the wipe becomes visibly soiled, discard the wipe into clinical trash and dispense fresh wipes as needed

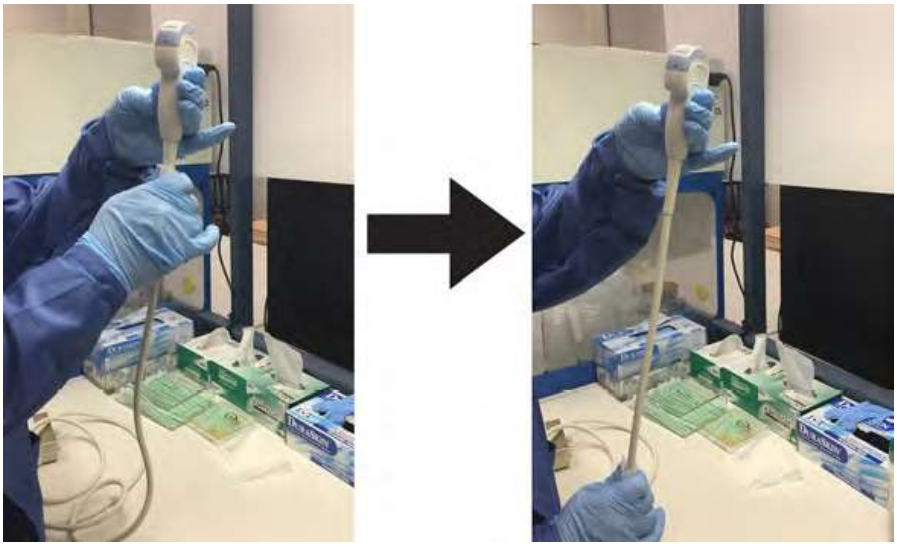


Figure 11-9. Cleaning the Probe Cable

NOTE: Some detergents and disinfectants might cause discoloration to the probe's cable.

3. Visually inspect the cable for any remaining soil and, if necessary, repeat cleaning until the cable is visibly clean

   If disinfection is needed, dispense a new cleaning/ disinfectant wipe and continue wiping the cable. Use as many wipes as needed, to ensure all surfaces remain wet for the minimum required contact time mentioned in Table 11-6 *on page 11-36*. Discard the wipes into clinical trash.

4. Saturate a soft, low-/non-linting cloth with Critical Water (remove excess water, wipe should be damp but not dripping) and thoroughly wipe all surfaces of the cable to remove chemical residues. Discard the cloth into clinical trash.

NOTE: Critical Water is water that is treated (usually by a multistep treatment process that could include a carbon bed, softening, DI, and RO or distillation) to ensure that the microorganisms and the inorganic and organic material are removed from the water to an appropriate level (Refer to AAMI TIR34/ST108). Use of this type of water will reduce the recontamination of probes during processing.

5. Let the cable air dry until visibly dry

Probe Intermediate-Level Disinfection (ILD)

For Intermediate-Level Disinfection of intact skin contacting probes, choose either the spray or wipe method.

NOTE: Probes that contact only intact skin may be disinfected in this manner. All probes that contact non-intact skin or mucous membranes (e.g., endocavitary, Transesophageal) require High-Level Disinfection.

CAUTION

After each use, inspect the lens, cable, and housing of the probe. Look for any damage that would allow liquid to enter the probe.

DANGER

If the probe is damaged, DO NOT place it into any liquid (e.g. for disinfection) and DO NOT USE until the probe has been inspected and repaired/replaced by a GE HealthCare Service Representative.

Probe ILD - Disinfectant Spray or Wipe

NOTE: Disinfectant exists either in pre-impregnated wipe or in spray. The spray should be sprayed onto a low-/non-linting cloth and then used in same way as a pre-impregnated wipe. In steps 1 to 4 of this section, "wipe" will then stand for a pre-impregnated wipe as well as for a low-/non-linting cloth saturated with disinfectant.

Do not spray disinfectant onto the probe directly.

Use necessary precautions (e.g. gloves, face screen and gown), as directed by your facility.

1. Dispense a new wipe.
2. Holding the probe near the strain relief, wipe the acoustic lens and handle areas. Slightly rotate the probe after each wiping pass and continue wiping until all areas of the probe and handle have been wetted. Wring the wipe above recessed areas and ridges for dripping liquid directly onto the less accessible surfaces.
3. Using fresh wipes, repeat step 2 as many times as needed to ensure all surfaces remain wet for the minimum required contact time listed in Table 11-6 *on page 11-36*

Probe ILD - Disinfectant Spray or Wipe (continued)

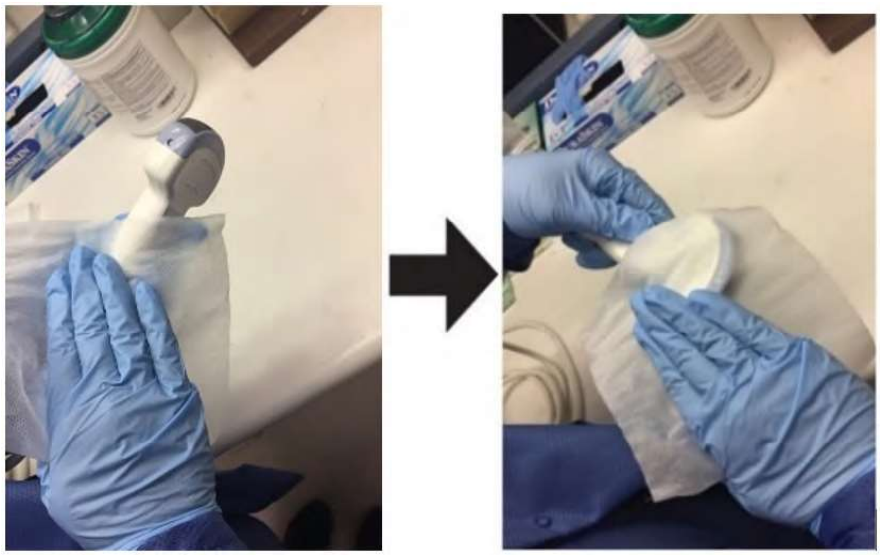


Figure 11-10. Disinfecting the Probe with slight rotation

4. Saturate a soft, low-/non-linting wipe with Critical Water (remove excess water, wipe should be damp but not dripping) and thoroughly wipe all surfaces of the probe to remove chemical residue. Discard the wipe into clinical trash.

NOTE: Critical Water is water that is treated (usually by a multistep treatment process that could include a carbon bed, softening, DI, and RO or distillation) to ensure that the microorganisms and the inorganic and organic material are removed from the water to an appropriate level (Refer to AAMI TIR34/ST108). Use of this type of water will reduce the recontamination of probes during processing.

5. Thoroughly dry all surfaces of the probe using a soft, low-lint wipe or cloth, changing wipes/cloths when necessary to ensure the probe is completely dry. Pat dry acoustic lens. Visually inspect the probe to ensure all surfaces are dry. Repeat drying steps if any moisture is visible.
6. If the probe is not immediately reused, store the probe in a manner that will protect and keep the probe from being recontaminated. Refer to the Probe Transportation and Storage section for additional information.

NOTE: Ensure that probe holder of the ultrasound system has been disinfected before returning the probe back to the system (refer to the probe holder disinfection instruction in ultrasound system user manual for details).

Probe High-Level Disinfection (HLD)

High-Level Disinfection is required for devices that contact intact mucous membranes or non-intact skin. High Level Disinfection can be performed using either disinfectant wipes (only for some probes), a disinfectant soaking method or an automated system such as trophon EPR and trophon2.

WARNING

DO NOT disinfect the probe in an automated washer-disinfector, due to the possible damage of the connector/console interface.

DANGER

If the probe is damaged, remove it from patient use. Clean and disinfect the probe before contacting your GE HealthCare Service Representative for inspection and repair/replacement.

CAUTION

After each use, inspect the acoustic lens, cable, and housing of the probe. Look for any damage that would allow liquid to enter the probe.

NOTE: Handles of semi-critical probes that are not submerged during High-Level Disinfection require at minimum Intermediate-Level Disinfection to avoid cross contamination.

NOTE: All probes must be thoroughly cleaned and dried prior to High-Level Disinfection.

Probe HLD - Soak

1. Ensure the probe has been disconnected from the console. Replace gloves and fill a sink or basin with High-Level Disinfectant diluted in accordance with the disinfectant manufacturers instructions to a level allowing immersion of the probe up to immersion line shown in Figure 11-11 *on page 11-31*.

CAUTION

Ensure no liquid comes into contact with the probe connector pins or labels.

2. Immerse probe in the disinfectant up to the immersion line and ensure no air bubbles are trapped. Ensure the probe remains in the disinfectant for at least the minimum contact time listed in the disinfectant manufacturer’s instructions for use.

Probe HLD - Soak (continued)

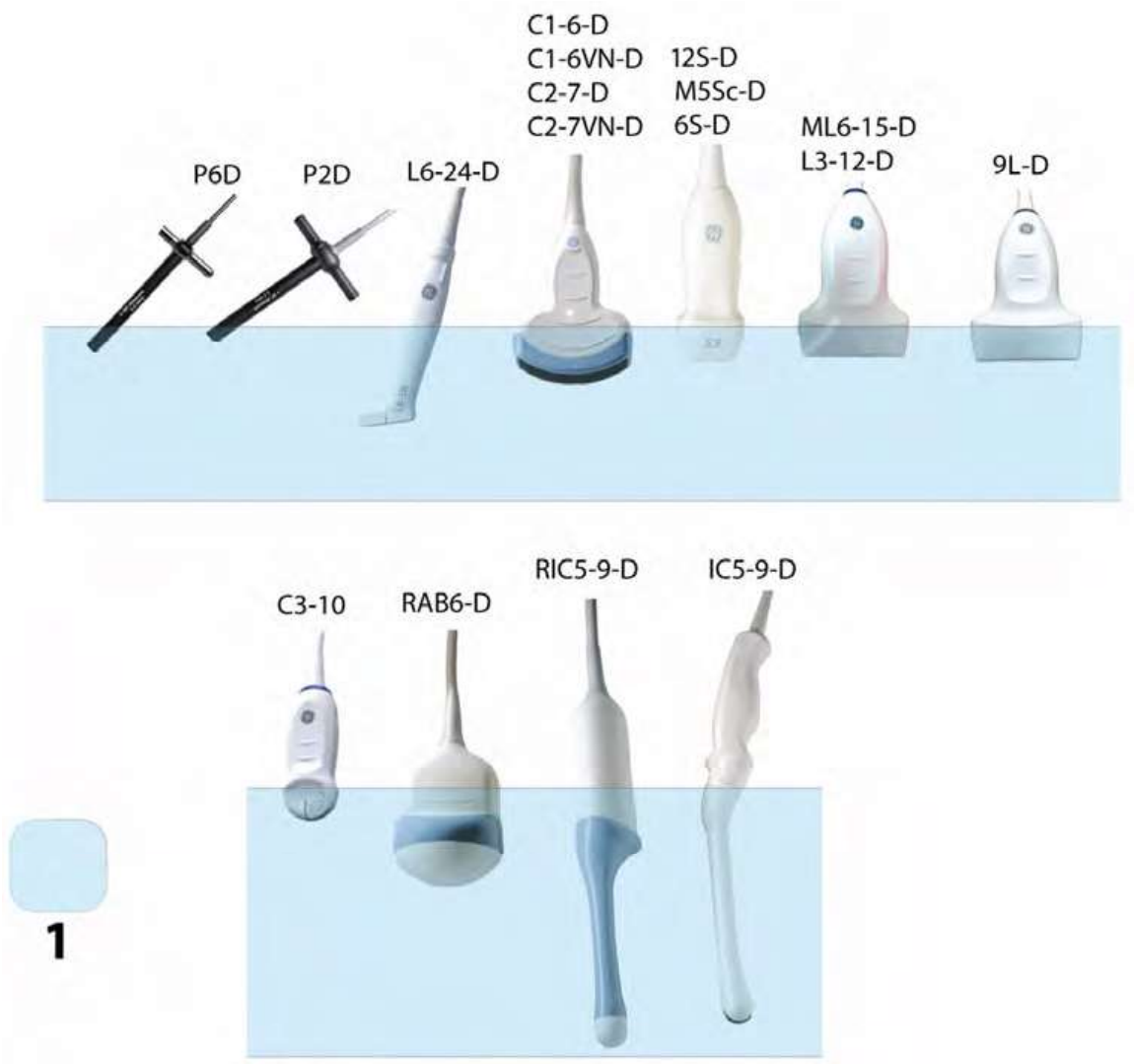


Figure 11-11. Probe Immersion Levels, 1 = Fluid Level

For IC5-9-D probe with serial numbers listed below or greater, refer to Figure 11-12 *on page 11-32* for the soaking level:

- IC5-9-D: 780333WX1 or greater (example 780334WX1, 780335WX1)

  The prefix number, i.e. 780333 for 780333WX1, indicates serial number sequence.

Probe HLD - Soak (continued)

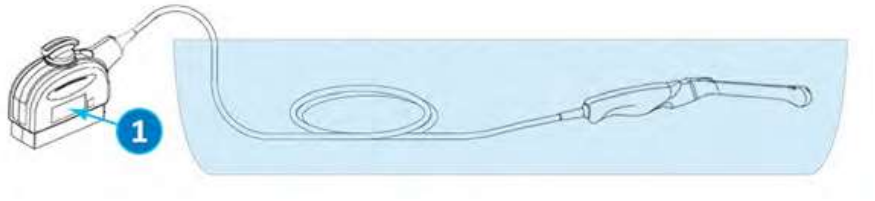


Figure 11-12. Probe Immersion Level for IC5-9-D

1. Serial number location

NOTE: Over-exposing ultrasound probes to high-level disinfectants may damage the ultrasound probe. NEVER exceed the disinfectant manufacturer's maximum exposure time.

CAUTION

Ensure that the probe is suspended. The probe face should not be resting against the tank/basin surface and should be in full contact with the liquid. Carefully place the probe in the basin, taking care not to damage the transducer lens.

Figure 11-13. Probe suspended in disinfectant basin

3. Thoroughly rinse the probe by immersing it in a large volume of critical (purified) water for a minimum of 1 (one) minute. Remove the probe and discard the rinse water.

   Do not reuse the water. Always use fresh volumes of water for each rinse. Repeat Step 3 two additional times, for a total of 3 (three) rinses.

NOTE: Critical Water is water that is treated (usually by a multistep treatment process that could include a carbon bed, softening, DI, and RO or distillation) to ensure that the microorganisms and the inorganic and organic material are removed from the water to an appropriate level (Refer to AAMI TIR34/ST108). Use of this type of water will reduce the recontamination of probes during processing.

Probe HLD - Soak (continued)

CAUTION

Failure to properly rinse probes with water following disinfection may cause skin irritation. Failure to follow these instructions could lead to inflammation to skin or mucosal membrane.

4. Thoroughly dry all surfaces of the probe using a soft, low-lint wipe or cloth, changing wipes' cloths when necessary to ensure the probe is completely dry. Pat dry lens. Visually inspect the probe to ensure all surfaces are clean and dry. Repeat drying steps if any moisture is visible.
5. If the probe is not immediately reused, store the probe in a manner that will protect and keep the probe from being recontaminated. This may be accomplished by placing the probe in a storage cabinet with filtered air flow and/or by using a disposable storage cover placed over the probe.

The instructions provided above have been validated to properly prepare GE HealthCare Ultrasound probes for re-use. It remains the responsibility of the processor to ensure that the processing is performed as specified in this document. This may require verification and routine monitoring of the process.

Probe HLD - trophon® EPR or trophon2

When performing High-Level Disinfection of GE HealthCare ultrasound probes with the trophon EPR and trophon2, it is not necessary to disconnect the probe from the ultrasound system. The probe must be inactive (not selected) during the disinfection cycle.

1. This automated disinfection replaces the manual HLD, but manual cleaning still needs to be performed prior to automated HLD. Refer to manual cleaning instructions mentioned in this document.
2. Follow the trophon instructions for probe placement and operation of the trophon system. Incorrect positioning of the probe may lead to probe/cable damage and High-Level Disinfection not being achieved.

CAUTION

Damage to the cable may occur if improperly hung. Damage to the probe may occur if the probe is placed in contact with the trophon chamber wall. Curved probes must be correctly positioned in the chamber using the Curved Probe Positioner (CPP) supplied with the trophon EPR system, or with the Integrated Probe Positioner (IPP) of trophon2 system.

3. Once the trophon High-Level Disinfection cycle is complete, use necessary precautions (e.g. gloves), as directed by your facility and promptly remove the probe from the trophon machine. DO NOT store the probe in the trophon chamber.
4. Hold the probe’s handle near the strain relief cable. DO NOT suspend or hold the probe by the cable, as this may damage the probe.

Probe HLD - trophon® EPR or trophon2 (continued)

5. Wipe the probe from the acoustic lens to strain relief with a clean, low-/non-linting, soft cloth or wipe to remove any possible residual hydrogen peroxide from the probe surface.

CAUTION

USE non-abrasive cloth or wipe, such as Kimwipes™, Delicate Task Wipers or equivalent. DO NOT use a twisting motion when wiping the probe. To extend the life of the probe acoustic lens, pat dry only.

6. If the probe is not immediately reused, store the probe in a manner that will protect and keep the probe from being recontaminated. Refer to the Probe Transportation and Storage section for additional information.

Chemicals Used for Efficacy Validation

The table below lists the products and intended use (clean, Intermediate-Level Disinfection, High-Level Disinfection) that were validated.

Table 11-6: Chemicals used for Efficacy Validation

Product Type	Trade Name	Manufacturer	Minimum Contact Time	Active Ingredient
Cleaning (Wipe)	Oxivir® Tb	Diversey	N/A	Hydrogen Peroxide
Enzymatic Detergent (Soak)	Enzol® (Cidezyme®)	Advanced Sterilization Products® (J&J)	1-Minute Soak	Proteolytic Enzymes
	MetriZyme™	Metrex™		
	Prolystica® 2X Concentrate Presoak & Cleaner	Steris		
Intermediate-level Disinfectant (wipe)	Oxivir® Tb	Diversey	10-Minute Exposure	Hydrogen Peroxide
High-level Disinfectant (Soak)	Cidex® OPA	Advanced Sterilization Products (J&J)	10-Minute Soak	Ortho-phthalaldehyde
	McKessen OPA/28	McKesson		

A full list of chemicals tested for compatibility is available at the GE HealthCare Probe Web Site:

Table 11-7: Probe Web Site

Ultrasound Probe Web Site
http://www.gehealthcare.com/transducers

NOTE: The tables in this manual indicate the status when this manual was published. Please visit the website for the latest information.

Covering the Transducer using a Sterile, Protective Sheath

CAUTION

Probe sheaths are disposable and must not be reused.

CAUTION

Protective barriers may be required to minimize disease transmission, but their use does not replace cleaning and disinfection. Probe sheaths are available for use with all clinical situations where infection is a concern. Use of legally marketed, sterile probe sheaths is recommended for intra-cavitary, intra-operative, and biopsy procedures.

1. Place an appropriate amount of gel inside the protective sheath and/or on the transducer face.

NOTE: Failure to use imaging gel may result in poor image quality.

2. Insert transducer into sheath, making sure to use proper sterile technique. Pull cover tightly over transducer face to remove wrinkles and air bubbles, taking care to avoid puncturing the sheath.

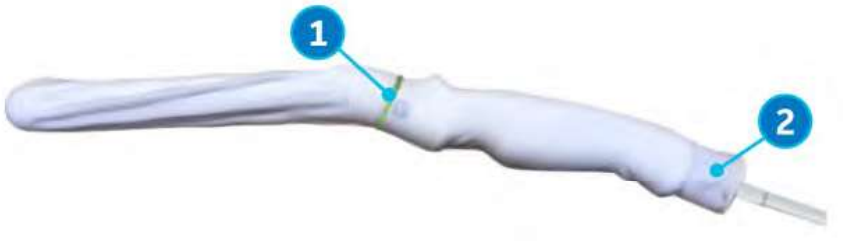


Figure 11-14. Applying the Sheath

1. Secure the Sheath with a rubber band.
2. The probe sheath should extend past the end of the probe to the probe's cable.

NOTE: No gel was applied to the probe in this photo.

3. Secure the sheath in place.

NOTE: Failure to use a sheath that fully covers the transducer to the cable strain relief may lead to cross-contamination of the transducer.

4. Inspect the sheath to ensure there are no holes or tears. If the sheath becomes compromised, stop the procedure and replace immediately.
5. After usage, discard the sheath into clinical trash.

Probe Cleaning and Disinfecting Notes

CAUTION

Each probe shall be cleaned and disinfected before initial use.

DANGER

Ultrasound transducers can easily be damaged by improper handling and by contact with certain chemicals. Failure to follow these precautions can result in serious injury and equipment damage.

- Do not immerse the probe into any liquid beyond the level specified for that probe. Never immerse the transducer connector or probe adapters into any liquid.
- Avoid mechanical shock or impact to the transducer and do not apply excessive bending or pulling force to the cable.
- Transducer damage can result from contact with inappropriate coupling or cleaning agents:
  - Do not soak or saturate transducers with solutions containing alcohol, bleach, ammonium chloride compounds or hydrogen peroxide (except in the case of using trophon's hydrogen peroxide).
  - Avoid contact with solutions or coupling gels containing mineral oil or lanolin
  - Avoid temperatures above 60°C (except with trophon for approved probes).
- Inspect the probe prior to use for damage or degeneration to the housing, strain relief, lens and seal. Do not use a damaged or defective probe.
- Use only the products that are listed on the Transducer website or on the Probe Care Card enclosed with the probe. In addition, refer to the local/national regulations.

WARNING

Do not steam, heat autoclave on general surface probes.

Probe Cleaning and Disinfecting Notes (continued)

CAUTION

CREUTZFELDT-JAKOB DISEASE

Neurological use on patients with this disease must be avoided. If a probe becomes contaminated, there is no adequate disinfecting means.

CAUTION

DO NOT expose the system/probe connector to any moisture or liquids.

CAUTION

Take extra care when handling the lens face of the Ultrasound transducer. The lens face is especially sensitive and can easily be damaged by rough handling. NEVER use excessive force when cleaning the lens face.

CAUTION

In order for liquid chemical disinfectants to be effective, all visible residue must be removed during the cleaning process. Thoroughly clean the probe, as described earlier before attempting disinfection.

You MUST disconnect the probe from the LOGIQ Totus prior to cleaning/disinfecting the probe. Failure to do so could damage the system.

DO NOT soak probes in liquid chemical disinfectant for longer than is stated by the disinfectant instructions for use. Extended soaking may cause probe damage and early failure of the enclosure, resulting in possible electric shock hazard.

Probe Cleaning and Disinfecting Notes (continued)

CAUTION

Avoid cross-contamination, follow all infection control policies established by your office, department or hospital as they apply to personnel and equipment.

CAUTION

- Do not use paper products or products that are abrasive when cleaning the probe. They damage the soft lens of the probe.
- Before storing the probes, ensure that they are thoroughly dry. If it is necessary to dry the probe after cleaning, blot the probe with a soft cloth.

CAUTION

Probes must be cleaned and disinfected before they are replaced or disposed of.

NOTE: Cleaning products should be as close to neutral PH as possible. Any gel, cleaning, or disinfectant products containing concentrations, surfactants, methanol, ethanol, benzyl or methyl alcohol, mineral oil, lubricant oil, oil-based lotions, acetone, ammonia, anhydrous ammonia, iodine, iodine compounds, acids with 5PH or greater may damage or discolor your probe. Ultrasounic cleaning is not approved for GE HealthCare probes.

NOTE: DO NOT re-use cloths or wipes. Soap, detergents, or enzymatic cleaners should be used in accordance with the manufacturer's instructions. GE HealthCare is not responsible for damage incurred during the cleaning process for products which no material compatibility evaluation has been conducted.

Probe Disinfectants

Choosing a Disinfectant

NOTE: For latest chemicals tested for compatibility, check the GE HealthCare Probe Website at the link listed in Table 11-8.

Table 11-8: Probe Web Link

Ultrasound Probe Web Site
http://www.gehealthcare.com/transducers

When choosing a disinfectant, determine the required level of disinfection. If the possibility of cross-contamination or exposure to unhealthy or non-intact skin exists, then high level disinfection should be performed. Good hand hygiene practice is highly recommended to help further reduce the risk of cross-contamination.

CAUTION

Disinfectant wipes and topical spray products are not FDA cleared high level disinfectants and do not provide adequate protection should the probe become cross contaminated or in contact with unhealthy or non-intact skin. Failure to appropriately disinfectant could lead to exposure to infectious agent(s).

CAUTION

Review the probe care card that is packed with each probe.

NOTE: For additional information about cleaning and disinfection, refer to the recommendations of the Association for Professionals in Infection Control (APIC), the U.S. Food and Drug Administration (FDA), and the U.S. Centers for Disease Control (CDC). For country-specific disinfection regulations, check with your local regulatory infection control authorities.

NOTE: GE HealthCare publishes a list of material-compatible disinfectants (see below and also refer to the GE HealthCare website at http://www3.gehealthcare.com/en/Products/Categories/Ultrasound/Ultrasound_Probes. DO NOT use non-GE HealthCare-approved disinfectants or products that have not been evaluated by GE HealthCare for material compatibility. Damages linked to the use of disapproved

chemicals are not covered under product warranty or service contract.

trophon EPR Probe High-Level Disinfection

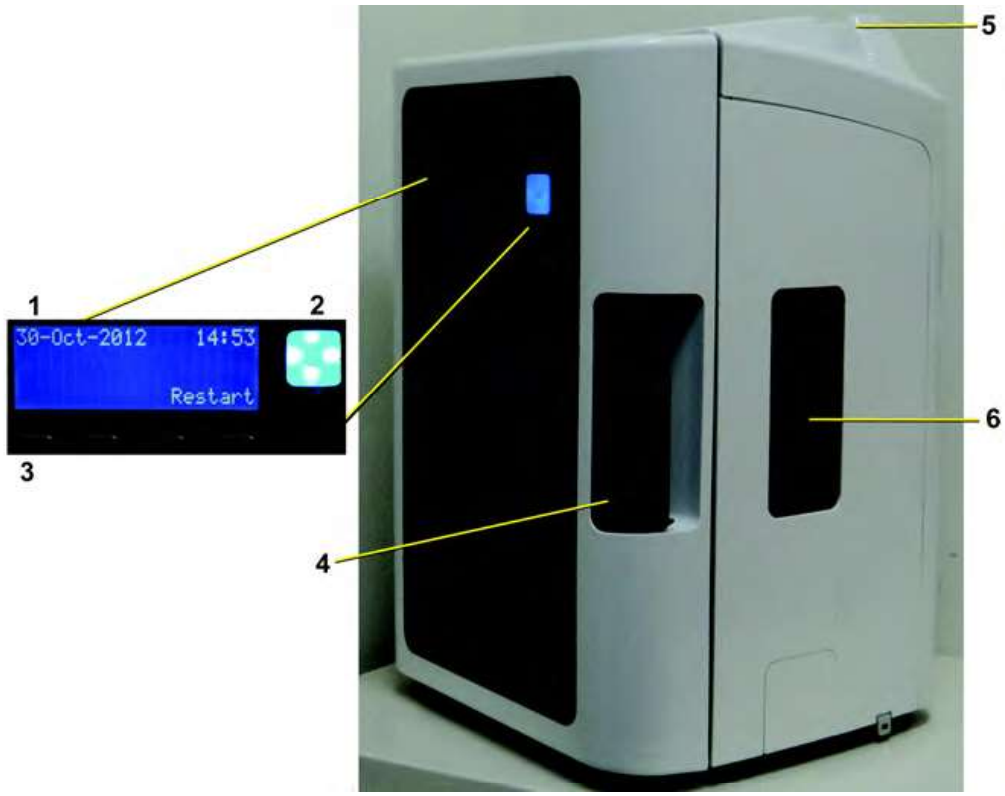


Figure 11-15. trophon EPR

1. Screen Display
2. Start Button
3. Soft key buttons
4. Chamber door handle
5. Probe cable clamp
6. Cartridge door

CAUTION

Only those individuals previously trained on the trophon EPR or trophon2 unit may use the device. Refer to the trophon EPR or trophon2 user documentation for more information on disinfecting approved probes.

trophon EPR Instructions for Use

Installing the disinfectant cartridge

1. The cartridge door automatically opens when a cartridge needs replacing.
2. Screen message: “Load Cartridge” or “Cartridge Empty, Replace Cartridge Now” displays.
3. Wear disposable gloves and chemical resistant goggles. These should be worn at all times while using the trophon EPR.
4. Press the soft key button under “Yes” to open the cartridge replacement door.
5. Remove the cartridge lid and insert the bottle on the side of the unit.
6. Rotate the cartridge until it drops into place and cannot rotate any further.
7. Close the cartridge door. Do not use excessive force to accomplish this. The door clicks into place and locks.

Disinfecting probe in trophon EPR

8. When the screen message reads “Load Probe”, open the chamber door.
9. Clean and rinse the probe. Dry the probe.

NOTE: The probe must be cleaned, per the manufacturer’s guidelines, and dried before disinfection.

10. Place Chemical Indicator on the bottom of the device chamber.
11. While holding the probe handle, press the top of the probe into the chamber’s seal. Ensure the probe is straight and not touching either the walls or bottom of the chamber. Strain relief (interface between cable and probe body) must be positioned at the top of the chamber. The tip of the probe must be above the horizontal line marked in the chamber.

CAUTION

Do NOT allow the probe surface or lens to touch the chamber’s wall during the disinfection process. This could cause permanent damage to the probe.

trophon EPR Instructions for Use (continued)

12. Press the probe's electrical cable into the cable clamp, found at the top of the chamber.
13. Close the chamber door. It will automatically lock.
14. The screen message "Is the probe clean and dry?" appears, select Yes.
15. Press "Start" to begin the disinfecting process.
16. Discard disposable gloves.

Removing the Probe after 7-minute cycle time

1. Wear a new pair of disposable gloves.
2. When "Cycle complete" displays on the screen, open the chamber door.
3. Check the Chemical Indicator color change and refer to the Chemical Indicator on the box.
4. Remove the Chemical Indicator from device and discard.
5. Remove the probe from the trophon EPR.
6. Wipe the probe prior to use with an absorbent, single-use, dry, low-lint cloth.
7. Remove and discard the disposable gloves.

Coupling Gels

CAUTION

Do not use unrecommended gels (lubricants). They may damage the probe and void the warranty.

Table 11-9: Probe Gels

Gel	9L-D	L3-12-D	L6-24-D	ML6-15-D	M5Sc-D	6S-D	12S-D	C1-6-D/C1-6VN-D	C2-7-D/C2-7VN-D	Vscan Air CL	C3-10-D	IC5-9-D	RAB6-D	RIC5-9-D	P2D	P6D
Aquasonic 100	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Clear Image	X	X		X	X	X	X	X		X	X	X				
EcoGel 200 Ultrasound Gel	X	X		X	X	X	X	X		X	X	X	X	X		
EcoVue Ultrasound Gel	X	X		X	X		X	X		X	X	X	X	X		
Haiyin	X	X		X		X	X	X		X		X				
Kendall Life Trace Ultrasound Gel	X	X		X	X	X	X	X		X	X	X	X	X		
Konix Ultrasound Gel	X	X		X	X	X	X	X		X	X	X	X	X		
MediChoice Standard Ultrasound Gel	X	X		X	X	X	X	X		X	X	X	X	X		
Medline Ultrasound Gel/ Ultrasound Transmission Gel	X	X		X	X	X	X	X		X	X	X	X	X		
Natural Image			X						X							
Scan	X	X		X	X	X	X	X		X	X	X	X	X		
Sonogel	X	X		X	X	X	X	X		X	X	X	X	X		
Wavelength Multi-Purpose Ultrasound Gel	X	X		X	X	X	X	X		X	X	X	X	X		

Coupling Gels (continued)

Applying

In order to assure optimal transmission of energy between the patient and probe, a conductive gel or couplant must be applied liberally to the patient where scanning will be performed.

CAUTION

Do not allow gel contact with eyes. If there is gel contact with the eye, flush eye thoroughly with water.

Precautions

Coupling gels should not contain the following ingredients as they are known to cause probe damage:

- Methanol, ethanol, isopropanol, or any other alcohol-based product
- Mineral oil
- Iodine
- Lotions
- Lanolin
- Aloe Vera
- Olive Oil
- Methyl or Ethyl Parabens (para hydroxybenzoic acid)
- Dimethylsilicone
- Polyether glycol based
- Petroleum

Sterile Ultrasound Procedures

ONLY ultrasound gel that is labeled as sterile, is sterile.

Ensure you always use sterile ultrasound gel for those procedures that require sterile ultrasound gel.

Once a container of sterile ultrasound gel is opened, it is no longer sterile and contamination during subsequent use is possible.

V Nav Cleaning Requirements

Cleaning and Disinfecting V Nav Probe Brackets

The probe bracket SHOULD NOT be autoclaved or gas sterilized. The bracket can be sterilized with Cidex. Details are in the CIVCO reference guide that is included with the bracket kit.

Cleaning and Disinfecting Cables, and Transmitter

Periodically clean the equipment (transmitter, sensor, and cables) by wiping them down with a cloth dampened in a cleaning solution such as mild soap and water, isopropyl alcohol, or a similar acceptable cleaning solution. If the tracker's components come in contact with biological fluid or tissue, be sure to follow your organization's procedures for proper cleaning and disinfection. The transmitters and sensors are not designed to withstand autoclaving or gamma radiation. Sensors are ETO-compatible. DO NOT immerse the transmitter, sensor, or cables in liquids. Components are not waterproof.

Disinfecting and Sterilizing General Purpose Sensor

High-level disinfect general purpose sensor using CIDEX OPA® ortho-Phthalaldehyde Solution (Johnson & Johnson) or equivalent .55% ortho-phthalaldehyde-based solution. Follow manufacturer's instructions and recommendations for concentration, time of contact and postprocess procedure.

High-level disinfect or sterilize general purpose sensor using CIDEX® Activated Dialdehyde Solution (Johnson & Johnson) or equivalent 2% glutaraldehyde-based solution, CIDEX Plus® (Johnson & Johnson) or equivalent 3.4% glutaraldehyde-based solution, or a hydrogen peroxide-based solution. Follow manufacturer's instructions and recommendations for concentration, time of contact and post-process procedure.

DO NOT gas sterilize or autoclave general purpose sensor.

Covers

Covers can be used to go over the probe, bracket, sensors, and transmitter.

Planned Maintenance

The following maintenance schedule is suggested for the system and probes to ensure optimum operation and safety.

DANGER

Improper handling can lead to early probe failure and electric shock hazards.

Failure to do so will void probe warranty.

DO follow the specific cleaning and disinfection procedures provided in this chapter and the disinfectant manufacturer's instructions.

Table 11-10: Planned Maintenance Program

Do the Following	Daily	After Each Use	As Necessary
Inspect the Probes	-	X	X
Clean the Probes	X	X	X
Disinfect Probes	-	X	X
Disinfect all other probe types	-	X	X

Automatic Probe Diagnostics

Automatic Probe Diagnostics uses automated lens echo acquisition and advanced processing to provide real-time probe health information.

Enable Automatic Probe Diagnostics by selecting "Enable Automatic Probe Diagnostics" on the Utility>Admin page.

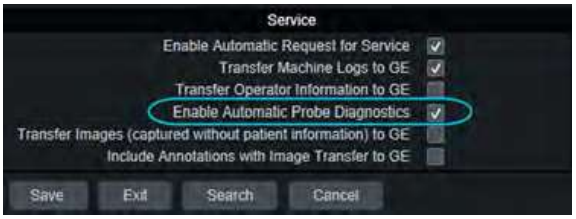


Figure 11-16. Enable Automatic Probe Diagnostics

Automatic Probe Diagnostics will execute once at each system startup (on only the first supported probe connected from the left to right) and generate a dump file in the “D:\log\diags\VITA” directory. The dump file will be transferred to the Back Office together with other files under D:\log directory every day.

NOTE: Pencil Probe does not support Probe check.

NOTE: M5Sc-D Probe check only supports inner row 80 elements.

Probe Check (not available in all countries)

The ***Probe Check*** utility appears on the B-Mode Touch Panel Page 2. (The Probe Check utility does not appear while Scan Assistant is running.) A manual probe check can be run with this utility.

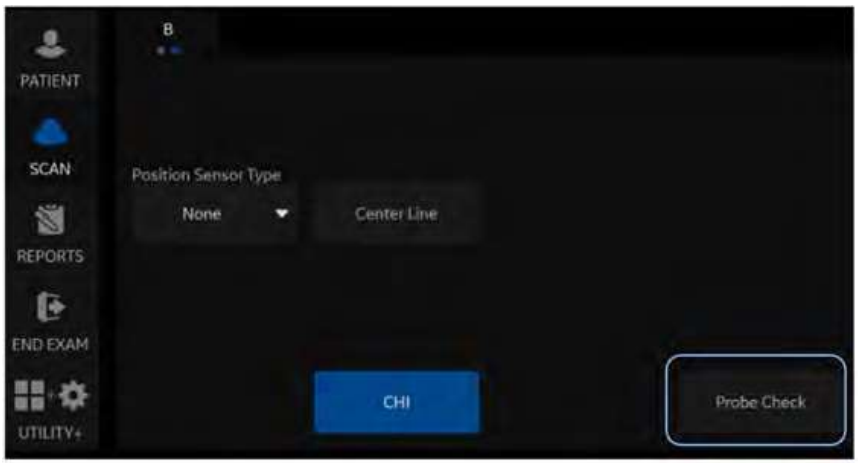


Figure 11-17. Probe Check

NOTE: Pencil Probe does not support Probe check.

NOTE: M5Sc-D Probe check only supports inner row 80 elements.

Run Probe Check

Ensure the probe lens surface is clean and free of dirt, water or coupling gel before beginning probe check.

1. Select the ***Probe Check*** button on the Touch Panel (see Figure 11-17).
2. A pop-up appears specifying to ensure the probe lens surface is clean. If the lens is clean, select ***Yes*** on the pop-up (see Figure 11-18). The probe check takes approximately 2 to 10 seconds.

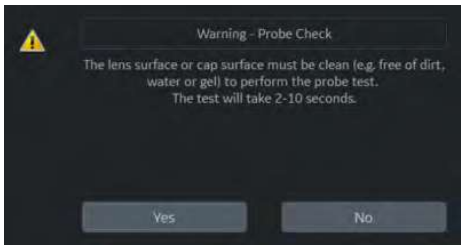


Figure 11-18. Probe Check Pop-up

Run Probe Check (continued)

3. When the probe check is complete, a pop-up displays specifying if the probe “Passed” or “Failed” the test (see Figure 11-19). If the probe passed the test, continue using the probe. If the probe failed the test, follow the instructions on the pop-up.

Figure 11-19. Probe Check Pass or Fail Pop-ups

NOTE: While Probe Check can correctly identify most damaged probes, there are some less common types of probe defects that Probe Check is not able to detect. If a probe passes the probe check but the image quality of the probe is unacceptable, please contact your service partner.

Automatic Probe Check

Automatic Probe Check runs during probe selection at a time interval specified at Utility >Admin page > Enable Automatic Probe Diagnostics (see Figure 11-20). The time interval options are: Every Time, Once a day, Once a week, Once a month and Never.

Automatic Probe Check runs for all supported probes with NOTE. Automatic Probe Check increases the probe selection time by about five seconds. If the probe fails the probe check, a pop-up displays (see Figure 11-19). If the probe fails the check, follow the instructions on the pop-up.

Figure 11-20. Automatic Probe Check

NOTE: Pencil Probe does not support Probe check.

NOTE: M5Sc-D Probe check only supports inner row 80 elements.

Probe Care Cards

Perform After Each Use

Ultrasound probes can be disinfected using liquid chemical disinfectants. The level of disinfection is directly related to the duration of contact with the disinfectant. Increased contact time produces a higher level of disinfection. Refer to the Probe Care Card that was shipped with each LOGIQ Totus probe.

Table 11-11: Description of Pictogram on Probe Care Cards

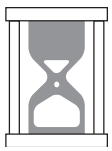
Pictogram	Description
	“ATTENTION” - Consult accompanying documents” is intended to alert the user to refer to the operator manual or other instructions when complete information cannot be provided on the label.
	“CAUTION” - Dangerous voltage (the lightning flash with arrowhead) is used to indicate electric shock hazards.
	Biohazard - Patient/user infection due to contaminated equipment. Usage • Cleaning and care instructions • Sheath and glove guidelines
	Ultrasound probes are highly sensitive medical instruments that can easily be damaged by improper handling. Use care when handling and protect from damage when not in use.
	Do not immerse the probe into any liquid beyond the level specified for that probe. Refer to the user manual of the ultrasound system.
	Since there is a possibility of having negative effects on the probe, observe the specified immersing time by the disinfectant manufacturer strictly. Do not immerse the probe in liquid chemical disinfectants more than the time prescribed in the care card.
	“Consult accompany document” - Refer to the ultrasound system user manual for important probe care and cleaning instruction.

Table 11-11: Description of Pictogram on Probe Care Cards (Continued)

Pictogram	Description
	Symbol indicates useful information
	This is to illustrate compatible ultrasound coupling gels
	This is to illustrate compatible cleaners or disinfectants available in spray format (to be used according to instruction from the manufacturers of these products).
	This is to illustrate compatible cleaners or disinfectants available in wipes format (to be used according to instruction from the manufacturers of these products)
	This is to illustrate compatible cleaners or disinfectants available in powder (to be used according to instruction from the manufacturers of these products).
	This is to illustrate compatible cleaners or disinfectants available in liquid format (to be used according to instruction from the manufacturers of these products).
	This is to illustrate compatible automated reprocessors (to be used according to instruction from the manufacturers of these products).

Returning/Shipping Probes and Repair Parts

US Department of Transportation and GE HealthCare policy requires that equipment returned for service MUST be clean and free of blood and other infectious substances.

When you return a probe or part for service (Field Engineer or customer), you need to clean and disinfect the probe or part prior to packing and shipping the equipment.

Ensure that you follow probe cleaning and disinfection instructions provided in the Basic User Manual.

This ensures that employees in the transportation industry as well as the people who receive the package are protected from any risk.

Biopsy Special Concerns

Precautions Concerning the Use of Biopsy Procedures

WARNING

Do not freeze the image during a biopsy procedure. The image must be live to avoid a positioning error.

Biopsy guide zones are intended to assist the user in determining optimal probe placement and approximate the needle path. However, actual needle movement is likely to deviate from the guideline. Always monitor the relative positions of the biopsy needle and the target mass during the procedure, otherwise it could result in repeated biopsies or patient injury.

WARNING

NEVER reuse the TR5° disposable biopsy guide attachment, disposable sterile Ultra-Pro II needle guide kits or Verza Needle guide kits. Failure to follow the manufacturer's instructions could lead to potential exposure to infectious disease.

WARNING

The use of biopsy devices with accessories that have not been evaluated for use with this equipment may not be compatible and could result in injury. Failure to follow these instruction could result in repeated biopsies or patient injury.

Precautions Concerning the Use of Biopsy Procedures (continued)

WARNING

The invasive nature of biopsy procedures requires proper preparation and technique to control infection and disease transmission. Equipment must be cleaned as appropriate for the procedure prior to use.

- Follow the probe cleaning and disinfection procedures and precautions to properly prepare the probe.
- Follow the manufacturer's instructions for the cleaning of biopsy devices and accessories.
- Use protective barriers such as gloves and probe sheaths.
- After use, follow proper procedures for decontamination, cleaning, and waste disposal.

  Failure to follow these instructions could lead to exposure to infectious agents.

CAUTION

Improper cleaning methods and the use of certain cleaning and disinfecting agents can cause damage to the plastic components that will degrade imaging performance or increase the risk of electric shock.

See ‘Probe Safety’ on *page 11-11 for more information.*

WARNING

Consult the biopsy needle manufacturer’s instructions for acceptable reprocessing of biopsy needles. Failure to follow the manufacturer's instructions could lead to exposure to infectious agents.

CAUTION

The biopsy needle and the biopsy needle guide (and the bore inside) must be sterile.

CAUTION

Before starting a biopsy procedure with a 3D/4D probe always perform a volume scan first. This is important to ensure proper mechanical alignment and centering of the transducer element before the biopsy is performed.

Freehand Biopsy

CAUTION

When performing a freehand biopsy, i.e. without a biopsy guide, it is the user's responsibility to use appropriate equipment.

CAUTION

Always only use basic modes when performing a freehand biopsy

NOTE: A water bath alignment verification is also necessary before performing freehand biopsy procedures

Biopsy Guide Sterilization

Sterilization with autoclave is possible for the reusable stainless steel Biopsy Guides for the following probes:

- IC5-9-D
- RIC5-9-D
- RAB6-D

See ‘Probe Biopsy Reprocessing’ on *page 11-89 for more information.*

Performing a Biopsy

Displaying the Guidezone

Activate the Biopsy Kit by selecting it from the B-Mode Touch Panel.

Figure 11-21. B-Mode Touch Panel Menu

The available biopsy options appear when Biopsy Kit is selected. There are fixed and adjustable angle biopsy kits and plastic/disposable and reusable biopsy guides available with the LOGIQ Totus depending on the probe. Select the desired biopsy kit.

CAUTION

Some angles (for example, if outside of the Field of View) may not be supported on all probes.

NOTE: You can display the biopsy guideline on the CFM image in simultaneous mode. Enabling Color Flow allows for visualization of the vascular structure around the area to be biopsied. Select the Show Biopsy Mark on CFM simultaneous Mode preset in the Utility -> System -> System Image -> Biopsy Guide screen.

Displaying the Guidezone (continued)

NOTE: Be sure to match the angle setting on the bracket to the Biopsy Kit setting on the system.

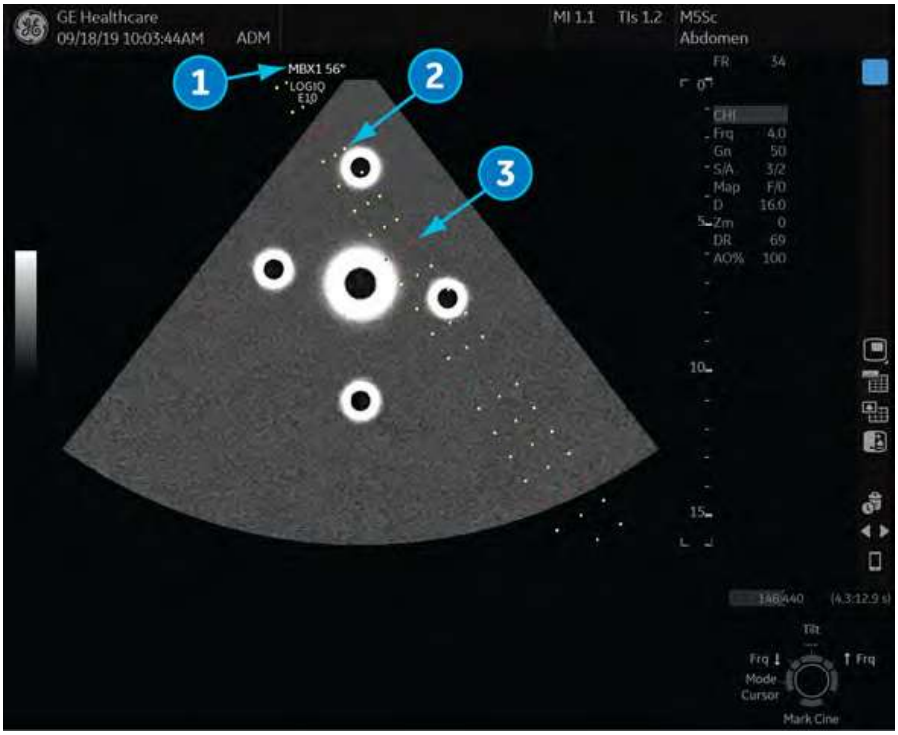


Figure 11-22. Biopsy Guidezones for the M5Sc Probe

1. Biopsy Kit Name and Biopsy Needle Angle
2. 1 cm increments
3. 5 cm increments

The biopsy guidezone represents the path of the needle. The dots which make up the guidezone represent the depth readout, where:

- Yellow represents 1 cm increments.
- Red represents 5 cm increments.

The display should be carefully monitored during a biopsy for any needle deviation from the center line or guidezone.

Before scanning, verify the needle can be visualized within the imaging plane. Use appropriate needle length to reach target area. Adjust the guide settings on the system and confirm they pass through the target, then match the setting on the system to the pin settings on the guide.

Displaying the Guidezone (continued)

NOTE: *Biopsy Needle Angle is defined with respect to the horizontal axis. This is equivalent to (90 deg) – (angle specified by CIVCO). Displayed angle may be slightly different from CIVCO's specifications due to part variability.*

The Biopsy Guidezone adjusts along with image adjustments, such as image inversion/rotations, zoom and depth changes.

The needle may vary from the center line or guidezone for various reasons:

- Needle barrel to needle clearance or strength.
- Bracket manufacturing tolerance.
- Needle deflection due to tissue resistance.
- Needle size chosen. Thinner needles may deflect more.

WARNING

Failure to match the guidezone displayed to the guide may cause the needle to track a path outside the zone.

It is extremely important that when using the adjustable angle biopsy guides, the angle displayed on the screen matches the angle set on the guide, otherwise the needle will not follow the displayed guidezone which could result in repeated biopsies or patient injury.

CAUTION

The default biopsy lines provided with the system software, must be verified at least once by the user. The procedure must be repeated if probes and/or biopsy guides are exchanged.

CAUTION

Depending on the needle stiffness/thickness and the elasticity and composition of the different tissue-types in the path of the biopsy needle, the actual needle track can deviate from the predicted biopsy line. The biopsy needle might bend and not follow a straight line.

Guide circle on the biopsy line

You can use a guide circle on the biopsy line.

Mode: B/CF/PDI/Elastography/Contrast/Volume Navigation

Display format: Single/Dual

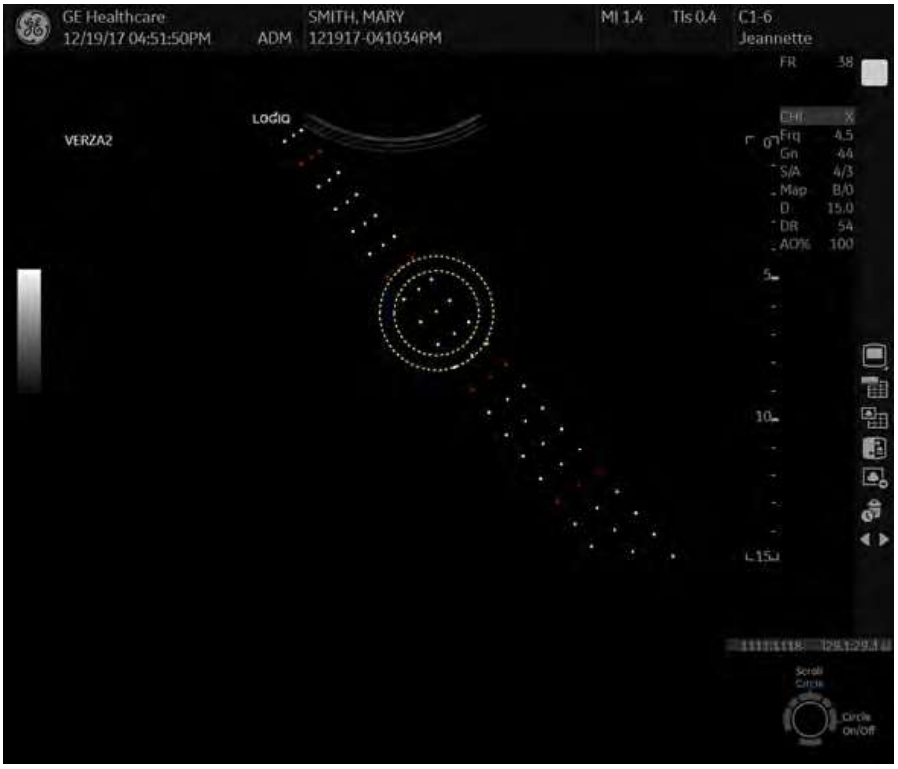


Figure 11-23. Guide circle

- Guide circle
- Biopsy line
- The system displays current size of Target diameter (inside circle) and margin distance in the status area.

Preset for guide circle

Check “Show Biopsy Circle” in Utility -> System -> System Imaging to display a guide circle control on the monitor display and the trackball key.

Biopsy circle control

Figure 11-24. Biopsy circle control

1. Target diameter
2. Margin distance
3. Guide circle display On/Off
4. Circle position (move Trackball Up/Down)

Preparing the Biopsy Guide Attachment

Convex, Sector and Linear probes have optional biopsy guide attachments for each probe. The guide consists of a non-disposable bracket to attach to the probe, disposable needle clip to attach to the bracket, sheath, gel (sterile gel if necessary) and disposable needle barrels.

The disposable needle barrels are available for a variety of needle sizes.

CAUTION

DO NOT attempt to use the biopsy bracket and needle guide until the manufacturer's instructions, provided with the biopsy bracket and needle guide in the kit, have been read and thoroughly understood. Failure to follow these instructions could result in repeated biopsies or patient injury.

The bracket is packaged non-sterile and is reusable. To avoid possible patient contamination, ensure bracket is properly cleaned, sterilized or disinfected before each use.

Disposable components are packaged sterile and are single-use only. Do not use if integrity of packing is violated or if expiration date has passed.

Fixed Needle Biopsy Guide Assembly

WARNING

DO NOT attempt to use the biopsy bracket and needle guide until the manufacturer's instructions, provided with the biopsy bracket and needle guide in the kit, have been read and thoroughly understood. Failure to follow these instructions could result in repeated biopsies or patient injury.

1. Identify the appropriate biopsy guide bracket by matching the label on the bracket with the probe to be used.
2. Orient the bracket so that the needle clip attachment will be on the same side as the probe orientation mark (ridge).

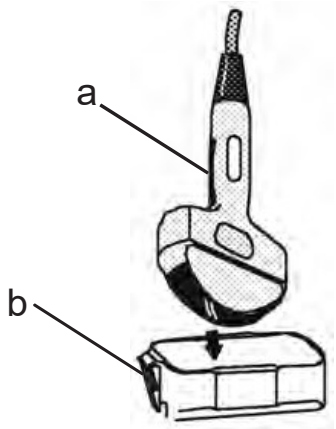


Figure 11-25. Probe/Bracket Alignment

a. Probe Orientation Mark
b. Bracket

3. Attach the biopsy bracket to the probe by sliding the bracket over the end of the probe until it clicks or locks in place.
4. Place an adequate amount of coupling gel on the face of the probe.

Fixed Needle Biopsy Guide Assembly (continued)

5. Using a sterile technique, place the proper sanitary sheath over the probe and biopsy bracket. Use the rubber bands supplied to hold the sheath in place.

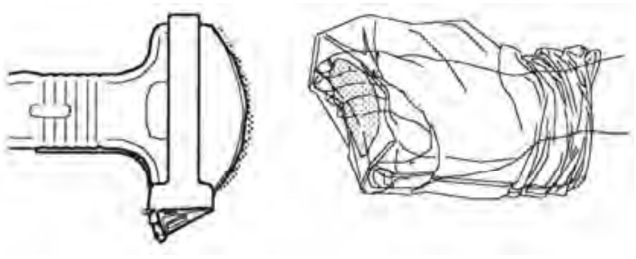


Figure 11-26. Applying Sanitary Sheath

6. Snap the fixed or adjustable needle clip onto the biopsy guide bracket.

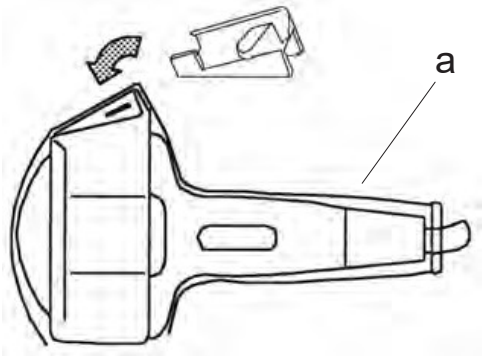


Figure 11-27. Fixed Needle Clip Attachment

a. Sheath

Fixed Needle Biopsy Guide Assembly (continued)

7. Push the locking mechanism towards the bracket to secure the lock. Make sure the needle guide is firmly attached to the bracket.

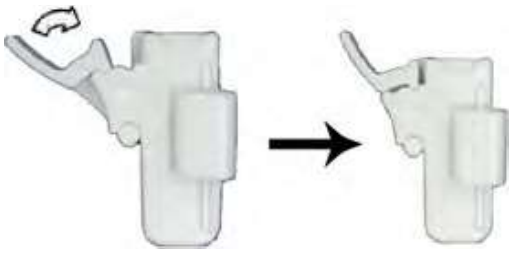


Figure 11-28. Locking the Needle Clip

NOTE: If using an in-plane needle guide, the needle clip appears as shown here. Be sure to choose an in-plane guide that matches the gauge of the needle being used. The in-plane guide does not support any on-screen graphics. This is because the guide allows variable angles. For in-plane needle guides, steps 8 and 9 are not applicable.

Figure 11-29. Example of In-Plane Needle Guide

Fixed Needle Biopsy Guide Assembly (continued)

8. Choose the desired gauge (size) needle barrel. Twist it back and forth to remove it from the plastic tree.

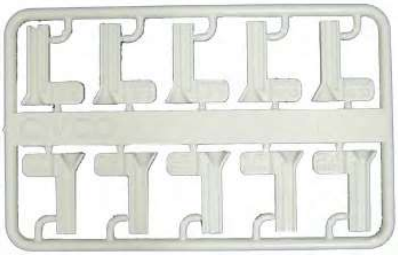


Figure 11-30. Needle Barrel Selection

9. Place the needle barrel into the needle clip with the desired gauge facing the needle clip and snap into place.

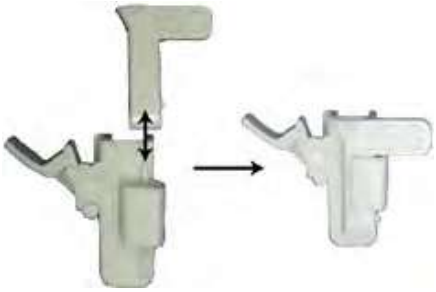


Figure 11-31. Needle Barrel Installation

WARNING

Ensure that all guide parts are seated properly prior to performing a biopsy. Failure to follow these instructions could result in repeated biopsies or patient injury.

Multi Angle Biopsy Guide Assembly

WARNING

DO NOT attempt to use the biopsy bracket and needle guide until the manufacturer's instructions, provided with the biopsy bracket and needle guide in the kit, have been read and thoroughly understood. Failure to follow these instructions could result in repeated biopsies or patient injury.

1. Scan the patient and identify the target for biopsy. Move the probe to locate the target to the center of the image. Enable the system biopsy guidezone and try guidezone angles MBX1 to MBX3 to decide the best angle setting for needle path.

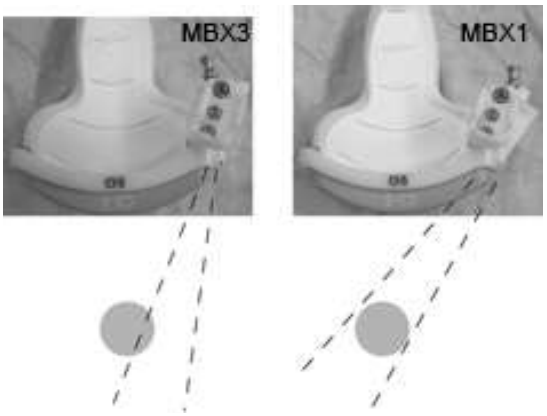


Figure 11-32. Example

2. Pull up on the pin (Figure 11-33 a) to freely move the needle guide attachment. Align the pin with the selected position of the needle guide attachment.

   Push the pin down (Figure 11-33 b) into the desired slot to secure the angle position of the needle guide attachment.

Figure 11-33. Pull up and push down the pin

Multi Angle Biopsy Guide Assembly (continued)

3. Fit a convex piece of the biopsy bracket (a) into the concave position of the probe (b).

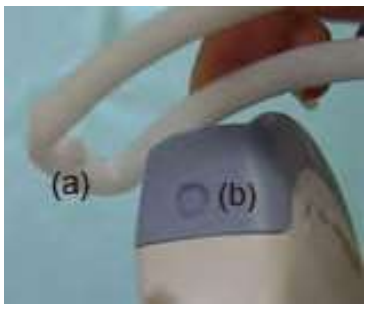


Figure 11-34. Probe/Bracket Alignment

Hold the side (a) and tuck down the needle guide side (b) until it clicks or locks in place.

Figure 11-35. Probe/Multi-angle Bracket Alignment 2

4. Place an adequate amount of coupling gel on the face of the probe.

Multi Angle Biopsy Guide Assembly (continued)

5. Place the proper sanitary sheath tightly over the probe and biopsy bracket. Use the rubber bands supplied to hold the sheath in place.

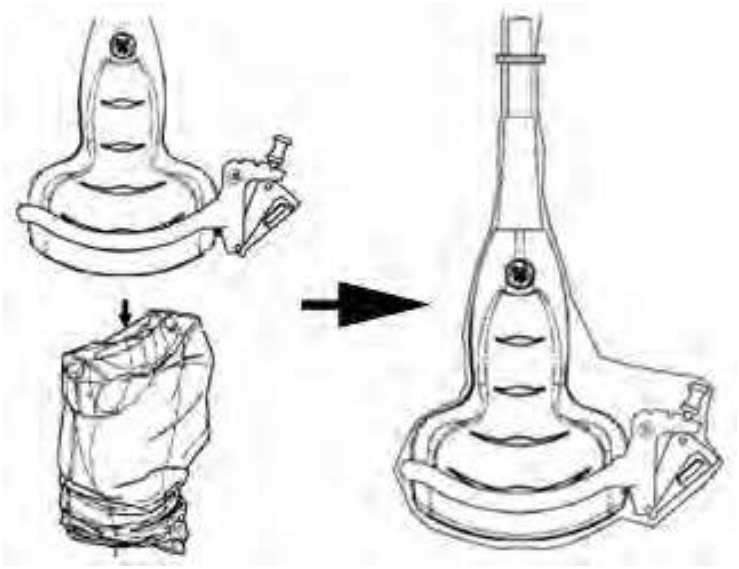


Figure 11-36. Applying Sanitary Sheath

6. Snap the needle guide onto the biopsy guide bracket.

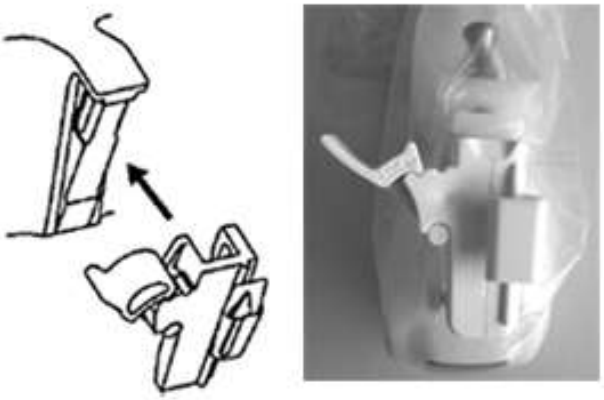


Figure 11-37. Snap the needle guide

Multi Angle Biopsy Guide Assembly (continued)

7. Push the locking mechanism towards the bracket to secure the lock (a). Make sure the needle guide is firmly attached to the bracket.

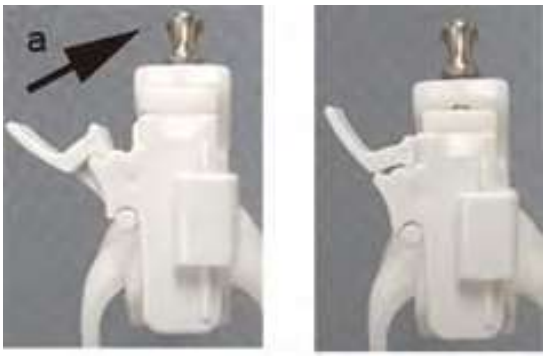


Figure 11-38. Lock the Needle guide

8. Choose the desired gauge (size) needle barrel. Twist it back and forth to remove it from the plastic tree.

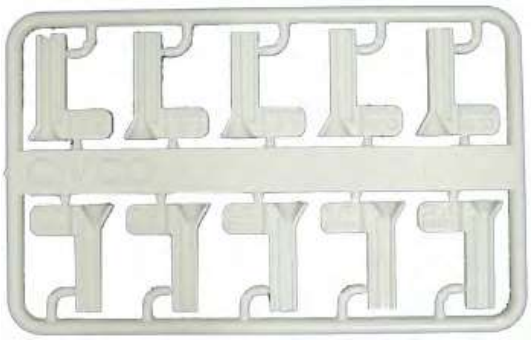


Figure 11-39. Needle Barrel

9. Place the needle barrel into the needle clip with the desired gauge facing the needle clip and snap into place.

Figure 11-40. Needle Barrel Installation

Multi Angle Biopsy Guide Assembly (continued)

Remove the biopsy guide

1. Hold the other side and push out the needle clip attachment side. See Figure 11-41.

Figure 11-41. Remove the biopsy guide

CAUTION

Prevent damage to the probe lens with finger nails.

Releasing the needle

According to the following procedure, you remove the needle from a probe and an assembly without moving the needle.

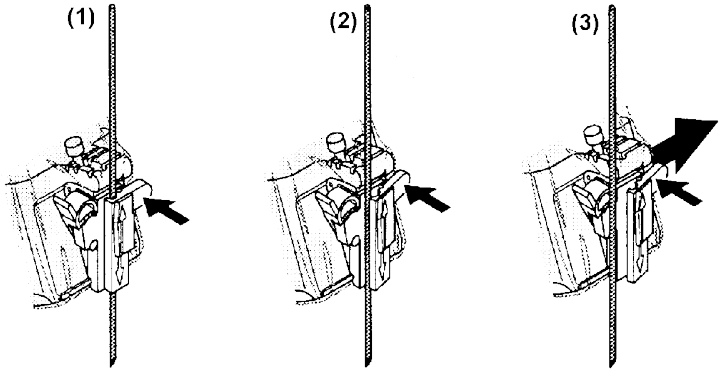


Figure 11-42. Release the needle from assembly

a. Push the knob portion of a sleeve in the direction of the arrow.
b. The needle is released from the assembly.
c. Push the probe and the assembly in the direction of the larger arrow to remove the needle.

Endocavitary Probe Biopsy Guide Assembly - Representative Example

WARNING

DO NOT use the needle with the catheter (soft tube). There is a possibility of breaking the catheter in the body.

WARNING

Before inserting the needle, scan the patient to determine the correct puncture depth and site. Only the sterile/sanitary sheath and rubber band are on the probe during the pre-needle placement scanning. Failure to follow these instructions could result in repeated biopsies or patient injury.

Preparation

To prepare the endocavitary probe for use:

1. Remove the probe from the box and carefully examine it for any damage.
2. If the biopsy guide is to be attached, use the filling removal tool to clean out the attachment area on the probe head.

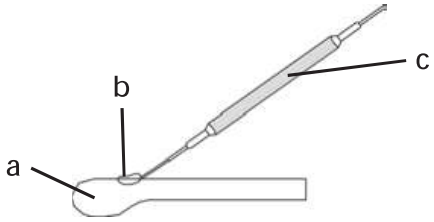


Figure 11-43. Attachment Filling Removal

a. Probe Head
b. Attachment
c. Filling Removal Tool

3. Clean, then disinfect the probe.

NOTE: Ensure that protective gloves are worn.

Installing the sheath

To install the sheath:

1. Remove the sheath from its package. Do not unroll the sheath.

NOTE: Remember to rinse all sanitary probe sheaths of powder before placing on the probe. Powder can degrade the displayed image.

2. Place an adequate amount of ultrasound gel inside the sheath tip (the gel is between the sheath inner surface and the probe aperture).

NOTE: Ensure that only acoustic coupling gel is used for this purpose.

3. Place the sheath tip over the probe aperture and then pull the sheath end toward the probe handle.
4. Inspect the sheath for nicks, cuts or tears.

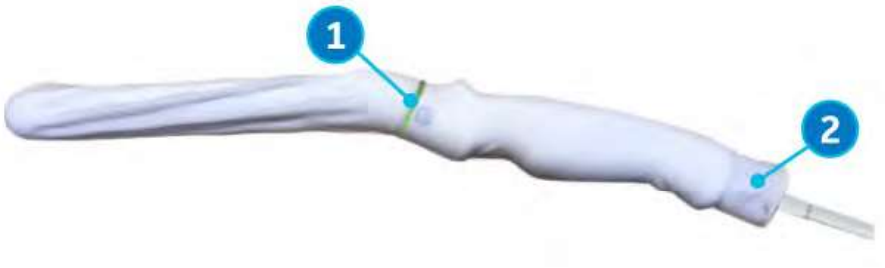


Figure 11-44. Endocavitary Probe with Sheath

1. Secure the Sheath with a rubber band.
2. The probe sheath should extend past the end of the probe to the probe's cable.

5. Rub a finger over the tip of the probe to ensure all air bubbles have been removed.

Endocavitary Probe Biopsy Guide Preparation

1. If a biopsy is to be performed, snap the metal or plastic biopsy guide on to the probe over the sheath.

WARNING

Ensure that all guide parts are seated properly prior to performing a biopsy. Failure to follow these instructions could result in repeated biopsies or patient injury.

2. Fix with a screw

NOTE: *For the RIC5-9-D and IC5-9-D probes, use the TR5 guidelines for the plastic (disposable-only) biopsy guides; use the RU guidelines with the stainless steel reusable biopsy guides.*

3. Place an adequate amount of ultrasound gel on the gel-filled sheath tip's outer surface.
4. Ensure the guide is properly seated and secure by pushing forward on the needle insertion end of the guide until the attachment node is firmly in place in it's hole.

4D Biopsy Guide Assembly - Representative Example

4D Probe

1. Place the needle guide onto the probe.
2. Push the needle forward until the bracket catches in the support on the housing of the probe (a).

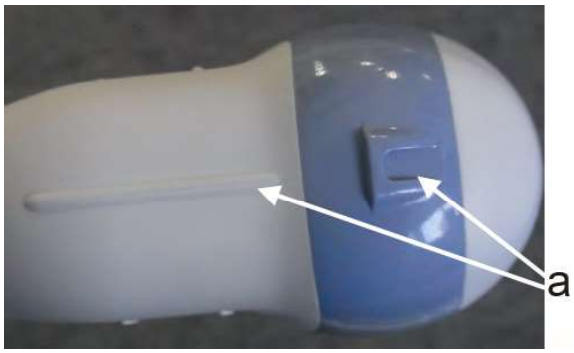


Figure 11-45. Support on the housing

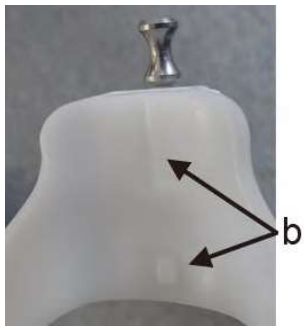


Figure 11-46. Biopsy Needle Guide

3. Fix the biopsy guide by locking the frame on the opposite side (b).

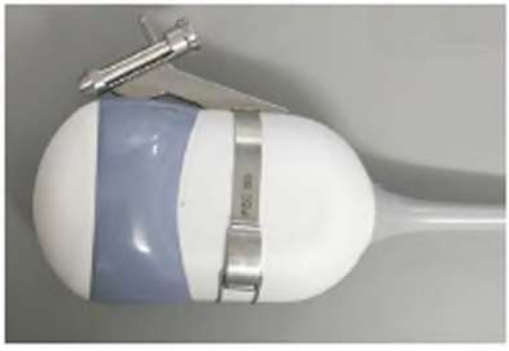


Figure 11-47. Mounting the Biopsy Needle Guide to the 4D Probe

NOTE: Needle guide sterilization with autoclave possible.

4D Endocavitary Probe

1. Place an adequate amount of ultrasound gel inside the sheath tip (the gel is between the sheath inner surface and the probe aperture).

NOTE: Ensure that only acoustic coupling gel is used for this purpose.

2. Place the sheath tip over the probe aperture and then pull the sheath end toward the probe handle.
3. Inspect the sheath for nicks, cuts or tears.
4. Rub a finger over the tip of the probe to ensure all air bubbles have been removed.
5. Position the small swelling of the needle guide on the notch at the probe tip. Snap the needle guide.

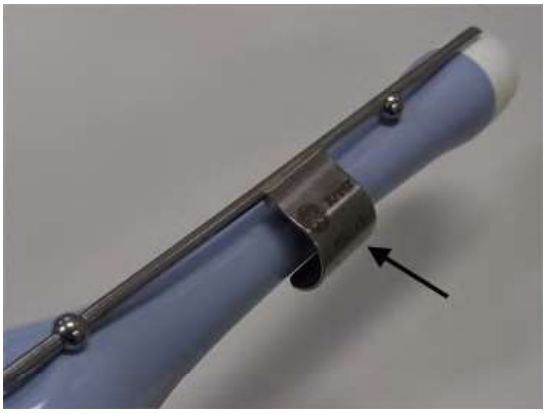


Figure 11-48. Installation (without probe sheath)

NOTE: Material: Stainless Steel

NOTE: Needle guide sterilization with autoclave possible.

Verza Biopsy Needle Guide

The Versa Biopsy Needle Guide is available for the C1-6-D and C1-6VN-D probes.

Activate the Biopsy Kit by selecting it from the B-Mode Touch Panel.

Figure 11-49. B-Mode Touch Panel Menu

The available biopsy options appear when Biopsy Kit is selected. Select the desired biopsy kit.

CAUTION

Be sure to match the ‘pin’ setting on the bracket to the pin setting on the system.

Verza Needle Guide Attachment Procedure

NOTE: The following procedure is shown with a C1-6-D probe.

Table 11-12: Verza Biopsy Guide Attachment Procedure

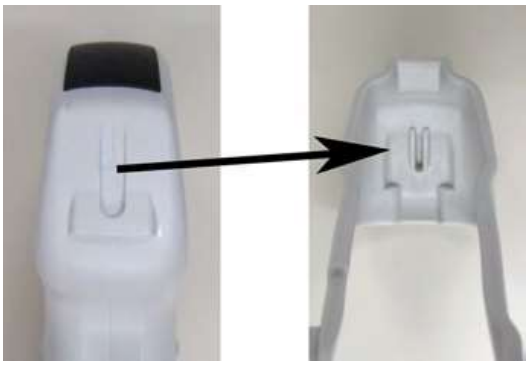
Step	Instructions	Illustration
1.	Attach the Biopsy Guide Bracket to the probe. a. Match the indentations on the Biopsy Guide Bracket and the probe.	
2.	Tightly secure the Biopsy Guide Bracket to the probe. NOTE: Be sure you are using the correct bracket for the probe. The bracket and probe are clearly marked.	 
3.	Attach the probe sheath. a. Apply gel. b. Cover the probe. c. Attach the rubber band.	 

Table 11-12: Verza Biopsy Guide Attachment Procedure (Continued)

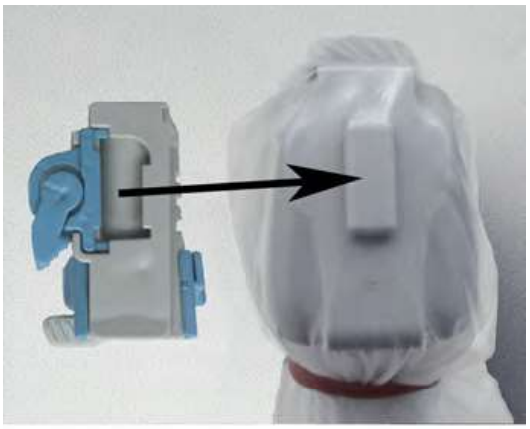
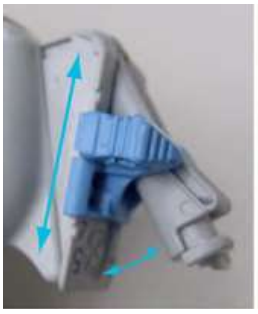
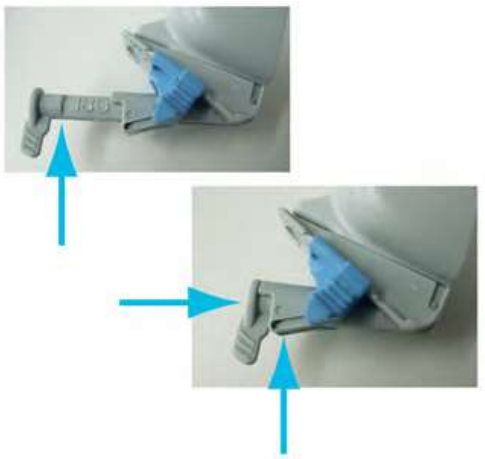
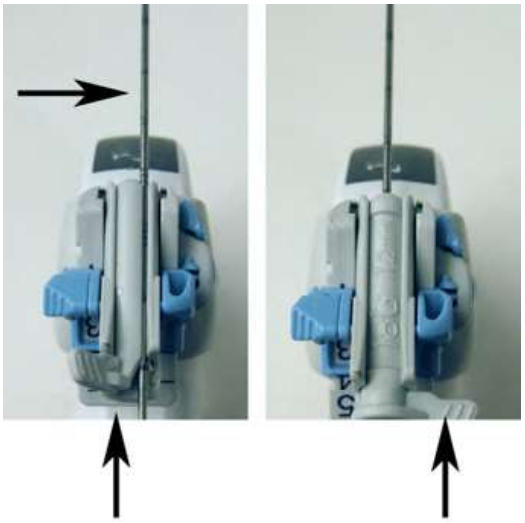
Step	Instructions	Illustration
4.	Tightly secure the Needle Guide to the Biopsy Guide Bracket through the sheath.	  
5.	Unlock angle lock to adjust the needle guide angle; then re-lock.	Locked Unlocked  
	Adjust Needle Guide Angle  	Re-lock 

Table 11-12: Verza Biopsy Guide Attachment Procedure (Continued)

Step	Instructions	Illustration
6.	Insert correct Needle Gauge Holder. 	
7.	Push the Quick Tab Release, insert the biopsy needle into the needle guide. Close the Quick Tab Release.	

4D Probe Biopsy Needle Path Selection

To select the needle path and verify that the path of the needle is accurately indicated within the guidezone on the system monitor, perform the following before use:

1. Properly install the bracket and biopsy guide.
2. Scan in a container filler with water (47° C).
3. Select ***Biopsy kit***. The available biopsy options from the Touch Panel.

   Select the biopsy guidezone where the needle echo passes through the center of the guidezone. Use the selected biopsy guidezone when performing the biopsy.

Biopsy Needle Path Verification

To verify that the path of the needle is accurately indicated within the guidezone on the system monitor, perform the following:

- Properly install the bracket and biopsy guide.
- Scan in a container filled with water (47° C).
- Display the biopsy guidezone on the monitor.
- Ensure that the needle echo falls within the guidezone markers.

CAUTION

The needle used for water bath alignment must not be used for a biopsy performed on a patient.

The Biopsy Procedure

WARNING

Biopsy procedures must only be performed on live images. Failure to follow these instructions could result in repeated biopsies or patient injury.

WARNING

Ensure that all guide parts are seated properly prior to performing a biopsy. Failure to follow these instructions could result in repeated biopsies or patient injury.

1. Place coupling gel on the scanning surface of the probe/ sheath/biopsy guide assembly.
2. Activate the biopsy guidezone on the system through the B-Mode Touch Panel. When using multi-angle guides, ensure that the proper guidezone angle is displayed.
3. Scan to locate the target. Center the target in the electronic guidezone path.

NOTE: Enabling color flow would allow for visualization of the vascular structure around the area to be biopsied.

4. Place the needle in the guide between the needle barrel and needle clip. Direct it into the area of interest for specimen retrieval.

Post Biopsy

When the biopsy is complete, remove the needle barrel, needle clip and probe sheath. Properly dispose of these items in accordance with current facility guidelines.

Clean and disinfect the probe. See ‘Probe Reprocessing’ on *page 11-19 for more information.*

The biopsy bracket can be cleaned and disinfected in a recommended disinfecting agent and reused.

WARNING

When the biopsy needle guide kit is opened, all parts must be discarded after the procedure whether they have been used or not. Failure to follow these instructions could result in repeated biopsies or patient injury.

Probe Biopsy Reprocessing

Manual Cleaning

NOTE: Efficacy of this manual cleaning process has been shown using ENZOL Enzymatic Detergent.

1. Remove the biopsy guide and protective sheath(s) from the probe.
2. Whenever possible the biopsy guide should be rinsed immediately after use. If the biopsy guide cannot be cleaned immediately after use, maintain moisture by placing them in a clean container. Cover the container with a towel dampened with purified water. Devices may remain in this condition for a maximum of 4 hours.
3. Remove all visible soil. Flush the biopsy guide using potable water (30 - 40°C) for not less than 2 minutes.
4. Prepare an enzymatic detergent safe for use with metal instruments according to the manufacturer's recommendations, using potable water.
5. Submerge the biopsy guide in the prepared solution and soak for no less than 2 minutes.
6. After the 2-minute soak, while the biopsy guide is submerged in the detergent water, vigorously scrub the device with a soft nylon bristle brush.
7. Use a round nylon cleaning brush to clean the biopsy lumen. Use a syringe to flush detergent water through the lumen. Scrub the device for a minimum of 2 minutes.
8. Remove the device from the detergent water and rinse thoroughly in running potable water (30 - 40°C) taking care to remove any visible detergent. Rinse the device for a minimum of 1 minute.
9. Visually inspect the device for any residual soil or detergent. Repeat steps 6 through 8 until the device is visibly clean.

NOTE: Discard solutions and rinse waters in accordance with local regulations

CAUTION

Do not clean any portion of the attachment with methanol, ethanol, isopropanol, or any other alcohol base detergent. Such substances can cause irreparable damage to the attachment.

High-Level Disinfection

NOTE: High-Level disinfection efficacy of this manual process has been shown using Cidex OPA.

1. Fill a sink or basin with high-level disinfectant prepared in accordance with the disinfectant manufacturer's instructions to a level allowing immersion of the biopsy guide.
2. Immerse the devices in the disinfectant solution and agitate to ensure all air bubbles are removed from the surface of the device.
3. Allow the devices to soak in the disinfectant solutions for least the minimum contact time listed in the disinfectant manufacturer's instructions for use.
4. Thoroughly rinse the device by immersing in a large volume of critical (purified) water for a minimum of 1 minute.

NOTE: Critical Water is water that is treated (usually by a multistep treatment process that could include a carbon bed, softening, DI, and RO or distillation) to ensure that the microorganisms and the inorganic and organic material are removed from the water to an appropriate level. (Refer to AAMI TIR34/ST108).

5. Repeat Step 4 two additional times, for a total of 3 (three) rinses using fresh volumes of water for each rinse.

NOTE: Discard solutions and rinse waters in accordance with local regulations

6. Thoroughly dry the biopsy guide using a sterile, lint-free wipe. Visually inspect the biopsy guide to ensure all surfaces are clean and dry. Visually inspect the biopsy to ensure all surfaces are dry. Repeat drying steps if any moisture is visible.

Autoclave Sterilization

NOTE: Sterilization efficacy testing was performed using worst-case parameters for time, temperature and load density. Parameters listed in the tables are the minimum required to ensure a Sterility Assurance Level (SAL) of 10^{-6} or better.

1. Place the cleaned and disinfected biopsy guide in an approved autoclave pouch.
2. Autoclave using the following parameters:

Table 11-13: Autoclave parameters

Parameter	Cycle Type 1	Cycle Type 2
Sterilizer	Pre-vacuum	Pre-vacuum
Preconditioning Pulses	3	3
Temperature (Minimum)	132 degrees C	134 degrees C
Exposure Time (Minimum)	4 Minutes	3 Minutes
Drying Time (Minimum)	15 Minutes	15 Minutes
Package Configuration	Tyvek Pouch (14 x 25 cm)	Tyvek Pouch (14 x 25 cm)

Chapter 12

User Maintenance

This chapter supplies system data, assistance information, and system care and maintenance instructions.

System Data

Features/Specifications

Table 12-1: Physical Attributes

Dimensions and Weight (for Transport) • Height Transport position : 1285mm, 50.6 in Normal use position (LCD monitor) : 1425mm - 1825mm, 56.1 in - 71.9 in Normal use position (HDU monitor) : 1465mm - 1865mm, 57.7 in - 73.4 in • Width Base width : 490mm , 19.3 in Monitor width (LCD monitor) : 545mm, 21.5 in Monitor width (HDU monitor) : 565mm, 22.2 in • Depth: 835mm, 32.9 in • Weight: 73kg, 160.9 lb. User interface • Operating keyboard adjustable in height and rotation • Ergonomic hard key layout • Interactive Back-Lighting • Integrated recording keys for remote control of up to 4 peripheral or DICOM devices • Integrated Gel Warmer (Option) Electrical Power • Voltage:100 - 240 Vac • Frequency: 50/60 Hz • Power consumption maximum of 0.65 KVA with peripherals. Touch Screen • 14 inch Capacitive Touch Panel • FHD 1920 x 1080(16:9) pixel Resolution. • Brightness adjustment • User-configurable layout	Console Design • 4 Active Probe Ports • Integrated SSD (1TB) • On-board storage for peripherals: Thermal printer. • Integrated speakers • Integrated locking mechanism that provides rolling lock and caster swivel lock • Integrated cable management • Front and Rear handles • Easily-removable air filters HDU Display • 23.8” Wide screen High-Resolution HDU Display • Monitor translation: 350mm, 13.7 in. horizontal; 120mm, 4.7 in. vertical; 90 degree swivel • Fold-down and Lock Mechanism for transport • Brightness & contrast adjustment • Resolution 1920 x 1080 • Anti Glare • Viewing Angle 89/89/89/89 degrees LCD Display • 23.8” Wide screen High-Resolution LCD Display • Monitor translation: 350mm, 13.7 in. horizontal; 120mm, 4.7 in. vertical; 90 degree swivel • Fold-down and Lock Mechanism for transport • Brightness & contrast adjustment • Resolution 1920 x 1080 • Anti Glare • Viewing Angle 89/89/89/89 degrees

Table 12-2: System Overview

Applications
• Abdominal
• Obstetrical
• Gynecological
• Breast
• Small parts
• Peripheral Vascular
• Transcranial (Adult and neonatal)
• Pediatric and neonatal
• Musculoskeletal (general and superficial)
• Urological
• Cardiac (adult and pediatric)
 	
Operating modes
• B-Mode
• M-Mode
• Color Flow Mode (CFM)
• B-FLow (Option)
• Extended field of view (LOGIQView)
• Power Doppler Imaging (PDI)
• PW Doppler
• CW Doppler (Option)
• Volume Mode (3D/4D) (Option)
  • 3D Static
  • 4D Real Time
• Anatomical M-Mode
• Coded Contrast Imaging (Option)
• Strain Elastography
• Shear Wave Elastography (Option)
• UGAP (Option)
 	
Scanning methods
• Electric sector
• Electric convex
• Electric linear
• mechanical volume sweep
 	
Transducer Types
• Sector Phased Array
• Convex Array
• Micro convex Array
• Linear Array
• Matrix Array
• Volume probe (4D)
• Split Crystal
	Standard Features
	• Automatic Optimization
	• CrossXBeam
	• Advanced Speckle Reduction Imaging
	• Fine Angle Steer
	• Coded Harmonic Imaging
	• Virtual Convex
	• Patient information database
	• Advanced 3D
	• Raw Data Analysis
	• Real-time Automatic Doppler Calculations
	• OB Measurements/Calculations
	• Fetal Trending
	• Multigestational Calculations
	• Hip Dysplasia Calculations
	• Gynecological Calculations
	• Vascular Calculations
	• Urological Calculations
	• Renal Calculations
	• Cardiac Calculations
	• InSite Capability
	• On-board electronic documentation
	• Auto Doppler Assist
	• Privacy and Security, including user and rights management
	• LOGIQView
	• External USB Printer connection
	• Network Printer Support
	• HDMI output available for compatible devices

Table 12-2: System Overview (Continued)

Options • DICOM • Adv. Security • Coded Contrast • Cardiac AFI • Report Writer • Stress Echo • Tricefy • LOGIQ Apps • Scan Assistant • Advanced Probes • AUTO IMT • B Steer+ • B-flow • flow QA • Measure Assist Breast • Measure Assist OB • Elastography • Elasto QA • Shear Wave Elastgraphy • UGAP • Hepatic Assistant - SWE-UGAP • Software DVR • Omni View • STIC • TUI • VCI-Static • VOCAL_II • SonoNT SonoIT • Compare Assistant • Thyroid Productivity • Breast Productivity • VITA on Demand (option for regions except for USA) • Auto Real-time Preset Selection • Voice Control • KOIOS INSTALL • KOIOS Thyroid • KOIOS Breast • CW Doppler • Realtime 4D • Power Assistant and Scan on battery • Small battery (3 packs) • Big battery (6 packs) • Pencil CW • ECG Option • ECG CABLE - AHA STYLE • ECG CABLE - IEC STYLE	• TVTR Probe Holder • PROBE CABLE HANGER • Control panel REAR TRAY • REAR BASKET • REAR HANDLE CABLE HOOK • Ultrasound Probe Rack (USA only) • Ethernet Protection Cable • Vscan Air CL • Voice Control • Auto Preset Assistant Peripheral Options • Sony BW Printer • Sony Color Printer • USB FOOTSWITCH 3 BUTTON • Barcode Reader USBee1000A (Japan only) • Magnetic Card Reader (Japan and AKA Only) • Powervar144k120v MG UPS (US and LATAM only) • Powervar144k 230V MG UPS (EU only) • EMI Filter • Wireless LAN • S-Video output available for compatible device • Digital Expert Cables and Video Grabber • Digital Expert with tablet • Microsoft Surface Tablet with Case Display Modes • Live and Stored Display Format: Full and Split Screen -- both with thumbnails for Still and CINE • Review Image Format: 4x4 and Thumbnails for Still and CINE • Time line Display [Independent Dual B or CrossXBeam/PW Display; CW; Display Formats; Top/Bottom or Side/Side selectable Format; 2 Timeline Methods: Scrolling or Moving Bar • Virtual Convex • Simultaneous Capability [B or CrossXBeam/PW, B or CrossXBeam/CW (Option), B or CrossXBeam/CFM or PDI, B/M, B/CrossXBeam, Realtime Triplex Mode [B/CrossXBeam + CFM/PDI + PW] • Selectable alternating Modes [B or CrossXBeam/PW; B or CrossXBeam + CFM (PDI)/PW; B/CW (option)] • Multi Image Split/Quad Screen [Live and/or Frozen, B or CrossXBeam+B or CrossXBeam/CFM or PDI, PW/M, Independent Cine playback]

Table 12-3: System Parameters

Controls Available on Freeze or Recall
- Automatic Optimization
- Advanced SRI Type 1
- CrossXBeam (display non-compounded and compounded image simultaneously in split screen)
- 3D Reconstruction from a stored CINE loop
- B/M/CrossXBeam Mode (Gray Map Optimization; TGC, Colorized B and M; Frame Average [Loops only]; Dynamic Range)
- Anatomical M-Mode
- Magnification Zoom
- Pan Zoom
- Baseline Shift
- Sweep speed
- PW-Mode (Gray Map; Post Gain; Baseline Shift; Sweep Speed; Invert Spectral Waveform; Compression; Rejection, Colorized Spectrum; Display Format; Angle Correct; Quick Angle Correct, Auto Angle Correct, Doppler Audio)
- Color Flow (Overall Gain [Loops and Stills]; Color Map; Transparency Map; Frame Averaging [Loops only]; Flash Suppression, CFM Display Threshold; Spectral Invert for Color/Doppler)
- Anatomical M-Mode on CINE Loop
- 4D (Gray Map, Colorize; Post Gain; Change display between single or rendered)

Controls Available While “Live”
- Magnification Zoom: Magnifies the entire image on the screen without zoom ROI
- Pan Zoom: Magnifies the display of the data within the ROI
- HD Zoom: Magnifies the image within the zoom ROI, with higher spatial resolution than original images
- B/M/CrossXBeam-Mode (Gain; TGC; Dynamic Range; Acoustic Output; Frame Rate Control, Sweep Speed for M-Mode; # of Angles for CrossXBeam)
- PW-Mode (Gain; Dynamic Range; Acoustic Output; Transmission Frequency; PRF; Wall Filter; Spectral Averaging; Sample Volume Gate for PW-Mode Length and Depth; Velocity Scale)
- Color Flow (CFM Gain; CFM Velocity Range; Acoustic Output; Wall Echo Filter; Frame Rate Control; CFM Spatial Filter; CFM Frame Averaging; CFM Line Resolution; Frequency/ Velocity Baseline Shift)

Connectivity
- Ethernet network connection
- Wireless LAN 802.11ac/a/b/g/n (option)
- DICOM 3.0 (option) with Verify, Print, Store, Modality Worklist, Storage Commitment, Modality Performed Procedure Step [MPPS], Media Exchange, Off network/mobile storage queue, Query/Retrieve)
- Public SR Template
- Structured Reporting - compatible with Vascular, OB, Cardiac, and Breast standard
- InSite capability
- Advanced privacy and security (Option)

Scanning Parameters
- Displayed Imaging Depth: 0-50cm [Minimum: 0-2 cm (Zoom); Maximum: 0-50 cm] (Probe dependent)
- Continuous Dynamic Receive Focus/Continuous Dynamic Receive Aperture
- Adjustable Dynamic Range
- Adjustable Field of View (FOV)
- Image Reverse: Right/ Left
- Image Rotation: 0, 90, 180, 270 degrees

Image Storage
- On-board database of patient information from past exams
- Storage Format: DICOM (compressed/ uncompressed, single/multiframe, enhanced [3D/ 4D], with/without Raw Data), Export JPEG, and WMV.
- Storage Devices: USB Memory Stick (64MB to 64GB, for exporting individual images/clips); Hard Drive Image Storage (~730GB)
- Compare previous exam images with current exam
- Reload of archived data sets

CINE Memory/Image Memory
- 1 GB of CINE Memory
- Selectable CINE Sequence for CINE Review
- Prospective CINE Mark
- Measurements/Calculations & Annotations on CINE Playback
- Scrolling timeline memory
- Dual Image CINE Display
- Quad Image CINE Display
- CINE Gauge and CINE Image Number Display
- CINE Review Loop
- CINE Review Speed

Table 12-4: Measurements and Calculations

B-Mode
• Depth and Distance
• Circumference and Area (Ellipse/Trace)
• Volume (Ellipsoid)
• Angle between 2 Lines
• % Stenosis (Area or Diameter)
• Dual B-Mode capability
 	
M-Mode
• M Depth and Distance
• Time
• Slope
• Heart Rate
 	
Doppler Measurements/Calculations
• Velocity
• Time
• Peak Systole
• End Diastole
• Acceleration
• Acceleration Time
• Ratios
  • A/B Ratio (Velocities/Frequency Ratio)
  • Peak Systole/End Diastole (PS/ED Ratio)
  • End Diastole/Peak Systole (ED/PS Ratio)
• Heart Rate
• TAMAX (Time Averaged Maximum Velocity)
• Volume Flow [TAMEAN and Vessel Area]
• PI (Pulsatility Index)
• RI (Resistivity Index)
 	
Shear Wave Measurements/Calculations
• Stiffness
• Velocity
 	
Vascular Measurements/Calculations
• Carotid, Vertebral, Subclavian Measurements, Auto IMT
• Summary Worksheet
• Summary Report
 	
Small Part Measurement Analysis
• Koios DS Breast Lesion Decision Support
• Koios DS Thyroid Lesion Decision Support
	Obstetrics Measurements/Calculations
	• Gestational Age Calculation
	• Calculations and Ratios
	• EFW Calculation
	• Growth Percentiles
	• Multi-Gestational Calculation
	• Fetal Qualitative Description (Anatomical Survey)
	• Fetal Environmental Description (Biophysical profile)
	• Programmable OB Tables
	• Fetal Graphical Trending
	• Measurements / Calculations by: ASUM, ASUM 2001, Alexander, Bahlmann, Baschat, Berkowitz, Bertagnoli, Brenner, Campbell, CFEF, Chervenak, Chitty, Doubilet, Ebbing, Eik-Nes, Ericksen, Goldstein, Hadlock, Hansmann, Hellman, Hill, Hohler, Jeanty, JSUM, Kurmanavicius, Kurtz, Mari, Mayden, Mercer, Merz, Moore, Nelson, Osaka University, Paris, Pexsters, Rempen, Robinson, Shepard, Shepard/Warsoff, Sonek, Tokyo University, Tokyo/Shinozuka, WHO, Yarkoni
	• Over 20 selectable OB Calcs
	• Summary Worksheet
	• Summary Report
	
	Gynecology Measurements/Calculations
	• Ovarian, Uterine, Pelvic Floor, Endometrium, Follicular Measurements, Cervix
	• Summary Worksheet
	• Summary Report
	• Qualitative Description (Anatomical Survey)
	
	Urology Measurements/Calculation
	• Bladder, Prostate, Renal, Generic, Post-Void Bladder Volume Measurements
	• Summary Worksheet
	• Summary Report
	
	Cardiology Measurements/Calculations
	• Cardiology Measurements and Calculations
	• Summary Worksheet
	• Summary Report

Table 12-5: Biopsy Guides

• Single-Angle, disposable with a reusable bracket • Multi-Angle, disposable with a reusable bracket	• Single-Angle, disposable with a disposable bracket

Table 12-6: Inputs and Outputs Signal

• HDMI (with stereo audio) • S-Video	• Ethernet • Multiple USB 3.0 ports

Clinical Measurement Accuracy

Basic Measurements

The following information is intended to provide guidance to the user in determining the amount of variation or measurement error that should be considered when performing clinical measurements with this equipment. Error can be contributed by equipment limitations and improper user technique. Be sure to follow all measurement instructions and develop uniform measurement techniques among all users to minimize the potential operator error. Also, in order to detect possible equipment malfunctions that could affect measurement accuracy, a quality assurance (QA) plan should be established for the equipment that includes routine accuracy checks with tissue mimicking phantoms.

Please be advised that all distance and Doppler related measurements through tissue are dependent upon the propagation velocity of sound within the tissue. The propagation velocity usually varies with the type of tissue, but an average velocity for soft tissue is assumed. This equipment is designed for, and the accuracy statements listed on are based on, an assumed average velocity of 1540 m/s. The percent accuracy when stated applies to the measurement obtained (not the full scale range). Where the accuracy is stated as a percent with a fixed value, the expected inaccuracy is the greater of the two.

Basic Measurements (continued)

Table 12-7: System Measurements and Accuracies

Measurement	Units	Useful Range	Accuracy	Limitations or Conditions
Depth	mm	Full Screen	±20%	
Distance:				
Axial (Equal to 1540m/s)	mm	Full Screen	±3% or ±1mm, whichever is greater	
Lateral (Equal to 1540m/s)	mm	Full Screen	±5% or ±1mm, whichever is greater	Linear Probes
Lateral (Equal to 1540m/s)	mm	Full Screen	±6.5% or ±3.5mm, whichever is greater	Convex Probes
Lateral (Equal to 1540m/s)	mm	Full Screen	±5% or ±1mm, whichever is greater	Sector Probes
Axial/Lateral (Not Equal to 1540m/s)	mm	Full Screen	±7.5% or ±5.0mm, whichever is greater	All probes Not Equal To 1540m/s
Circumference:				
Trace (Equal to 1540m/s)	mm	Full Screen	±5% or ±1mm, whichever is greater	
Ellipse (Equal to 1540m/s)	mm	Full Screen	±5% or ±1mm, whichever is greater	
Trace (Not Equal to 1540m/s)	mm	Full Screen	±7.5% or ±5mm, whichever is greater	All probes Not Equal To 1540m/s
Ellipse (Not Equal to 1540m/s)	mm	Full Screen	±7.5% or ±5mm, whichever is greater	All probes Not Equal To 1540m/s
Area:				
Trace (Equal to 1540m/s)	mm^2	Full Screen	±10% or ±5mm^2, whichever is greater	
Ellipse (Equal to 1540m/s)	mm^2	Full Screen	±10%, or ±5mm^2, whichever is greater	
Trace (Not Equal to 1540m/s)	mm^2	Full Screen	±20% or ±20mm^2, whichever is greater	All probes Not Equal To 1540m/s
Ellipse (Not Equal to 1540m/s)	mm^2	Full Screen	±20% or ±20mm^2, whichever is greater	All probes Not Equal To 1540m/s
Time	s	Timeline Display	±5%, not to exceed 10ms	M or Doppler Mode
Slope	mm/s	Timeline Display	±5%, not to exceed 1mm/s	M-Mode Only

Table 12-7: System Measurements and Accuracies (Continued)

Measurement	Units	Useful Range	Accuracy	Limitations or Conditions
Doppler Sample Volume Depth (SVD)	mm	Full Screen	2mm (0.2cm) in any direction	When SVD is at least half the depth of the image
Velocity	cm/s	Full Range	10%	PW and CW Doppler Mode
Doppler Angle Correction	degrees	From 0-59° From 60-90°	±1% ±2%	
Shear Wave Speed Variation and Precision with Depth				
Velocity	m/s	Shear wave ROI	Absolute range <= 0.5 m/s or relative range <= 15%, whichever is greater, for C1-6-D and C1-6VN-D. Absolute range <= 0.5 m/s or relative range <= 10%, whichever is greater, for all other probes with shear wave elastography.	Normalized SD less than or equal to 5% for multiple repeated measurements over the range of depths for which measurements can be made, limited by shear wave penetration.
The formula for Stiffness: $E = 3 * rho * c^2$ Where E = Young's modulus of tissue rho = density of tissue (assumed to be 1 g/cc) c = shear wave speed in m/s *Note: The conversion from shear wave speed (m/s) to Young's modulus is done under the assumption that the underlying material in which the shear wave propagates is linear, isotropic, incompressible, and homogenous.* *Note: Relative Range = (Absolute Range / Actual Velocity).* *Note: Normalized SD = (SD) / Average Velocity.*				

Clinical Calculation Accuracy

Estimate the overall inaccuracy of a combined measurement and calculation by including the stated inaccuracy from the basic measurement accuracy statements.

Calculation formulas and databases are provided as a tool to assist the user, but should not be considered an undisputed database, in making a clinical diagnosis. The user is encouraged to research the literature and judge the equipment capabilities on an ongoing basis in order to assess its utility as a clinical tool.

V Nav Magnetic Field Data

For the Patient

DANGER

DO NOT use the Volume Navigation feature on any patient relying on life-sustaining electronic equipment, such as a pacemaker or defibrillator. Failure to follow this instruction could lead to interference with patient electronic device(s).

WARNING

The Tracker’s magnetic fields may possibly interfere with nearby electrical systems, e.g., an EKG. It is the users’s responsibility to identify nearby devices to ensure their performance is not degraded when you are simultaneously using Volume Navigation.

Electromagnetic Field Strength is measured in units called Tesla, or for smaller fields, milliTesla (mT). According to this article from the World Health Organization (WHO), https://www.who.int/peh-emf/publications/facts/fs299/en/, people with pacemakers should avoid fields that exceed 0.5 mT.

The electromagnetic field created by the transmitter in our Volume Navigation offering is 0.5 mT once you are 7.5cm away from the transmitter face and goes down quickly after that (0.1 mT at 18cm away, e.g.). Nevertheless, we recommend not using V Nav on patients relying on a pacemaker or defibrillator.

V Nav Magnetic Field Data (continued)

For the Operator

The World Health Organization website addresses many items regarding exposure to electro-magnetic (EM) fields at http://www.who.int/peh-emf/about/WhatisEMF/en/index.html (see extract below).

Extracted from World Health Organization:

"Many people are surprised when they become aware of the variety of magnetic field levels found near various appliances. The field strength does not depend on how large, complex, powerful or noisy the device is. Furthermore, even between apparently similar devices, the strength of the magnetic field may vary a lot. For example, while some hair dryers are surrounded by a very strong field, others hardly produce any magnetic field at all. These differences in magnetic field strength are related to product design. The following table shows typical values for a number of electrical devices commonly found in homes and workplaces. The measurements were taken in Germany and all of the appliances operate on electricity at a frequency of 50 Hz. It should be noted that the actual exposure levels vary considerably depending on the model of appliance and distance from it."

In the context of this, the VNav transmitter has the following EM field strengths at various distances from the transmitter face:

- 928µT at 5.1cm (2 inches) distance
- 287µT at 10.2cm (4 inches) distance
- 64µT at 20.3cm (8 inches) distance
- 11µT at 40.6cm (16 inches) distance
- 2.4µT at 71cm (28 inches) distance

NOTE: Note that the field is only active when the green light on the position sensing electronics unit is on. This is the same unit that the transmitter plugs into.

V Nav Magnetic Field Data (continued)

Typical Magnetic Field Strength Data

Typical magnetic field strength commonly found in your home are shown below:

Table 12-8: Typical magnetic field strength of household appliances at various distances

Electric Appliance	3 cm Distance (µT)	30 cm Distance (µT)	1 m Distance (µT)
Hair Dryer	6 – 2000	0.01 – 7	0.01 – 0.03
Vacuum Cleaner	200 – 800	2 – 20	0.13 – 2
Portable Radio	16 - 56	1	< 0.01
Microwave Oven	73 - 200	4 - 8	0.25 - 0.6
Fluorescent Light	40 – 400	0.5 - 2	0.02 - 0.25
Electric Oven	1 - 50	0.15 - 0.5	0.01 - 0.04

Privacy and Security

Introduction

Privacy & Security considerations, capabilities and configuration of the LOGIQ Totus Ultrasound System are described in the LOGIQ Totus Privacy and Security Manual, available in the GE HealthCare Product Security Portal at the GE HealthCare Documentation Library website at:

https://www.gehealthcare.com/support/documentation

Privacy & Security Environment

The GE HealthCare LOGIQ Totus Ultrasound System has been designed for an intended use with the following expectations of Privacy & Security protections included in the environment where this product will be used:

- The system should be connected to a secured LAN or VLAN, configured and segmented according to appropriate networking best practices, not open to unintended users or generally connected to a WAN.
- The LOGIQ Totus Ultrasound System should be physically secured in such a way that it is not accessible to unintended users.
- Default application users and passwords should be replaced with customized users and passwords.
- External media containing images, patient data, reports and logs should be secured. When no longer used, the data should be securely erased and/or the media should be securely deleted.
- The monitors of the LOGIQ Totus Ultrasound System should be placed in a way limiting the visibility of the screen content to the user only.

How to contact GE HealthCare

For privacy and security concerns regarding GE HealthCare products, visit to : https://www.gehealthcare.com/security

Identity Provisioning

The provisioning of user accounts includes the steps of account creation, maintenance, and suspension of the account when it is no longer needed. A user account is created for the use by a specific individual. It is associated with access rights.

Management of user accounts

User accounts are created, maintained and suspended by users with administrator privileges. When received from factory the system has three predefined user accounts:

- “ADM”: an administrative user account
- “USR”: a normal user account template without administrative privileges
- “EUSR” : an emergency user account template with limited privileges

When receiving the LOGIQ Totus Ultrasound System, it is recommended to do the following steps to ensure control of the user accounts on the system:

- Change the password of the “ADM” account.
- Change the password of the “USR” user account.
- Create groups for local or LDAP users and set their rights/ privileges appropriately for your workflows and operating environment.
- Create user accounts for each individual user of the system:
    - Give each user the needed group memberships / privileges.
    - Make sure to give administrative privileges only to users intended to perform administrative tasks on the system, like configuring dataflows, managing users on the system, inspecting audit logs etc. As administrative privileges may give the user access to privacy and security related configurations on the system, there should be a limited number of users with these privileges.
    - It is recommended to create individual users for each user of the system. This is particularly relevant for the audit logging, to associate actions performed on the system with individual persons.

Identity Provisioning (continued)

Maintenance of user accounts

It is recommended to establish administrative routines for removing user accounts no longer being used.

User information stored on the system

The following information can be entered for a user defined on the system:

- User ID / User name (Required)
- Display ID (Optional)
- Last name (Required)
- First name (Optional)
- Title (Optional)
- Phone number (Optional)
- E-mail address (Optional)
- Address (Optional)

The user password is encrypted and not accessible in the system.

User name and password restrictions

The restrictions for usernames and passwords are:

- User names can be 1 - 32 characters long.
- Password can be 0 - 256 characters long.

It is recommended to enable and configure username and password policies as described below.

Identity provisioning by use of Backup/Restore

Users defined on a system can be copied from one system to another by use of the system's built-in Backup/Restore functionality.

Network Infrastructure

The infrastructure of the network where the LOGIQ Totus Ultrasound System is connected must be configured to allow traffic. For information on inbound and outbound firewall configuration, refer to the LOGIQ Privacy and Security Manual, available in the GE HealthCare Product Security Portal at:

https://www.gehealthcare.com/en-US/security

Anti-Virus Software Note

LOGIQ Totus Security

Since the LOGIQ systems are integrated into your IT-network, GE HealthCare wants to make sure that you are aware of the proactive measures we are taking to secure the system. Below are measures we have implemented to secure the LOGIQ systems.

- Use of Windows* Embedded Standard 10, a componentized version of Windows 10 specifically made for embedded systems. Only the components required are used for the LOGIQ scanners, thereby reducing the OS attack surface. Please note that Windows 10 ioT Enterprise is NOT the same operating system as Windows 10.
- Disabled the user's ability to access the internet and Windows desktop.
- Disabled, or made inaccessible, functionality that is typically used as malware vectors for spreading viruses (e.g. email services, web browsers).
- Disabled AutoRun functionality on removable media.
- Closed network entry points that are not in use by the LOGIQ scanner software by strict firewall configuration and by disabling Services. The only Internet connection needed is on outbound port to GE HealthCare's remote service platform (Insite™ ExC), which is only opened on request by the user and through a secure HTTPS connection (port 443), and inbound and outbound connections through port 104 for DICOM connectivity.

LOGIQ Totus Security (continued)

- System provides user access controls under customer management to control scanner access.
- Uses secure integration and communication between systems (Scanners, Workstations and Servers).
- Monitor public security bulletins from software vendors and news services, analyze for applicability to the LOGIQ scanner, and include third party software security patches as necessary within GE HealthCare software.
- Release GEHC Ultrasound validated software or use other measures as necessary to resolve or mitigate product vulnerabilities.
- Assess potential vulnerabilities of our systems using up-to-date commercially available vulnerability scanning tools. Identified vulnerabilities are mitigated as appropriate based on risk assessment of the product.

GE HealthCare believes that this Defense in Depth strategy using the combination of the security measures above and the security standards of Microsoft Windows 10 ioT Enterprise will provide security against malware, especially for a system used in a professional hospital grade networking environment that itself should provide a high level of security measures.

Finally, a few points as to why GE HealthCare (as well as all other manufacturers of PC-based medical Ultrasound devices) do not use Anti-Virus software: Commercial Anti-Virus software is commonly used on general-purpose computers to detect the presence of malicious software (e.g. virus, Trojan horse, worm). Anti-Virus software is useful on general-purpose computers as they typically cannot be sufficiently hardened against the attack vectors used by malicious software.

LOGIQ Totus Security (continued)

The LOGIQ ultrasound systems however are single purpose (dedicated) devices that have controlled intended use, and thus are well hardened. For the LOGIQ ultrasound systems, the potential patient safety and security risks introduced by using commercial Anti-virus software would outweigh the security benefits. Such risks include:

- Real-time anti-virus scanning can affect ultrasound system performance.
- The effectiveness of Anti-Virus software depends on regular updates of the virus definitions files. This would typically require internet connectivity for the ultrasound system.
- The Anti-Virus software itself is a popular attack vector.
- Disruptive nature of the support of the Anti-Virus software throughout the life cycle of the medical device. The operating system of a medical ultrasound system is part of a medical device that requires a special and controlled release process. Any update of the Anti-Virus software would require a change of the system software.

Due to the cited risks, the use of commercial anti-virus software is not part of the LOGIQ systems product security strategy.

*Microsoft and Windows are trademarks of Microsoft Corporation.

Loading Windows Patches

Loading a Windows Patch

As part the product lifecycle management, GE HealthCare regularly analyzes and integrates software updates from our third party vendors into our products. These are typically released as part of regular updates or software releases.

To load a Windows patch onto the LOGIQ Totus:

1. Power down the LOGIQ Totus and insert the Windows Patch USB Flash Drive into a rear USB port.

NOTE: Ensure that the system is USB Device Enabled (check setting on System Admin Utility page).

2. Power on the LOGIQ Totus. Windows Patch files will be loaded onto the LOGIQ Totus automatically, following several screen prompts:
   a. Select **Install SW...** on the Start Application screen.
   b. Select OK on the first StartLoader screen.
   c. Select the package and then select Install on the second StartLoader screen; software patch installation will begin.

NOTE: The Patch package is installed at the root folder or under the SWLoad directory in the root folder of the USB.

   Multiple screens appear during the software re-imaging installation process. **DO NOT** interrupt this process **AND** follow instructions as they appear on the display.

   d. Once the installation is complete, a message displays saying that the “Software Installation completed successfully. System will reboot soon.” The LOGIQ Totus restarts.

3. When the system starts up after the software installation has finished, the following dialog displays: the “New Software Verification” Checklist.

Performing Software Patch Verification

The Software Patch Verification dialog is **critical**. You **MUST** perform software verification after downloading and installing a software update.

a. If you are able to successfully perform each function, then Pass all of the items and type your name into the Signature box and press OK. Press the Question Mark if you have questions about how to perform this task.

CAUTION

Perform a check for all the features listed. You **MUST** ensure that the entire system functions normally, as expected, in each of the categories listed on the New Software Verification checklist.

These verification results are tracked for regulatory purposes, sent back to GE HealthCare for tracking, and approved with your signature.

b. As you verify that each feature works correctly, select “Passed.” If all features work correctly and “Passed” is filled in for all features, then the signature field is enabled at the bottom of the New Software Verification Checklist.

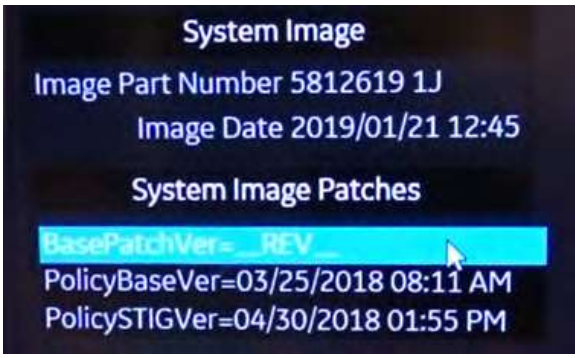
Type your signature (minimum of three characters) and press ***OK***. The system is now ready for use.

Performing Software Patch Verification (continued)

CAUTION

If any of the features **DID NOT** function as expected, you need to select “Failed” next to the feature that failed. Type your signature (minimum of three characters) and press ***Reload***.

The version of the installed Patch appears on the Utility--> System--> About page.



Performing Software Patch Verification (continued)

c. If one of the steps fails, then Fail the item(s).

d. Type your **Signature**, then press **Reload**. The previous version of software will be reloaded onto the system automatically.

e. Load the latest system patch which should be stored with the software located under the LOGIQ Totus covers.

Patch Installation Notes

If by accident you try to load a patch that is not compatible with the software on the LOGIQ Totus, an error message will notify you of this incompatibility.

If there is any issue with the media, an error message will indicate “The package cannot be installed. The package is not compatible or has been tampered. Please contact GE HealthCare Service.”

The system may reboot multiple times during patch/software update.

If the software reload fails, an error message will indicate “Software Reload operation failed. Please contact GE HealthCare Service.”

Reloading Software

When reloading software, you will need to reload the latest system patches which should be stored with the software located under the LOGIQ Totus covers.

Software Download

Overview

The LOGIQ Totus is designed to download software updates when they are available. Software Download monitors, notifies, delivers and installs available system software updates. This feature requires active InSite ExC connectivity.

When system software is available for download, a Software Download icon appears in the system status bar at the bottom of the monitor screen.

Table 12-9: Software Download Icons

	Software Download Available Icon
	Software Download In Progress Icon
	Software Download Paused Icon
	Software Download Complete/Ready to Install Icon
	Software Download Information Icon

Software Download Available

When the “Software Download Available” icon appears in the status bar, select the icon to bring up the following Software Download and Install menu. Choose the desired option.

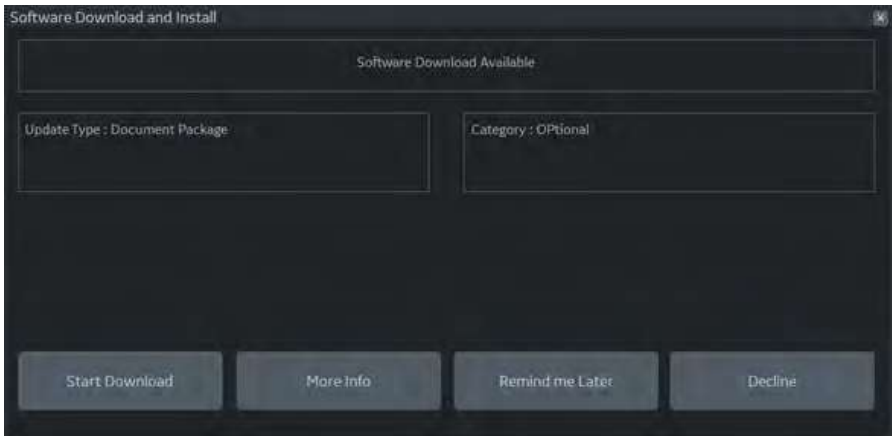


Figure 12-1. Software Download and Install Menu

Start Software Download and Install

1. Select **Start** to begin the software download. The software download status displays in the menu and the Software Download in Progress icon appears in the system status bar at the bottom of the monitor.

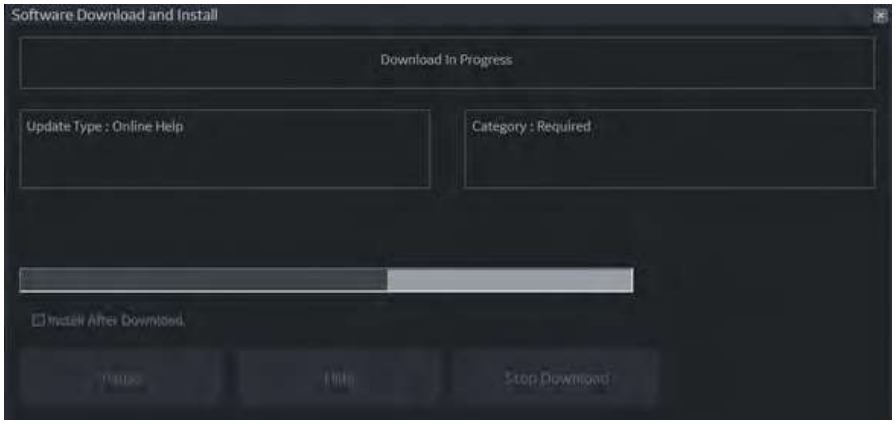


Figure 12-2. Software Download in Progress

While the software is downloading, you can choose to pause the download, hide the Software Download and Install menu or stop the download.

- Select **Pause** to temporarily pause the download. The Software Download Paused icon appears in the system status bar. Select the icon again to bring up the Software Download menu and press **Resume** to resume the download from the previous download point.

Start Software Download and Install (continued)

- Select **Hide** to hide the Software Download menu (the download continues in the background). The Software Download in Progress icon appears in the system status bar. Select the icon again to bring up the Software Download menu.
- Select **Stop Download** to discontinue the download process. The download progress is not saved, and the Software Download Available icon must be selected again to bring up the Software Download menu to restart the software download process.

2. When the download is complete the Software Download and Install menu informs you the software is ready to install.

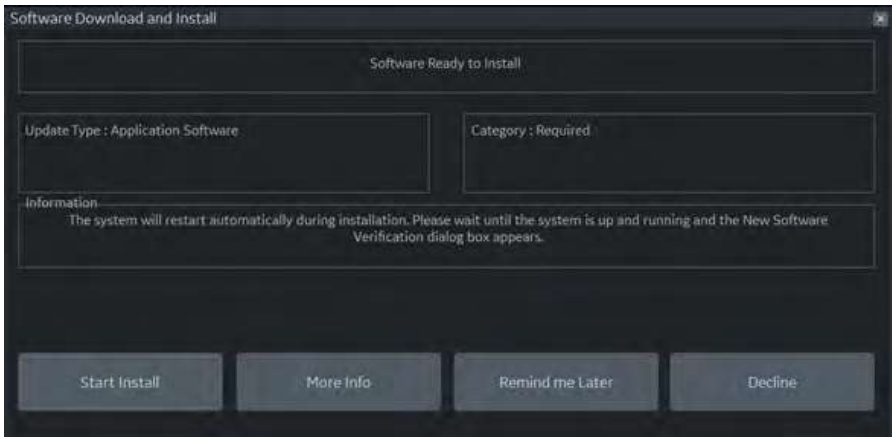


Figure 12-3. Software Ready to Install Menu

Select **Start** to begin the installation. The installation begins and the software Installation in Progress status is displayed.

Start Software Download and Install (continued)

3. **New Software Verification** - When the software package installation is complete, the system shuts down and restarts. When the system restarts, the New Software Verification checklist dialog displays. You **MUST** perform the new software verification.

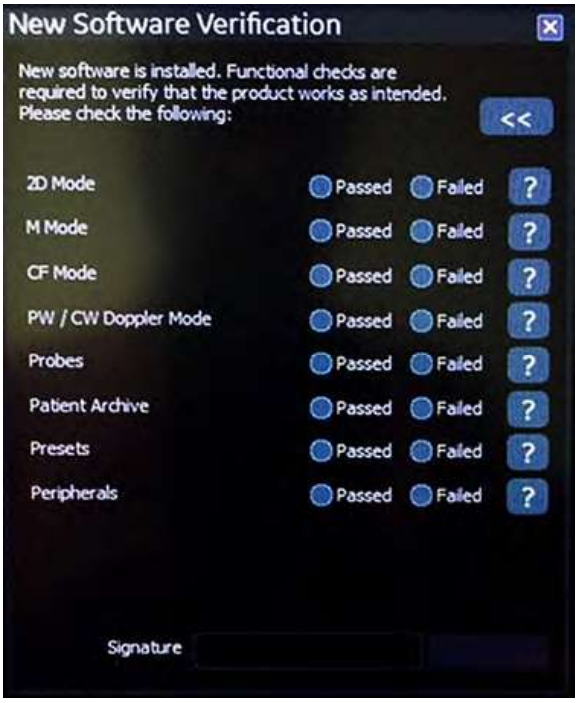


Figure 12-4. New Software Verification Dialog

CAUTION

Perform a check for all the features listed. You MUST ensure that the entire system functions normally, as expected, in each of the categories listed on the New Software Verification checklist.

As you verify that each feature works correctly, select “Passed.” If all features work correctly and “Passed” is filled in for all features, then the signature field is enabled at the bottom of the New Software Verification Checklist. Type your signature (minimum of three characters) and press OK. The system is now ready for use.

If any of the features **DID NOT** function as expected, you need to select “Failed” next to the feature that failed. Type your signature (minimum of three characters) and press Reload.

Contact your GE HealthCare Service Representative for assistance.

More Info

Select **More Info** from the Software Download and Install menu to see details about the available software download.

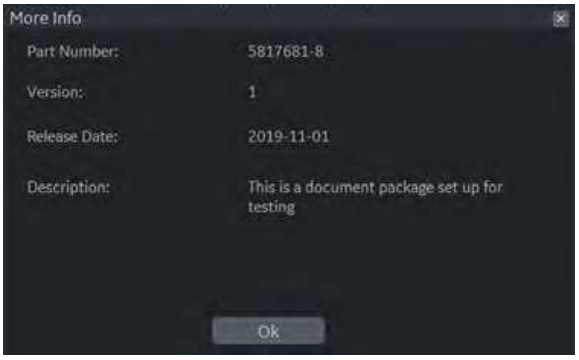


Figure 12-5. More Info

Remind Me Later

Select **Remind Me Later** to close the Software Download and Install Menu and download the software at a later time. The Software Download Available icon remains in the system status bar at the bottom of the monitor screen.

Decline

Select **Decline** to decline the software download package. A popup displays.

Figure 12-6. Decline Software Download Package Popup

You can then select **OK** or **Cancel**.

- Select **OK** to decline the package. You must then enter a signature consisting of three or more characters.

  OR

- Select **Cancel** to go back to the Software Download and Install menu.

Base Image and Software Load

Base Image and Software Load Procedure

For the Base Image and Software Load procedure, refer to the LOGIQ Totus Basic Service Manual.

Copyrighted Material

Viewing Copyrighted Third Party Software License Information

The LOGIQ Totus contains copyrighted material. For more information, you can view Copyrighted Third Party Open Source Software Licenses via the Utility-> System-> Licenses page.

- Select Utility-> System-> Licenses
- Scroll to select the license you wish to view in the License Title section. Press Set.

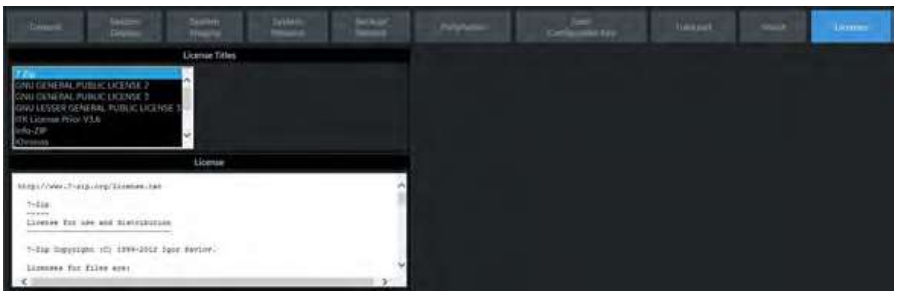


Figure 12-7. Third Party Software License Information

- The selected software license appears in the License window. Use the Set+Trackball to scroll through the license.

System Care and Maintenance

Overview

Refer to Section 10 of the LOGIQ Totus Service Manual for any additional maintenance guidance.

The user must ensure that safety inspections are performed at least every 12 months according to the requirements of the patient safety standard IEC 60601-1. Refer to the Service manual, Chapter 10.

Only trained persons are allowed to perform the safety inspections mentioned above.

Technical descriptions are available on request.

To ensure that the unit constantly operates at maximum efficiency we recommend that the following procedures be observed as part of the customer's internal routine maintenance program.

Contact the local Service Representative for parts or periodic maintenance inspections.

Expected Service Life Description

The expected service life for the LOGIQ Totus system and probes is identified in this table:

Table 12-10: Expected Service Life

Equipment / Accessory	Expected Service Life
LOGIQ Totus system	The expected service life for the LOGIQ Totus is at least seven (7) years from the manufacturing date under the provision of regular maintenance by authorized service personnel.
LOGIQ Totus Probes	The expected service life for the LOGIQ Totus probes meets or exceeds five (5) years from the date the probe is placed in service, under the provision that the customer follows the care instructions provided on the Probe Care Card / Accompanying LOGIQ Totus Instructions for Use.

Maintenance Schedule

Follow this Maintenance Schedule to maintain optimum system function and patient care:

Table 12-11: LOGIQ Totus Maintenance Schedule

Monthly	Weekly	Daily	After Each Patient

Inspect the following on a monthly basis:
• Connectors on cables for any mechanical defects.
• Entire length of electrical and power cables for cuts or abrasions.
• Equipment for loose or missing hardware.
• Control panel and keyboard for defects.
• Casters for proper movement and locking operation.
	Clean the following on a weekly basis:
	• Console
	  • System Cabinet
	  • Removable Trackball/Trackball
	  • Air Filters (weekly, or as needed)
	  • Footswitch
	  • B/W Printer
	• Monitor and Monitor Frame
	• Operator Controls and Touch Panel
		Clean and Disinfect the following areas where Cross Contamination can occur:
		• Operator Panel and Touch Panel
		• Monitor Frame
		• Front and Rear Handles
			Clean and Disinfect the following after each patient:
			• Probe
			• Biopsy Bracket, as applicable
			Additionally, Clean and Disinfect any area on the system that has visible contamination from the previous exam.
			Note: Biopsy Accessories must be cleaned and disinfected or disposed of after each patient. Refer to the Probes Chapter, for probe cleaning and disinfecting instructions.

DANGER

To avoid electrical shock hazard, do not remove panels or covers from console. This servicing must be performed by qualified service personnel. Failure to do so could cause serious injury.

If any defects are observed or malfunctions occur, do not operate the equipment but inform a qualified service person. Contact a Service Representative for information.

Cleaning and Disinfecting the System

WARNING

All cleaners and disinfectants **NOT** on this list are **unapproved** by GE HealthCare. Failure to follow guidelines could result in damage to the device.

CAUTION

When reprocessing the operator control panel, make sure not to spill or spray any liquid on the controls, into the system cabinet, or in the probe connection receptacle.

CAUTION

To avoid liquids entering the product, **DO NOT** spray any liquid directly onto the surfaces. **ALWAYS** use a cloth or wipe.

CAUTION

Avoid using ALCOHOL (ISOPROPANOL) 70% inside the trackball. ALCOHOL (ISOPROPANOL) 70% may also compromise the durability of the paint used on the console controls.

CAUTION

Oxivir TB Wipes may compromise the durability of the paint used on the console handles and controls. Avoid the use of any Hydrogen Peroxide (H2O2) based disinfectants on the HDU monitor, as it may result in damage to screen.

These cleaners/disinfectants can be used anywhere on the console (Operator Panel, Monitor, Probe Holders, etc.), except for the probes. Refer to ‘Probe Disinfectants’ on *page 11-41* for probe disinfectant information and web links.

Always consult the cleaner or disinfectant manufacturer’s instructions for proper use of their product. Wear appropriate PPE as indicated by the manufacturer.

Cleaning and Disinfecting the System (continued)

Appropriate cleaners/disinfectants for the console that have been validated for compatibility are shown below:

Table 12-12: Appropriate Cleaners/Disinfectants

Product	Manufacturer	Notes	Chemistry	Locale	Cleaner/ Disinfectant
Acryl-Des Wipes	Schülke & Mayr GmbH	Same as Mikrozid Sensitive Wipes also by Schulke	Quat	Europe	Cleaner/ Disinfectant
Alcohol (Isopropanol) 70%	Generic		Alcohol	Global	Disinfectant
Cleanisept Wipes	Dr. Schumacher GMBH	Same as GE HealthCare branded Septiwipes	Quat	Europe	Cleaner/ Disinfectant
Clinell Clorox Wipes	GAMA HealthCare	Same formula as Clorox Healthcare Bleach Germicidal Wipes sold in USA	Bleach	Europe	Cleaner/ Disinfectant
Clinell Universal Sanitizing Wipes	GAMA HealthCare		Quat+ Polyhexanide (PHMB)	Europe	Cleaner/ Disinfectant
Clorox HealthCare Bleach Germicidal Wipes	Clorox Professional	Same formula as Clinell Clorox Wipes	Bleach	US Canada Europe	Cleaner/ Disinfectant
Easy Screen Cleaning Wipes	Professional Disposables Inc. (PDI)	This product is 70% IPA	Alcohol	US	Disinfectant
Mikrobac Tissues	BODE Chemie GmbH		Quat	Europe	Cleaner/ Disinfectant
Mikrozid Sensitive Wipes	Schülke & Mayr GmbH	Same formula as Acryl-Des wipes	Quat	Europe	Cleaner/ Disinfectant
Oxivir TB Wipes	Sealed Air		H2O2	US Canada	Cleaner/ Disinfectant
Protex Ultra Wipes	Parker Laboratories	Same formula as SONO Wipes	Quat	US	Cleaner/ Disinfectant

Table 12-12: Appropriate Cleaners/Disinfectants (Continued)

Product	Manufacturer	Notes	Chemistry	Locale	Cleaner/ Disinfectant
Sani-Cloth HB Germicidal Disposable Wipe	Professional Disposables Inc. (PDI)		Quat	US	Cleaner/ Disinfectant
Sani-Cloth Plus Germicidal Disposable Cloth	Professional Disposables Inc. (PDI)	Same Formula as Asepti Wipes II	Quat + Alcohol	US	Cleaner/ Disinfectant
Sani-Cloth Prime Germicidal Disposable Cloth	Professional Disposables Inc. (PDI)		Quat + Alcohol	US	Cleaner/ Disinfectant
Septiwipes	EDM Medical Imaging	Same formula as Cleanisept Wipes	Quat	Europe	Cleaner/ Disinfectant
Sodium Hypochlorite 5.25% (Bleach) diluted 10:1	Generic	Same formula as Clorox Healthcare Bleach Germicidal Wipes sold in USA	Bleach	Worldwide	Cleaner/ Disinfectant
SONO ULTRASOUND WIPES	Advanced Ultrasound Solutions, Inc.		Quat	US	Cleaner/ Disinfectant
Super Sani-Cloth Germicidal Disposable Wipes	Professional Disposables Inc. (PDI)		Quat + Alcohol	US	Cleaner/ Disinfectant
Tristel Distel	Tristel		Quat+PHMB	Europe	Cleaner/ Disinfectant
Trophon Companion Cleaning Wipes	Nanosonics	Same formula as SONO Wipes	Quat	US	Cleaner/ Disinfectant
Virox Accel TB wipes	Virox Technologies Inc. (owned by Sealed Air)	Same formula as Oxivir TB	H202	CAN	Cleaner/ Disinfectant

Console

Cleaning the LOGIQ Totus Console

The LOGIQ Totus Console includes the System enclosure, Monitor, Monitor Frame, Operator Panel, Touch Panel, and Probe Holders. For Probes Reprocessing, see ‘Probe Reprocessing’ on *page 11-19*.

Always clean visible soil from surfaces first before disinfecting the Console.

Follow the cleaning/disinfecting frequency suggested in ‘Maintenance Schedule’ on *page 12-33*.

To clean the system,

1. Moisten a soft, non-abrasive folded cloth with a mild, general purpose, non-abrasive soap and water solution or approved cleaning/disinfecting agent.

NOTE: The cloth/wipe should be damp, not dripping wet and running. Moisture should not drip into the crevices anywhere on the console.

NOTE: Refer to Table 12-12 on page 12-35 for a list of acceptable solutions to be used on the Console.

2. Use a gentle wiping action to clean any surface on the console.

HINTS

A scrubbing action with the wipe may be necessary to help remove stubborn soil from the surfaces. However be careful with this action over cervices and gaps in the surface to prevent liquid from being scraped off the wipe and entering the product.

3. Wipe off excess cleaning agents.

NOTE: Do not spray any liquid directly into the unit.

NOTE: DO NOT scratch or press on the panel with any sharp objects, such as pencils or pens, as this may result in damage to the panel.

Disinfecting the LOGIQ Totus Console

For disinfectants to be effective, the surface must first be clean. Refer to ‘Cleaning the LOGIQ Totus Console’ on *page 12-37*.

ALWAYS follow the manufacturer’s instructions concerning the use of the disinfectant and follow the contact time to be sure the disinfectant’s kill claims are accomplished.

Follow the cleaning/disinfecting frequency suggested in ‘Maintenance Schedule’ on *page 12-33*.

Disinfect the desired surfaces of the console. To prevent cross contamination, surfaces that are often touched during exams should be disinfected after every patient. To disinfect the system,

1. Moisten a sterile cloth with a liquid disinfectant or remove pre-moistened disinfectant wipe from the container.

CAUTION

If a cleaner/disinfectant wipe was used to clean off visible soil per the above section, a second, fresh cleaner/ disinfectant product should be used for the disinfectant step.

2. Wet the surfaces by gently applying the cloth or wipe. Avoid high pressure or squeezing the wipe to avoid having the liquid enter the gaps and cervices of the Console. Scrubbing is not necessary in the disinfecting step; evenly applying the liquid is the goal.
3. Let the surface remain wet for the appropriate contact time.
4. If the surface does not remain wet for the full contact time, apply an additional application of the disinfectant, as necessary, to extend the time.
5. After the contact time has expired, remove excess liquid with a dry sterile cloth.
6. To avoid disinfectant buildup, or to remove disinfectant residue which may cause skin irritation, perform a rinse step with a sterile damp cloth.

Probe Cleaning Notes

When cleaning/disinfecting probes, take care **NOT** to damage the Console with a solution that is approved for the probe but that **IS NOT APPROVED** for the Console. Refer to 'Probe Disinfectants' on *page 11-41* for a list of acceptable solutions to be used on the Console. Refer to the Probes Chapter, for probe cleaning and disinfecting instructions.

CAUTION

NEVER use any cleaner or disinfectant containing alcohol.

When cleaning/disinfecting probes using a spray cleaner/ disinfectant, DO NOT spray the probe while the probe is set in its probe holder on the Ultrasound system.

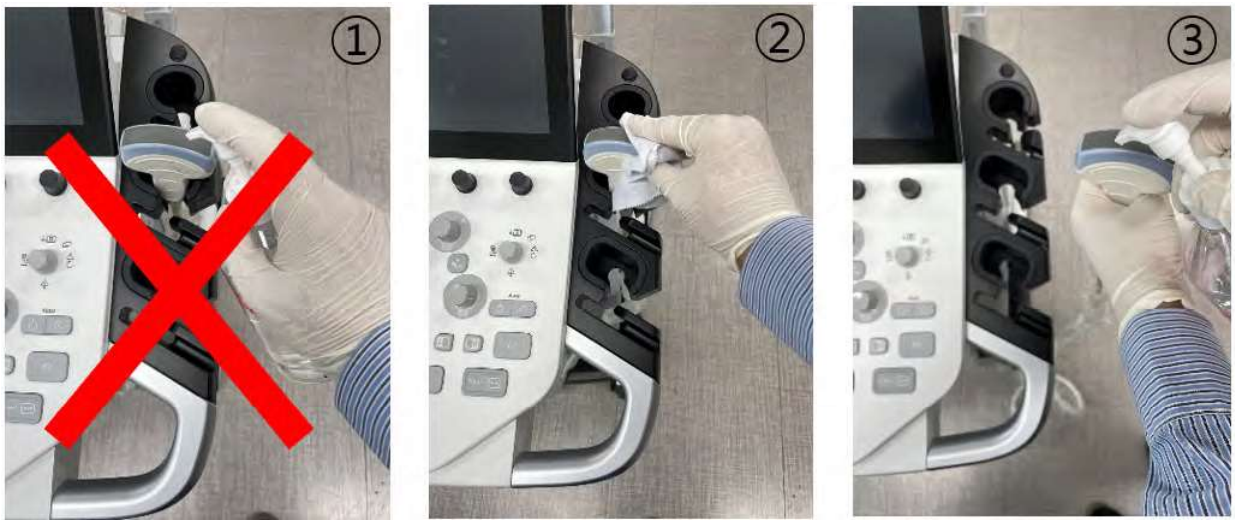


Figure 12-8. DO NOT Spray a Probe While in its Holder

1. Spraying the probe while the probe is set in its probe holder can damage the Control panel.
2. If you are cleaning/disinfecting probes while they are on the ultrasound system, use a wipe cleaner/disinfectant.
3. Keep away from the ultrasound system while using a spray cleaner.

Monitor and Monitor Frame

Monitor

To clean the Monitor:

1. Moisten a soft, non-abrasive folded cloth with a mild, general purpose, non-abrasive soap and water solution.

NOTE: The cloth should be damp, not dripping wet.

2. Wipe down the top, front, back, and both sides of the monitor.
3. Wipe off excess cleaning agents.

NOTE: Never use thinner, benzene, alcohol (ethanol, methanol, or isopropyl alcohol), abrasive cleaners, or other strong solvents, as these may cause damage to the monitor.

Monitor Frame

To clean the monitor frame:

1. Moisten a soft, non-abrasive folded cloth with a mild, general purpose, non-abrasive soap and water solution.

NOTE: The cloth should be damp, not dripping wet.

2. Wipe down the top, front, back, and both sides of the monitor frame.
3. Wipe off excess cleaning agents.

Other acceptable cleaning agents are:

- Ammonia
- Bleach (10 to 1 ratio of water to 5% home bleach)
- Hydrogen Peroxide / Hydrogen Peroxide Wipes

NOTE: DO NOT scratch or press on the panel with any sharp objects, such as pencils or pens, as this may result in damage to the panel.

Operator Controls and Touch Panel

ONLY USE the following cleaners on the LOGIQ Totus Operator Panel:

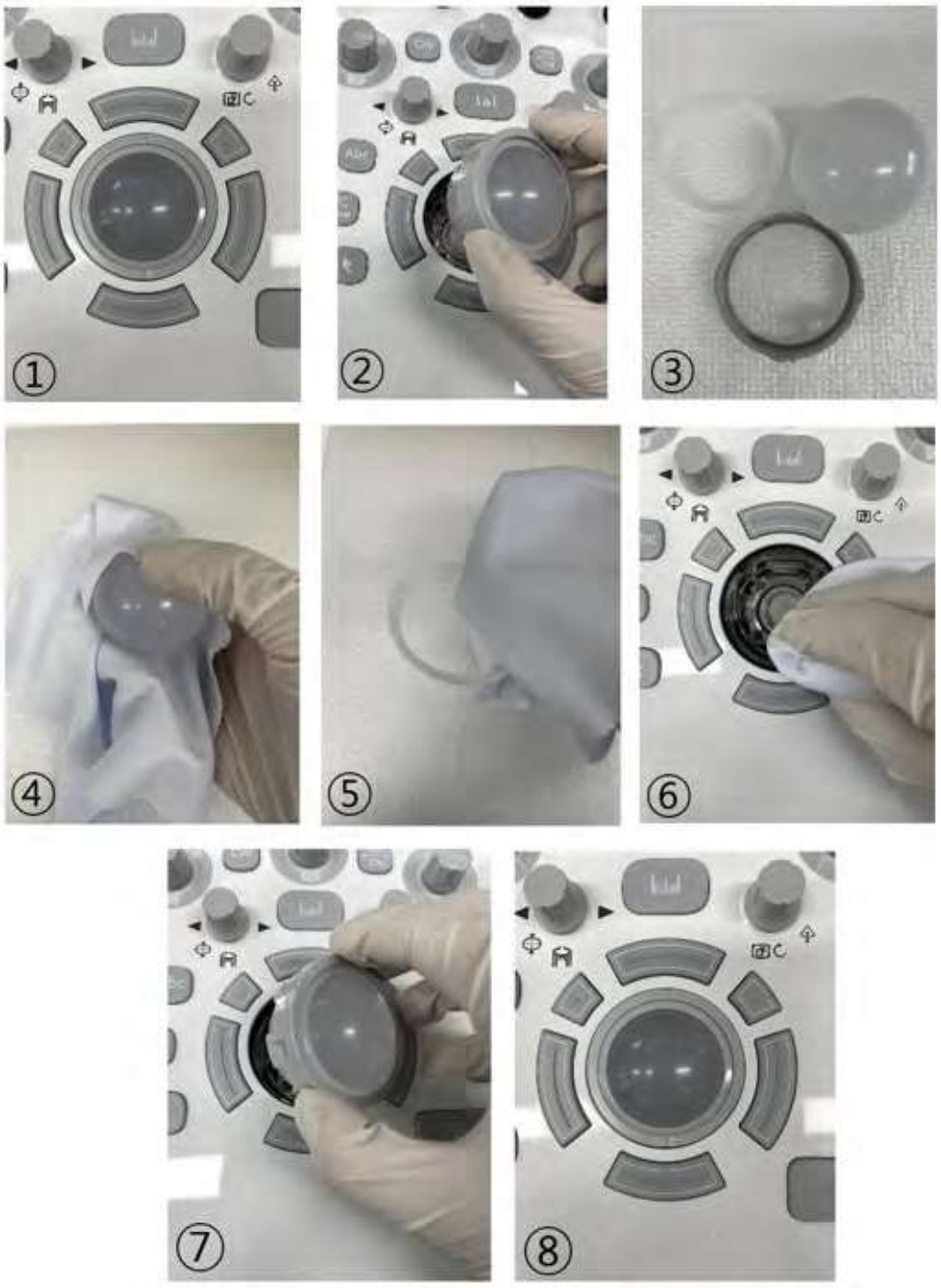
- Palmolive Dishwashing Liquid (manufactured by Colgate-Palmolive, www.colgatepalmolive.com)
- Sani-Cloth® HB, green cap (manufactured by Professional Disposables International, www.wearepdi.com). *NOTE: May cause yellowing to the operator panel and probe cabling.*
- Super Sani-Cloth®, purple cap (manufactured by Professional Disposables International, www.wearepdi.com)
- Sani-Cloth® Prime, plum cap (manufactured by Professional Disposables International, www.wearepdi.com)
- Sono® Ultrasound Wipes (manufactured by Advanced Ultrasound Solutions, Inc, www.UltrasoundWipes.com)
- Bleach (10 to 1 ratio of water to 5% home bleach)
- Hydrogen Peroxide / Hydrogen Peroxide Wipes

DO NOT USE:

- Cleaners or Disinfectants **NOT** listed above

Cleaning the Trackball

To clean the Trackball,



1. Twist and remove the trackball prior to cleaning both the trackball and trackball housing. (1-3)
2. Clean the trackball and trackball housing with dry, soft cloth. (4-6)
3. After cleaning the trackball, replace and twist the trackball into the trackball housing. (7-8)

Other Maintenance

Cleaning the air filter

Clean the system's air filters to ensure that a clogged filter does not cause the system to overheat and reduce system performance and reliability. It is recommended the filters be cleaned every two weeks, but the requirements will vary due to your system use.

CAUTION

Be sure to lock the wheels before cleaning the air filters to avoid injury by any unexpected movement of the system.

DO NOT operate the unit without the air filters in place.

Allow the air filters to dry thoroughly before re-installing them on the unit.

Cleaning rear cover air filter

1. Pull the rear cover.

Figure 12-9. Remove the rear cover

Cleaning rear cover air filter (continued)

2. Unlock the air filter and pull out from the rear cover.

Figure 12-10. Remove the air filter

3. Dust the filter with a vacuum cleaner and/or wash it with a mild soapy solution.

   If washed, rinse and dry the filter before re-installation.
4. Put back the air filter into rear cover and assemble the rear cover.

Cleaning side cover left/right air filter

1. Pull out the side cover left or right.

Figure 12-11. Remove the side cover left or right

Cleaning rear cover air filter (continued)

2. Unhook the air filter and pull out from the frame.

Figure 12-12. Remove the air filter

3. Dust the filter with a vacuum cleaner and/or wash it with a mild soapy solution.

   If washed, rinse and dry the filter before re-installation.

4. Put back the air filter into side cover left or right and assemble the rear cover.

Cleaning Straoge Tray and TVTR probe holder

Cleaning Base Tray

1. Push up the base tray from the bottom and disassemble from the system.
2. Wash the tray with mild detergent.
3. Thoroughly dry the tray using a clean, low-lint, soft cloth or wipe.
4. Attach the tray to the system.

Figure 12-13. Disassemble the base tray

Cleaning the Control panel rear tray (Option)

1. Unhook 3 hooks on the bottom of the tray.
2. Pull the tray with the arrow direction.
3. Wash the tray with mild detergent.
4. Thoroughly dry the tray using a clean, low-lint, soft cloth or wipe.
5. Attach the tray to the system.

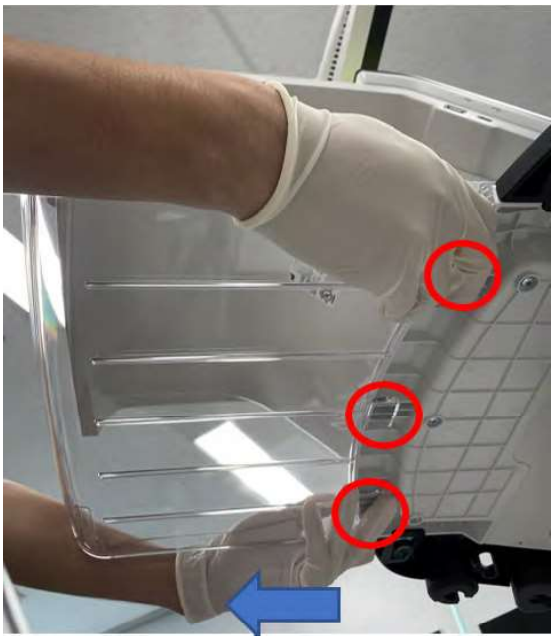


Figure 12-14. Disassemble the Control panel rear tray

Cleaning the Control panel rear tray (Option)

1. Grab the rear basket with 2 hands and pull up to disassemble.
2. Wash the tray with mild detergent.
3. Thoroughly dry the tray using a clean, low-lint, soft cloth or wipe.
4. Attach the tray to the system until the clicking sound heard.

Figure 12-15. Disassemble the rear basket

Cleaning Straoge Tray and TVTR probe holder (continued)

Cleaning TVTR Probe Holder

1. Pull the hook to disassemble the probe holder from the system.
2. Wash the probe holder with mild detergent.
3. Thoroughly dry the probe holder using a clean, low-lint, soft cloth or wipe.
4. Put the probe holder to the original position.

Figure 12-16. Pull the hook to disassemble the probe holder

Replacing key caps

Contact a local Service Representative when a key cap needs to be replaced.

For Feature Keys, the user can rearrange these keys if desired. Please see ‘System/User Configurable Key’ on *page 10-26* for more information on how to remove and replace these Feature keycaps.

Footswitch

To clean the footswitch:

1. Disconnect the footswitch from the LOGIQ Totus.
2. Moisten a soft, non-abrasive folded cloth with a mild, general purpose, non-abrasive soap and water solution.

NOTE: The cloth should be damp, not dripping wet.

3. Wipe the external surfaces of the unit then dry with a soft, clean, cloth.

Quality Assurance

Introduction

A good Quality Assurance Evaluation program consists of periodic systematic actions that provide the user with adequate confidence that their diagnostic ultrasound system will produce consistently high quality images and quantitative information.

Therefore, it is in the best interests of every ultrasound user to routinely monitor equipment performance.

The frequency of Quality Assurance evaluations should be based on user's specific needs and clinical practice.

Periodic monitoring is essential in order to detect the performance changes that occur through normal aging of system components. Routine equipment evaluations may also reduce the duration of exams, number of repeat exams, and maintenance time required.

NOTE: *For information on setting up the Image Quality Check, refer to Image Quality Check .*

For details on system and peripheral routine preventive maintenance instructions, See ‘System Care and Maintenance’ on *page 12-32 for more information.*

Typical Tests to Perform

Quality assurance measurements provide results relating to system performance. Typically these are:

- Axial Measurement Accuracy
- Lateral Measurement Accuracy
- Axial and Lateral Resolution
- Penetration
- Functional & Contrast Resolution
- Gray Scale Photography.

With these tests, a performance baseline can be set at installation with the phantom in your department. Future test results can be compared to the baseline in order to maintain a record of system performance trends.

The phantom shown is shown as a representative example of a phantom. You can select from any number of phantoms available on the market.

Frequency of tests

Quality assurance tests are used to determine whether a scanner is providing the same level of performance from day to day.

The frequency of testing varies with the amount of system usage and modes to be tested. It is recommended that the user perform quality assurance tests at least every three months or every 400 patient studies. Tests should also be performed when a question about system performance exists.

A mobile system may require more frequent tests.

Image quality should also be tested immediately after the following events:

- Service calls
- System upgrades/modifications
- Dropped probe, power surge, etc.

Phantoms

Quality Assurance Evaluations may be done with phantoms and test objects that are applicable to the parameters being evaluated or to the user's clinical practice.

Typical phantoms are composed of material that acoustically mimic human tissue. Pins, anechoic and echogenic targets are physically positioned to provide information for a variety of tests.

The RMI 403GS phantom is shown in the illustration below as a representative example of a phantom.

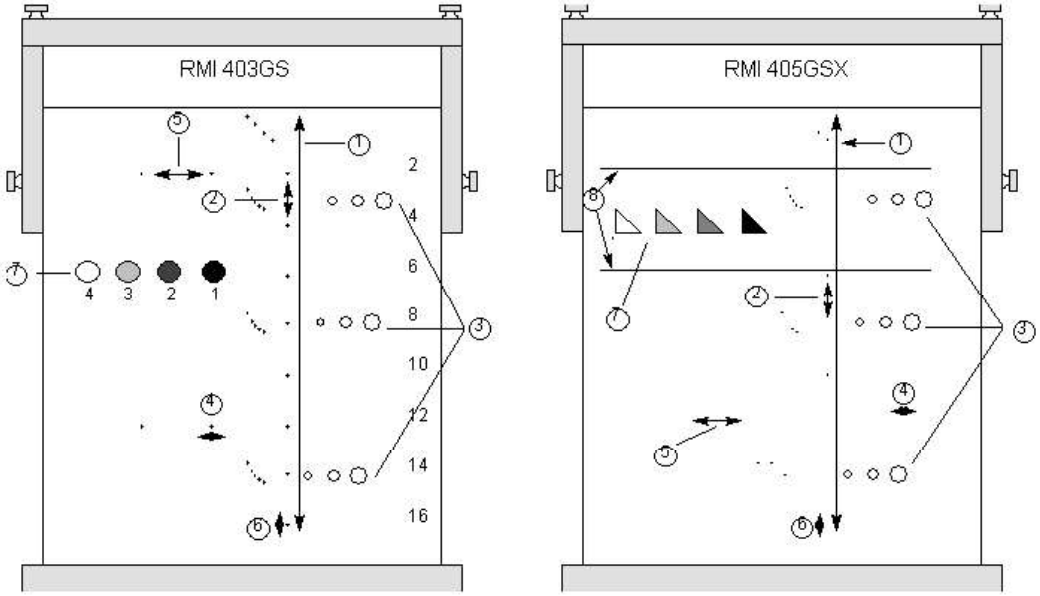


Figure 12-17. Representative Phantom Example

1. Penetration
2. Axial Distance Measurement
3. Functional Resolution
4. Lateral Resolution
5. Lateral Distance Measurement
6. Axial Resolution
7. Contrast Resolution and Gray Scale Photography
8. Gray Scale Plane Targets

Baselines

An absolute necessity for a quality assurance program is establishing baselines for each test or check. Baselines are established after the system has been verified to be working properly at installation or after a repair. If a probe or major assembly is replaced, new baselines should be generated.

Baselines can be made by adjusting system parameters to prescribed levels or to the best possible image. The key factor to remember is reproducibility. The same conditions must be reproduced for each periodic check.

All system parameters not displayed on the monitor should be recorded for the permanent record.

Periodic Checks

Periodic checks should be performed in accordance with your facility's quality assurance requirements. For the data to be valid, periodic checks should mimic the baseline setup parameters.

The resulting image, when scanning the phantom exactly as before, should be recorded and compared to the baseline. When a matching image is obtained, it can be assumed that the system performance has not degraded from the baseline.

If a significant difference between the baseline and periodic check is noted, double check the system setup and repeat the test. If the difference between the baseline and periodic check persists, contact a local Service Representative.

Failing to reproduce the control settings as in the baselines will introduce errors in the data and potentially invalidate the results.

Results

Lack of standardization among test instruments, the wide range of acceptance criteria, and incomplete knowledge regarding the significance of certain performance parameters prohibit the establishment of absolute performance criteria for these tests.

Quality Assurance Evaluation results should be compared to previously-recorded results.

Performance trends can then be detected. Unacceptable performance or diminishing trends should be identified for maintenance or repair before a malfunction or inappropriate diagnosis occurs.

The user should determine the best method for recording and archiving the baseline and periodic checks. In most cases the choice is hard copy.

It is important to maintain good consistent records for inspections that may arise, as well as to detect system performance trends.

System Setup

The user should tailor the tests to their particular needs. It is certainly not necessary to make all checks with all probes. A representative example, with the probes used most often by the customer, should be adequate in judging system performance trends.

Use a gray scale phantom as the scan object for the tests. Commercial phantoms are supplied with its own operator manual. Be familiar with proper phantom operating procedures prior to use for quality assurance evaluations.

1. Adjust image monitor. Brightness and contrast should be set to the normal viewing of a good gray scale image.
2. Check all recording devices for proper duplication of image monitor. Ensure that what is seen is what is recorded.
3. Annotate non-displayed image processing controls.
4. Set TGC slide pots to center (detent) position.
5. Place focal zone marker(s) in area of interest for an optimum image.

Test Procedures

The following are recommended Quality Assurance tests. A brief description of the test, the benefit it provides and steps to accomplish the test are supplied.

The importance of recording scan parameters and consistent record keeping cannot be stressed enough. Reproducibility to monitor system trends is the key to quality assurance evaluations.

Using the system's dual image display format is often very convenient and saves recording media.

Axial distance measurements

Description

Axial measurements are the distance measurements obtained along the sound beam. See Figure 12-17 for more information.

Benefit

The accurate measurement of the size, depth and volume of a structure is a critical factor in determining a proper diagnosis. Most imaging systems use depth markers and/or electronic calipers for this purpose.

Method

Axial distance should be measured in the near, mid and far fields as well as in zoom. If necessary, different depths or fields of view can be tested.

Procedure

To measure axial distance:

1. Scan a test phantom with precisely-spaced vertical pin targets. Adjust all scan controls, as necessary, for the best image of the pin targets to typical depths for the probe being used.
2. Press **Freeze** to stop image acquisition and perform a standard distance measurement between the pins at different points in the image. Record all images for archiving.
3. Scan the vertical pins in zoom or at different depth/scale factors.
4. Press **Freeze** to stop image acquisition; repeat the distance measurements between pins and record the images for archiving.
5. Document the measurements for reference and future comparison.

Contact a Service Engineer if vertical measurements differ by more than 1.50% of the actual distance.

Lateral distance measurements

Description

Lateral measurements are distance measurements obtained perpendicular to the axis of the sound beam. See Figure 12-17 for more information.

Benefit

The purpose is the same as vertical measurements. Precisely-spaced horizontal pin targets are scanned and results compared to the known distance in the phantom.

Method

Lateral distance should be measured in the near, mid and far fields as well as in zoom. If necessary, different depths of fields of view can be tested.

Procedure

To measure lateral distance:

1. Scan a test phantom with precisely-spaced horizontal pin targets. Adjust all scan controls, as necessary, for the best image of the pin targets from side to side.
2. Press **Freeze** to stop image acquisition and perform a standard distance measurement between the pins at different points in the image. Record all images for archiving.
3. Scan the horizontal pins in zoom or at different depth/scale factors.
4. Press **Freeze** to stop image acquisition; repeat the distance measurements between pins and record the images for archiving.
5. Document the measurements for reference and future comparison.

Contact a Service Engineer if horizontal measurements differ by more than 3mm or 3% of that distance, whichever is greater.

Axial resolution

Description

Axial resolution is the minimum reflector separation between two closely-spaced objects to produce discrete reflections along the axis of the sound beam. It can also be monitored by checking the vertical size of known pin targets. See Figure 12-17 for more information.

Axial resolution is affected by the transmitting section of the system and the probe.

Benefit

In clinical imaging, poor axial resolution displays small structures lying close together as a single dot. This may lead to improper interpretation of the ultrasound image.

Procedure

To measure Axial resolution:

1. Scan a test phantom with precisely-spaced vertical pin targets.
2. Adjust all scan controls, as necessary, for the best image of the pin targets to typical depths for the probe being used.
3. Press **Freeze** to stop image acquisition.
4. Perform a standard distance measurement of the pin vertical thickness at different points in the image. Record all images for archiving.
5. Scan the vertical pins in zoom or at different depth/scale factors.
6. Press **Freeze** to stop image acquisition; repeat the vertical thickness measurements of the pins and record the images for archiving.
7. Document the measurements for reference and future comparison.

Axial resolution should remain stable over time. Contact a Service Engineer if any changes are observed.

Lateral resolution

Description

Lateral resolution is the minimum reflector separation between two closely spaced objects to produce discrete reflections perpendicular to the axis of the sound beam. It can also be monitored by checking the horizontal size of known pin targets. See Figure 12-17 for more information.

Lateral resolution is dependent upon the beam width produced by the probe. The narrower the beam, the better the lateral resolution.

The beam width is affected by the frequency, degree of focusing, and distance of the object from the face of the probe.

Benefit

Clinically, poor lateral resolution will display small structures lying close together as a single dot. This may lead to improper interpretation of the ultrasound image.

Procedure

To measure lateral resolution:

1. Scan a test phantom with precisely-spaced horizontal pin targets.
2. Adjust all scan controls, as necessary, for the best image of the pin targets from side to side.
3. Press **Freeze** to stop image acquisition and perform a standard distance measurement of the horizontal thickness of a pin at different points in the image. Record all images for archiving.
4. Scan the horizontal pins in zoom or at different depth/scale factors.
5. Press **Freeze** to stop image acquisition; repeat the horizontal thickness measurements of the pins and record the images for archiving.
6. Document the measurements for reference and future comparison.

Pin width should remain relatively constant over time ("1mm). Dramatic changes in pin width may indicate beamforming problems. Contact a Service Engineer if beam width changes consistently over 2 to 3 periodic tests.

Penetration

Description

Penetration is the ability of an imaging system to detect and display weak echoes from small objects at large depths. See Figure 12-17 for more information.

Penetration can be affected by the system's:

- Transmitter/receiver
- Degree of probe focusing
- Attenuation of the medium
- Depth and shape of reflecting object
- Electromagnetic interference from local surroundings.

Benefit

Weak reflecting echoes are commonly produced from the internal structure of organs. Definition of this tissue texture is important in the interpretation of the ultrasound findings.

Method

Scan a phantom to see how echoes begin to fade as depth is increased. The maximum depth of penetration is the point at which homogeneous material in the phantom begins to lose brightness.

Procedure

To measure penetration:

1. Set the front panel TGC slide pots to their center (detent) position.
2. Gain and acoustic output can be adjusted, as necessary, since these values are displayed on the monitor.
3. Scan a test phantom along the vertical pin targets to typical depths for the probe being used.
4. Perform a standard distance measurement from the top of the image displayed to the point at which homogeneous material in the phantom begins to lose brightness.
5. Document the depth measurement for reference and future comparison.

Contact a Service Engineer if the depth of penetration shifts more than one centimeter (1cm) when using the same probe and same system settings.

Functional resolution

Description

Functional resolution is an imaging system's ability to detect and display the size, shape, and depth of an anechoic structure, as opposed to a pin target. See Figure 12-17 for more information.

The very best possible image is somewhat less important than reproducibility and stability over time. Routine tests at the same settings should produce the same results.

Benefit

The data obtained will give a relative indication of the smallest structure the system is capable of resolving at a given depth.

Procedure

To measure functional resolution:

1. Set the front panel TGC slide pots to their center (detent) position.
2. Gain and acoustic output can be adjusted as necessary, since these values are displayed on the monitor.
3. Scan a test phantom with a vertical row of anechoic cyst targets to typical depths for the probe being used.
4. Evaluate the cysts at various depths for a good (round) shape, well-defined borders and no fill in. Remember, TGC slide pots are centered and should remain fixed. This may NOT provide optimal cystic clearing.
5. Document all results for future reference and comparison.

Contact a Service Engineer if a greatly distorted image is obtained.

Contrast resolution

Description

Contrast resolution is the ability of an imaging system to detect and display the shape and echogenic characteristics of a structure. See Figure 12-17 for more information.

Specific values measured are less important than stability over time. Routine tests at the same settings should produce the same results.

Benefit

A correct diagnosis is dependent upon an imaging system's ability to differentiate between a cystic or solid structure versus echo patterns from normal surrounding tissue.

Method

A phantom with echogenic targets of different sizes and depths should be used.

Procedure

To measure contrast resolution:

1. Set the front panel TGC slide pots to their center (detent) position. Set dynamic range to 54 db.
2. Gain and acoustic output can be adjusted, as necessary, since these values are displayed on the monitor.
3. Scan a test phantom with echogenic targets at the depths available.
4. Evaluate the echogenic targets for contrast between each other and between the surrounding phantom material. Remember, TGC slide pots are centered and should remain fixed. This may NOT provide an optimal scan image.
5. Document all results for future reference and comparison.

Contact a Service Engineer if the echogenic characteristics or shapes of the targets appear distorted.

Gray Scale photography

Description

Poor photography will cause loss of low level echoes and the lack of contrast between large amplitude echoes. See Figure 12-17 for more information.

Benefit

When photographic controls and film processors are properly adjusted, weak echoes, as well as strong echoes, are accurately recorded on film.

Procedure

1. Adjust the camera according to the manufacturer's instructions until the hard copy and video display are equal.
2. Scan the phantom and it's echogenic contrast targets.
3. Make a hard copy photograph of the display and compare it to the image on the video monitor for contrast and weak echo display.
4. Document all results for future reference and comparison.

Contact a Service Engineer if camera cannot duplicate what is on the image monitor.

NOTE: Optimization of brightness/contrast controls on the display monitor is imperative in order to make sure that the hardcopy and monitor look alike.

The display monitor is adjusted first. The hardcopy camera or printer is adjusted to match the display monitor.

Setting up a Record Keeping System

Preparation

The following is needed:

- Quality Assurance binder.
- Hard copy or electronic file of images.
- Quality Assurance Checklists.
- Display the following information while testing quality assurance:
  - Acoustic Output
  - Gain
  - Depth
  - Probe
  - Dynamic Range
  - Set up new patient to be the name of the test.
- Annotate the following:
  - Any control where its value is **NOT** displayed.
  - Significant phantom information.

Record Keeping

Complete the following:

1. Fill out the Ultrasound Quality Assurance Checklist for each probe, as scheduled.
2. Make a hard copy or archive the image.
3. Compare images to baseline images and acceptable values.
4. Evaluate trends over previous test periods.
5. File hard copy or electronic file of images and checklist in Quality Assurance binder.

Ultrasound Quality Assurance Checklist

Table 12-13: Ultrasound Quality Assurance Checklist (Part 1)

Performed By		Date
System		Serial Number
Probe Type	Probe Model	Serial Number
Phantom Model	Serial Number	Room Temperature
Acoustic Output	Gain	Focal Zone
Gray Map	TGC	Depth
Monitor Setting		
Peripheral Settings		
Other Image Processing Control Settings		

Table 12-14: Ultrasound Quality Assurance Checklist (Part 2)

Test	Baseline Value Range	Tested Value	Image Hardcopy/Archived	Acceptable? Yes/No	Service Called (Date)	Date Resolved
Vertical Measurement Accuracy						
Horizontal Measurement Accuracy						
Axial Resolution						
Lateral Resolution						
Penetration						
Functional Resolution						
Contrast Resolution						
Gray Scale Photography						

Image Quality Check

Image Quality Check (IQC)

Image Quality Check is intended to facilitate Image Quality checks during Quality Assurance Evaluations. Quality Assurance tests are used to determine whether a scanner is providing the same level of performance year after year.

By using the same settings year after year, this ensures that the data collection is consistent, independently of who performs the test.

This preset only includes fundamental settings for B-Mode. Processing modes like SRI, Harmonics, etc., are turned off.

To do an Image Quality Check (IQC),

1. Activate IQC via Utility--> Imaging Preset Manager--> Category (select the Category first).
2. Click on the plus sign in front of IQC for Service and select IQC.
3. Assign IQC to a Touch Panel key by using the right arrow key.
4. Map the IQC to the location you want it to appear on the Touch Panel.
5. Select Probe. Then select IQC.

Assistance

Supplies/Accessories

Not all features or products described in this document may be available or cleared for sale in all markets.

Contact the distributor, GE HealthCare affiliate or sales representative for approved peripherals. For HCATs, contact your sales person. For field service replacement part numbers (FRUs), these are service replacement part numbers that may be either new or refurbished, please consult the Basic Service Manual. To order these, contact CARES in the US, or call service in Europe and Asia.

The following supplies/accessories have been verified to be compatible with the system:

Peripherals

Table 12-15: Peripherals and Accessories

Accessory	Illustration/Photo
Onboard Printer installation kit (UP-D898DC)	
Sony UP-D25M Color Printer	
Footswitch, USB	
Powervar144k120v MG UPS UPS	N/A
Powervar144k 230V MG UPS	N/A
Magstripe Card Reader	
ASUS Z380M-A2-GR ZenPad 8 Tablet	N/A
Digital Expert (Microsoft-Surface)	N/A
Ethernet protection cable (GES.2203369.01)	N/A

Console

Table 12-16: Console Accessories

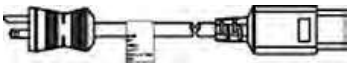
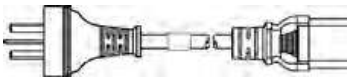
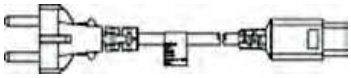
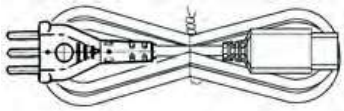
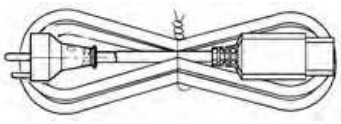
Accessory	Illustration/Photo
AN keyboard English	
AN keyboard German	
AN keyboard French	
AN keyboard Greek	
AN keyboard Norwegian	
AN keyboard Russian	
AN keyboard Swedish	
Power Cord - North American	
Power Cord - Argentina	
Power Cord - Europe	
Power Cord - UK-Ireland	
Power Cord - Switzerland	
Power Cord - Denmark	
Power Cord - Italy	
Power Cord - Israel	

Table 12-16: Console Accessories (Continued)

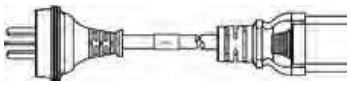
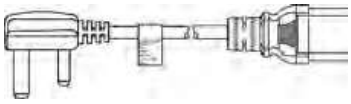
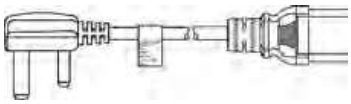
Accessory	Illustration/Photo
Power Cord - Japan	
Power Cord - China	
Power Cord - Australia/New Zealand	
Power Cord - India	
Power Cord - South Africa	
Power Cord - Brazil	
Power Cord - Taiwan	
TVTR Probe Holder Assembly	
Probe Cable Hanger	
Rear basket	

Table 12-16: Console Accessories (Continued)

Accessory	Illustration/Photo
Drawer	
Rear handle cable hook	
Gel warmer	
OPIO rear tray	

Volume Navigation

Table 12-17: Volume Navigation

Accessory
V Nav Active Tracker (Omni TRAX) Starter Kit
V Nav Needle Tracking Storage Insert
V Nav eTRAX • 18/20g Starter Kit • 14g Starter Kit • 12g Starter Kit
V Nav Probe Sensor
Probe Holder Insert
Volume Navigation Stand
V Nav Needle Tracker Starter Kit
V Nav Needle Virtual Tracker Starter Kit (VirtuTRAX)
Virtual Tracker Sensor
Volume Navigation Bracket Starter Kit
V Nav Upgrade to Needle Tracking Kit

V Nav Shelf Load Description

Shelf load for the V Nav wire shelf on the V Nav Stand is 10 lbs.

Hardware options

Table 12-18: Hardware options

Accessory
CW Doppler Option
Realtime 4D
ECG Option
Battery Option
Volume Navigation
WLAN (AX210)
UVSC Option
Pencil CW Hardware Kit
EMI Filter (TNC, BF-10A)
Gel warmer
Vscan Air Charger
HDU monitor

ECG Accessories

Table 12-19: ECG Accessories

Accessory
ECG Cables, IEC, AHA Style for Americas
ECG Cables, IEC Style
ECG Cable Kit

Probes

Table 12-20: Probes and Accessories

Probe	Biopsy Guide	V Nav Capable
C1-6-D Convex	Verza starter Kit Note: ONLY support Verza Starter Kit. Biopsy Starter Kit	No
C1-6VN-D Convex	Verza starter Kit Note: ONLY support Verza Starter Kit.	Yes
C2-7-D Convex	Multi-angle disposable with a reusable bracket Multi-Angle Reusable Stainless Bracket	No
C2-7VN-D Convex	Multi-angle disposable with a reusable bracket Multi-Angle Reusable Stainless Bracket	Yes
Vscan Air CL	N/A	No
C3-10-D Convex	N/A	Yes
IC5-9-D Micro Convex Intracavitary	Single Angle Disposable with a Plastic Bracket or Reusable with a Stainless Steel Bracket	Yes
9L-D Linear	Multi-angle	Yes
L3-12-D	Multi-angle	No
L6-24-D Linear Array	N/A	No
M5Sc-D XDclear Active Matrix Single Crystal Phased Array Transducer	Multi-angle disposable with a reusable bracket	Yes
ML6-15-D Matrix Array Linear	Multi-angle	Yes
RIC5-9-D 4D Convex Volume Intracavitary	Single Angle, Reusable Biopsy Kit for RAB Light or Disposable with a Plastic Bracket	N/A
RAB6-D 4D Volume	Starter Kit RAB Biopsy Starter Kit	N/A
6S-D	N/A	No

Table 12-20: Probes and Accessories (Continued)

Probe	Biopsy Guide	V Nav Capable
12S-D	N/A	No
P2D Pencil Probe	N/A	N/A
P6D Pencil Probe	N/A	N/A

Options

NOTE: Not all options are available in all countries.

Table 12-21: Options

Option
Advanced Security
*Coded Contrast - AM
Cardiac Automated Functional Imaging (AFI)
Report Writer
Stress Echo
Tricefy
LOGIQ Apps
KOIOS SW
Thyroid Assistant, Powered by Koios DS
Scan Assistant
Advanced Probes
Auto IMT
B-Steer+
B-Flow
Compare Assistant
DICOM
Flow Quantification (Q-Analysis)
Breast Measure Assist
OB Measure Assistant
Elastography
Elastography QA
Shear Wave Elastography
Ultrasound Guided Attenuation Parametre (UGAP)
Hepatic Assistant
SonoNT/SonoIT
DVR

Table 12-21: Options (Continued)

Option
SRI HD Type2
OmniView
STIC
TUI
VCI Static
VOCAL II
Thyroid Productivity
Breast Productivity
VITA on Demand
Vscan Air CL
Auto Preset Assistant
Voice Control
*The LOGIQ Totus 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.

Gel

Table 12-22: Gel — Refer to Accessories Catalog

Accessory	Units
Thermasonic Gel Warmer	Holds three plastic bottles (250ml or 8 oz)
Aquasonic 100 Scan Gel	5 liter jug
	250 ml plastic bottles (12/case)
Scan Ultrasound Gel	8 oz plastic bottles (12/case)
	1 gallon plastic jug
	Four 1-gallon plastic jugs

Disinfectant

Table 12-23: Disinfectant — Refer to Accessories Catalog

Accessory	Units
Cidex Activated Dialdehyde	16/1 quart bottles
	4/1 gallon bottles
	2/2.5 gallon bottles

Ultrasound Probe and Cord Sheath Sets

Table 12-24: Probe and Cord Sheath Sets — Refer to Accessories Catalog

Accessory	Units
Sterile Ultrasound Probe Sheath Set	20 Per Set
Sterile Ultrasound Cord Sheath Set	20 Per Set
Sanitary Rectal/Vaginal Probe Cover	20 Per Set
Sterile Combination Probe and Cord Cover Set	12 Per Set
Sterile Ultrasound Probe Sheath Set for Wide (2.5 and 3.5) Aperture Sector Probes	20 Per Set

Chapter 13

Advanced Features

Describes Advanced system features and options.

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Using 4D

4D Introduction

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 13-1: 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
- Annotations
- Measurements and Calculations

The following post-processing controls are available with 4D:

- CINE
- Zoom

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.

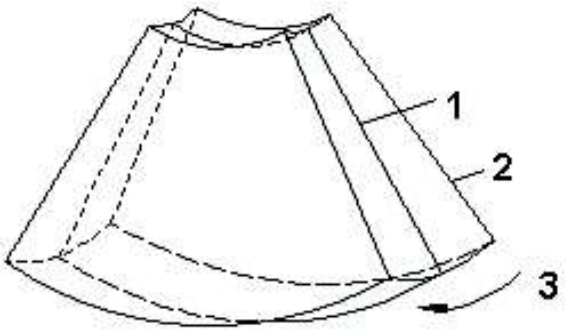


Figure 13-1. Volume Sweep

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 Volume of Interest (VOI).

You can adjust the view direction of the ROI.

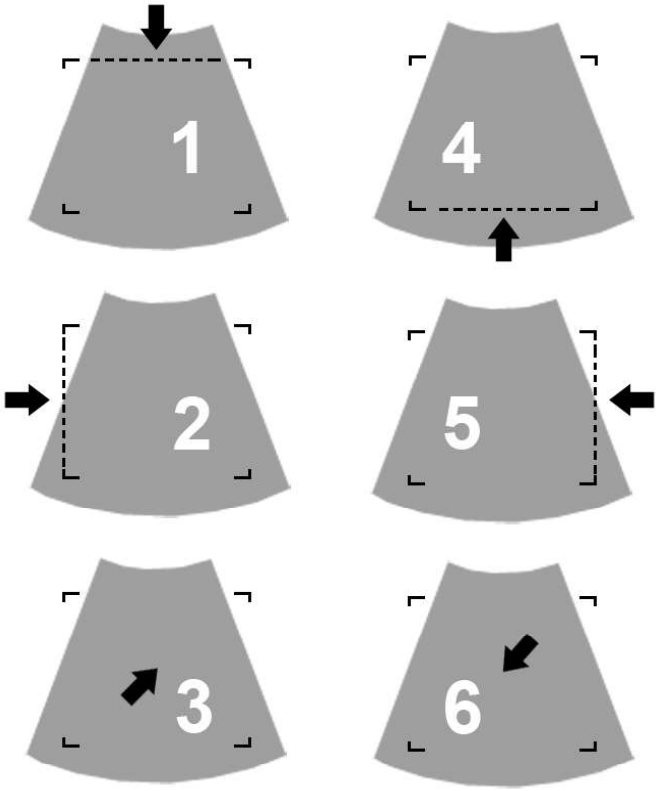


Figure 13-2. Render View Directions

1. Up/Down
2. Left/Right
3. Front/Back
4. Down/Up
5. Right/Left
6. Back/Front

Render View

In Render view, only the rendered image displays - no reference images.

Image Orientation

Orientation of Image in Sectional view

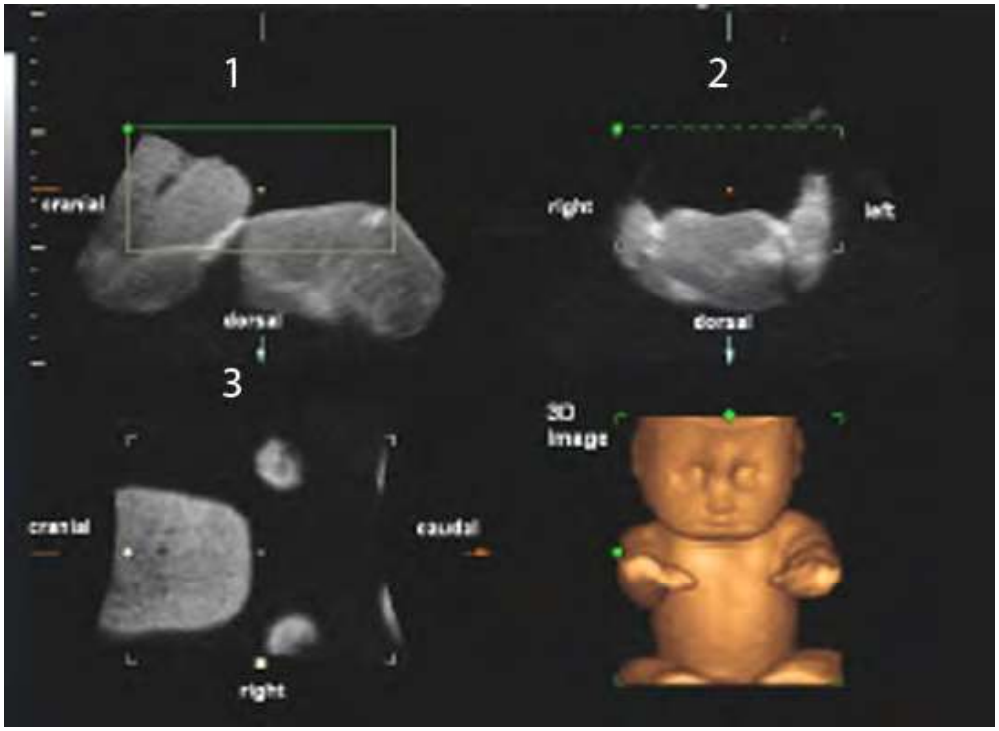


Figure 13-3. Quad Render Visualization Mode

1. Longitudinal
2. Transverse
3. Coronal

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).

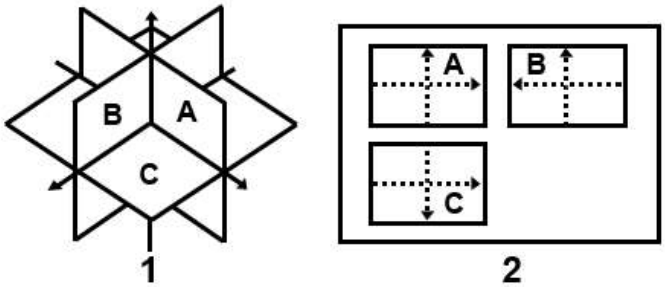


Figure 13-4. Illustration of Sectional Planes

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 the longitudinal view; reference image B the transverse view, and reference image C represents the coronal view.

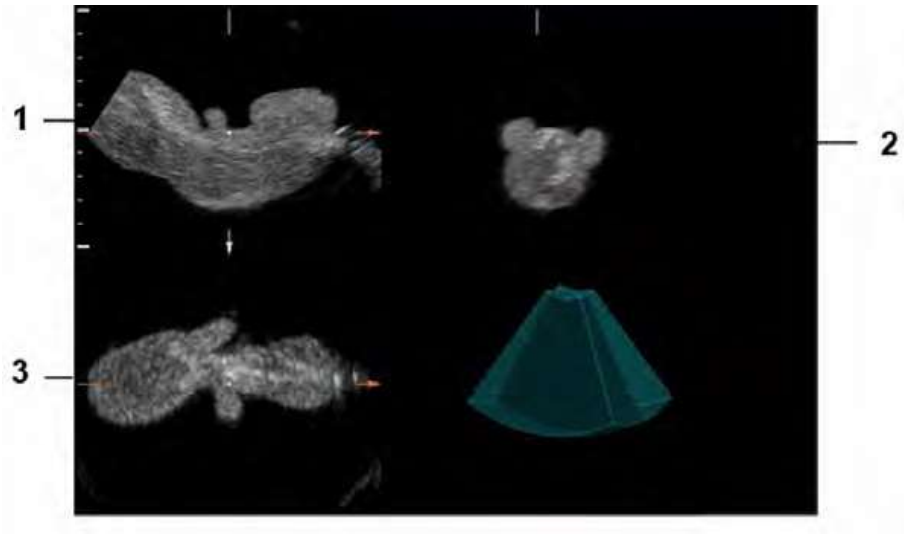


Figure 13-5. Monitor Display of Reference Images in Sectional View

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)

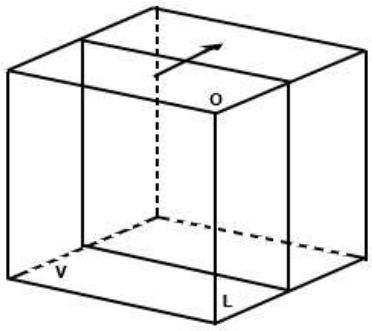


Figure 13-6. Reference Image A

For Reference image A, the transducer plane migrates from the FRONT to the REAR through the volume body.

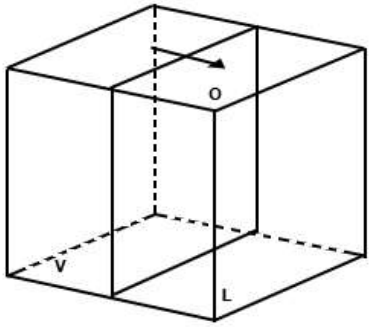


Figure 13-7. Reference Image B

For Reference image B, the transducer plane migrates from the LEFT to the RIGHT through the volume body.

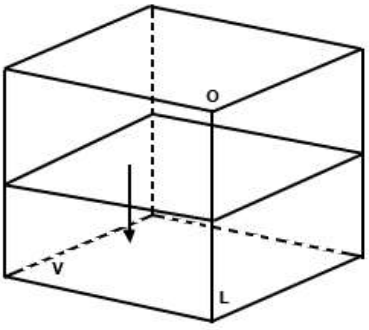


Figure 13-8. Reference Image C

For Reference image C, the transducer plane migrates from the TOP to the BOTTOM through the volume body.

Reference Images (continued)

Examples of Probe Orientation with Reference Planes

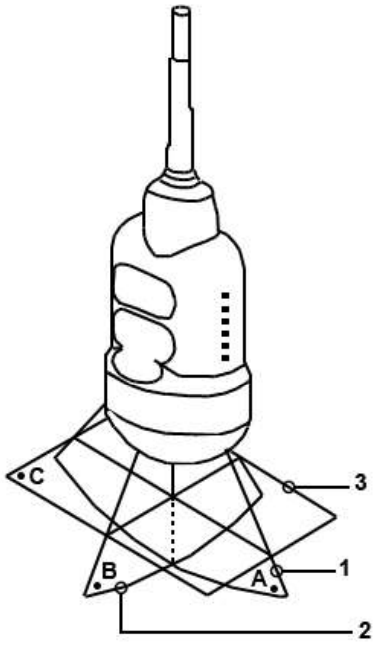


Figure 13-9. Abdominal Probe Orientation

1. Image Plane A
2. image Plane B
3. Image Plane C

Reference Images (continued)

Examples of Probe Orientation with Reference Planes

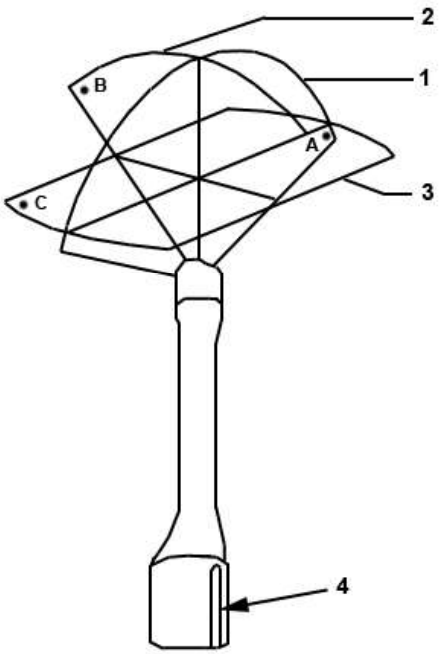


Figure 13-10. Endocavity Probe Orientation

1. Image Plane A
2. Image Plane B
3. Image Plane C
4. Groove

4D Operational Controls

Control Panel Overview

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 PW-Mode, CF-Mode, M-Mode buttons (along with Depth) to manipulate the Volume of Interest (VOI).

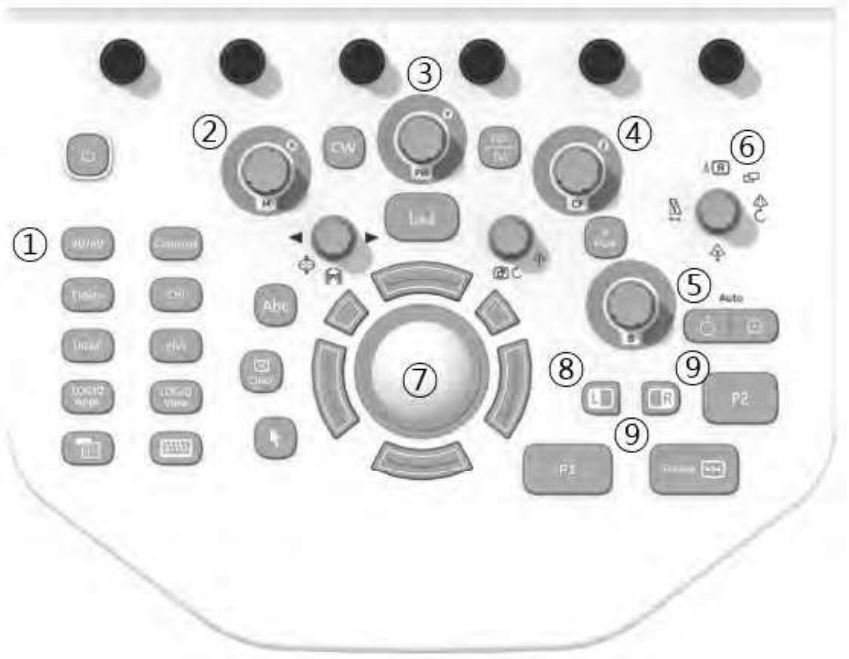


Figure 13-11. Control Panel Buttons

1. User-configurable controls.
2. M key, M-Mode key used to rotate about the X axis.
3. PW key, PW-Mode key used to rotate about the Y axis.
4. CF Key, CF-Mode key used to rotate about the Z axis.
5. Depth key, used as a transverse translation through the image.
6. Width key, used to adjust the size and position of the VOI.
7. Trackball, used to move the VOI. Also, the 4 keys surrounding the Trackball map to additional functionality, as shown on the monitor display.
8. L (left) key, used to begin a 4D acquisition.
9. Freeze or R (right) key, used to freeze a 4D image.

4D Monitor 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.

4D Touch Panel Overview

The following is the first Touch Panel that appears when you press **3D/4D**.

Common 4D Touch Panel Controls

Most 4D Touch Panel 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 13-2: Common 4D Touch Panel Controls

Preset Parameter	Description
Tile	You can divide the display into 1, 2, or 4 windows for Render view (Render = On) and 1 or 4 windows for Sectional view (Render = Off).
Reset Curve	Resets the three-point curve to a straight line.
Direction	Adjusts the view direction of the ROI.
Visualization	Sectional, Render, VCI, or Tomographic Ultrasound Imaging (TUI). Render view displays one rendered image, or reference image(s) and rendered image.
Focus Position	Adjusts the focal position.
Volume Angle	Sets the range of the volume sweep.
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 the ***Preset*** tab.
2. Select one of the preset settings for data acquisition and display. Presets are defined in the preset file and differ by application.

Table 13-3: Common 4D Touch Panel Controls

Preset Parameter	Description
Save	Selections: Overwrite, Create New, Cancel. **Overwrite**. 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. **Cancel**. Cancel without saving preset parameters.
Pre-defined Preset	Reloads the presets for the selected application.
User1, User2, User3, User4	Used to define new user presets for a given application.

Static 3D Presets

1. When you enter 3D/4D mode, press ***Static 3D***, then the ***Preset*** tab.
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, Render, and Tomographic Ultrasound Imaging (TUI).

Sectional View

Sectional view contains one display for each sectional plane.

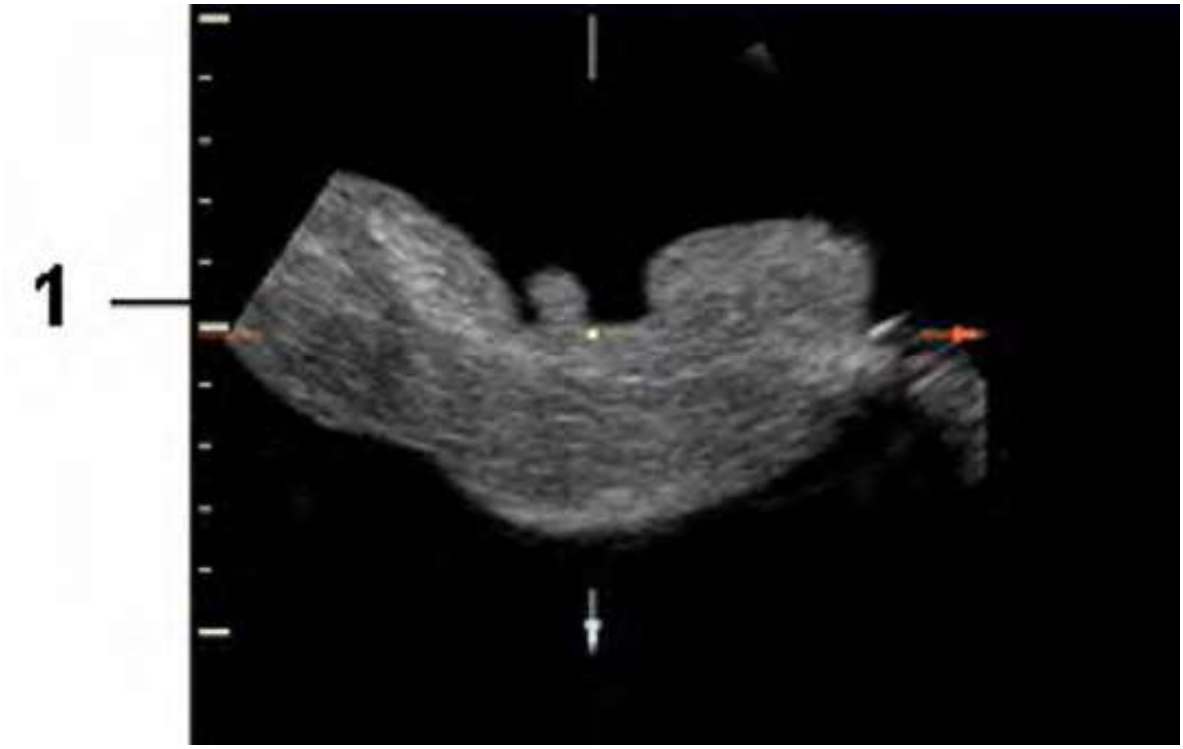


Figure 13-12. Monitor Display in Sectional View

1. Sectional Image A
2. Sectional Image B
3. Sectional Image C

Visualizations (continued)

Render View

The LOGIQ Totus continuously displays the 4D rendered image.

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.

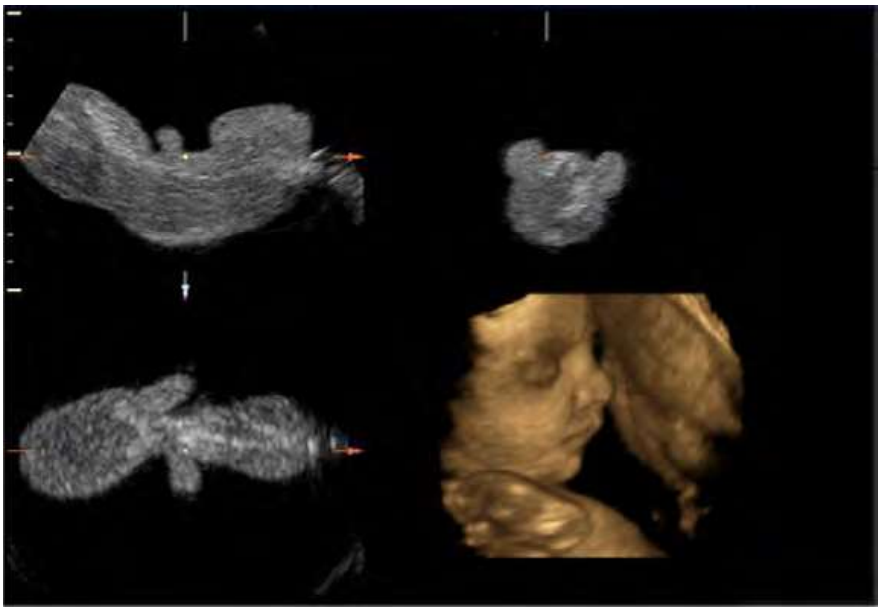


Figure 13-13. Quad Tile Render View

Visualizations (continued)

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.

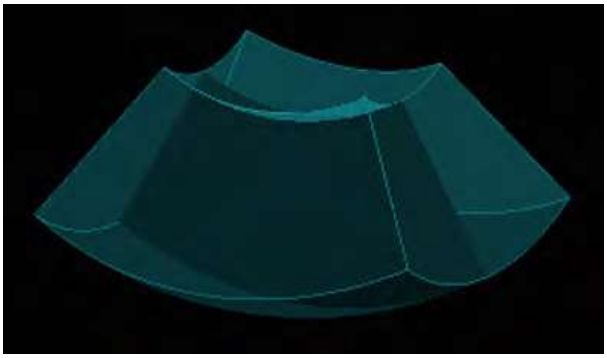


Figure 13-14. Orientation Help Graphic

Acquiring and Rendering a 4D VOI

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 appropriate 4D-compatible probe, leaving the probes in their respective holders. Follow the guidelines in Chapter 3 for connecting probes.

NOTE: If the appropriate 4D probe is not connected, the original 3D Touch Panel appears.

2. 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** to enter 3D/4D mode. The first time you press 3D/4D, the system is in B Pre 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.

The default acquisition mode varies by application. If you are in OB, the default acquisition mode is Real-Time 4D; for all other applications, Static 3D is the default acquisition mode. When you enter pre-mode, an ROI graphic may appear on the monitor display that defines the initial ROI (Region of Interest) of the volume.

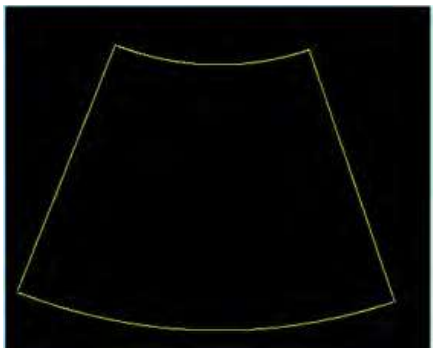


Figure 13-15. ROI Graphic

2. Press the ***Preset*** tab. 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 appropriate 4D-compatible probe, leaving the probes in their respective holders. Follow the guidelines in Chapter 3 for connecting probes.
2. Select a 4D probe 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. Use the **Trackball** to move the VOI and the **Width** button to re-size and re-position the VOI. Only the area defined within the VOI is rendered.
6. Adjust the volume angle and quality. 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 the **L** 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 or right, use the ***PW*** control. To rotate the VOI forward or backward, use the ***CF*** control. To rotate the VOI in a circular motion, use the ***M*** control.

   To return to 3D/4D pre-mode, press **L**.

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** or **R**.
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, Render, and Tomographic Ultrasound Imaging (TUI). 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 acquire a 4D VOI:

1. Press ***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 the **L** 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 **L**.
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 Touch Panel. The reference image selected contains the focus for control panel keys, allowing you to manipulate or optimize that image.

Table 13-4: 4D Data Acquisition Parameters

4D Parameter	Description
Restore View	Resets all parameters back to the original values or chosen presets.
Tile	Selections: Single, Quad. You can divide the display into 1 or 4 windows.
Visualization	Sectional, Render, or Tomographic Ultrasound Imaging (TUI). Render view displays one rendered image, or reference image(s) and rendered image.
Ref Image	Use to select the reference image that has focus for use with the control panel keys and **Trackball**.
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. Max combines the highest density with the slowest speed. Low combines the lowest density with the highest speed. BQ displays on the display.

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.

Table 13-5: 4D Data Acquisition Parameters - Render Mode

4D Parameter	Description
Restore View	Select to reset all 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, or Tomographic Ultrasound Imaging (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.
Ref Image	Use to select the reference image that has focus for use with the control panel keys and **Trackball**. This control is enabled only if Tile is set to Quad.
Volume Angle	Sets the range of the volume sweep.
Quality	Selections: Max, Hi2, Hi1, Mid2, Mid1, Low. Used to balance speed with line density. Max 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.
Lower 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 13-6: 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).
Render 1	Allows you to combine render mode values from render mode 1. 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, HDlive Texture. **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 the mean value of 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. **HDlive Texture** - Uses an illumination source that can be positioned by the user around the rendered 3D object on a spherical coordinate. By highlighting structures from the side, the three-dimensional impression can be improved considerably.

Table 13-6: 4D (Data Acquisition) Render Parameters (Continued)

4D Parameter	Description
Render 2	Allows you to combine render mode values from render mode 2. Render Mode 2 Selections: Surface Smooth, Light, Gradient Light, Transp Max, Transp X-ray, Transp. Min., HDlive Smooth. **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 the mean value of 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 hollo4w structures. **HDlive Smooth** - Smoothed HDlive texture mode. When Render 1 value is set to HDlive Texture, the only available mode for Render 2 is HDlive Smooth.Note: HDlive rendering is not available if VCI is active.
Edit Light	Activates the light editor for the virtual light source in HDlive render mode. User can position the light source by moving the Trackball, A light icon on the main display indicates the direction of the light. Note: The **Edit Light** parameter is only available for the HDlive rendering modes.
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.

NOTE: The manipulation examples are with A set as the reference image.

Rotating the 4D VOI Left/Right or Forward/Backward

You can rotate the VOI around the X, Y, and Z axes. To rotate the VOI around the Z axis, turn the **CF** control left/right.

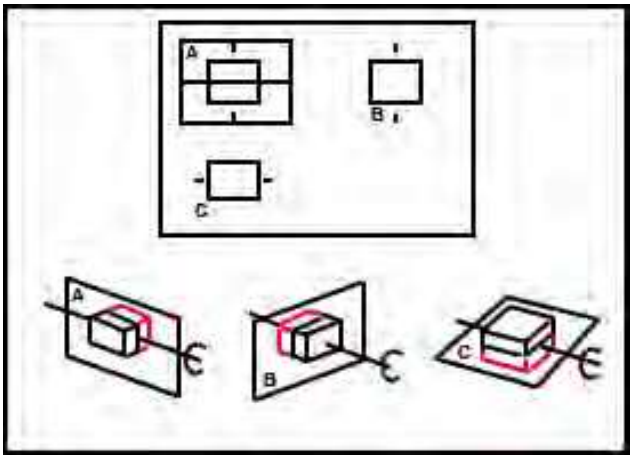


Figure 13-16. Rotate about Z Axis with CF Control

Manipulating the Volume of Interest (VOI) (continued)

To rotate the VOI around the Y axis, turn the **PW** left/right.

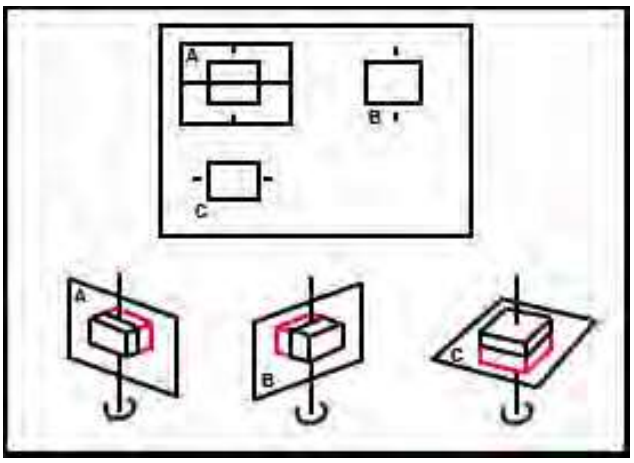


Figure 13-17. Rotate about Y Axis with PW Control

Rotating the 4D Image in a Circular Motion

To rotate the VOI around the X axis, turn the **M** control left/right.

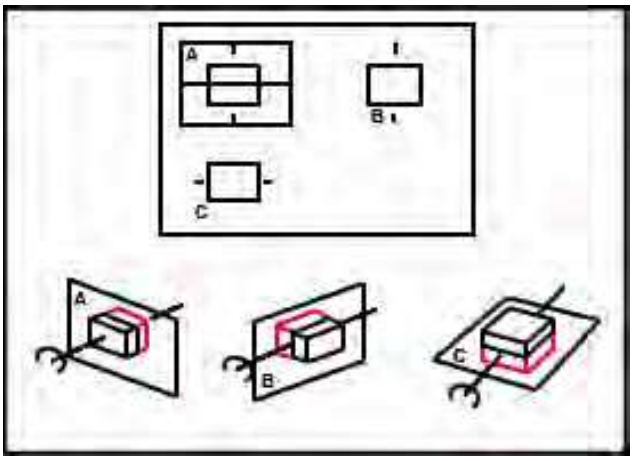


Figure 13-18. Rotate about X Axis with M Control

*NOTE: To speed up the rotation, press the **PW**, **CF**, or **M** controls before you turn them. To slow down the rotation, press **PW** or **CF** again.*

Manipulating the Volume of Interest (VOI) (continued)

Moving through the VOI

To move through the image to view a particular slice, press **Depth**.

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. See 'Reference Images' on *page 13-9 for more information.*

Zooming the Image

Rotate **Zoom** to zoom on the image.

Moving the VOI Position

To move the position of the VOI, move the **Trackball** left, right, up and down, as needed.

Resizing the VOI

To re-size the VOI, use the **Width** control panel button. See the Width section in this chapter.

Stopping 4D Image Acquisition

To stop acquiring a 4D image, press **Freeze** or R if you are in Render view or just **Freeze** if you are in Sectional view.

4D VOI Post-Processing

When you press **Freeze** or **R**, one of the following Touch Panel displays, 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 13-7: 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	Adjusts the CINE loop speed.
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; press **L** to return to Pre-Mode.

   If you were in Sectional visualization mode when you entered 4D CINE mode; press **L** to return to Pre-Mode.
4. To re-start real-time 4D acquisition, press **Freeze**.

Static 3D

You can create a single sweep, single volume static 3D image.

Performing a Static 3D Scan

1. Connect the appropriate 4D-compatible probe, leaving the probes in their respective holders. Follow the guidelines in Chapter 3 for connecting probes.
2. Select a 4D probe from the probe indicator.
3. Obtain a 2D image. Optimize the image as usual.
4. Press **3D/4D**.
5. Press ***Static 3D***. Set Visualization to Render.
6. Set the Volume of Interest (VOI) to be rendered. Use the **Trackball** to move the VOI and **Width** to re-size the ROI.
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 **L** key to start acquisition.

NOTE: During 3D acquisition, no control panel keys are not available, except for 'R.'

NOTE: When the 3D acquisition begins, the Touch Panel 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 **Touch Panel** changes to display the Render Setting, 3D Rotational Cine, and Scalpel tabs.

   To stop the acquisition manually, press the **R** key.
10. Save the image.
11. To further manipulate the 3D image, press ***Static 3D***.

    The Touch Panel that displays depends on the visualization mode selected prior to freeze, Sectional, Render, TUI or VCI.

Static 3D Sectional View

Table 13-8: 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.

Static 3D Render View

Table 13-9: 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.
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.

VCI

Introduction

VCI (Volume Contrast Imaging) allows you to sweep smaller slices of data with a higher volume rate. The resulting image shows an average, integrated gray value of the tissue contained within the ROI. VCI improves the contrast resolution and signal/noise ratio. It also reduces image speckle. This may facilitate finding diffuse lesions in organs.

Touch Panel

The data is represented as in Static 3D - Sectional Planes. However, the three planes are VCI renderings (tissue information of a thick slice) computed from the 3D dataset.

Table 13-10: VCI View

Preset Parameter	Description
Slice Thickness	Select the slice thickness

Static 3D Color

To view Static 3D Color,

1. Acquire the anatomy you want to view in B-Mode.
2. Activate Color Flow or PDI.
3. Activate 3D/4D. The Pre-3D displays. Select the desired Visualization.

NOTE: 4D cannot be selected from Pre-Mode with Color active.

4. Press ‘L’ to render the image.

The color is rendered. You can adjust the Render Mode (default is Glass Body):

- **Gray**. Gray, no color.

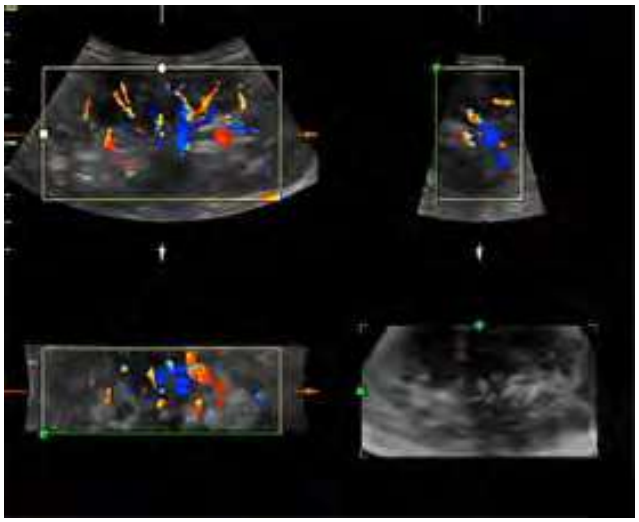


Figure 13-19. 3D Color - Gray

- **Inversion**. Inverts the grayscale.

Static 3D Color (continued)

- **Color**. Displays Color-Flow.

  Select the rendering method ([Rend Color1] (Surface only) or [Rend Color2]) and the mixing ratio.

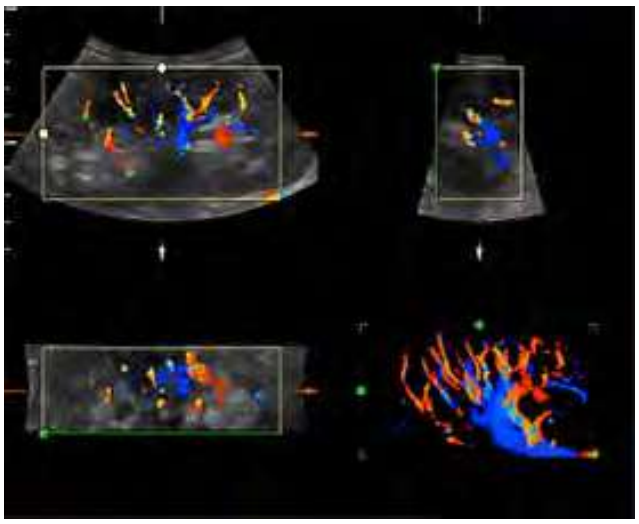


Figure 13-20. 3D Color - Color

- **Glass Body**. Displays both Color-Flow and B-Mode.

  Select the rendering method ([Rend Gray] or [Rend Color]) and the mixing ratio.

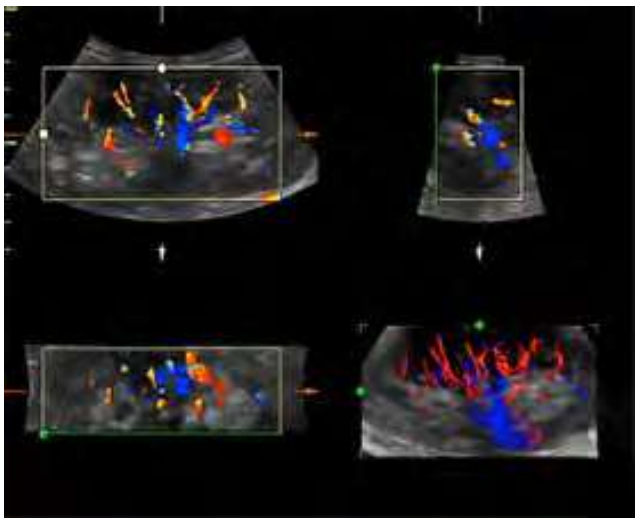


Figure 13-21. 3D Color - Glass Body

To hide the color on the sectional planes, select ***Color Off*** from the Touch Panel.

NOTE: If you scan in Render mode and select Tile as Quad, you can hide the color with the Color Off Touch Panel key.

Volume Review

You can post process VOI (the entire volume of interest) and scroll through acquisition planes via Volume Review. This allows you to review all of the frames within this volume set.

In Volume Review, start in Run/Stop so that every frame in the volume is displayed.

NOTE: If you adjust the screen while in Volume Review, these changes ARE NOT reflected on the Static 3D volume.

Scalpel

Scalpel allows you to edit/cut sections of a 3D image. Scalpel is available only on a rendered image.

1. Press ***Scalpel***.

Table 13-11: 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	Applies to User Defined Cut Depth when complete.

Scalpel (continued)

2. Select the cut mode.
3. 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].

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.

Table 13-12: 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.

VOCAL

You use VOCAL (Virtual Organ Computer-aided Analysis) to visualize and calculate the volume of anatomical structures, such as a tumor lesion, cysts, and the prostate. VOCAL is available after a Static 3D or Real-Time 4D acquisition.

1. Press ***Vocal***. Specify the volume calculation method (***Manual***, ***Contour Detect***, ***SemiAuto Detect***, or ***Sphere***). Select the reference image you want to use to perform the trace by selecting ***Ref Image*** A, B, or C. Press ***Start***.
2. Trace the anatomy using the **Trackball**. Press **Set** to start and end the trace. You must go across the dotted line for the trace to take effect (it turns yellow). The trace is performed on each image slice, separated by the rotational step angle. Rotate the ***Rot. Ref*** dial until you have completed the total of the required rotations (for example, if you've selected 30 degrees, you need to complete six traces if you've selected Manual). After you've completed the trace target, the ***Calc Volume*** button is active for you to press. The calculated VOCAL image appears in the lower, right-hand corner of the display. You are now in the edit state.

NOTE: Trace not used for Sphere. For Sphere, set the Poles.

3. Edit as necessary. You can apply a shell, adjust its thickness, navigate through the reference angles, or restart the VOCAL.

VOCAL Touch Panel states are described in the following tables.

Table 13-13: VOCAL Parameters on Setup Touch Panel

Parameter	Description
Manual	When you select the Manual method, you need to perform a manual trace on each of the rotation angles.
Contour Detect	When you select the Contour Detect method, you need to perform a manual trace on each of the rotation angles.
SemiAuto Detect	When you select the Semi Automatic Detect method, you need to perform a trace on only two rotation angles. The system applies an algorithm to define the traces.
Structure	Structure is only available with the SemiAuto Detect method. Select Hypo, Cystic, or Hyper/Iso.
Sphere	Calculates the volume based on the pole settings.
Pole 1	Adjust the upper contour point (green arrow) of the structure.
Pole 2	Adjust the lower contour point (green arrow) of the structure.

Table 13-13: VOCAL Parameters on Setup Touch Panel (Continued)

Parameter	Description
Rotational Step Angle	Specify the angular spacing between contour traces. Typical values are 6, 9, 15, and 30 degrees. The number of planes varies by this formula: 180 degrees / selected rotational step angle.
Ref Image	Use this to select the image you want to use to perform the trace.
Start	Press Start when you're ready to perform the trace.
Rot.Ref #/# Back/Next	Select Next/Back to move to the next image for contour definition in the rotation step.

Table 13-14: VOCAL Calculate Volume Touch Panel

Parameter	Description
Calc Volume	Press Calc Volume to initiate the VOCAL image calculation.
Clear	Press Clear to remove the trace from the image.
Restart Vocal	Press Restart Vocal to return to the initial VOCAL state.

The Shell Modes allows you to construct a shell or contour "around" the structure of interest, which enables you to distinguish between the contour of the targeted structure and the contours the inside and outside of the structure.

Table 13-15: VOCAL Parameters on Edit Touch Panel

Parameter	Description
Shell Off	Select Shell Off if you do not want a shell around the VOCAL image.
Inside	Select Inside if you want a shell inside the volume.
Outside	Select Outside if you want a shell outside the volume.
Symmetric	Select Symmetric if you want half of the shell thickness inside and half outside the volume's perimeter.
Shell Thickness	Adjust to vary the thickness of the shell.

Static 3D Render Setting

Table 13-16: 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.
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 Volume Review

You can post process VOI (the entire volume of interest) and scroll through acquisition planes via Volume Review. This allows you to review all of the frames within this volume set.

In Volume Review, start in Run/Stop so that every frame in the volume is displayed.

NOTE: If you adjust the screen while in Volume Review, these changes ARE NOT reflected on the Static 3D volume.

Storing 4D Images

You store 4D images exactly as you would your 2D images. Because 4D images contain more data, they also require more space. Pay close attention to the size of the volumes.

- Still image: Store as Raw Data
- CINE: Store as Raw Data when “Enhanced DICOM” is selected for printing 4D.

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.
2. Press ‘L’ to start acquisition.
3. If in 4D, press ‘R’ to end the acquisition. This step is not required in Static 3D.

   The reference image + 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)

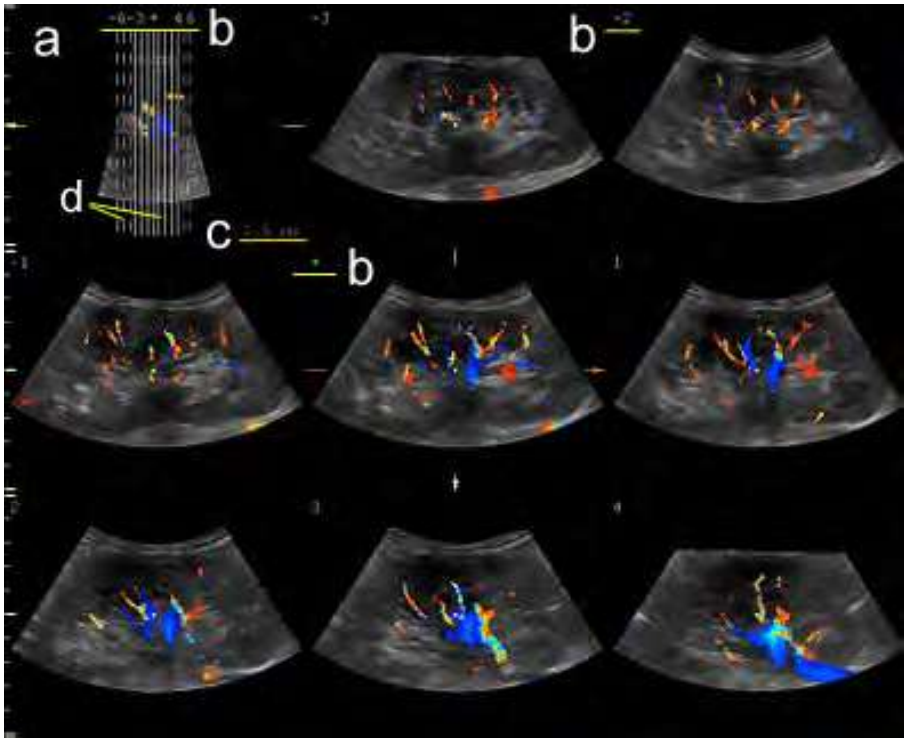


Figure 13-22. TUI 3x3 Example

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.

NOTE: TUI with Color is only available with Static 3D, not with 4D.

Tomographic Ultrasound Imaging (TUI) (continued)

4. Adjust the number of slices and slice distance.

   You can adjust the number of slices by using the ***Slices*** rotary. You can adjust the distance between the slices using the ***Slice Distance*** rotary. Max value is 40mm.

   - Move forward/backward through the slices via ***Prev./ Next Slice***.
   - Change the center image via ***Ref. Image*** if needed (Reference image A, B or C).
   - Select ***Display Format*** from 1X1, 1X2, 2X2 and 3X3.
   - The following features are supported in TUI: Zoom, Rotation (X/Y/Z), Trackball (Move the position), Translation and Gain.
   - To hide the color, select ***Color Off*** from the Touch Panel.

Tomographic Ultrasound Imaging (TUI) (continued)

You can adjust each slice position with ***Adjust Slices***.

1. Press ***Adjust Slices*** on the Touch Panel.
2. The pointer displays. Select a slice by using the **Trackball**.

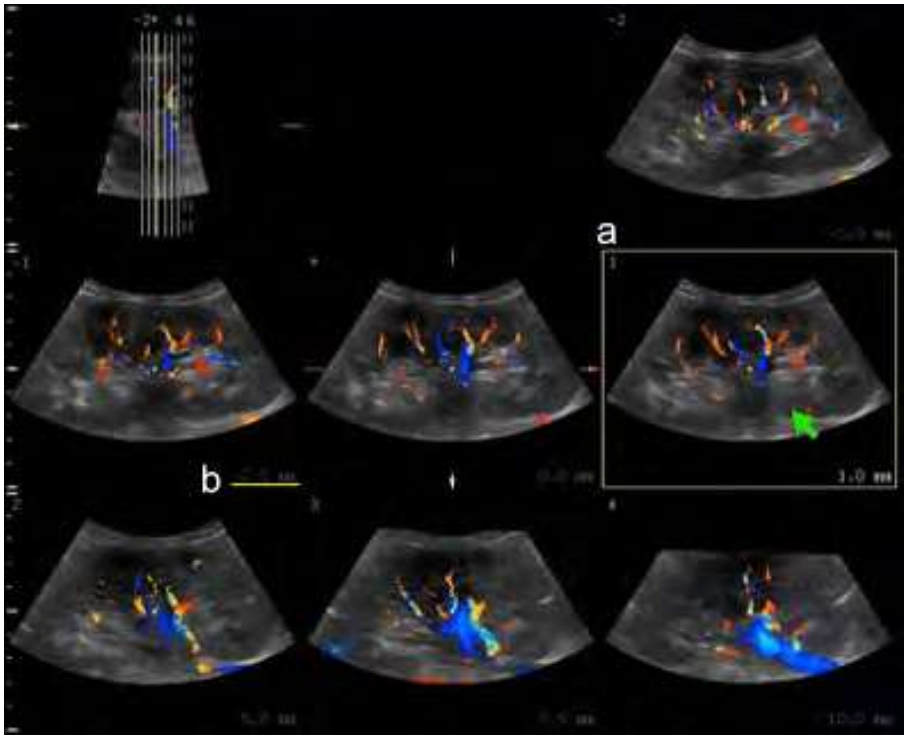


Figure 13-23. Adjust Slice screen (example)

a. Selected slice displays with yellow border
b. Distance from the center image

- Adjust the slice distance from the reference image by using ***Slice Position***. Slice Position only affects the selected slice.

*NOTE: If you place the pointer on the reference image and rotate **Slice Position**, the position of the reference image and all slices are moved.*

- Adjust the number of right and left slices off the center image by using ***Left Slices*** or ***Right Slices***.

3. After the adjustment is finished, press **Set**. The slice is marked with an “X”. To print this slice, press a print key.

SonoRenderlive

SonoRenderlive helps to find the render start position to easily separate solid tissue in front of the render object.

The SonoRenderlive algorithm “looks” for the transition from solid to liquid tissue and positions the “Render Start” into the liquid area visualized by the green render start line. The render start line is not a straight line but a “free” trace for optimal adaptation to the render object.

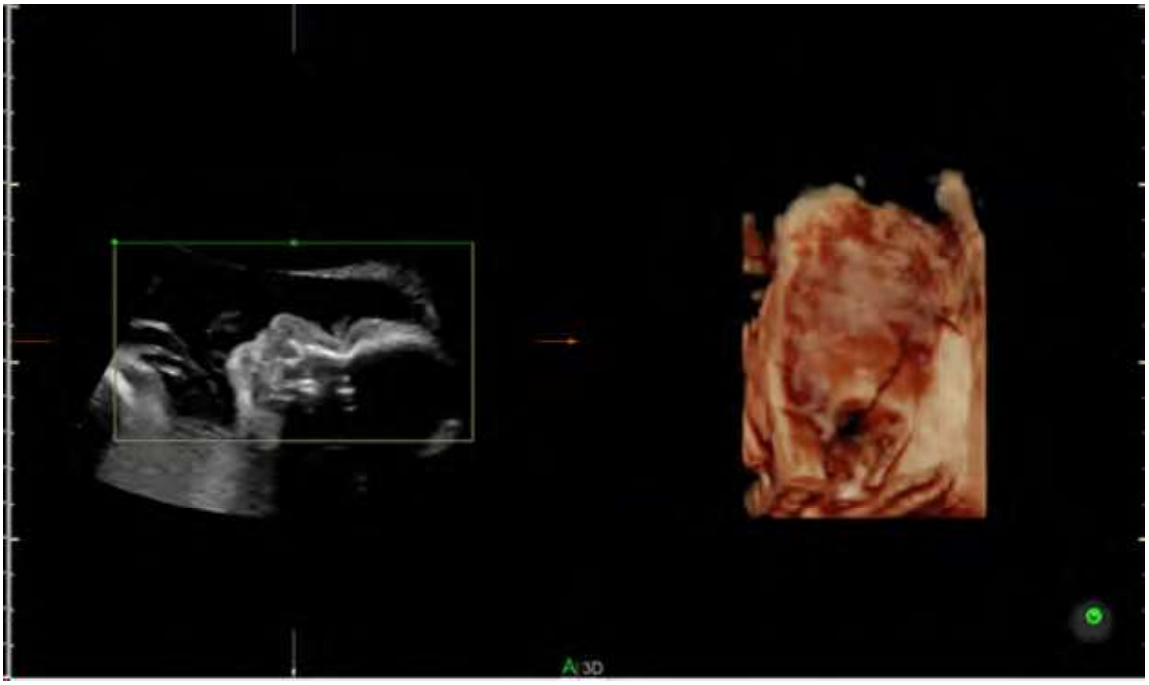


Figure 13-24. Screen Display Off

SonoRenderlive (continued)

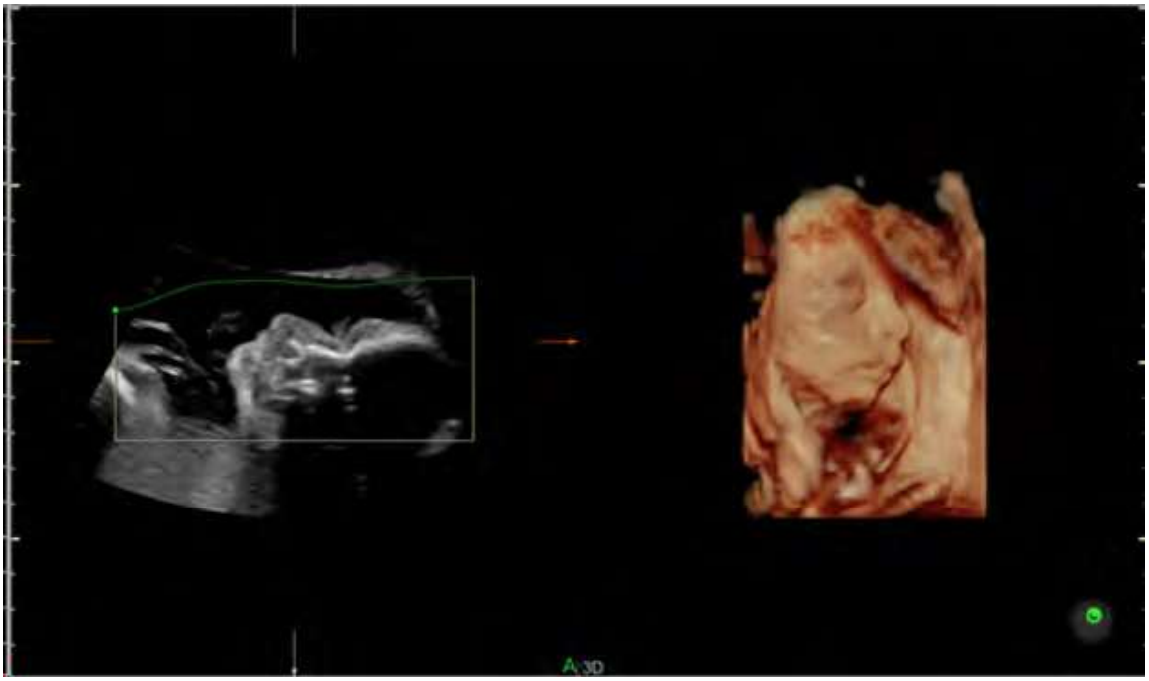


Figure 13-25. Screen Display On

Using SonoRenderlive

1. Start the Render Visualization Mode.
2. Press the **SonoRenderlive** Rotary control.
3. To adjust the distance between the render start position and the render object, rotate the **Sensitivity** control below the Touch Panel. A high value indicates a smaller distance.

NOTE: If SonoRenderlive is not used, the Render Start line can also be modified manually. Press the trackball button Curve to activate Curved Render Start and move the trackball to modify the line.

OmniView

OmniView provides an arbitrary cross-sectional plane, as opposed to a strict coronal plane. In VCI OmniView, the rendering box is very thin so you can visualize the tissue information of a thick slice. The resulting image shows the average (integrated) gray value of the tissue contained within the narrow box.

VCI OmniView improves the contrast resolution and the signal/noise ratio and therefore facilitates the detection of diffuse lesions in organs. The result is an image with no speckle pattern and a highly improved tissue contrast.

- 4D Real Time
- 3D Static
- STIC

OmniView Workflow

1. Press **3D/4D**.
2. Select ***OmniView***.
3. Adjust Volume Angle and B Quality as necessary.
4. Press the right **Set** key to start acquisition.

   The volume acquisition starts and the acquired images are displayed.
5. The cross cursor displays on the reference image.
6. Select the appropriate trace mode to display the sectional plane.
   - Line: Select the sectional image by using straight line.
   - Curve: Select the sectional image by using curved line.

     Move the cursor to the start point and press **Set**. Move the cursor to the end point and press **Set**. Use the **Trackball** to make a curved line and press **Set**.
   - Trace: Select the sectional image by using any arbitrary curve.
   - Polyline: Select the sectional image by using a continuous line composed of one or more line segments. You can create a polyline by specifying the endpoints of each segment by press **Set**.

OmniView Main Menu

Table 13-17: OmniView Parameters on Edit Touch Panel

Parameter	Description
View Icon	Show or hide the OmniView Icon.
View Line	Show or hide the OmniView Line.
VCI OmniView	Switch to VCI Omniview.
Trace Mode	Four tracking line methods are available.
Tile	Select a display format (Single, Dual, Quad)
Clear All	All existing lines are deleted and a new line entry is started.
Ref. OmniV	To activate OmniView Ref. Line view.
Ref. Image	Select the Reference image.
OmniV. Rot	Rotates the OmniView line.
Undo	To re-adjust the traced 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.
Slice Thickness	Select the slice thickness

OmniView Control

Figure 13-26. OmniView Control

Table 13-18: OmniView Parameters on Line Edit Mode: New

Parameter	Description
Img.	Activate the image.
Redo	Restart the line.
OmniView	Activate OmniView Line
View#	Select the next OmniView image and line as 1, 2, or 3.
Next	Select to activate the next OmniView Ref. Line view.

STIC (Spatio-Temporal Image Correlation)

Overview

With this acquisition method the fetal heart or vascularity can be visualized. It is not a Real Time 4D technique, but a post processed 3D acquisition.

STIC is designed for beating (fetal heart) as well as blood perfused organs. Only STIC can synchronize structures that have a pulsation in Doppler mode, but no visible pulsation in B-Mode.

Data is acquired for a predefined period of time. The acquired images are post processed to calculate a Volume Cine sequence representing one complete heart cycle.

In order to achieve a good result, try to adjust the size of the volume box and the sweep angle to be as small as possible. The longer the acquisition time, the better the spatial resolution will be. The user must be sure that there is minimal movement of the participating persons (e.g., mother and fetus), and that the probe is held absolutely still throughout the acquisition period. Movement will cause a failure of the acquisition. If the user (trained operator) clearly recognizes a disturbance during the acquisition period, the acquisition has to be canceled.

A good STIC data set shows a regular and synchronous beating of the fetal heart or of an artery. Please make sure that the borders of the fetal heart or the artery are smooth and there are no sudden discontinuities. Always adopt a critical attitude to images created in STIC mode.

If the expected frame rate is too low (10Hz) for a good STIC quality, a warning is displayed in STIC mode.

After the STIC acquisition is finished the calculation process starts to calculate the volume cine sequence. If a result is detected by the system, the Volume cine sequence is shown in run mode and the STIC accept menu appears. As soon as the result is accepted the system releases the volume cine mode. If the result is not accepted but canceled, the system switches back to STIC pre mode.

Overview (continued)

One or more of the following artefacts in the data set indicate a disturbance during acquisition:

- Sudden discontinuities in the reference image B: These are due to the motion of the mother, the fetus or fetal arrhythmia during acquisition.
- Sudden discontinuities in the color display: Motion of the mother, the fetus or fetal arrhythmia affects the color flow in the same way it affects the gray image.
- Fetal heart rate far too low or far too high: After acquisition the estimated fetal heart rate is displayed. If the value does not correspond to the estimations based on other diagnostic methods at all, the acquisition failed and has to be repeated.
- Asynchronous movement in different parts of the image: e.g., the left part of the image is contracting and the right part is expanding at the same time.
- The color does not fit the structures displayed in gray mode: The color is displayed above or below the actual vessel.
- Color “moves” through the image in a certain direction: This artefact is caused by a failure in detecting the heart rate due to low acquisition frame rate. Use higher acquisition frame rate for better result.

NOTE: In all of the above cases the data set has to be discarded and the acquisition has to be repeated.

When is it not allowed to perform the STIC fetal cardio acquisition?

- Severe fetal arrhythmia

Following STIC acquisition modes are available:

- STIC
- STIC CFM
- STIC PDI

Performing STIC Scan

NOTE: STIC can only be used in OB applications.

1. Select a 4D probe from the probe indicator.
2. After obtaining a feasible 2D image of the fetal heart or an artery, press 3D/4D to activate the Volume mode.
3. Select ***STIC***.
4. Set the Volume of Interest (VOI) to be rendered. Use the Trackball to move and resize the VOI.

NOTE: Press top Trackball key to switch Pos and Size.

5. Adjust the ***Acquisition Time***.
6. Set the volume sweep angle by using ***Volume Angle***.

NOTE: In order to acquire a good result, try to adjust the ROI and the sweep angle to be as small as possible. The longer the acquisition time, the better the spatial resolution will be.

7. Hold the probe still and ask the patient not to move.
8. Press the right **Set** key to start the acquisition.

NOTE: When the STIC acquisition begins, the Stop Acquisition button appears. If the user recognizes a movement of the probe, fetus or the patient during the scan, press Stop acquisition to cancel the acquisition.

9. Hold the probe steady until the system stops automatically. Estimated Fetal Heart Rate and Accept/Cancel buttons appears on the Touch Panel.
10. Press ***Accept*** if the fetal heart rate displayed on the Touch Panel is accepted. STIC image is displayed.

    If the result is not accepted, select ***Cancel***. The system switches back to STIC-pre mode.

NOTE: If the user (trained operator) clearly recognizes a disturbance during the acquisition period, the acquisition has to be canceled.

Screen Layout

The yellow caution icon and the calculated heart rate are displayed as well.

NOTE: Displayed Heart Rate indicates the heart rate [B/min] calculated from the delta time length per beat. A yellow caution icon indicates that the displayed heart rate is only an estimation. Do not diagnose based on this value.

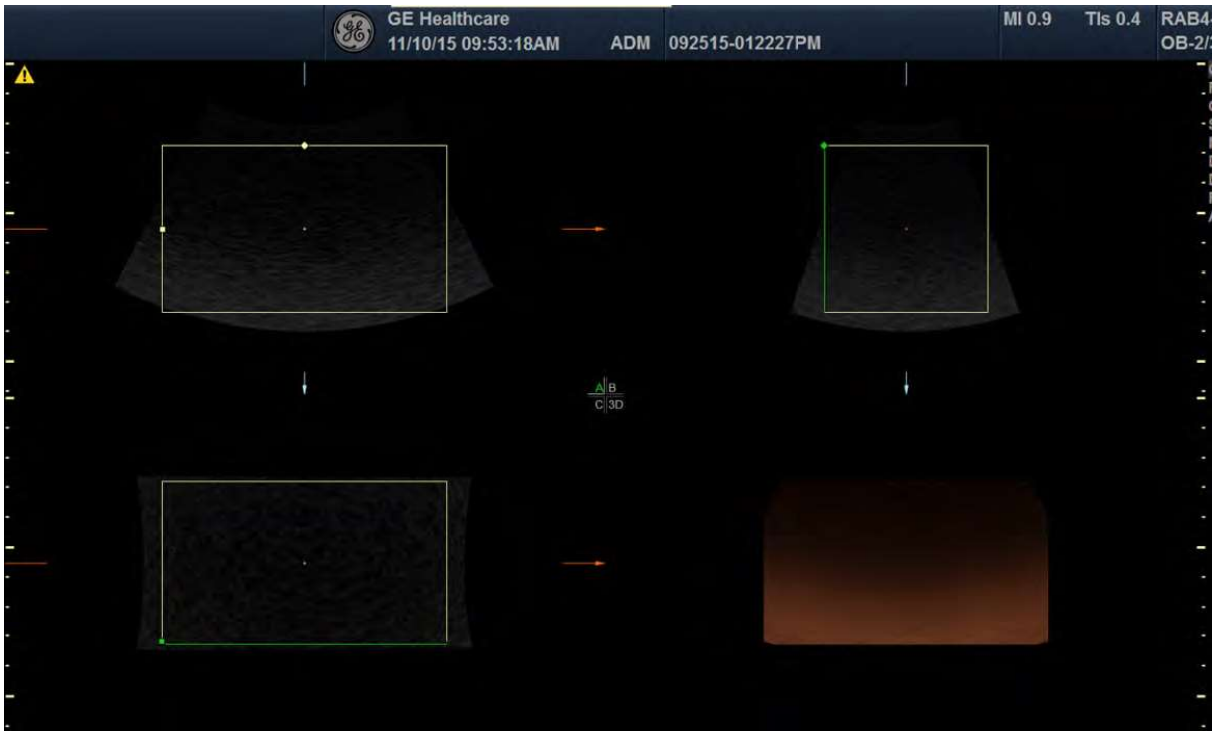


Figure 13-27. Screen Layout

STIC Controls

Touch Panel/All hard key and trackball controls are the same as in 4D/Static 3D mode. Therefore only the STIC relevant controls are described here:

Table 13-19: STIC Pre-mode Touch Panel

Relevant controls	Description
Acq. Time	Only available in STIC. Acquisition time can be set.
Volume Angle	Adjusts the volume angle.

Contrast Imaging

Overview

NOTE: The LOGIQ Totus 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

Misdiagnosis based on image artifacts

Misdiagnosis in ultrasound contrast images may be caused by several artifacts, most importantly:

Motion artifacts: Give rise to signals independent 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 the system failing to detect the contrast agent due to erroneous settings induced by the operator.

Tissue harmonics: Creates contrast-like signals independently of the presence of contrast agent.

CAUTION

Cardiac rhythm disturbances during cardiac 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.

Contrast Imaging Overview

By adjusting the acoustic output, you can enhance either contrast harmonics or stimulated acoustic emission (SAE).

See Chapter 11 for probe availability.

Coded Contrast Imaging utilizes three technologies: Amplitude Modulation (AM), Phase Inversion (PI), and Coded Harmonic Angio (CHA).

- Contrast: Amplitude Modulation and Phase Inversion (AM and PI) is included in the Contrast option.

Table 13-20: Available Contrast Display Settings

Label	Description	Clinical Use
Low MI B--Single Low MI B-Mode image display mode	Find the tumor before/after contrast agent injection	Tumor detection and characterization
Contrast Only—single contrast image display mode	Use contrast agent nonlinearity to detect contrast agent signal.	Tumor detection and characterization
Single View--Single Contrast enhanced image display with low MI B-Mode image data acquisition mode	Use contrast agent nonlinearity to detect contrast agent signal.	Tumor detection and characterization
Dual View—Real-time side-by-side dual image display with the right side contrast image and the left side B-Mode reference image	Use contrast agent nonlinearity to detect contrast agent signal.	Tumor detection and characterization

Benefits

The contract 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 tumors of the liver, kidney, and pancreas and to enhance flow signals in the determination of stenosis or thrombus.

Contrast Imaging 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, Rejection, and Suppression). 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. The ***Power Output*** key has been enhanced to provide more subtle gradations for use while contrast imaging. The Mechanical Index displays values less than 0.1. These values are displayed on CINE Loops and on archived images.
Feature Availability	3D and Volume Navigation are available; Multi Image and LOGIQView are not available.
Technique Availability by Probe	Use the table in Chapter 11 to determine which contrast technique is available by probe.

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 MVI Mode

Contrast MVI uses MVI (Micro Vascular Imaging) in Contrast mode. The characteristics of MVI's higher sensitivity and higher spatial resolution can be used in Contrast Imaging.

In addition to the MVI features, Flash, Flash + Capture, Max Enhance, and Contrast Clock can be used.

The choice of AM, PI, CHA mode in Contrast is not in Contrast MVI.

Support probes: C1-6-D, C1-6VN-D, 9L-D, L3-12-D and ML6-15-D.

Contrast Presets

You access the Contrast Imaging Presets via Utility -> Imaging -> Ref or Con tabs.

Target MI

Description Target MI control provides automated adjustment of the acoustic output to keep a specified Target value to reduce an unexpected change in MI during a contrast exam.

Target MI control can be preset in the Utility -> Imaging -> CON and Ref.

NOTE: The value of Target MI for Reference Image is adjustable on Ref tab, only when Ref-Only mode.

Time Delay To set the Trigger time delay, press the down arrow next to *Time Delay*.

Dual View To set the default contrast mode, press the down arrow next to *Default Mode* on Con tab to select the mode.

Additional Presets To adjust other Contrast Imaging presets (Map, Frame Average, etc.), press the down arrow to adjust the setting.

Sonazoid™ Contrast Agent

Sonazoid™ is a contrast agent approved in some countries. Refer to local clearances and availability in your respective market(s).

Sonazoid is a different microbubble, compared to other agents. You can select the Sonazoid contrast agent via Utility--> Imaging--> CON.

Contrast Controls

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.

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, Contrast Clock1 and Contrast Clock2 can be displayed on the bottom, left-hand corner in the image area and info area for several injections.

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.

Values

On/Off. You deactivate the Contrast Clock via the Touch Panel control or by starting a new patient.

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. Press ***TIC Analysis*** on the Touch Panel to enter TIC application.
3. Put a ROI on the image.
4. Press Export Traces. Type the file name and store it to the storage device.

Accumulation

Description Accumulation enhances the flow in an image.

Values 8 settings: 0=Off, 0.2, 0.4, 0.6, 0.8, 1.6, 3.2, and Infinite.

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, and PDI.

Benefit Accumulation detects the maximum signal and holds it for the level specified (1-7).

SRI Usage

Description You can use SRI-HD for the tissue image and the contrast image independently or together.

Adjusting You can preset SRI Usage in Utility -> Imaging -> Ref tab.

Visualization

Description Define the display technique. Only available for Single View or Dual View.

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.

Hybrid Map

Description Select the hybrid map for the Hybrid Contrast visualization in the Dual/Hybrid Display.

Flash

Description This feature provides a way to expose the higher acoustic power for a specified time duration by pressing a control once.

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 Con menus, 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 Con menu.

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 a recalled CINE, 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.
- Advanced 3D/Tru3D
  - Build volume data from active visualization.
  - For the Single/Dual View data set of contrast mode, both reference and contrast data are rendered in individual volume segments. Each volume data is manipulated using Active Data and Visual Data.
- 3D
  - Hybrid Map is disabled and forces “Contrast” visualization.
  - The Cine frames have “Contrast” data only.
- 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.

Static 3D with Contrast

Static 3D is available while in Contrast imaging mode while imaging with 4D probes.

1. Activate Contrast imaging.
2. Adjust the image, as necessary.
3. Activate the Contrast Clock (if you want the acoustic output set at 100%). Or, you can activate these when you inject the contrast agent.

NOTE: To restart the Contrast Clock, you need to turn it off, then back on.

4. Activate 3D--> Static 3D. Specify the quality, angle, and render mode (Sectional, Render, and VCI Static are supported).

   Wait to inject the contrast agent until after you have set up your pre-mode data. Adjust the ROI and other parameters before injecting the agent.

NOTE: Accumulation and Trigger turns off or resets to 0 when you activate Pre-mode.

5. Activate the Contrast Clock and inject the contrast agent, then press the Start Key to activate the Static 3D acquisition as soon as the contrast agent washes in.

   The system automatically ‘stores’ the sweep (to internal memory, not to the clipboard).

NOTE: You may want to set up a Fast Key to automate these keystrokes. See Chapter 6 for more information.

Static 3D with Contrast (continued)

6. To store this VOI, press a print key. All CINE and volume data loops are saved in 3D when you press P1. Store loops from Static 3D or from the Volume Review tab in order to store the complete volume.

NOTE: You can also configure the system to perform a count down for the contrast injection via Utility-->System-->System Imaging.

7. At the completion of the sweep, the Static 3D tab appears.

NOTE: The Contrast Timer on the Volume Review images represents a timestamp of when the image was captured relative to when the timer was started.

8. Press the **Start** key to acquire volume data.

Time Intensity Curve (TIC) Analysis

Overview

Time Intensity Curve (TIC) enables the user to perform the following analysis:

- Time-Intensity analysis allows instant time-intensity calculation from up to eight regions of interest.
- Curve fitting analysis for research studies of contrast agent concentration rates.

The basic TIC process works as follows:

1. Scan the patient after injecting the contrast agent.
2. Observe 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

Starting TIC in cine loop

1. Open an examination and select a contrast cineloop.
2. Select ***TIC Analysis*** on the Touch Panel.

Starting TIC in live mode

1. Scan and freeze the patient in Contrast live mode.
2. Move the trackball to activate Cine.
3. Select ***TIC Analysis*** on the Touch Panel.

Exiting TIC Analysis

There are several methods to exit TIC Analysis.

- Select ***Exit TIC Analysis*** on the TIC Touch Panel.
- Press **Freeze** to unfreeze and resume scanning.
- Press any other button that returns the system to real-time scanning.

TIC Analysis Screen Description

Figure 13-28. TIC Analysis Screen - Graph with dual image layout (example)

1. Contrast cineloop window
2. B-Mode cineloop window
3. Analysis window
4. Sample area
5. Time and velocity at cursor position
6. Sample area tools
7. Layout icons
8. Frame marker

Table 13-21: Cineloop windows

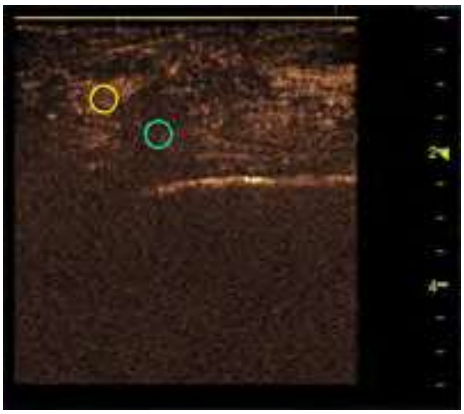
Graphic	Description
	Displays Contrast image data Sample area: Indicates sampling position of the intensity trace. The sample area is color-coded: the first sample area is yellow, the second blue...etc.

Table 13-21: Cineloop windows (Continued)

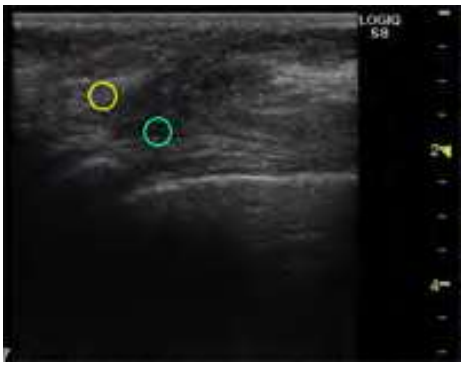
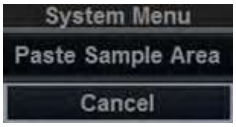
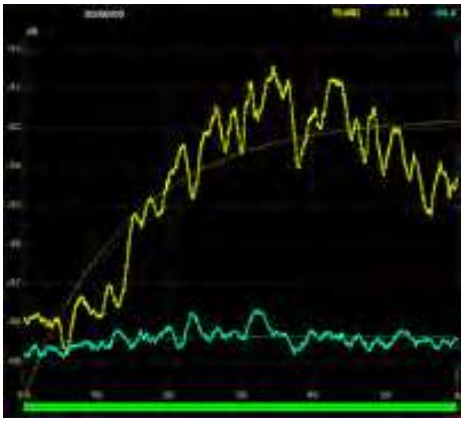
Graphic	Description
	Displays B-Mode data Sample area: Indicates sampling position of the intensity trace. The sample area is color-coded: the first sample area is yellow, the second blue...etc. NOTE: B-Mode image is not displayed when cine clip stored in contrast only mode.
 	System menu on Sample Area This menu is displayed by pressing the left Set key when the cursor is placed over a sample area in one of the Cineloop windows. Note: The system menu is dependent on mode. • Set As Default ROI Size: Displays on elliptical ROI. • Label Sample Area: Sets a descriptive name to the sample area. The label is useful for identification of the sample area when exporting data. • Delete Anchor (On ROI setting as anchor point only) • Copy Sample Area • Copy & Move • Copy & Move (Same Depth) • Move (Same Depth) • Set Start Frame: Set start frame for current ROI to calculate the TIC parameters and fitting curves. • Set End Frame: Set end frame for current ROI to calculate the TIC parameters and fitting curves. • Cancel: exits the System menu. System menu on Image when copy sample area is selected. • Paste Sample Area
	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): displays ECG trace (where available). • Frame Marker: 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)

Table 13-21: Cineloop windows (Continued)

Graphic	Description
	System menu of the analysis window This menu is displayed by pressing left Set key when the cursor is in the Analysis window. Note: The system menu is dependent on mode. • Vertical Auto-Scaling: selects between full unit range or a range according to the maximum and minimum values of the displayed trace(s). Delayed, On, Off. • Vertical Unit: toggles between logarithmic (dB) and linear acoustical units (AU). Vertical unit of previous analysis is retained. • Horizontal scale: Only on a loop including different frame rate. • Line Style: selects between solid line only or solid line with square markers at each data point. • TIC Parameters: The TIC parameters dialog appears. • Curve Fitting Parameters: toggles between Wash-in, Wash-out, Gamma Variate and off. • Gradient: On or Off. • Gradient Plot: Gradient, Gradient Derivative, All or Off (On Graph with Dual Image Layout and Small Data Layout only). • ECG Triggering: Only on a loop including the ECG cycle. • Cancel: exits the System menu.

Table 13-22: Analysis windows

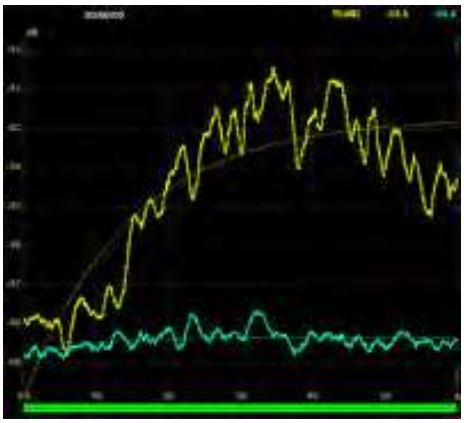
Graphic	Description
	Displays time-intensity curve. • Y axis: Intensity scale (logarithmic) (db) or linear acoustic units (AU). • X axis: Time(s) or Dt(s) [Diastolic time in seconds], elapsed time from previous frame. • ECG (where available -- not shown): displays ECG trace (where available). • Frame Marker: 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)

Table 13-22: Analysis windows (Continued)

Graphic	Description
	System menu of the analysis window This menu is displayed by pressing left Set key when the cursor is in the Analysis window. Note: The system menu is dependent on mode. • Vertical Auto-Scaling: selects between full unit range or a range according to the maximum and minimum values of the displayed trace(s). Delayed, On, Off. • Vertical Unit: toggles between logarithmic (dB) and linear acoustical units (AU). Vertical unit of previous analysis is retained. • Horizontal scale: Only on a loop including different frame rate. • Line Style: selects between solid line only or solid line with square markers at each data point. • TIC Parameters: The TIC parameters dialog appears. • Curve Fitting Parameters: toggles between Wash-in, Wash-out, Gamma Variate and off. • Gradient: On or Off. • Gradient Plot: Gradient, Gradient Derivative, All or Off (On Graph with Dual Image Layout and Small Data Layout only). • ECG Triggering: Only on a loop including the ECG cycle. • Cancel: exits the System menu.

Table 13-23: Layout icon

Graphic	Description
	You can select layout from following. • Graph with Dual Image Layout • Small Data Layout • Large Data Layout • Everything Layout • Single Image Layout • Dual Image Layout
	Indicates an analysis graph.
	Indicates an image One icon means Contrast image. Two icons mean Contrast and B-Mode.
	Indicates parameters. 10 dots means that all parameters display. 4 dots means that only displays high level parameters.

Table 13-24: Sample area drawing tool

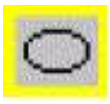
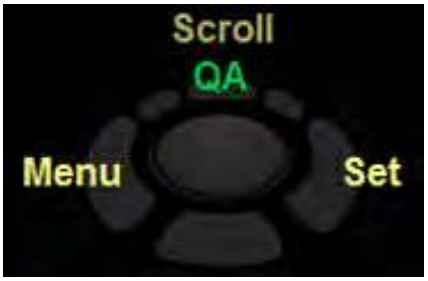
Graphic	Description
	Creates a sample are based on freehand drawing.
	Creates a sample area with a pre-defined circular/elliptic shape.

Table 13-25: Trackball Assignment

Graphic	Description
	Press the top Trackball key to toggle the trackball assignment between QA and Scroll. • QA Pointing tool in TIC mode. • Scroll When the cineloop is stopped, enables scrolling through the cineloop. • Menu Press left Set key to display System Menu. • Set

TIC Touch Panel

Table 13-26: TIC Touch Panel Description

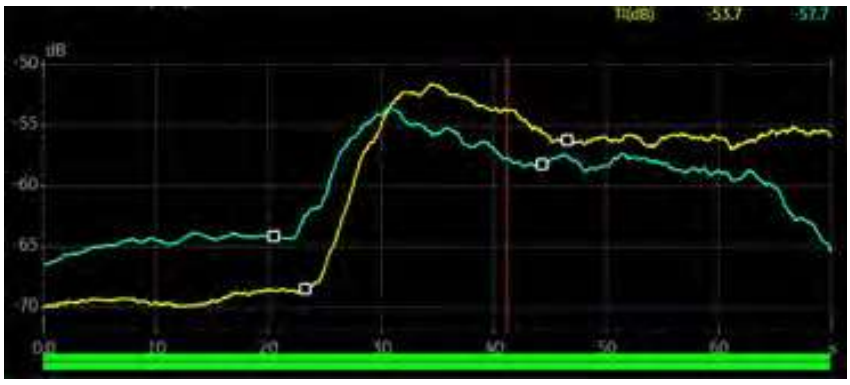
Parameter	Description
Exit TIC Analysis	Exit TIC.
Motion Tracking	Users use TIC to analyze tumor characteristics precisely, without distortion due to patient movement. Motion Tracker enables the system to automatically adjust the ROI's placement across multiple frames in order to accommodate patient breathing or body movements. To activate, press Motion Tracking on the Touch Panel. This starts the calculation to adjust the all ROI positions for every image frame. After completion, the ROI graphic on each frame is changed to the ROI with the anchor.
Accumulation	Enhances the flow in an image.
Enable All Frames	Re-enables disabled frames.
Curve Fitting	Toggles between Wash-In, Wash-Out, Gamma Variable and Off.
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.
Auto Calc Range	Auto Calc Range enables system to automatically estimate the ROI's start frame and end frame to calculate TIC parameters and fitting curves. The start and end frames for each ROIs are displayed by small squares on the graph. Toggles between Current Sample, All Samples and Reset All. 
First	Move to the first frame of cineloop.
Last	Move to the last frame of cineloop.
Run/Stop	Start/Stop the cineloop review.
Loop Speed	Adjust the cine loop playback speed.
ROI width/height	Move the rotary left/right or up/down to adjust ROI width/height.
ROI tilt angle	Rotate the rotary to adjust ROI tilt angle.

Table 13-26: TIC Touch Panel Description (Continued)

Parameter	Description
Start Frame	Rotate the rotary to select the start frame and push to set the frame.
End Frame	Rotate the rotary to select the end frame and push to set the frame.
Frame by Frame	Rotate the rotary to review the CINE image frame by frame manually.
Disable frame	Push the rotary to disable the selected frame.
Graph #	Select the clip for general TIC analysis. System can register up to 10 clips and the individual parameters for each TIC analysis are maintained in one TIC analysis session.
Remove Graph	Remove the selected graph from the clip list in Graph # button.
Merge Graphs	Referring to Contrast Clock1 in the stored clips, system merges the TIC graphs. Contrast Clock1 and at least 2 ROIs are required for Merge Graphs.

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 (Ellipse ROI)

1. Press the top **Trackball** key until the QA trackball assignment is selected.
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.

Copy, move and paste a Sample Area

To copy and paste the ROI,

1. Move the cursor over the ROI and press the left **Set** key. The system menu displays.
2. Select ***Copy sample area***.
3. Move the cursor to the desired location for the copied ROI and press the left **Set** 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 the left **Set** key. 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.

To move the ROI,

1. Move the cursor over the ROI and press the left **Set** key. The system menu displays.
2. Select ***Move (same depth)***.
3. Move the ROI using the **Trackball**. Press **Set** to fix the position.

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 the top **Trackball** key until the QA trackball assignment is selected.
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 the top **Trackball** key until the scroll trackball assignment is selected.
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 top Trackball key until the scroll trackball assignment is selected.
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 top Trackball key until the QA trackball assignment is selected.
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 left **Set** 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 the top Trackball key until the QA trackball assignment is selected.
2. Move the cursor over one of the sample area. Confirm that cursor is changed to hand icon.
3. Press the ***Delete Sample Area*** on the touch panel.
4. Select ***Current Sample*** or ***Delete all*** as necessary.

NOTE: The corresponding traces for the deleted ROIs are erased from the plot.

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 on the Frame Marker which you want disable.
2. Press **Set** to disable the 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 on the Frame Marker.
2. Press and hold down ***Set***
3. Move the cursor with the Trackball to the last frame to be disabled and release Set.

   The marker is turn red and the data from that frame is removed from the trace and any subsequent trace processing.

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 analysis window and press left **Set** key. 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

1. Select ***Enable all frames*** on the Touch Panel.
2. All disabled frames are re-enabled.

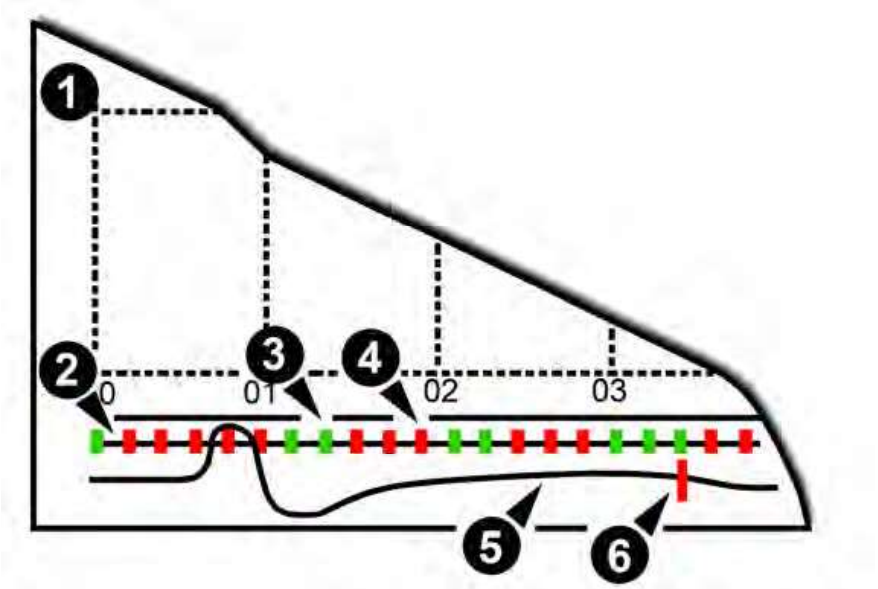


Figure 13-29. Frame markers

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. Place the cursor on the sample area.
2. Press left **Set** key. The system menu displays.
3. Select ***Set as Default ROI Size***.
4. The current ROI size is set as the default for subsequent Ellipse ROIs.

Reshaping a Sample Area

To reshape the sample area:

Figure 13-30. ROI

- Move the rotary up and down to change the height.
- Move the rotary left and right to change the width.
- Rotate the rotary to change the tilt angle.

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 the left **Set** key.
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***.

TIC Plot Control

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. The unit of previous analysis is retained.

- ***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.

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.

Y-Scale

1. When you select “Off” for Vertical Auto-Scaling, Y-Scale dialog displays.
2. Enter maximum and minimum value for vertical scale on the graph.
3. Press ***OK***. The vertical scale is updated.

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.

Horizontal Scale

Set the horizontal unit as time scaling (s) or time interval (dt) between frames.

NOTE: Only on a loop including different frame rate.

Smoothing

The system can smooth the traces displayed by applying a filter over a defined time window. The type of filter available is depending on the analysis signal displayed.

1. Select ***Smoothing*** on the Touch Panel.

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: When smoothing is turned on, it applies to all traces in the plot window.

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 13-31. Gradient

Trace Measurement (continued)

TIC Parameters

Following parameters are automatically calculated and displayed with the graph.

Table 13-27: TIC Parameters

MGrad	Maximum Gradient
MGT	Max Gradient Time
Grad.	Mean Gradient for the peak intensity.
ArT	Arrival Time
TtoP	Time to Peak
PI	Peak Intensity
TWH	Time Width at Half maximum intensity
TWR	Time Width Ratio for wash-in and wash-out
AUC	Area Under the Curve
WiAUC	Wash-in Area Under the Curve
WoAUC	Wash-out Area Under the Curve
A, B, C, k and MSE	The coefficients and the mean square error for fitting curve equation. These parameters are displayed only on Large Data Layout with curve fitting.

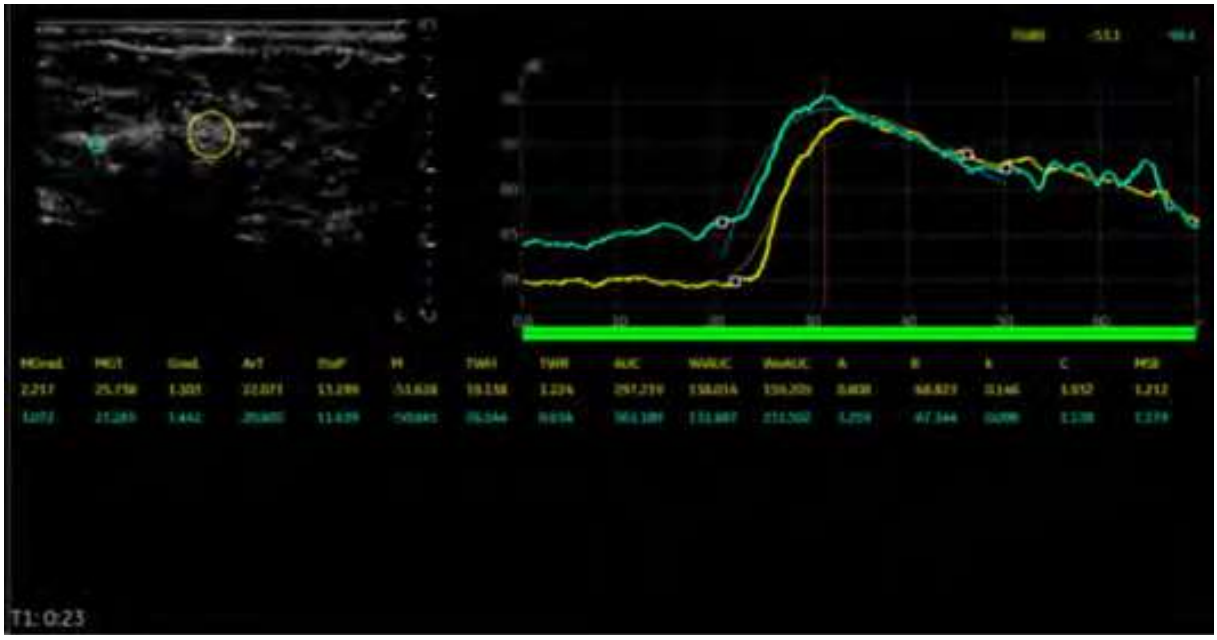


Figure 13-32. TIC Parameters

Trace Measurement (continued)

Show graph (Gradient plot)

1. Select ***Gradient Plot*** from the pull-down menu.
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.
   - 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.
   - All: Three graphs plot TIC, TIC gradient and TIC gradient derivative.

Curve Fit

1. Select ***Curve Fitting*** on the Touch Panel.
2. The Curve Fit selection list displays.

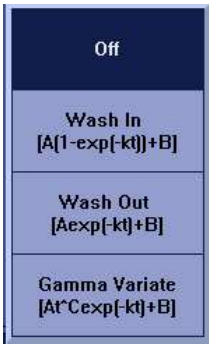


Figure 13-33. Curve Fit Selection List

- ***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. Exponential 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.
- ***Wash-out***—Used to find and estimate a local wash-out rate. Exponential wash-out is described by the function:

  Y(t) = Aexp(-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***

  $Y(t) = At^{c}exp(-kt)+B$

Parameters of Gamma curve fitting

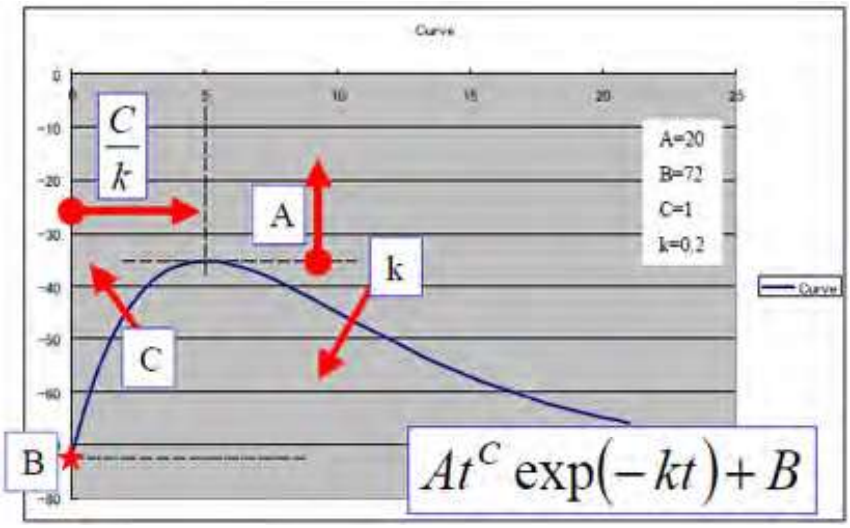


Figure 13-34. Gamma Curve

- 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.
2. Push Auto Calc Range on Touch Panel and select All Samples. Then the start and end frames for each ROI are automatically estimated.

If you need to optimize the start and/or end frames,

1. Select the start frame as with Cine or move the cursor to the desired position on the graph and press the right **Set** key.
2. Move the arrow pointer on the ROI (hand cursor appears) and press the left **Set** key. The system menu appears.
3. Select ***Set Start Frame*** from the menu.
4. Select the End Frame as with Cine or move the cursor to the desired position on the graph and select the right **Set** key.
5. Move the arrow pointer on the ROI (hand cursor appears) and select the unmarked key (the left Set key). The system menu appears.
6. Select ***Set End Frame*** from the menu. The ROI colored line displays.
7. 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 select the TIC parameters for Small Data Layout and Everything Layout.

1. Place the cursor on the analysis graph and press left Set key. Select TIC Parameters from the pull-down menu.
2. The TIC Parameters dialog appears.
3. Select a maximum of 6 parameters to display for each TIC.
   - Save As Default: saves as a system preset.
   - Save: saves as temporary.
   - Cancel

NOTE: If you select more than 6 parameters and select Save or Save as default, you will be prompted to select up to 6 parameters.

4. The selected parameter displays for Small Data Layout and Everything Layout. Press the Large Data Layout button to display all parameters; or press the other Layout button to hide all parameters.

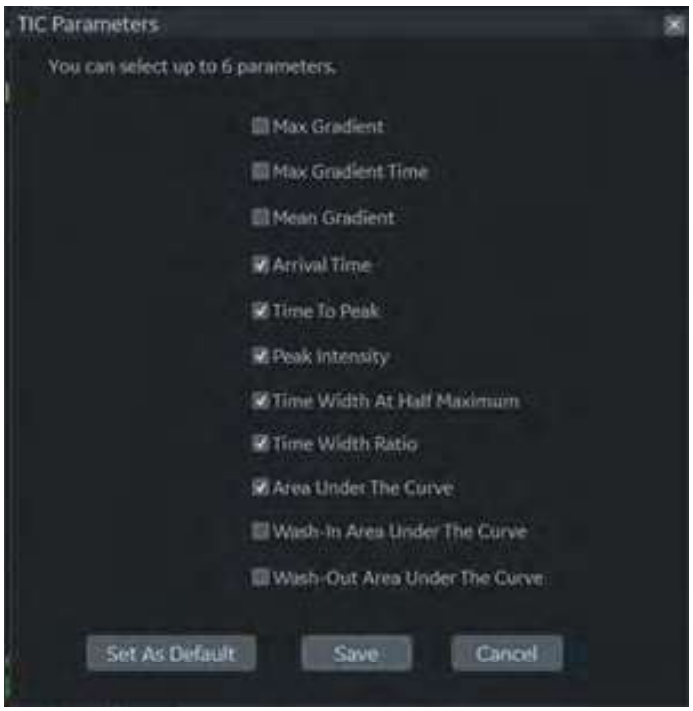


Figure 13-35. Curve Fitting Parameters Dialog

Raw Data store with TIC Setting

You can store the raw data with TIC setting.

1. Run TIC cineloop.
2. During cine running mode, press appropriate print key.

When you recall the raw data clip with TIC data, you can add, delete or modify the analysis measurements on the recalled raw data in TIC mode.

Printing TIC Data

1. Press **Run/Stop** to freeze the image.

   The still image can be get when cineloop is stopped by Run/Stop button.
2. The system captures a single still frame which consists of the plot, the reference image and user annotation.

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.

SaveAs (Save image file and export trace data)

You can save the image file and trace data.

1. Select ***SaveAs***.
2. The following dialog displays.
   - Location: Select Location which to save.
   - Filename: Enter the file name. (Only Text)
   - Export Trace: If you check this box, LOGIQ Totus exports trace data to .csv file.

     Note: Name of exported file has same name as the image file saved at the same time.
3. Select ***OK*** to save the image and 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.

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 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.

TIC cineloop store

When you transfer TIC cineloop to the external server, check “Add Multiframe Data” in Utility -> Connectivity -> Button and then store the cineloop to the system.

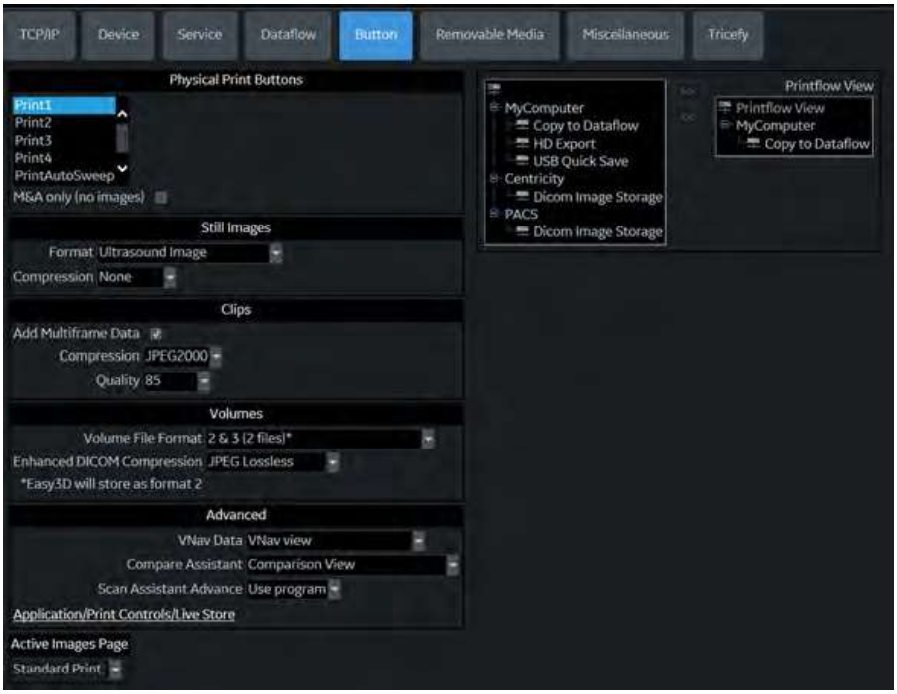


Figure 13-36. Button page

TIC Analysis for multiple Clips

When you load additional contrast data on the clipboard in TIC mode, the system registers the contrast clips to analysis list up to 10 data in one TIC analysis session. The system maintains individual TIC setting such as ROI shape, position, smoothing, motion tracking state etc. for each clip. You can recall the clip by eGraph #f button on touch panel. The eRemove Graph button can remove selected clip from the analysis list.

The registered clip list and TIC settings are reset by exiting the TIC mode.

Merge Graphs

You can merge the multiple graphs such as early phase and late phase for 2 TIC graph plots by eMerge Graphs button on touch panel. This function requires the stored clips which have the Contrast Clock1 information and at least 2 ROIs (yellow and light blue) for TIC analysis.

The horizontal scale of merged graph is based on Contrast Clock1.

Table 13-28: Merge Graphs Touch Panel Description

Parameter	Description
Exit	Exit to individual TIC analysis mode. All TIC parameters for registered clips are maintained.

Merged graph Screen Description

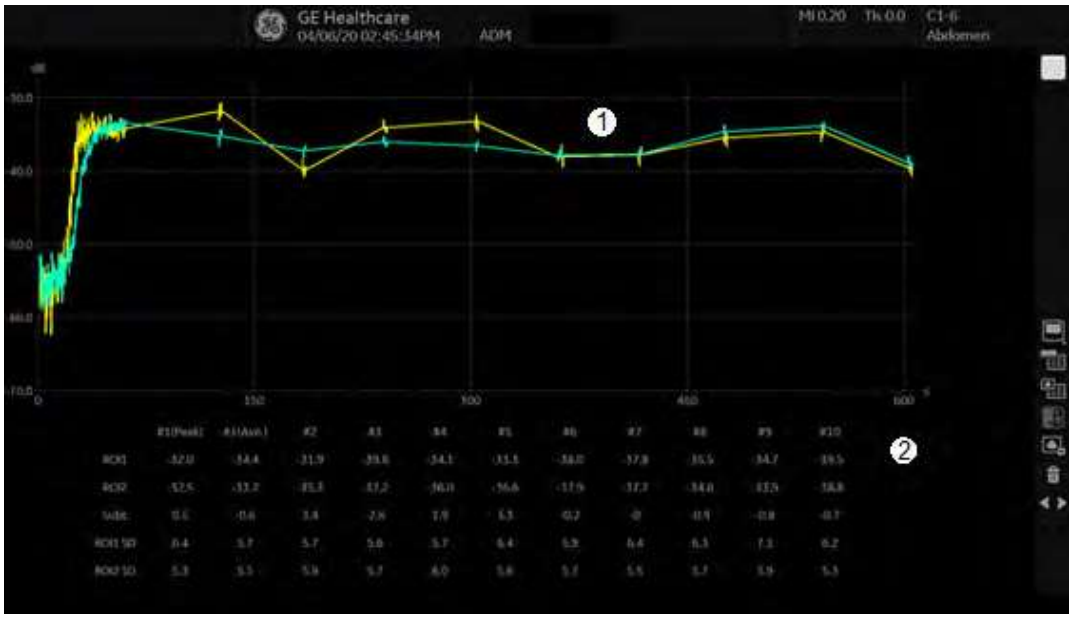


Figure 13-37. Merged Graph display

1. Merged graph window
2. Parameter table

Table 13-29: Merged graph window

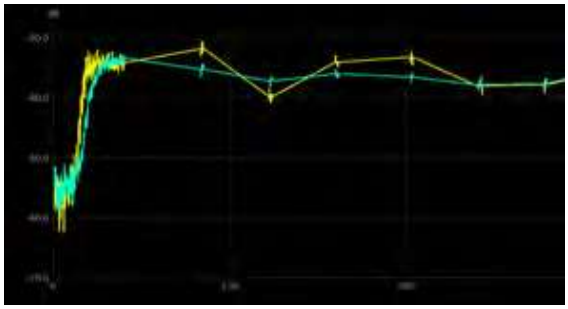
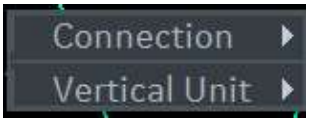
Graphic	Description
	Displays the merged graph on the upper part of monitor. The horizontal scale is based on the Contrast Clock1.

Table 13-29: Merged graph window

Graphic	Description
	Displays the parameters on the lower part of monitor. The parameters are the intensity of ROI1 (Yellow), ROI2 (Light blue), Subtraction (ROI1-ROI2) and Standard deviation of ROI1 and ROI2.. These are calculated for peak and last 5sec. average of 1st clip, and average of other clips based on Contrast Clock1 value.
	This menu is displayed by pressing the left Set key when the cursor is placed over the merged graph window. Connection : selects the graph connection method. Average, Direct and No Line. Vertical Unit : toggles between logarithmic(dB) and linear acoustic units(AU). Vertical unit of previous analysis is retained.

SaveAs (Save image file and export merged trace data)

You can save the graph image file and trace data.

1. Select SaveAs.
2. The following dialog displays.
   - Location: Select Location which to save.
   - Filename: Enter the file name. (Only Text)
   - Export Trace: If you check this box, system exports trace data to csv file.

   Note: Name of exported file has same name as the image file saved at the same time.
3. Select OK to save the image and data and return to the merged graph screen.

Strain Elastography

Description

Strain 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 Strain Elastography. The image is displayed in dual mode with the color map/bar of the Strain Elastography on the left side and the imaging parameters on the right side of the display below E.

You activate Elastography via the Elasto hard key on the Control Panel.

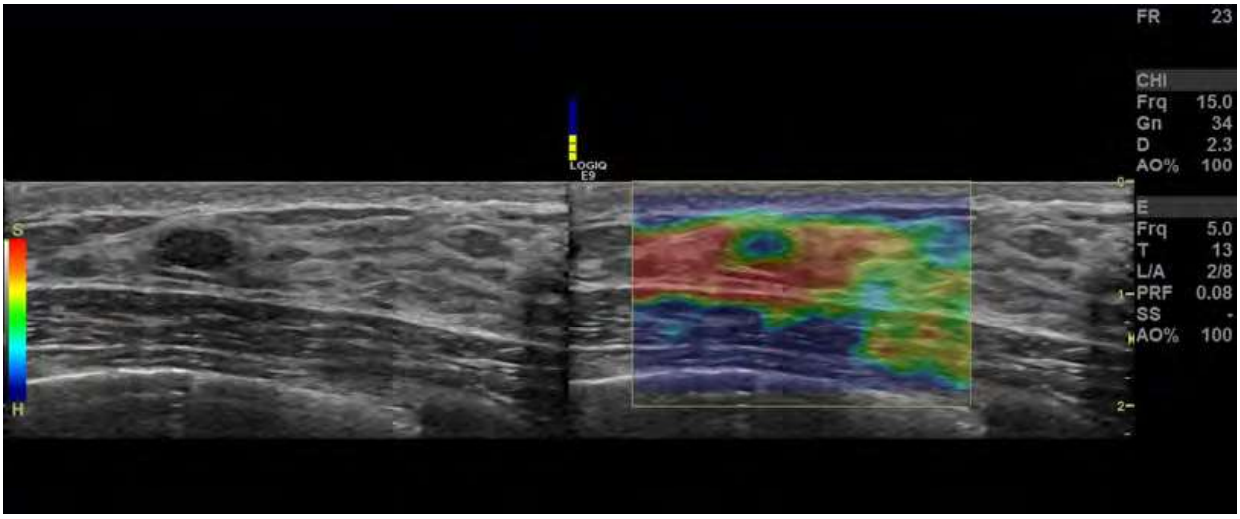


Figure 13-38. Strain Elastography Example

Using Strain Elastography

The Strain 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.

Strain Elastography displays firmer tissue in blue and softer tissue in red. To enhance Blue, increase Hard Compress; to enhance Red, increase Soft Compress on the Touch Panel. To enhance strain elastography contrast, reselect the Color Map.

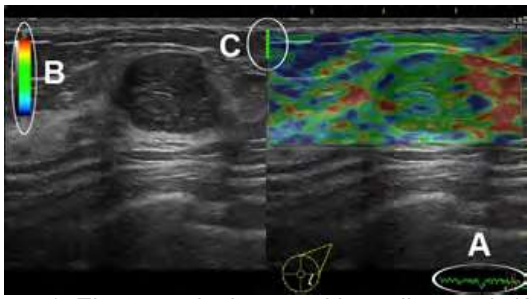
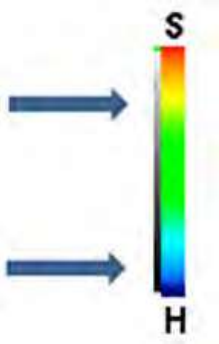
If you need more resolution, reduce Smoothing, increase Frequency, or reduce Window.

If you need a smoother image, increase Window or Smoothing.

If the images seem too flashy, decrease Frame Reject to 1.0 and Noise Reject to have consistent imaging throughout.

Using Strain Elastography (continued)

Table 13-30: Strain Elastography

Using Strain Elastography	
Manual Compression: 1. Press “Elasto” button at the console to activate. 2. Select Strain on Touch Panel. 3. Adjust the position of the ROI to place the suspicious area at the center. 4. Adjust the size to include surrounding tissue (sample area size = x3 dimension of the lesion per axis). Manual compression depends on the type of probe. 1. Linear probes: Perform slight compressions keeping transducer perpendicular to the skin. Duration: 5 sec. or 10 compressions. 2. Convex probes: Turn the patient on his left side more than 90 deg. Pressing with the probe above the lesion, allowing the heart and lungs to create the compressions. 3. Endocavitary probes: Perform soft, angular movement in plane of the probe. Duration: 5 sec. or 10 compressions. *Note 1: Any very soft (vessel, cyst, air) or very stiff (bone) tissue above the lesion or the reference area may cause interference with the compressions. You may want to attempt from a different view.* *Note 2: Keep the lesion within the image and watch the quality graph for consistent high nearly flat (plateau-like) peaks.*	**Select the frame to analyze** 1. Press “Freeze.” 2. Using the trackball or “frame by frame” knob, select a frame on a plateau of the quality graph (Image 1, A) or when consistent frames with green bars are visualized (Image 1, B).  *Image 1: Elastography image with quality graph (A), quality bar (C) and elasto color bar (B).* The relation between elastography colors and area’s stiffness is given at the elastography color bar (Image 1, B). Less Stiff Stiffer 

Clinical Applications

Table 13-31: Clinical Applications

Application	Compare the suspicious lesion with:	Probe
Breast	A fatty area in the breast or the average rounding breast tissue.	• 9L-D • ML6-15-D • L3-12-D
Thyroid	A normal area in the parenchyma of the gland.	• 9L-D • ML6-15-D • L3-12-D
MSK	A normal area in the same part of the body.	• C1-6-D/C1-6VN-D • 9L-D • L3-12-D • ML6-15-D
Liver	A normal area in the parenchyma of the liver.	• C1-6-D/C1-6VN-D • 9L-D
Prostate	A normal area in the parenchyma of the prostate.	• IC5-9-D
Uterus	A normal area in the parenchyma of the uterus.	• IC5-9-D

Strain Elastography Controls

Table 13-32: Strain Elastography Touch Panel Description

Parameter	Description
Axial Smoothing	Controls the smoothness of the strain elastography image in the axial direction. A higher value means a smoother image.
Lateral Smoothing	Controls the smoothness of the strain 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 strain elastography maps. Seven different maps are available with various contrast and color schemes, including a grayscale map. Selections: E0-7, E-Gray, and S Map. The E Map calculates the mean strain for the whole ROI and assigns this mean value to a green (center) color. This is best suited for imaging a localized mass compared to the surrounding tissue with external forces (the movement of the hand-held probe). The S Map is useful for imaging diffusely-distributed diseases and local strain changes brought about by internal forces such as the movement of a beating heart and moving vessels. The default strain sensitivity is unique by probe/application. You can adjust the strain scale by adjusting the strain sensitivity tool.
Frame Average	Controls the persistence of the strain elastography images.
Frequency	Controls the transmit frequency.

Table 13-32: Strain Elastography Touch Panel Description (Continued)

Parameter	Description
Strain Sensitivity	If S0 Map (in live) is selected, the user can control Strain Sensitivity (SS).
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 strain 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.
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.
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.
Show Quality Graph (restart needed)	Select to display a Quality Graph for Elastography. The higher the level, the higher the data quality for the frames.

Application Parameters

You can set the Quality Bar and Quality Graph on the Utility--> Application--> Settings --> Elasto page.

For Quality Bar:

- Check to display a Quality Bar for Elastography.

For Quality Graph:

- Off (No elasto quality graph is displayed in the image)
- Small, Medium or Large for display size of Quality Graph.

General Imaging Parameters by Application/Probe/Feature

Select the Default Elasto Mode via Utility--> Imaging--> General.

You can specify Strain to be the default setting by application and probe.

1. To specify a default probe per application, select Utility --> Imaging --> General.
2. Select the application.
3. Select the default probe from the pull-down menu.
4. Specify the Default Elasto setting:
   - Strain
   - Shear

Elastography Analysis

Overview

The Elastography Mode detects strains by correlating the echo amplitudes of the tissue when compressed and uncompressed. Different displacement of echoes is an indicator for different stiffness (strain) of the tissue. High strain means that the tissue is softer, low strain means that it is stiffer. Zero is absolutely stiff without any elasticity. Elastography Analysis is a strain ratio comparative tool that enables users to compare the strain of one tissue to the surrounding tissue.

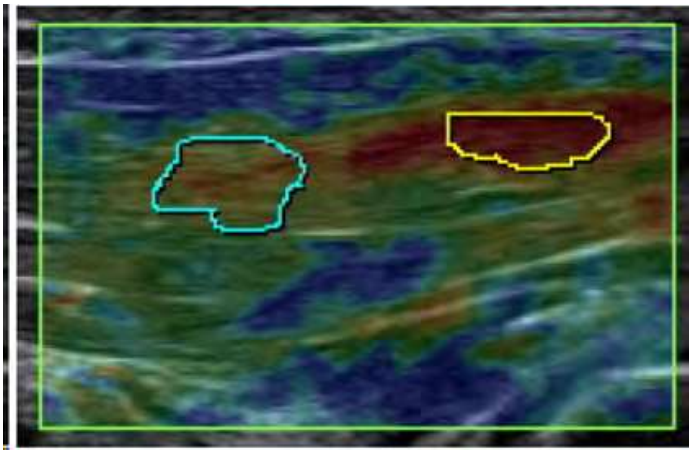
Using Elastography Analysis

1. If not yet in Elastography Mode press Elasto.
2. Perform the scan. Proper manual compression/ decompression is indicated by a fully green quality bar.
3. Press Freeze and scroll the Trackball to bring up the CINE tab on the Touch Panel.
4. Press Analysis on the Touch Panel. The Elastography Analysis Touch Panel appears and the monitor screen shows the Elastography Analysis display. The valid Elastography frames are marked green.
5. Adjust the start and end of the CINE Loop within the green frames using the rotary buttons below the Touch Panel (Start Frame/End Frame). Press Set to confirm..
6. Activate the cursor and move it over the Elastography image on the top left side of the screen. A white sample area appears. By default this sample area is a circle. It will be the reference sample area and should be placed in the normal breast tissue.
7. Position this reference sample area and press Set. A yellow plot curve displays the strains over time on the right side of the monitor screen.
8. Move the Trackball again. A new sample area appears (sample area 1) which should be placed in the lesion.
9. Position the sample area and press Set. A second plot curve is displayed (blue curve).

Using Elastography Analysis (continued)

In total you can create 7 sample areas and 1 sample area. Each sample area can be edited, moved, copied, or deleted. A sample area can also be drawn manually.

1. To edit an existing sample area, move the cursor over the sample area then press the left Trackball control (Menu) to bring up the menu. Select “Set Sample Area Shape” to enter a dialogue window where Height and Width can be adjusted. You can also label, delete, copy, move the sample area by selecting corresponding options in the menu.
2. To draw a sample area manually, select the pencil icon. Then the cursor becomes a cross inside the strain image. Start to draw the sample area by pressing “Set.” Press “Set” again to stop drawing.



3. Both Stiffness and Ratio plots can be displayed: Switch to Ratio plots by pressing the Ratio control on the Touch Panel.
4. Press Exit Analysis to return to Elastography Mode.

Using Elastography Analysis (continued)

HINTS

Use the trackball to scroll the Cine Loop quickly.

NOTE: The maximum strain value in human tissue can be up to 2%.

NOTE: The ratio value indicates how many times the tissue of a sample area is harder or softer than the tissue of the Reference sample area.

Elastography Analysis Display Description

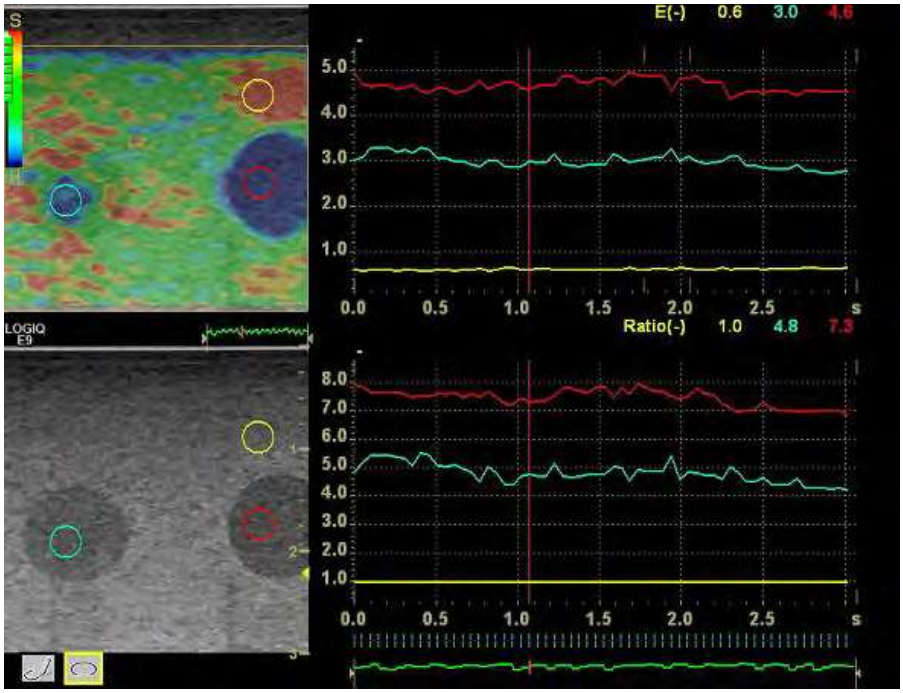


Figure 13-39. Elastography Analysis Example

1. Reference sample area
2. Lesion
3. Harder compression
4. Lower compression
5. Strain plot
6. Ratio plot
7. Frame indicator lines: green lines indicate frames with color in the Elastography image, red lines indicate invalid frames without color.
8. Reference sample area is set to 1
9. Lesion is 0.8 times as rigid as the Reference sample area

Additional Notes for Elastography Analysis

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 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 Analysis and setting the sample area in the blue portion of the three-layer pattern on the cyst and then setting the sample area in the “normal” tissue may cause you to misinterpret the Elastography Analysis ratio as the cyst to be hard as compared to the “normal” tissue.

Shear Wave Elastography

Overview

Shear wave elastography on the LOGIQ Totus is an ultrasound imaging mode in which shear waves are generated in-vivo acoustically via the imaging ultrasound transducer. The motion of the shear waves is then tracked using ultrasound to determine their velocity of propagation, which is a quantifiable indicator of the mechanical properties of the tissue through which it traveled. The steps associated with performing this analysis on the LOGIQ Totus include correctly placing a user-specific region of interest (ROI) over the anatomy of interest. Next, the user activates the shear wave analysis mode where the shear wave generation and tracking occurs. Up to four (4) sites may be analyzed. After acquiring the data, the user either stores the image or analyzes it via measurement tools which can produce shear wave velocity or stiffness statistics of areas within the ROI.

Overview (continued)

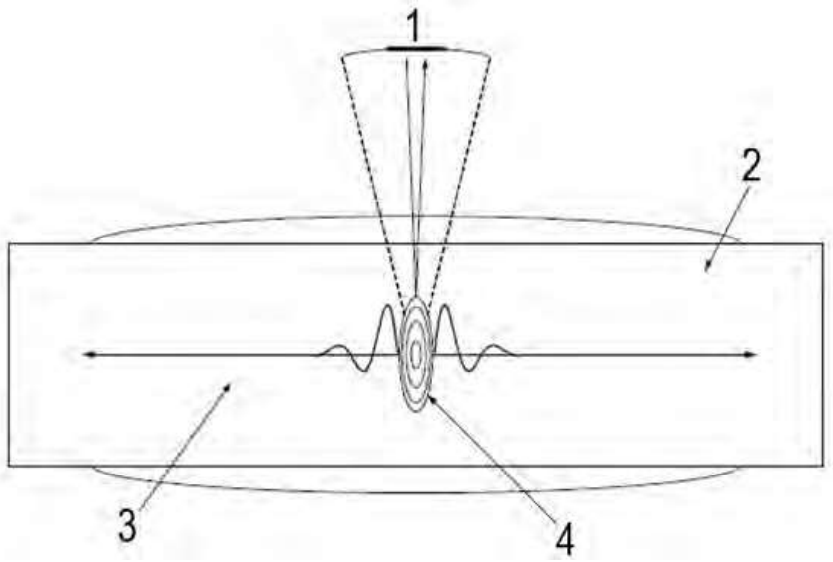


Figure 13-40. Shear wave Probe Characteristics

1. Excitation and imaging transducer
2. Tissue
3. Propagating Wave
4. Focus

Intended Uses

Shear wave elastography Intended Uses are:

- Abdomen
- Small Parts
- Musculoskeletal
- Gynecological
- Urological

CAUTION

Shear wave elastography IS NOT intended for use for Obstetrical exams.

Configuring Shear Wave

To configure Shear Wave parameters, you need to adjust the following Utility pages:

- ELASTO Imaging Parameters (Utility -> Imaging -> Elasto)
- General Imaging Parameters (Utility -> Imaging -> General)
- System Imaging Parameters (Utility -> System -> System Imaging)
- Measurement Parameters (Utility -> Measure -> Advanced -> for both Abdomen and Small Parts Breast)

ELASTO Imaging Parameters

To configure Shear Wave Elastography settings, select Utility--> Imaging--> ELASTO.

- Push Output (%) — The acoustic output of the shear wave push
- Track Output (%) — The acoustic output of the shear wave tracking pulse
- Transparency — The transparency of the shear wave image overlay
- Gain — Gain, as can be manipulated by the CF knob
- Width — ROI Width (values vary by probe)
- Vertical Size (cm) — ROI Vertical Height (values vary by probe)
- Center Depth (cm) — ROI Center Depth (values vary by probe)
- Color Map — Select shear wave Map 0 or shear wave Map 1 (SW0 or SW1) plus other ELASTO Maps (E1, E2, E3, E4, E-GRAY)
- Enter ELASTO DualView by Default — Check to select entering shear wave in DualView.

ELASTO Imaging Parameters (continued)

Shear wave Color Bars:

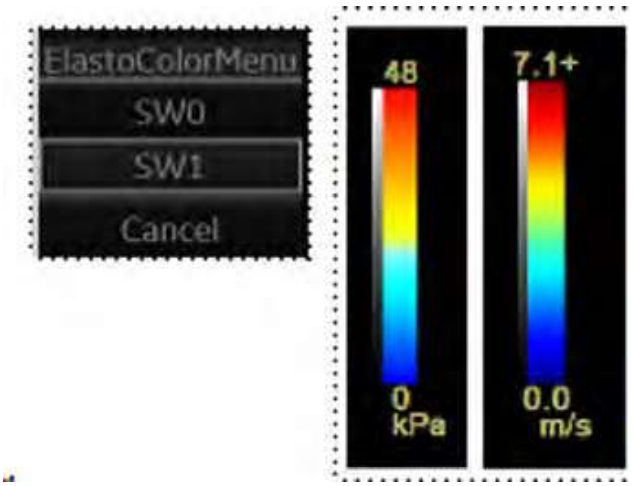


Figure 13-41. Shear wave Maps

The illustration shows the color maps for kiloPascals and velocity (meters per second). The images look the same, regardless of the unit (m/s or kPa). You can preset which color on the map represents stiffness (Red as Hard or Blue as Hard).

General Imaging Parameters by Application/Probe/Feature

Select the Default Elasto Mode via Utility--> Imaging--> General.

You can specify shear wave to be the default setting by application by probe.

1. To specify a default probe per application, select Utility --> Imaging --> General.
2. Select the application.
3. Select the default probe from the pull-down menu.
4. Specify the Default Elasto setting:
   - Shear
   - Strain

System Imaging Parameters

You can set the shear wave Display Units and specify which color on the shear wave map represents stiffness on the Utility--> System--> System Display--> Display page.

Set the Shear Elasto Display Units to either of the following settings:

- m/s (meters per second)
- kPa (kiloPascals)

Specify which color on the shear wave map represents stiffness:

- Red as Hard
- Blue as Hard

Measurement Parameters

On the Utility--> Measure--> Advanced--> Abdominal page, set the following:

- Shear Measure Size — Sets the Default Diameter size of the shear wave measurement circle
- Shear Measure Fixed Size — Sets to ON to move the shear wave measurement circle with keeping the fixed size.
- Shear Calculation Method — Specify Mean (Mean averages of all of the shear wave points within the measurement circle) or Median (Median sorts, then selects the middle point of all points within the measurement circle)
- Shear Units Determine Folder — When On is specified, the unit specified pre-selects the measurement folder. If m/s is specified as the unit, then the Velocity folder is used; if kPa is specified as the unit, then the Stiffness folder is used

Measurement Parameters (continued)

On the Utility--> Measure--> Advanced--> Small Parts page, specify the Calculation Method (Mean/Median).

- Shear Measure Size - Sets the Default Diameter size of the shear wave measurement circle.
- Shear Measure Fixed Size - Sets to ON to move the shear wave measurement circle with keeping the fixed size.
- Shear Calculation Method — Specify Mean (Mean averages all of the shear wave points within the measurement circle) or Median (Median sorts, then selects the middle point of all points within the measurement circle)

Activating Shear Wave

To activate shear wave, press **ELASTO** and Touch Panel **Shear** controls. (1) To position and size the shear wave ROI, or to Start or return to Pre-Mode shear wave, touch the right-most **Trackball** control. (2) To save the Shear Elasto image, activate the P1 control.

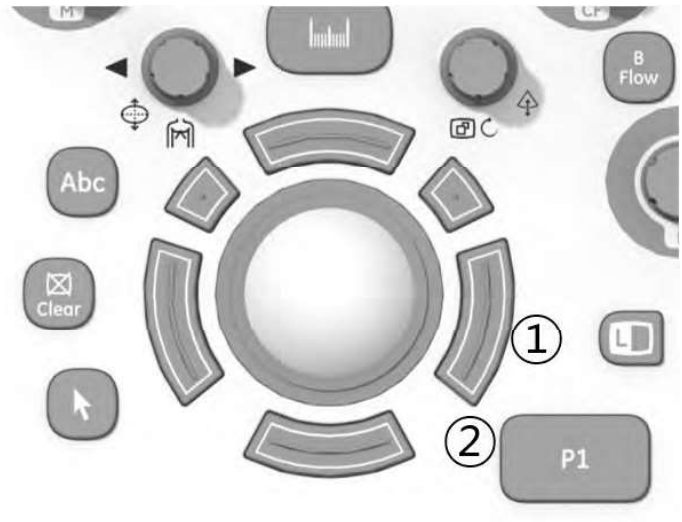


Figure 13-42. Shear wave Operator Panel Controls

ELASTO -- When you activate ELASTO, the default Elasto Mode appears on the display and Touch Panel. If shear wave is preset as the default Elastography Mode, then Shear Wave Elastography mode appears; if Strain Elastography is set, then Strain Elastography mode appears.

Shear Wave Display

Shear wave displays as follows while performing a measurement:

Figure 13-43. Shear wave Display with Measurement

1. Measurement Window
2. Shear wave Map
3. Measurement(s)
4. Shear wave ROI
5. Trackball Controls
6. Imaging Parameters
   - E = Elastography, Shear Wave
   - Gn = Gain
   - T = Transparency
   - SVD = Sample Volume Depth
   - PO% = Push Output Percentage
   - TO% = Track Output Percentage
   - f50-200Hz = Shear Wave Frequency range
   - Gen/Pen = General/Penetration.
     “Gen” appears when viewing an image where general settings were applied.
     “Pen” appears when viewing an image optimized for penetration.
     “Clock” displays in Low Frame Rate Use cases.

Note: The measurements’ Median and Inter-Quartile Range (IQR) are displayed by default in the Measurement Window and Worksheet. The Caliper Area, Depth of Caliper Center, and average Quality within the measurement area can also be displayed on the Worksheet, along with how many measurements used for the median calculation.

Selecting Measurements to Display

The following measurements are displayed by default, except those marked with an asterisk (*):

- Shear Stiffness (kPa)
- Standard Deviation within the Shear Stiffness Measurement Area*
- Shear Velocity (m/s)
- Standard Deviation within the Shear Velocity Measurement Area*
- Measurement Area (cm^2)*
- Depth of Caliper Center (cm)*
- Average Quality within the measurement area (%)*

*Items not displayed by default can be added via Utility--> Measure. See below.

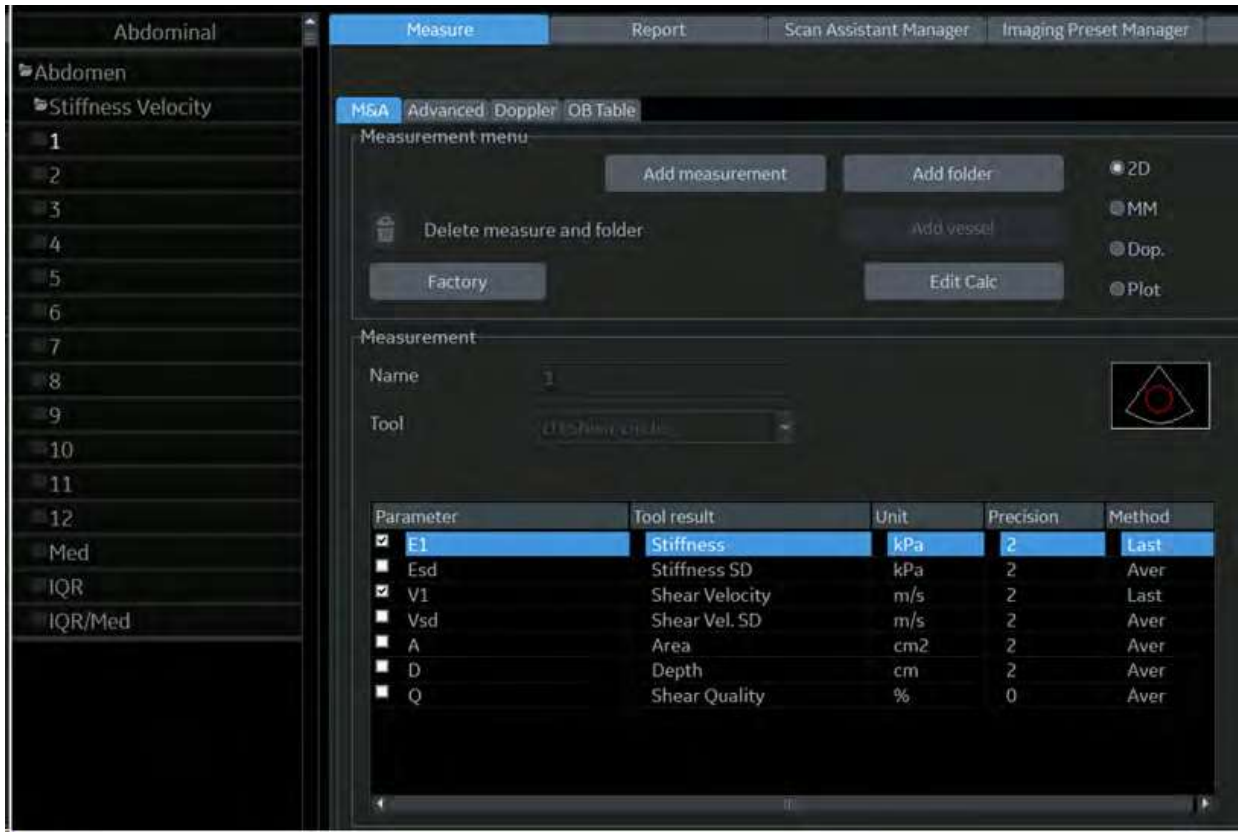


Figure 13-44. Configure Shear Wave Measurements

Selecting Measurements to Display (continued)

Checkmark the Shear Wave measurements to be displayed on the monitor and on the Extended Worksheet.

Figure 13-45. Selecting Default Shear Wave Measurements

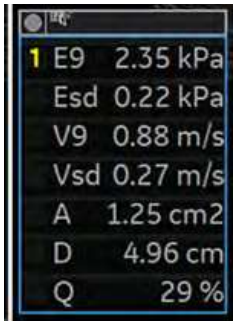


Figure 13-46. Shear Wave Measurement Results Window

Figure 13-47. Shear Wave Extended Worksheet

Shear Wave Quality Indicator

The Shear Wave Quality Indicator displays the reliability of the Shear Wave image. A Quality value is computed for every pixel of the Shear Wave image and displayed as an image in a color-coded ROI. Locations with higher quality values have more reliable Shear Wave data.

To View the Shear Wave Quality Image

The Quality Image can only be displayed in Dual Mode. It can be turned on and off using the Quality button on the Shear Elasto page on the Touch Panel.

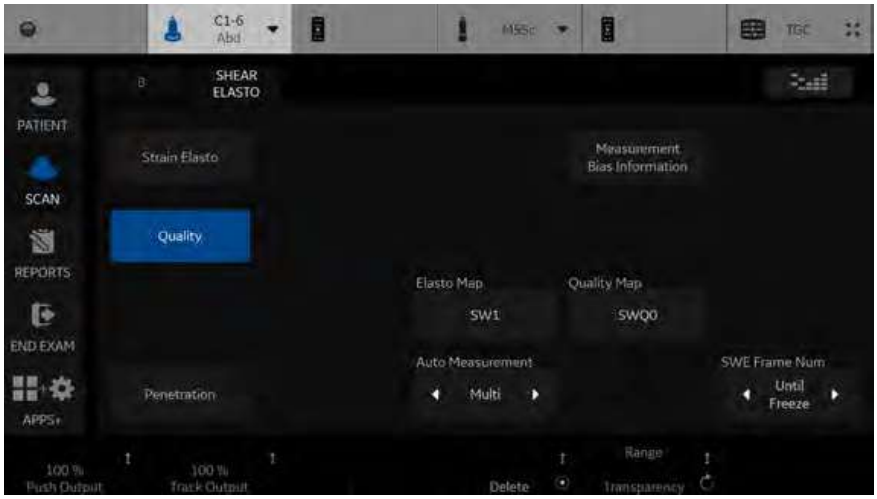


Figure 13-48. Quality Image Button

NOTE: You must be in Elasto Dual Mode to select the Quality button.

To View the Shear Wave Quality Image (continued)

When the Quality Image display is turned on, the Quality Image is displayed on the left and the Shear Elasto image on the right.

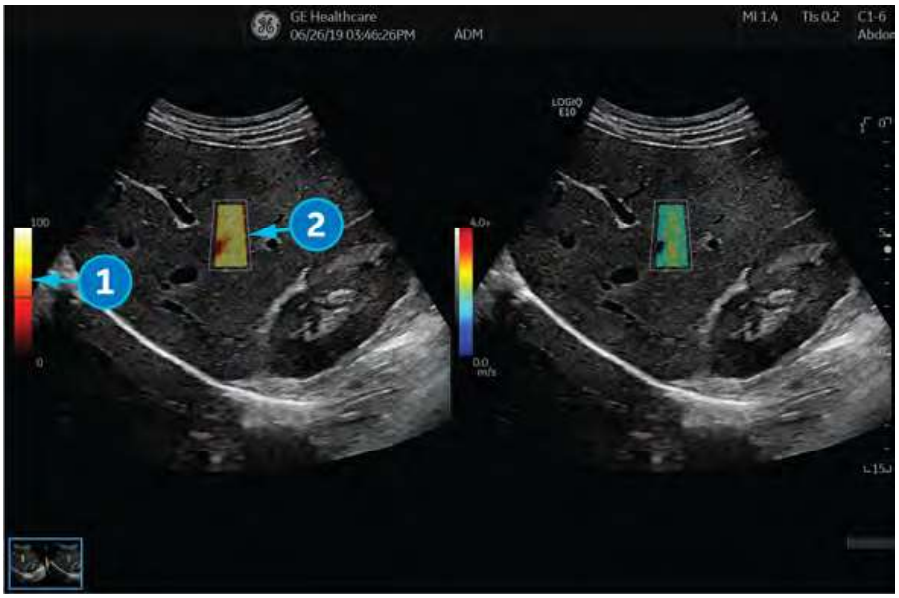


Figure 13-49. Shear Wave Display with Quality Image Enabled

1. Color Bar for Quality Image
2. Quality Image

The Color Bar on the left of the Quality Image shows the quality value corresponding to the colors in the Quality Image. Low quality is indicated by the colors at the bottom of the bar, and high quality by colors at the top.

Quality Map

There are two Quality Maps available to choose from on the Shear Elasto screen (under Quality Map), each with a specific color range:

- SWQ0 - Black/red/orange/yellow/white (low to high quality)
- SWQ1 - Red/orange/yellow/green (low to high quality)

Elements of a good Shear Wave image

Elements of a good shear wave image contain the following:

- Good contact
- ROI placed in the middle of image
- Gain at or near factory default
- Uniform color fill-in
- Homogeneous color pattern

Shear Wave Touch Panel

Table 13-33: Shear wave elastography Touch Panel Parameters

Preset Parameter	Description
Strain or Shear Elasto	Toggle touch key between Strain and shear wave elastography.
Measurement Bias Information	Press to bring up measurement bias information.
Quality	Press the Quality button to open the Quality Indicator screen (while in Dual Mode).
Phantom	Press the phantom button to get good performance when measuring stiff, motion-free phantoms. The 049A phantom is recommended. For more information, refer to the CIRS website at http://www.cirsinc.com/products/all/74/elasticity-qa-phantoms/?details=specs .
Penetration	Press Penetration for instances measuring especially hard tissue (fibrotic or cirrhotic livers or technically difficult tissue in general).
Map	Shear wave Color Map.
Push Output	The acoustic output of the shear wave push.
Track Output	The acoustic output of the shear wave tracking pulse.
Range	Min/Max Velocity, or Stiffness displayed.
Transparency	The transparency of the shear wave image overlay.

Measurement Bias Information Tables

The Measurement Bias Information tables display the bias and precision percentage at different spatial resolutions (Bias/Precision vs Object Size, in millimeters) and at incremental depths (Bias/Precision vs Depth, in centimeters) for each shear wave probe.

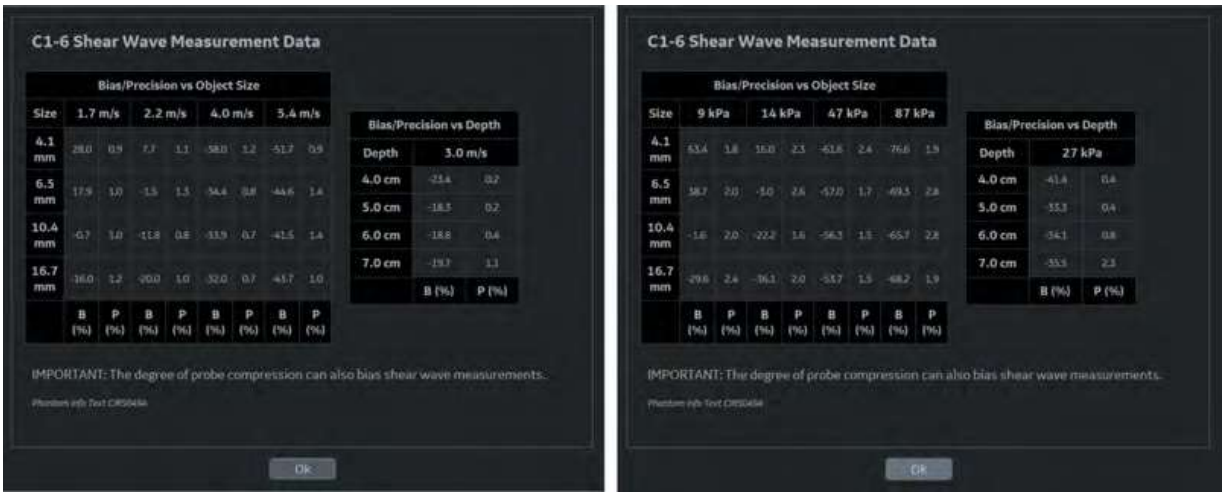


Figure 13-50. C1-6-D/C1-6VN-D Measurement Bias Information (Velocity on the left and Stiffness on the right)

Measurement Bias Information Tables (continued)

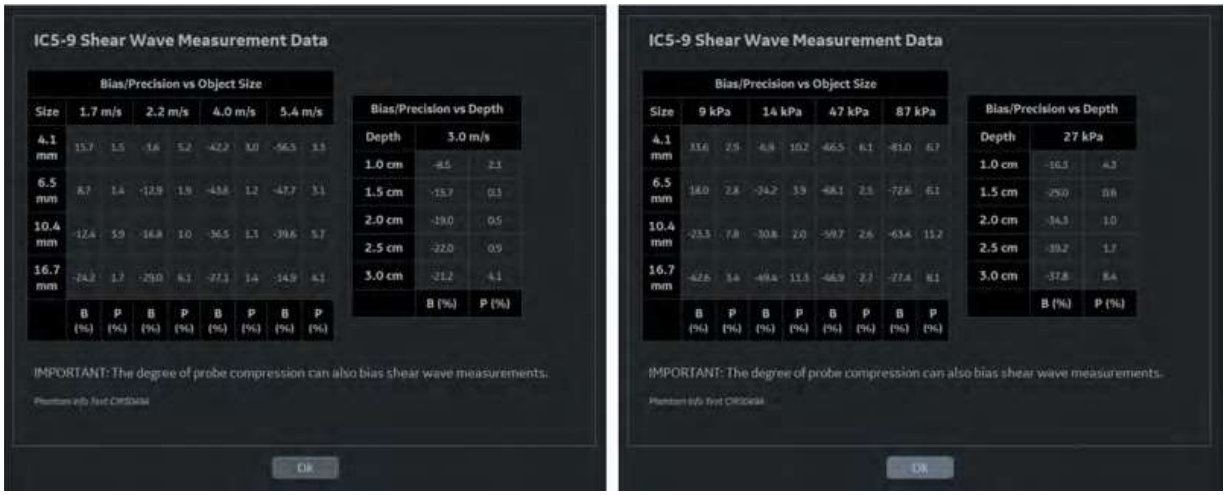


Figure 13-51. IC5-9-D Measurement Bias Information (Velocity on the left and Stiffness on the right)

Measurement Bias Information Tables (continued)

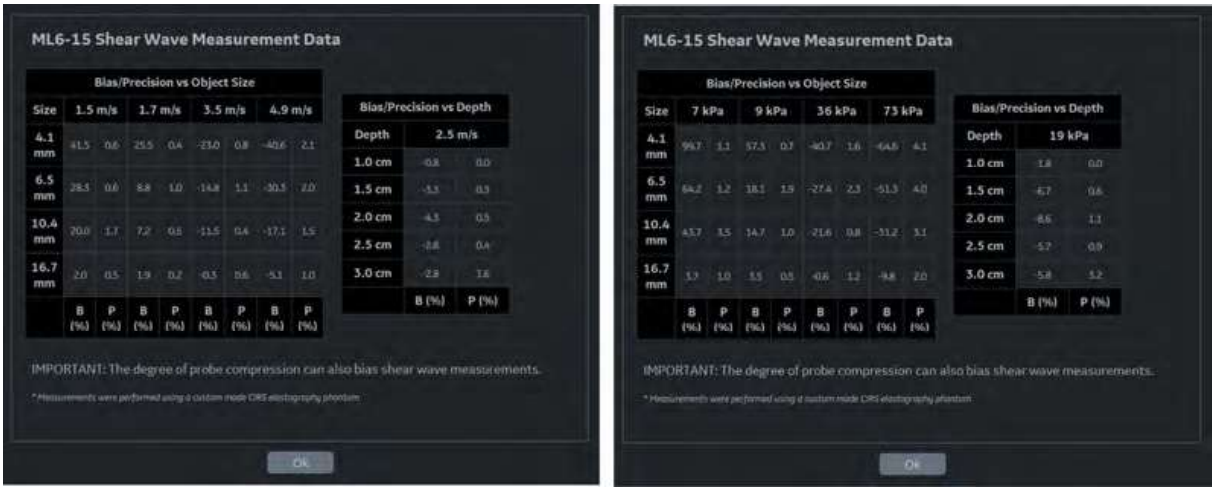


Figure 13-52. ML6-15-D Measurement Bias Information (Velocity on the left and Stiffness on the right)

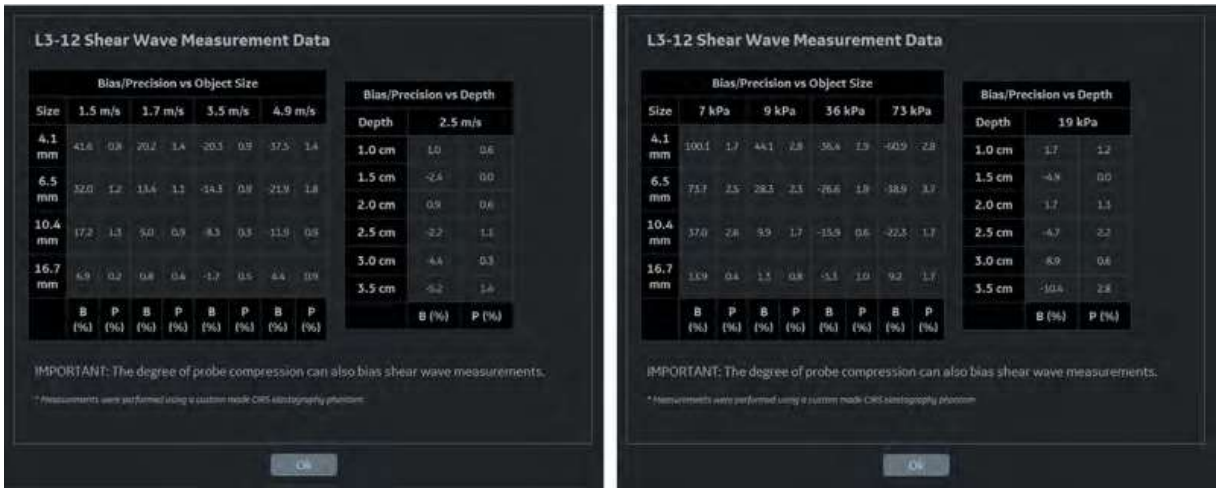


Figure 13-53. L3-12-D Measurement Bias Information (Velocity on the left and Stiffness on the right)

Measurement Bias Information Tables (continued)

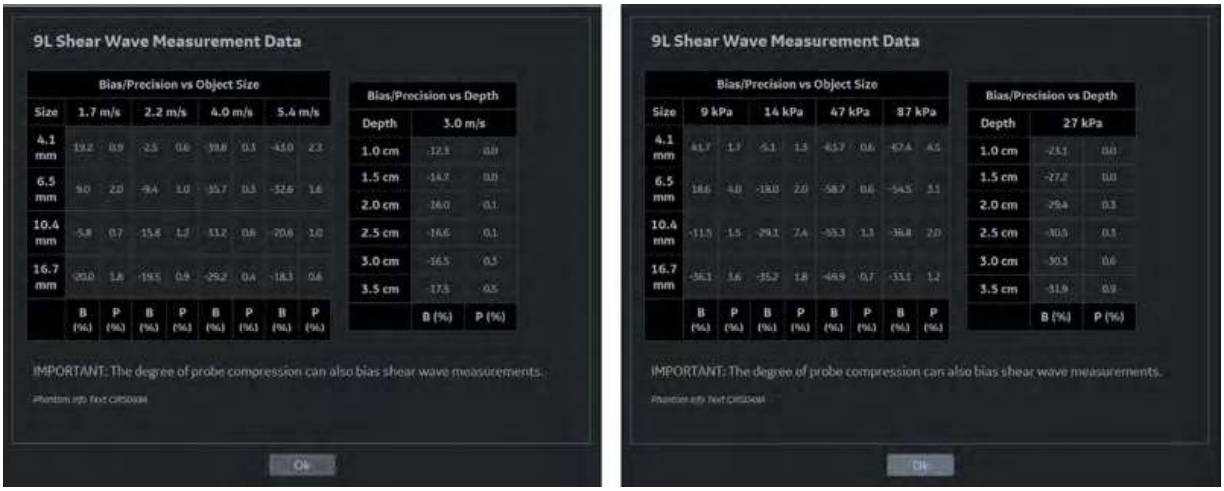


Figure 13-54. 9L-D Measurement Bias Information (Velocity on the left and Stiffness on the right)

Speed Ranges and Accuracy are shown at the top of the Bias/ Precision vs Object Size tables.

Using Shear Wave (SW)

There are three shear wave states:

- Pre-shear wave acquisition

  Pre-shear wave acquisition is an intermediate mode between B-Mode and shear wave acquisition. During Pre-mode, the previous B-Mode imaging mode is still active.

NOTE: You cannot store images in Pre-Mode.

- Shear wave acquisition

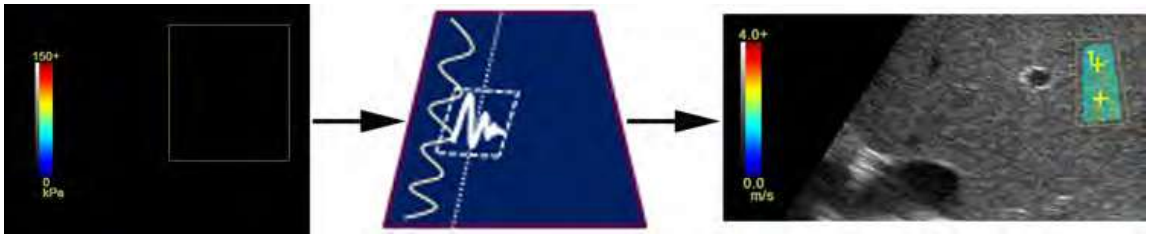
  Pressing the “Start" set key initiates SW acquisition.

- Post-shear wave acquisition (Freeze)

  The system displays the acquired SW image and background B-Mode image. The User can cycle through the acquired frames, perform measurements, and annotate the image.

SW images can be stored in both raw data and DICOM format.

Table 13-34: Using Shear wave



Pre-Shear wave Mode | Shear wave Acquisition | Post-Shear wave Acquisition

Typical Exam Protocol (Liver)

A recommended shear wave elastography protocol to scan the liver is,

1. Image the right lobe of the liver intercostally in Pre-shear wave Mode.
2. Position and size the ROI.

HINTS

The smaller the ROI, the faster the Frame Rate.

3. Instruct the patient that during the exam they can mostly breathe normally. However, advise the patient that they will need to suspend their breathing mid breath so that you can obtain an optimum image while performing the scan.
4. Adjust ROI as needed, avoiding vessels and fluid-filled structures. It is advisable to avoid rib shadows whenever possible.
5. Start the shear wave acquisition.
6. Freeze the image when desired frame is obtained.
7. Perform the measurement. The system prompts you through the measurement.
8. The system will auto sequence the measurements and walk you through all of the measurements (Abdominal Application Preset), if preset.

NOTE: For Breast measurements, users typically take single measurements to measure the lesion once. Or, users can perform a ratio of two different tissues (one of the lesion and non-lesion tissue).

9. Repeat steps 3 through 9 for the remaining samples.
10. Typically, users obtain ten (10) samples.

Typical Exam Protocol (Liver) (continued)

11. Once measurements are complete, you can elect to add another site to the exam. To add another site, press ***Add Site*** on the Touch Panel. Select ***Enter Site Name*** to add the name for the new site.

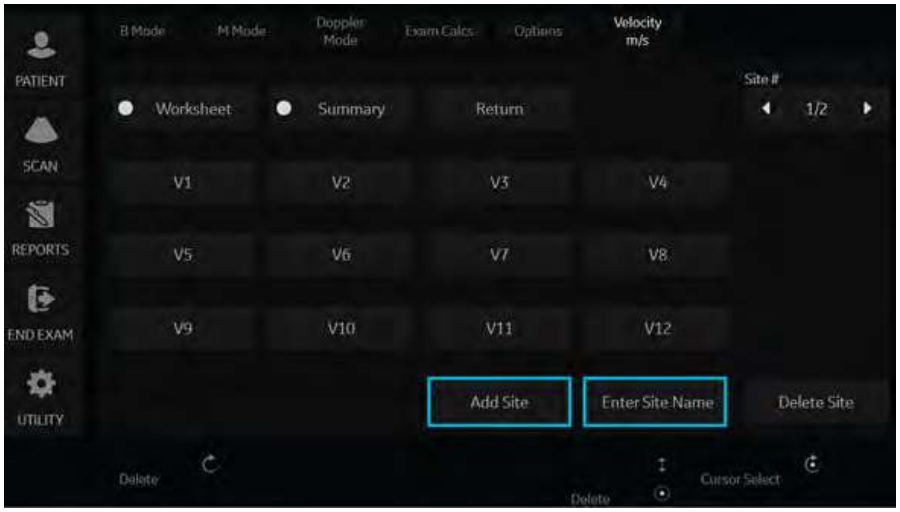


Figure 13-55. Add Additional Shear Wave Site and Enter Site Name

*NOTE: If you no longer need the added site, you can select to delete the site via **Delete Site** on the Touch Panel.*

12. Once measurements for all sites are complete, select Summary on the Touch Panel to view saved measurements.

CAUTION

Excessive manual compression of the underlying tissue with the probe can lead to biased shear wave measurements.

Shear Wave Measurements

The higher the velocity, the stiffer the tissue.

Types of Shear Wave Meeasurements

There are two types of measurement units for quantifying stiffness:

- Velocity (meters per second)
- Stiffness (kiloPascals)

Measurement used to quantify stiffness: Shear wave imaging measures the velocity of shear waves generated by acoustic radiation force impulse in tissue. The velocity, in units of meters per second (m/s), can be converted to Young's Modulus (stiffness), in units of kiloPascals (kPa), under simplifying assumptions. Velocity or stiffness can be used to quantify the local tissue elasticity.

NOTE: Acoustic radiation force is generated by a transfer of momentum from an acoustic wave to the medium through which it is propagating, caused by absorption and scattering in soft tissue. Impulsive application of focused acoustic beams in tissue can generate shear waves which propagate away from the focal region of the beam.

CAUTION

Tissue inhomogeneities and other factors may bias shear wave measurements.

Measurement Analysis

To take shear wave measurements, typically users get ten (10) samples.

1. After you have acquired the desired image, avoiding vessels and fluid-filled structures, press Freeze.
2. Press Measure. Select the measurement (Stiffness or Velocity) unless preset to "Shear Units Determine Folder" is turned on.

NOTE: This step only needs to be done in the Breast Small Parts Application Preset and is not needed in Abdomen.

Measurement Analysis (continued)

3. Perform the measurement. The system prompts you through the measurement.
   a. Position the first caliper at the desired location on the ROI. Place the first control point and press Set on the Trackball control.

      An ROI ellipse appears and a second caliper.
   b. Adjust the size of the ROI. Adjust ellipse and place the last control point.

NOTE: This step only needs to be done in the Breast Small Parts Application Preset and is not needed in Abdomen.

4. Repeat the scan and measurement. The system will auto sequence the measurements and walk you through all of the measurements, if preset.
5. Measurements are transferred to the Worksheet.

NOTE: The measurements' Median and Inter-Quartile Range (IQR) are displayed by default in the Measurement Window and Worksheet. The Caliper Area, Depth of Caliper Center, and average Quality Percent within the caliper, and Standard Deviation within the caliper can also be displayed by going to Utility--> Measure, as shown in Figure 13-44 on page 13-119.

Shear Wave Worksheets

There are two types of Worksheets (Overall and Extended).

Shear Elasto / UGAP (Site1)

Name	Stiffness Site1	Velocity Site1	Attenuation Coefficient Site1	Attenuation Rate Site1
Med	2.26 kPa	0.87 m/s	0.50 dB/cm/MHz	
IQR	0.08 kPa	0.01 m/s	0.02 dB/cm/MHz	
IQR/Med	3.4 %	1.7 %	3.7 %	
N	6	6	5	
1	2.34 kPa	0.88 m/s	0.49 dB/cm/MHz	
2	2.26 kPa	0.87 m/s	0.50 dB/cm/MHz	
3	1.98 kPa	0.81 m/s	0.51 dB/cm/MHz	
4	2.24 kPa	0.86 m/s	0.51 dB/cm/MHz	
5	2.49 kPa	0.91 m/s	0.49 dB/cm/MHz	
6	2.25 kPa	0.87 m/s		
7				
8				

Figure 13-56. Shear Wave Overall Worksheet

Shear Elasto (Site1)

	Stiffness	Velocity
Med	2.26 kPa	0.87 m/s
IQR	0.08 kPa	0.01 m/s
IQR/Med	3.4 %	1.7 %
N	6	6

	Stiffness	Stiffness SD	Velocity	Velocity SD	Area	Depth	Quality
1	2.34 kPa	0.23 kPa	0.88 m/s	0.28 m/s	0.96 cm2	4.86 cm	3 %
2	2.26 kPa	0.21 kPa	0.87 m/s	0.27 m/s	1.66 cm2	4.60 cm	3 %
3	1.98 kPa	0.12 kPa	0.81 m/s	0.20 m/s	1.03 cm2	6.15 cm	3 %
4	2.24 kPa	0.18 kPa	0.86 m/s	0.24 m/s	2.04 cm2	5.82 cm	3 %
5	2.49 kPa	0.23 kPa	0.91 m/s	0.27 m/s	0.72 cm2	4.85 cm	4 %
6	2.25 kPa	0.25 kPa	0.87 m/s	0.29 m/s	1.47 cm2	4.35 cm	3 %
7							
8							

Figure 13-57. Shear Wave Extended Worksheet

Deleting or Excluding Measurements from the Worksheet

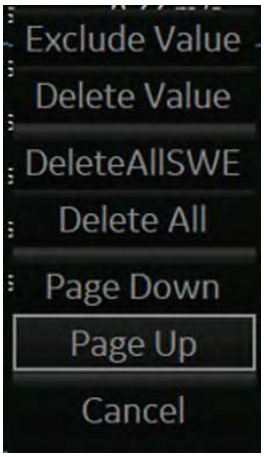
Measurements can be deleted from the Extended Worksheet.Once a measurement has been deleted, it cannot be re-added. Deleted measurements show as a blank.

NOTE: You can also choose to delete all Shear Wave measurements, without deleting non-Shear Wave measurements from the worksheet.

Measurements can also be excluded from the Extended Worksheet -- and added back in at a later time. Excluded measurements show as a blank.

To delete/exclude a measurement,

1. Highlight the measurement you want to delete/exclude.
2. Right click on the Extended Worksheet to bring up the Delete/Excluded pop-up menu.



3. Select the appropriate action.

Deleting or Excluding Measurements from the Worksheet (continued)

In the example below, measurements from line 4 with the blue rectangle have been excluded (and can be added back in); and measurements from line 2 have been deleted (and cannot be added back in).

Figure 13-58. Example showing both deleted and excluded measurements

Shear Wave Graph

The Shear Wave Graph displays an average of Shear Wave stiffness and velocity measurements for a patient over a period of time. To see the Shear Wave Graph, select ***Worksheet*** and then ***Graph*** on the touch panel.

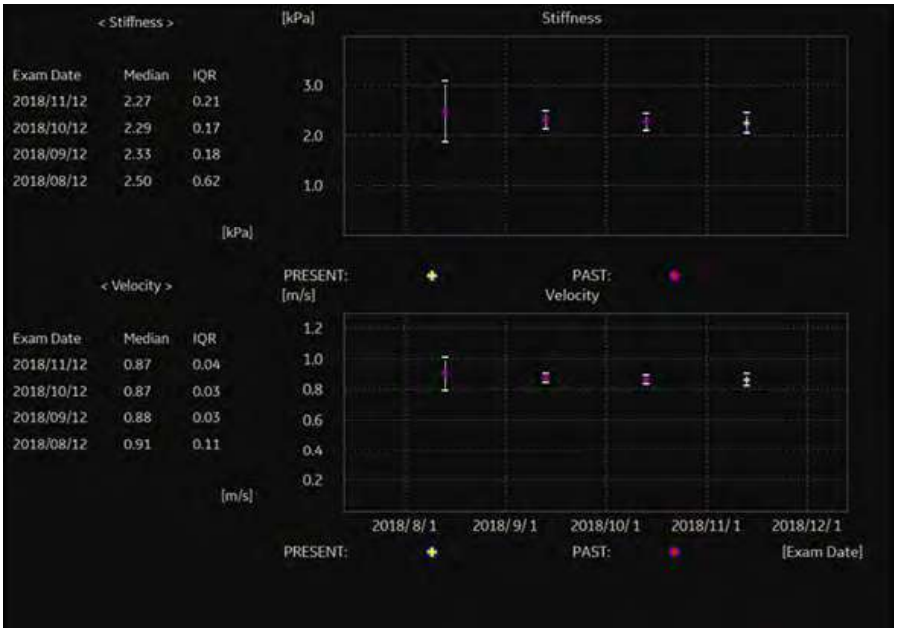


Figure 13-59. Shear Wave Graph

Measurement Information

Table 13-35: Shear Wave Speed Variation and Precision with Depth

Measurement	Units	Useful Range	Accuracy	Limitations or Conditions
Velocity	m/s	Shear wave ROI	Absolute range <= 0.5 m/s or relative range <= 15%, whichever is greater, for C1-6-D and C1-6VN-D. Absolute range <= 0.5 m/s or relative range <= 10%, whichever is greater, for all other probes with shear wave elastography.	Normalized SD less than or equal to 5% for multiple repeated measurements over the range of depths for which measurements can be made, limited by shear wave penetration.

The formula for Stiffness: $E = 3 * rho * c^2$

Where E = Young's modulus of tissue

rho = density of tissue (assumed to be 1 g/cc)

c = shear wave speed in m/s

NOTE: The conversion from shear wave speed (m/s) to Young's modulus is done under the assumption that the underlying material in which the shear wave propagates is linear, isotropic, incompressible, and homogenous.

NOTE: Relative Range = (Absolute Range / Actual Velocity)

NOTE: Normalized SD = (SD) / Average Velocity

CAUTION

The values for shear wave speed and tissue modulus are relative indices intended only for the purpose of comparison with other measurements performed using the system. Absolute values for these measurements may vary among different measurement devices. Use Shear Wave Elastography as a complement to other techniques when making a diagnostic decision.

Shear Wave Elastography Calculation

An Interquartile Range/Median (IQR/Median) Shear Wave Elastography ratio has been added. You can use this ratio to evaluate the reliability of Shear Wave measurements in the liver. This ratio is displayed as a percentage (%) on the worksheet (Display Accuracy to 1 decimal place). Values <30% are recommended for a reliable Shear Wave Liver exam.

NOTE: The IQR/Median ratio is calculated automatically for both Velocity and Stiffness and displayed by default to the user.

Scanning Hints

HINTS

You may find the following recommendations helpful when performing a Liver shear wave scan:

- Locate right lobe of liver intercostally.
- Place the ROI away from the capsule in an area free of vessels and fluid-filled structures.
- Suspend Patient breathing in mid-breath during the scan
- Position the ROI between 2-5 cm deep for an optimal shear wave scan

You may find the following recommendations helpful when performing a Breast shear wave scan:

- Locate lesion
- Place lesion in center of ROI, including a sufficient amount of the surrounding tissue
- Only compress slightly, if necessary (compression changes the elastic tissue properties).

To increase frame rate:

- Reduce ROI Width
- Turn off Penetration Mode
- Reduce Push Output

To increase penetration:

- Turn on Penetration Mode
- Keep Push and Track Output at 100%
- Place ROI away from edges of image

To reduce artifacts:

- Minimize motion during acquisition
- Ensure there are no vessels within the ROI or near the left or right edge of the ROI. It is advisable to avoid rib shadows whenever possible.
- Keep ROI at least 1cm away from the liver capsule.

Ultrasound-Guided Attenuation Parameter (UGAP) Option

Overview

Ultrasound-Guided Attenuation Parameter (UGAP) measures the attenuation value (i.e. attenuation coefficient [dB/cm/MHz] or attenuation rate [dB/m]) in the liver to evaluate diffuse liver disease. There are four visualizations: B Ref, Color Ref, B/Color Dual, and Qual./Att. Dual. All visualizations measure a representative attenuation value. Color Ref, B/Color Ref, and Qual./Att. Dual measure a representative attenuation value in 2D color map and dual display of B-Mode and 2D color map, respectively.

UGAP Availability

UGAP is available on the C1-6-D and C1-6VN-D probes in the Abdomen (ABD) application.

Activation

To activate UGAP, select the appropriate probe Abdominal application, then press BT1 (configured as UGAP). UGAP parameters are displayed as “U” (Frequency and Acoustic Output Percent) in Simple Mode. Unit of attenuation coefficient values are displayed as dB/cm/MHz.

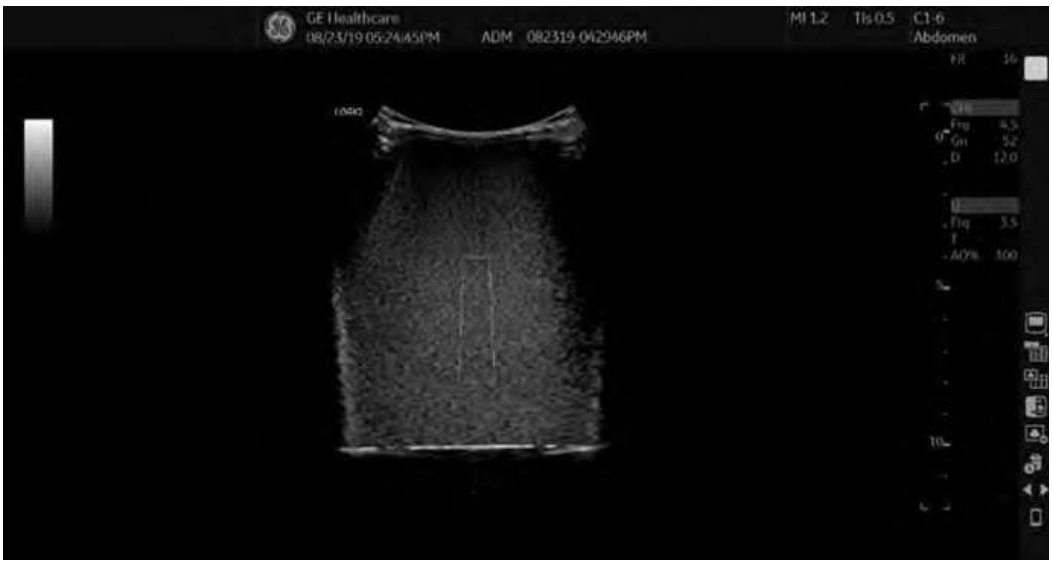


Figure 13-60. UGAP Display

Measurement and Worksheet

Measure the Coefficient Value

1. Scan to get the appropriate view to measure.
2. Press Start (right Set key).

NOTE: The Measurement ROI can be moved using the Trackball; more than one ROI can be placed in one frame. Avoid structures such as vessels to obtain UGAP measurement.

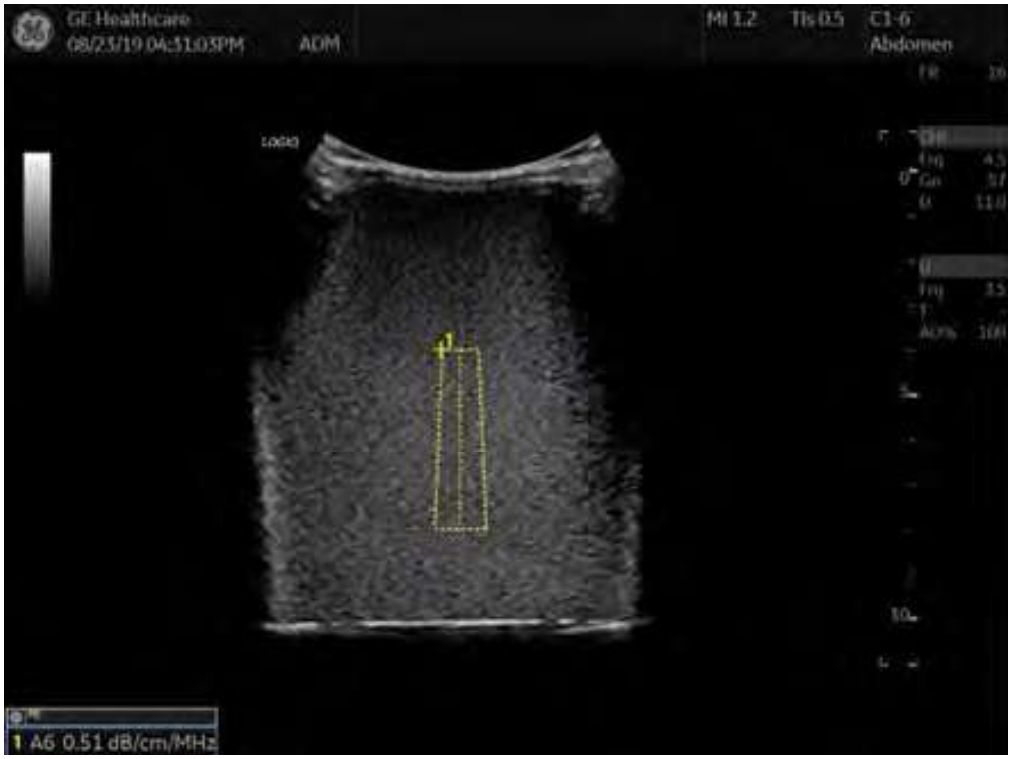


Figure 13-61. UGAP Study

Measurements can be performed afterwards using CINE or recalled data where multiple frames can be selected to measure attenuation coefficients.

Add a New Site

Once measurements are complete, you can elect to add another site to the exam. To add another site:

1. Press the **Measurement** button on the console.
2. Select ***Add Site*** on the Touch Panel.
3. Select ***Enter Site Name*** to add the name for the new site.

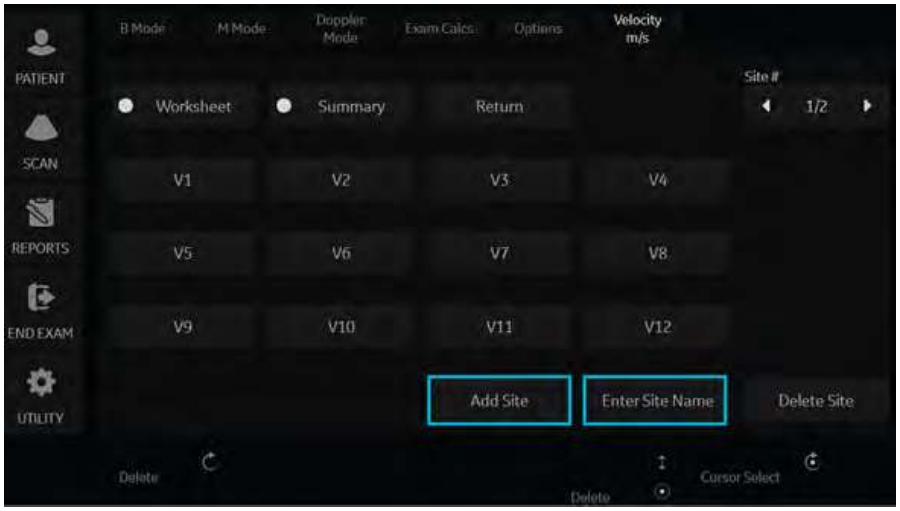


Figure 13-62. Add Additional Shear Wave Site and Enter Site Name

*NOTE: If you no longer need the added site, you can select to delete the site via **Delete Site** on the Touch Panel.*

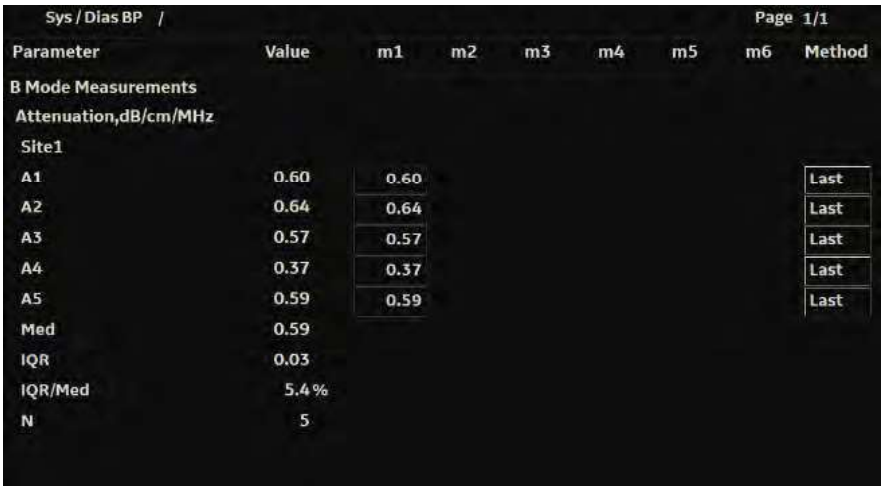
Summary and Overall Worksheets

Measurements are transferred to the Summary and Overall Worksheets.

Shear Elasto / UGAP (Site1)

Name	Stiffness Site1	Velocity Site1	Attenuation Coefficient Site1	Attenuation Rate Site1
Med	2.26 kPa	0.87 m/s	0.50 dB/cm/MHz	
IQR	0.08 kPa	0.01 m/s	0.02 dB/cm/MHz	
IQR/Med	3.4 %	1.7 %	3.7 %	
N	6	6	5	
1	2.34 kPa	0.88 m/s	0.49 dB/cm/MHz	
2	2.26 kPa	0.87 m/s	0.50 dB/cm/MHz	
3	1.98 kPa	0.81 m/s	0.51 dB/cm/MHz	
4	2.24 kPa	0.86 m/s	0.51 dB/cm/MHz	
5	2.49 kPa	0.91 m/s	0.49 dB/cm/MHz	
6	2.25 kPa	0.87 m/s		
7				
8				

Figure 13-63. UGAP Summary Worksheet



Sys / Dias BP /

Page 1/1

Parameter	Value	m1	m2	m3	m4	m5	m6	Method
B Mode Measurements Attenuation,dB/cm/MHz Site1								
A1	0.60	0.60						Last
A2	0.64	0.64						Last
A3	0.57	0.57						Last
A4	0.37	0.37						Last
A5	0.59	0.59						Last
Med	0.59							
IQR	0.03							
IQR/Med	5.4 %							
N	5							

Figure 13-64. UGAP Overall Worksheet

Attenuation Coefficients are displayed (A1, A2, A3), Median, IQR, IQR/Median, and number of measurements (N).

2D Color Map

2D color map is available on Color Ref, B/Color Dual and Qual./ Att. Dual. There are two 2D color maps: Attenuation Map and Quality Map. Attenuation Map provides the distribution of attenuation values. Quality Map provides the distribution of the signal quality to support ROI placement.

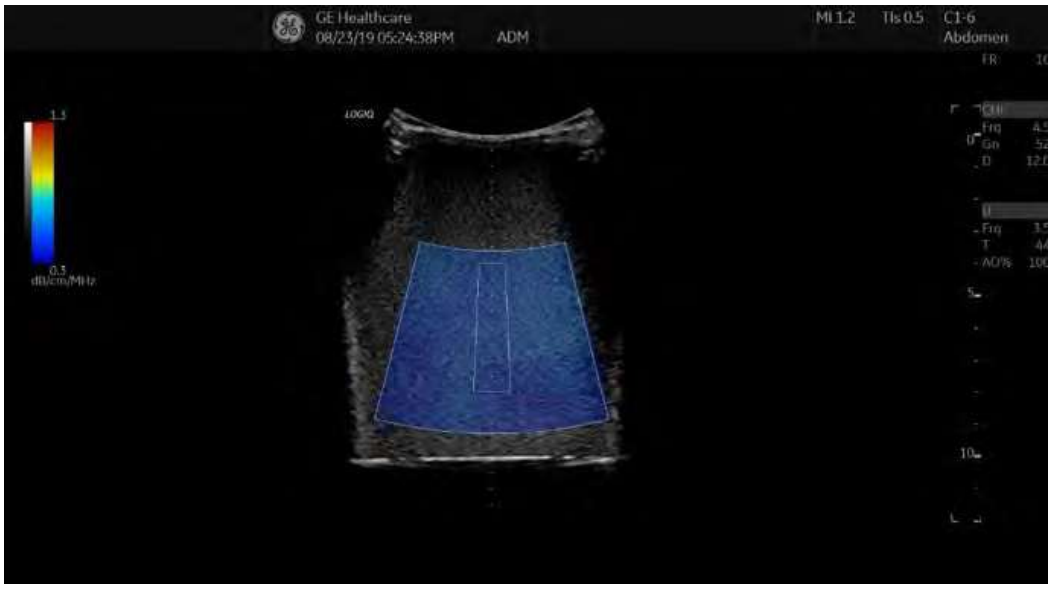


Figure 13-65. Attenuation Map

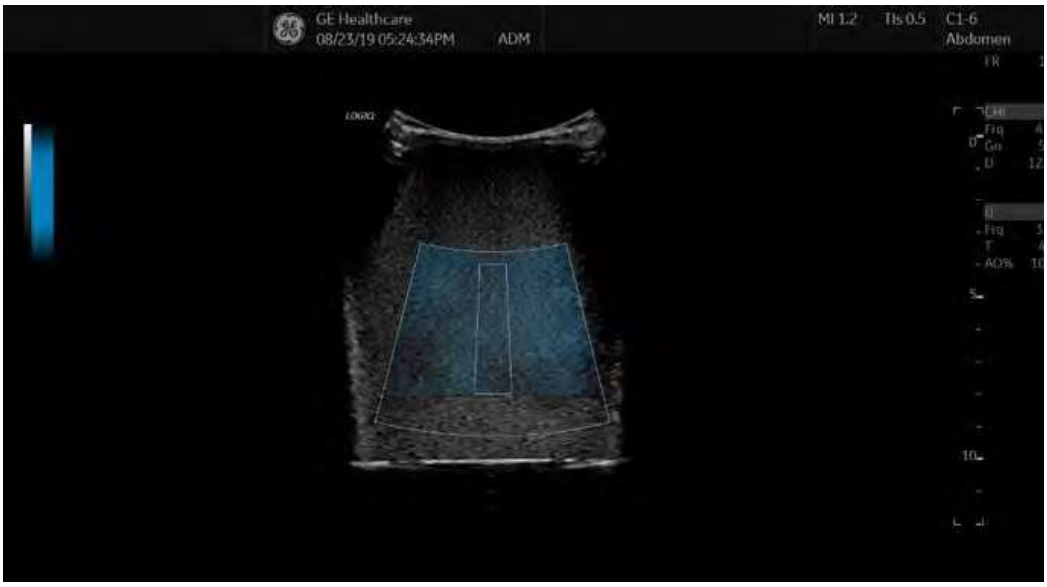


Figure 13-66. Quality Map

Continuous Wave Doppler (CWD)

Overview

There are two CW Doppler operating modes: Steerable and Non-Imaging.

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 and listening to the Doppler Audio signal.

Non-Imaging

Provides only Doppler Spectrum and Audio for ascending/ descending aortic arch, other hard-to-get-to spaces or higher velocities.

Activating CW Doppler

To activate CW Doppler Mode, press **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.

Update toggles between real time B-Mode with Doppler Mode and real time spectral display.

Exiting CW Doppler

To exit CW Doppler Mode, press **CW**.

Tissue Velocity Imaging (TVI)

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.

CAUTION

TVI can be activated on Cardiac Sector and TEE probes only.

Activating TVI

1. Select the desired probe.
2. While in B-Mode, press the **TVI** key located above the PDI control on the Touch Panel. The TVI image and Touch Panel display.

NOTE: To set up TVI on the Imaging Preset page, go to Utility--> Imaging--> TVI.

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.

TVI and TVD

TVI

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.

Table 13-36: TVI Parameters

Control	Details
Visible Description Adjusting Values	 In LIVE/Freeze/Archive, you can display TVI Color with TVI. Select ***Visible*** on the Touch Panel. On or Off.
Invert	Color Invert
Baseline	Adjusts the Baseline.
Angle Steer	Steers the angle
Line Density	Optimizes B-Mode frame rate or spatial resolution for the best possible image.
Map	Values: TV1 and TV2.
Frame Average	Averages color frames.
Threshold	High values display more color. Low values limit the color to lower tissue echo (Opposite of Threshold in Color Flow Mode).
Transparency Map	Values 0-5.
Spatial Filter	Values 0 and 1.
Duplex	Allows two modes to be active at the same time.
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

While in TVI, press **PW** to activate Tissue Velocity Doppler.

You can preset all parameters in Utility -> Imaging ->TVD.

Quantitative Analysis (QAnalysis)

Overview

Quantitative Analysis is available for the following CINE loops obtained in the following modes: Tissue Velocity Imaging, Color Flow Mode, and Power Doppler Mode. All of the Quantitative Analysis modes operate similarly, with some variation.

The Touch Panel may be slightly different, for example; and the type of information you quantify varies by mode as well. Please see a summary of each mode below; followed by general instructions on how to perform Quantitative Analysis.

Quantitative Flow Analysis

Provide tools for semi-quantitative assessment of inflammation in joints and vascularization in tumors.

NOTE: There is frame number limitation for color quantification as 400 frames.

Statistics

The LOGIQ Totus extracts various statistics from the image data within each sample area. The statistics depends on the imaging mode in use.

Press ***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 pixels over total sample area area.
- Area (mm2): The size of sample area
- Max Ratio/Time of Max Ratio: Maximum Ratio of Color (Power) Doppler pixels in each sample area, and which frame that occurs in.
- Min Ratio/Time of Min Ratio: Minimum Ratio of Color (Power) Doppler pixels in each sample area, and which frame that occurs in.

Quantification supports two different statistical display formats: Short Form and Long Form.

Statistics (continued)

- Short Form: Ratio and Area.

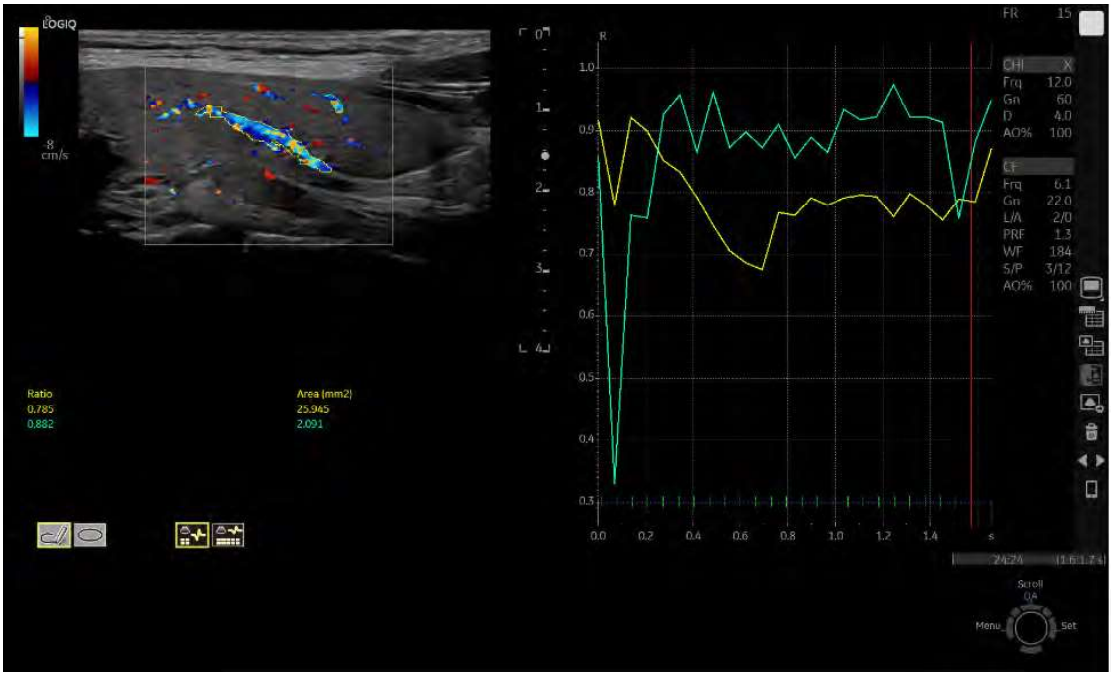


Figure 13-67. Color Flow Mode Short Form - Example

- Long Form: Ratio, Area, Max Ratio/Time of Max Ratio, Min Ratio/Time of Min Ratio

Figure 13-68. Color Flow Mode Long Form - Example

QAnalysis - Tissue Velocity Imaging

Multiple Time -Motion trace display from selected points in the myocardium.

QAnalysis Screen Description

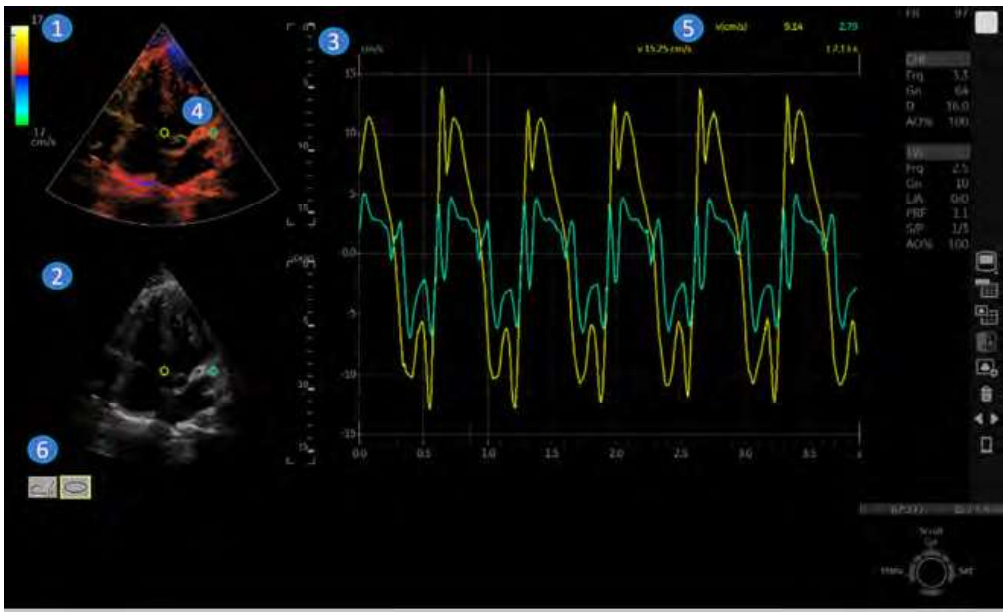


Figure 13-69. Q-Analysis Screen

Table 13-37: 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) • ECG • 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.

QAnalysis Plot Control

The following controls are user configurable presets which are configurable through the pull-down menu in QAnalysis mode. When using the pull-down menu:

1. Place the cursor over the analysis window and press the left ***Set*** key. The system menu displays at the cursor position.
2. Select the appropriate parameter.

To switch trace (Analysis signal)

Analysis Signal toggles the trace display between velocity, displacement or gray scale intensity curves.

1. Position the cursor over the plot window and select Analysis Signal from the pull-down menu.
2. Select ***Velocity***, ***Displacement*** or ***Grayscale Intensity*** as necessary.

Vertical Unit

NOTE: Vertical Unit is only available when Grayscale intensity is selected in Analysis Signal.

When analyzing the data, the Y-axis can be set to display either logarithmic scale (dB) or linear, acoustic units (AU).

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 Qanalysis.

Drift Compensation

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.

NOTE: Drift Compensation is inactive if ECG data cannot be acquired.

Trace Measurements

Gradient

Select Gradient entry on the pull-down menu that is obtained when the cursor is placed over the plot.

Gradient is displayed on the screen instead of velocity. The gradient calculates from 7 points (includes previous and next frames).

Max Gradient

Displays the time and gradient that becomes the maximum gradient between the CINE start and end frame.

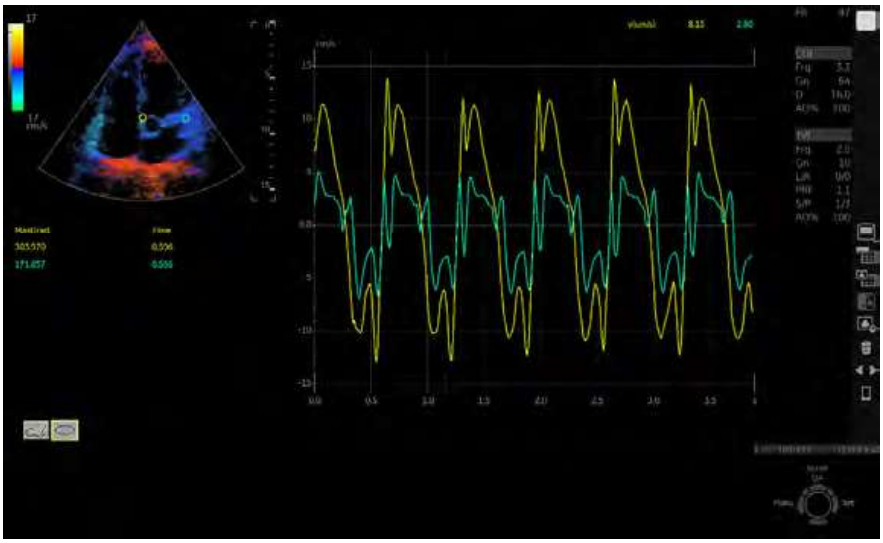


Figure 13-70. Max Gradient

Selecting QAnalysis Image Range

A range of frames is selected for the QAnalysis in Cine mode (before accessing QAnalysis). Only the frames in this range are used for the QAnalysis.

If a range is not selected prior to accessing the QAnalysis, the system uses the default Cine start and end frames as the default start and stop frames.

1. The first frame in the analysis series is selected by adjusting the ***Start Frame*** control to the desired frame

   OR

   using the **Trackball** or the ***Frame by Frame*** control to select the desired first frame and then selecting the ***Start Frame*** control.
2. The last frame in the analysis series is selected by adjusting the CINE ***End Frame*** control to the desired frame

   OR

   using the **Trackball** or the ***Frame by Frame*** control to select the desired end frame and then selecting the ***End Frame*** control.

Activating QAnalysis

1. Scan and Freeze the patient in the desired live mode or recall a desired cine loop from the stored images.

NOTE: QAnalysis is only available when the system is in CINE mode.

NOTE: Images from the current scan session acquired in the desired analysis mode (already in CINE) or from a saved image loop can be used for QAnalysis.

2. ***QAnalysis*** displays on the Cine Touch Panel.
3. Select ***QAnalysis***. The QAnalysis screen and Touch Panel displays. To toggle the trackball function between QA and Scroll, press the top **Trackball** key.

Common QAnalysis Function

Display the System Menu

Place the cursor to the desired position and press the left ***Set*** key. The system menu displays at the cursor position.

The system menu is dependent on the area which you place the cursor.

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. If the trackball assignment is not on QA, press the top **Trackball** key until QA highlights.
2. If necessary, select the sample area Ellipse sample area button (shape icon on the monitor display).
3. Move the cursor to one of the Cineloop windows using the **Trackball**.
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 sample area button (pencil icon on the monitor display).
2. Move the cursor to one of the Cineloop windows using the **Trackball**.
3. Press and hold down the **Set** key while drawing a sample area using the **Trackball**.
4. Release the **Set** key.

   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)

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 the top **Trackball** key until the QA trackball assignment is selected.
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.
7. Press the top **Trackball** key until the scroll trackball assignment is selected.
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.

Generating a Trace (continued)

Moving a dynamic anchored sample area

1. Press the top **Trackball** key until the scroll trackball assignment is selected.
2. 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.

3. Press the top **Trackball** key until the QA trackball assignment is selected.
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 a new location.
7. 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.

Manipulating the Sample Area

Up to eight sample areas can be saved on the reference image, with the corresponding eight traces plotted simultaneously on the graph. Each sample area display has a different color, and its corresponding trace data is plotted using that same color.

Once eight sample areas have been saved, the system does not automatically generate an active sample area when the cursor is positioned over the displayed reference image.

The saved sample areas can be a mixture of elliptical and freehand sample areas.

When the user repositions a sample area, the old trace data is erased from the plot and the trace data for the new position replotted.

If the sample area position on the last frame of the selected image range is moved, the corresponding sample areas on all frames are repositioned to match the last frame.

The user shall also have the capability of setting separate sample area positions on different frames of the contrast images, and the system shall linearly interpolate the sample area positions for the frames in between the selected frames.

Setting the default sample area shape

1. Select ***Set sample area shape***. The Information Box displays.

Figure 13-71. Sample Area Information Box

2. Select Height, Width and Tilt angle.
3. Select ***Set as default***. The current sample area size is set as the default for subsequent Ellipse sample areas.

Sample Area Shapes

There are two different methods for determining the shapes of the sample area.

Ellipse sample area

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 sample area is automatically generated and displays on the reference image(s).
3. The average velocity 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 sample area, 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 sample area, press **Set** to fix the sample area position and freeze its corresponding trace on the plot. A new active sample area is generated whose position is manipulated by the trackball and whose velocity curve traces will be plotted as before, while the previous sample area and trace remain fixed at the points they were saved at.

NOTE: Elliptical sample areas can be positioned in any manner that keeps their center within the image boundaries. In the case that part of the sample area is outside the image boundary, only data from within the image boundary is used for calculating the mean velocity value.

NOTE: You can change the size of the Ellipse sample area by adjusting the Ellipse control.

Freehand sample area

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. While holding down the **Set** key, trace the outline of the desired sample area by moving the caliper with the **Trackball**.

Reshaping a Sample Area

To reshape the sample area:

1. Position the cursor on the sample area to reshape and press the left **Set** key.
2. The sample area system menu displays. Select ***Set sample area shape***.

Figure 13-72. Sample Area Information Box

3. Adjust Height, Width and Tilt angle.
4. Press ***OK***. The selected sample area 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 sample area to label and press the left **Set** key.
2. The sample area system menu displays. Select ***Label sample area***. The Label Dialog box displays.

Figure 13-73. Label Dialog Box

3. Enter a name for the sample area.
4. Select ***OK***.

Copy, move, and paste a Sample Area

To copy and paste the sample area,

1. Move the cursor over the sample area and press the left Set key. The system menu displays.
2. Select ***Copy sample area***.
3. Move the cursor to the desired location for the copied sample area and press the left Set Key. The system menu displays.
4. Select ***Paste sample area***.

To copy and move the sample area,

1. Move the cursor over the sample area and press the left Set key. The system menu displays.
2. Select ***Copy & move***. Or if you want to move to the same depth as the original sample area, select ***Copy & move (same depth)***.
3. Move the copied sample area using the **Trackball**. Press **Set** to fix the position.

Deleting a Sample Area

Sample sample areas and their corresponding traces can be deleted using ***Delete Sample Area***.

1. Select ***Delete Sample Area***; a pull-down menu displays.

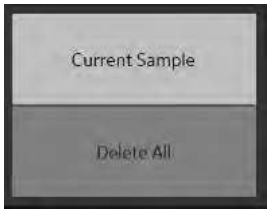


Figure 13-74. Delete Sample Area pull-down menu

2. Select ***Current sample*** to delete the currently active sample area.

   Select ***Delete all*** to delete all currently set sample areas and all of their traces.

NOTE: The corresponding traces for the deleted sample areas are erased from the plot.

NOTE: Deleting a sample area causes the sample areas to be deleted from all frames in the analysis loop.

QAnalysis Plot Control

NOTE: Plot Control is available only with TVI and Elastography modes.

The following controls are user configurable presets which are configurable through the pull-down menu in QAnalysis mode. When using the pull-down menu:

1. Place the cursor over the analysis window and press the left ***Set*** key. The system menu displays at the cursor position.
2. Select the appropriate parameter.

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 sample area 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) sample area 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.

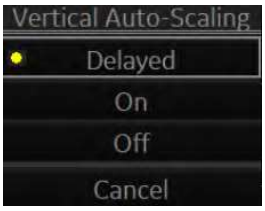


Figure 13-75. Vertical Autoscale Pop-up menu

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 13-76. Line style Pop-up menu

Smoothing

The system can smooth the traces displayed by applying a filter over a defined time window. The type of filter available is depending on the analysis signal displayed.

1. Select ***Smoothing***.

   OR

   Position the cursor over the analysis window and press the left ***Set key***. 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 analysis curve.

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.

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 left **Set** key in the Analysis window. The system menu displays.
2. Select ***Unzoom***.

Disabling/Enabling the frame

NOTE: Frame disable/enable is available only with Elastography, CF, and PDI modes.

Frame disabling excludes the actual frame from the cineloop display.

Disabling the frame from the frame marker

To disable One Frame:

1. Use the **Trackball** to move the cursor to the frame marker to disable.
2. Press **Set** to disable the 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 marker to disable.
2. Press and hold down ***Set***
3. Move the cursor with the Trackball to the last frame to be disabled and release Set.

   The marker is turn red and the data from that frame is removed from the trace and any subsequent trace processing.

Disabling a frame from the cineloop window

1. Use the trackball to move the cursor to the cineloop window.
2. Press the left ***Set*** key. The system menu displays.
3. Select ***Disable frame***.

   The current frame is disabled and the corresponding frame marker displays red.

Disabling Frames - Auto

When the user enters Elasto Quantification, the useless frames are disabled automatically. The LOGIQ Totus uses Elastography Index value to find useless frame (low quality frames).

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 left **Set** key. 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 left ***Set*** key. The system menu is displayed at the cursor position.
2. Select ***Enable all frames***.
3. All disabled frames are re-enabled.

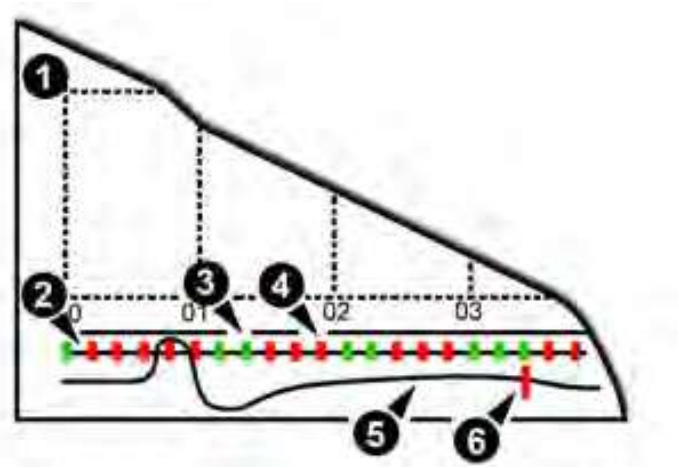


Figure 13-77. Frame Markers

1. Analysis Window
2. Frame markers axis
3. Enabled frame (Green)
4. Disabled frame (Red)
5. ECG (where available)
6. Current frame

Exporting Traces (Saving the Trace Data)

You can save the trace data to an external file in ASCII format, readable in spreadsheet programs.

1. Select ***Export Traces*** to save the trace data.
2. Specify the following:
   - 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 sample area traces are saved in the exported file.

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.

Printing QAnalysis Data

Press the appropriate print key in the desired analysis mode mode.

The system captures a single still frame which consists of the plot, the reference image, and user annotation.

Exiting QAnalysis

There are several methods to exit QAnalysis.

- Toggling ***Exit QAnalysis*** on the QATouch Panel.
- Press **Freeze** to unfreeze and resume scanning.
- Press any other button that returns the system to real-time scanning.

Stress Echo

Introduction

The LOGIQ Totus Ultrasound system provides an integrated stress echo package, with the ability to perform image acquisition, review, image optimization, and wall segment scoring and reporting for a complete, efficient stress echo examination.

The stress package provides a protocol template for the two types of stress exams (exercise and pharmacological stress).

In addition to preset factory protocol templates, templates can be created or modified to suit your needs.

You can define various quad screen review groups, in any order and combination, that will suit your normal review protocol.

When reviewing stress examination images, the images are viewed at their original image quality, and different post-processing and zoom factors may be applied to the images under review for effective image optimization.

The protocol template may be configured for Continuous Capture.

A stress echo examination consists of three steps:

- Selection of a stress test protocol template
- Image acquisition
- Stress Analysis

NOTE: If WallMotion Segment Score is not displayed on the screen, select the "WallMotion" preset in the Utility -> Measure -> M&A -> Plot -> Available Folders and Measurements.

Getting started with a stress study

1. After selecting the appropriate application and probe, press the ***Protocol*** tab on the Touch Panel. The protocol screen displays the layout of the default stress protocol for the current probe. This layout is also known as a template.

Table 13-38: Protocol Tab

Parameter	Description
Analyze	Display the Analysis screen
Template Editor	Display the template editor screen
Add Level	Add Level to the template
Delete Images	Delete the selected image
Move Image	Move the selected image to the another cell
Sync. Select	Synchronize the selected images.
End CC	End Continuous Capture
Begin/Cont.	Begin or continue the acquisition
Template	Display the template list
T1	Display/Hide the timer T1
T2	Display/Hide the timer T2
Cancel	Cancel Stress Echo

Getting started with a stress study (continued)

2. To use the current template, press ***Begin/Cont.*** to initiate scanning.

   To use another template, press ***Template***. The template list displays.

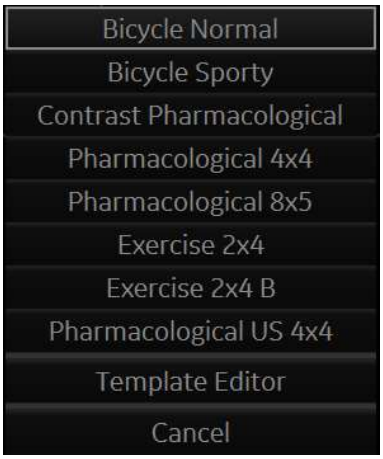


Figure 13-78. Template List

3. **Trackball** to the desired template and press **Set**.

Getting started with a stress study (continued)

4. The selected template displays.

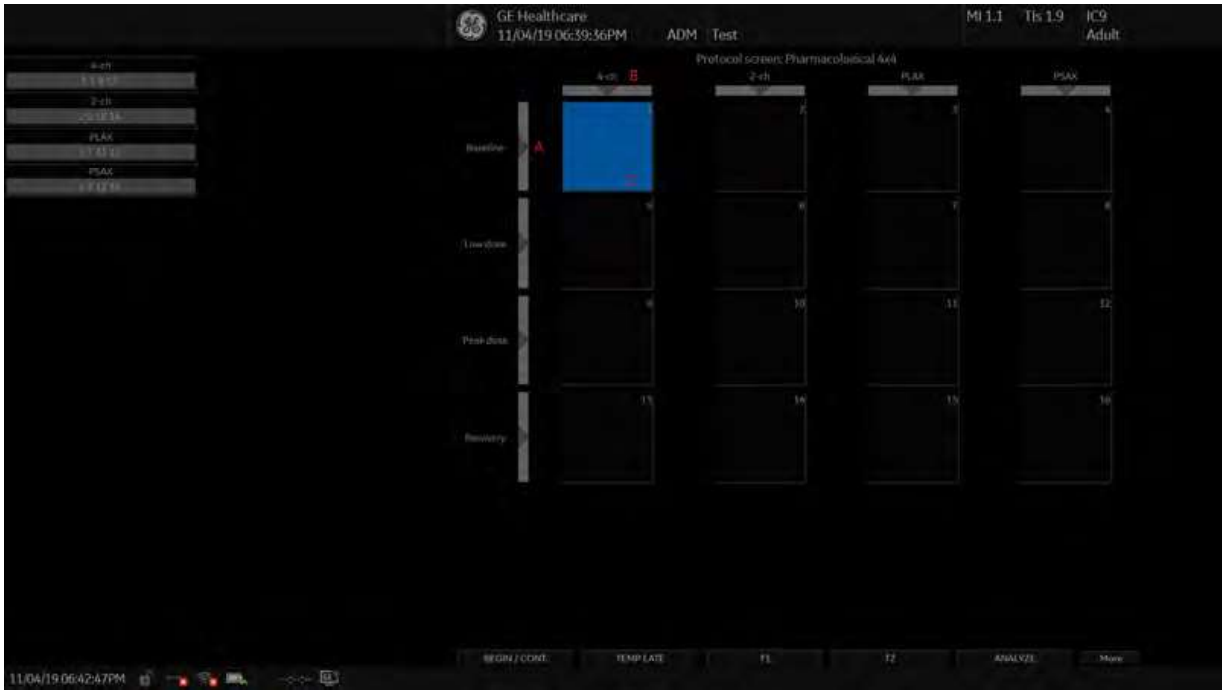


Figure 13-79. Template (Example)

a. Level
b. Projection
c. Current Acquisition (green)

5. Press ***Begin/Cont.*** to initiate scanning using the new template.

Image acquisition

Images are acquired in a pre-defined order, according to the selected template. The highlighted (green) cell of the template matrix, displayed in the Clipboard window, indicates which view is currently being acquired.

The names of the view and levels for the current cell are displayed on the top left corner of the image area and under the template matrix.

Acquisition Screen

1. Current View Level
2. Timer
3. Template Matrix
4. Current View (Green cell)

Starting acquisition

1. Select the template.
2. Press ***Begin/Cont.***
3. Perform a scan that conforms with the view that is highlighted in the template matrix on the Clipboard window.
4. Press the **P1** (Image Store) key.
   - If the actual stress level is configured to preview the cine loop before storing, use the cine loop controls to select the most appropriate heart cycle and if desired adjust the loop markers. Press **P1** again to save the selected cine loop.

     or

     If you do not want to store the cine loop, press **Freeze** to cancel. Return to the scan screen.
   - If the actual stress level is not configured to preview the cine loop before storing, the system automatically stores the last heart cycle.

Stress levels can be configured for side-by-side display/ comparison of the reference loop from baseline or previous level and the loop to acquire.

5. After storing the cine loop, the system automatically highlights the next view in the matrix to be acquired.
6. Repeat previous steps until all required views are completed.
7. If you select Auto Start Analysis on the Template Editor for this template, a dialogue asking “Do you want to start protocol analysis now?” displays when the last acquisition is complete. If you select Yes, the Stress Echo Analysis screen is displayed.

The template used can be configured so that analysis automatically starts by displaying the first protocol group. The wall segment scoring diagrams for each view is displayed in the Parameter window on the left side of the screen.

Starting acquisition (continued)

If the ***Protocol*** tab is selected during acquisition, the following Touch Panel displays.

Table 13-39: Protocol Tab during acquisition

Parameter	Description
Stop	Stop Stress Echo.
Pause	Pause Stress Echo. The template matrix continues in display. Even if you press P1, the cine loop does not store to the matrix.
Select Cycles	The Continuous Capture Selection screen is displayed (only available in Continuous Capture mode).
Analyze	Enter Analysis screen.
Template	Enter Template screen.
Add Level	Add level to the template.
T2	Display (Start)/Hide Timer T2.

Selecting a view during acquisition

A fixed protocol is provided for scanning, based on the selected template. The system automatically highlights the next view to be acquired in the template matrix, as images are stored. However, the order of scanning may be changed manually as follows:

Manual selection of a view during acquisition

1. Use the **Trackball** or the ***arrow keys*** on the alphanumeric keyboard to move the cursor to the cell that represents the view to be acquired.

   The selected cell in the template matrix, highlighted in red, indicates the non-default position. When blinking, it contains a previously-stored acquisition.
2. Press ***Begin/Cont.*** to initiate scanning.
3. Scan and save the selected loop as explained in the previous section.

After storage, the system automatically highlights the next available view to be acquired.

Moving an acquired image

An image can be moved from one cell to another during acquisition.

Procedure 1

1. When in the Protocol screen, press ***Move Image***.
2. Use the **Trackball** to move the cursor to the desired image.
3. Press **Set**.
4. Use the **Trackball** to move the cursor to the destination cell.
5. Press **Set**. The image is moved from the source cell to the destination cell.

Procedure 2

1. In the Protocol screen, use the **Trackball** to move the cursor to the cell containing the image to move (source cell).
2. Press and hold down **Set**.
3. With the **Set** key still depressed, move the **Trackball** to the desired cell.
4. Release the **Set** key. The image is moved from the source cell to the destination cell.

If the destination cell contains an image, the images from the source and destination cells is exchanged when moving an acquired image.

Timers

Two timers can be displayed in the Stress mode acquisition screen, beside the template matrix.

Timers

- T1 displays the elapsed time from the start of stress examination.
- T2 starts when entering live scanning on the second stress level.

Both T1 and T2 timers can be manually stopped and restarted during the acquisition.

The display of T1 and T2 is user-configurable.

NOTE: If you activate the Timer in Stress Echo, the T1 timer is displayed in the lower left-hand corner of the image area after exiting Stress Echo.

Continuous Capture mode

Continuous Capture mode enables the user to perform acquisition continuously for all views at any level depending on the selected template configuration. Continuous Capture consists of temporary images and loops acquired during the session in a storage buffer in system memory. To enable best possible use of the limited storage buffer capacity, a Pause/ Capture mode is provided, as opposed to the normal Freeze/ Scan mode. The Pause mode enables scanning and live display on the screen, without any capture, thereby leaving the buffer available.

WARNING

Leaving a Stress Echo exam **PRIOR TO** saving portions of the Continuous Capture through “select cycle” or triggering a “Store All” could result in the loss of Continuous Capture data.

The continuous capture acquisition obtained using the P1 print key while in protocol is stored in temporary memory. Loss of power before properly ending the patient or before selecting cycles will result in the loss of this information in certain configurations.

Upon completion of cycle selection or when ending current patient, the user will be prompted as to what they would like to do with this temporary buffer. If they choose "store all," the information will then be placed in permanent memory on the system’s hard drive.

WARNING

DO NOT change modes or power off the system while in Continuous Capture Mode. Doing so causes images and data acquired during the session to be lost.

To run Continuous Capture, the user has to select a template where this feature is activated.

The buffer bar

When entering a level with Continuous Capture enabled, a buffer bar displays in the window.

The Buffer bar displays the following information:

- The scanning state
  - Pause (live scanning without storing)
  - Capture (live scanning with storing temporary images and loops to system memory buffer)
- The percentage of the buffer that is filled
- The buffer filling progression showed by a filling gage
- The capturing sessions, reflected by the red lines along the buffer bar

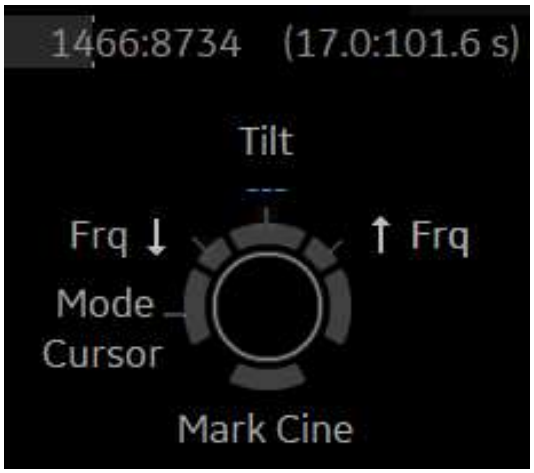


Figure 13-80. Buffer Bar

Controlling the capture process

When entering a stress level with Continuous Capture enabled, the system is automatically set in Pause mode.

1. Press **P1** to start image capture.

   “Capture” is displayed in the buffer bar, the gage starts filling and the percentage of filled memory buffer increases.
2. Press P1 again to stop capture.

   “Pause” is displayed in the buffer bar.

When 90% of the memory buffer is filled up, the text display in the buffer bar turns red.

The system enters Freeze mode automatically once the buffer is full and the captured loops display in the Continuous Capture selection screen.

Activating Continuous Capture

1. Do all your pre-stress acquisitions in the Cardiac application.
2. Press the ***Protocol*** tab to enter the Stress Echo mode. The Protocol screen displays.
3. Press ***Template***. The template list displays.
4. Select the template ***Exercise 2x4*** from the list.
5. Press ***Begin/Cont.***.
6. Acquire the resting loops in all four views.

*NOTE: Use the **P1** key to store the images.*

7. Once the fourth loop is acquired, the system enters into a waiting mode where Continuous Capture is in a pause state awaiting the patient to exercise.
8. When the patient is back on the bed, press **P1**. The Continuous Capture acquisition starts.
9. Acquire all your views.

   The memory buffer gage increases. When memory exceeds 90%, the percent number turns red.
10. Press **Freeze** to finish.

Activating Continuous Capture (continued)

11. Press ***Select Cycle***.

    The Continuous Capture selection screen displays.

    Refer to the next section if additional image acquisitions are necessary after the buffer is full.

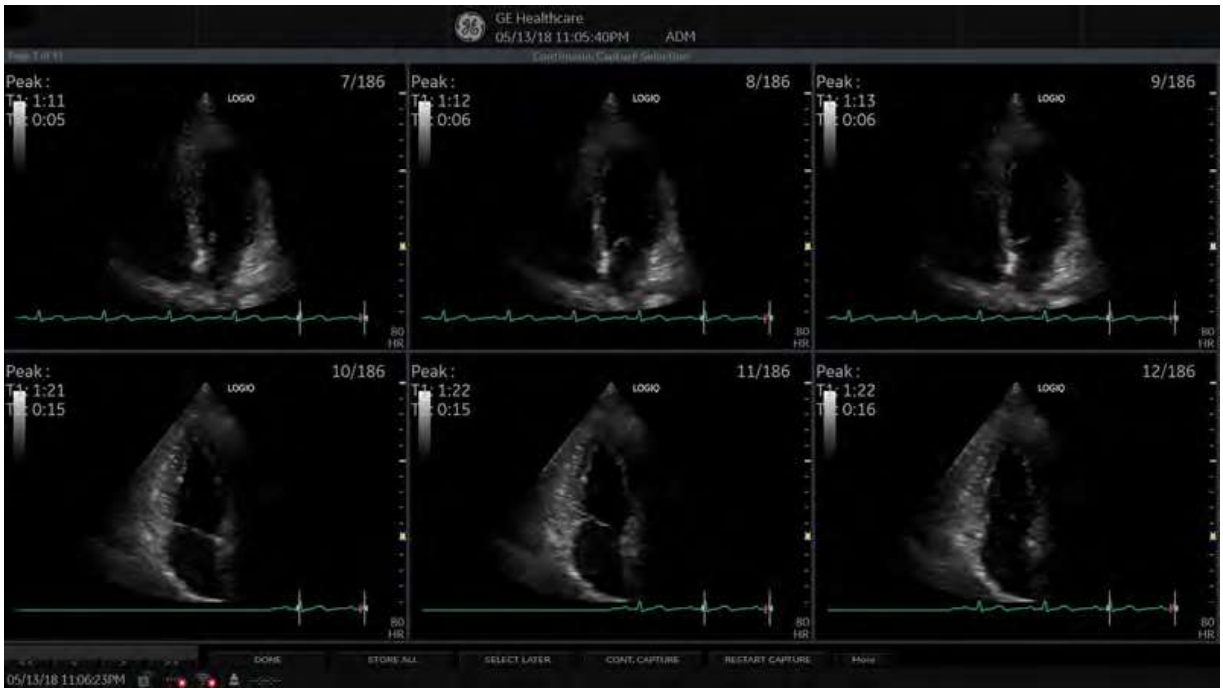


Figure 13-81. Continuous Capture Selection Screen

Activating Continuous Capture (continued)

12. Assign the cine loops to the four views.

1. **Trackball** to the desired loop.
2. Press **Set**. A drop-down menu appears with the available choices.
3. **Trackball** to the appropriate view.
4. Press **Set**.
5. Continue these steps until all views are selected.
   NOTE' To access additional cycles, use the arrow keys on the lower left portion of the select cycle screen.
6. Select ***Done*** when complete. A dialogue window displays, asking whether the entire Continuous Capture acquisition should be saved.

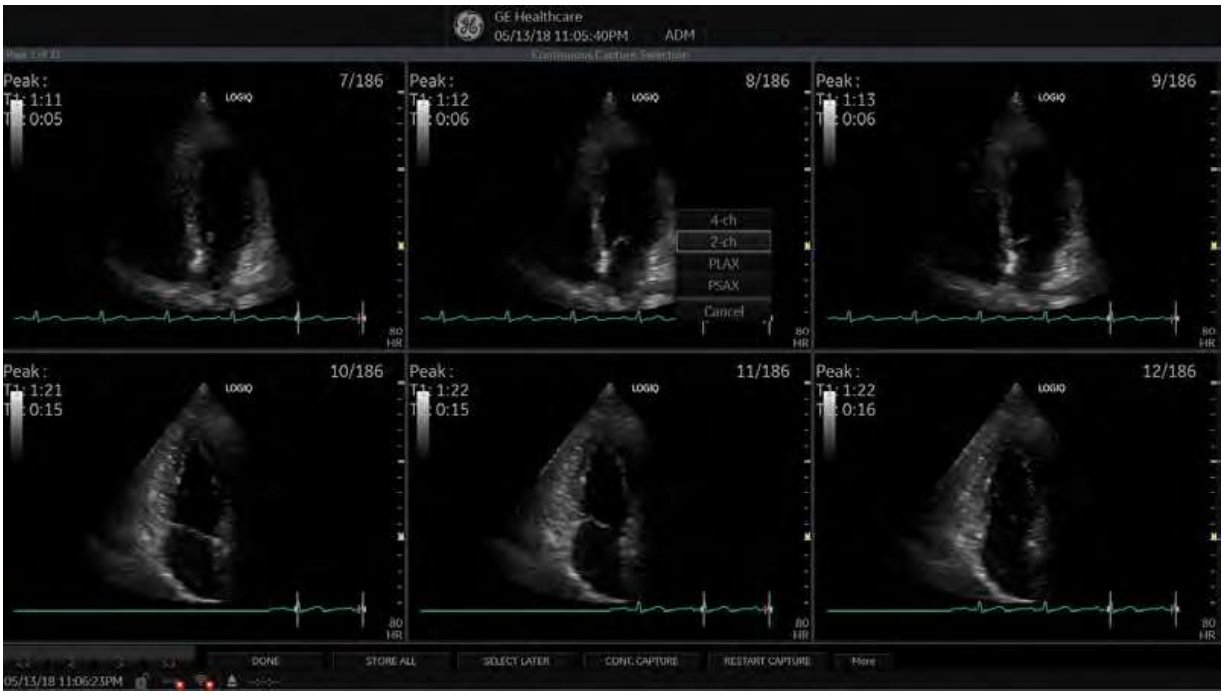


Figure 13-82. Drop-down Menu

Activating Continuous Capture (continued)

Figure 13-83. Dialogue Window

13. Press ***Delete*** to discard the loop or press ***Store*** to keep the entire loop.
14. Perform Analysis and scoring.

Continuous Capture with additional image acquisition

If the buffer is filled up before all the image acquisitions are done, additional loops can be stored in the clipboard before doing image assignment to the views.

1. Perform the Continuous Capture. See ‘Activating Continuous Capture’ on *page 13-184 for more information.* (Steps 1 to 11).
2. In the Continuous Capture selection screen, press ***Select Later***.

   The Continuous Capture screen displays.
3. Perform the additional acquisition.
4. In order to resume the stress echo exam and assign loops for the views from the Continuous Capture buffer, press ***Protocol***. If not displayed, select the template ***Exercise 2x4*** from the template list.
5. Click the continuous capture images on the Protocol Template screen.

   The Continuous Capture selection screen displays.
6. Assign the cine loops to the view. See ‘Activating Continuous Capture’ on *page 13-184 for more information.* (Step 12 a - f).
7. Press ***Delete*** to discard the loop or press ***Store all*** to keep the entire loop.

   The normal procedure is to discard the loop. The loop is very big and requires a lot of disk space.
8. Perform Analysis and Scoring.

Postponed image assignment

The assignment of the cine loops to the view can be done on a later stage on a stored Continuous Capture acquisition.

1. Perform the Continuous Capture. See ‘Activating Continuous Capture’ on *page 13-184 for more information.* (Steps 1 to 11).
2. Press ***Store all***.

   The entire Continuous Capture acquisition is stored. The examination can be ended and the image assignment, analysis and scoring can be done later.
3. Re-open the examination, if necessary.
4. Press ***Protocol***. The Protocol screen displays.
5. Click the continuous capture images on the Protocol Template screen.

   The Continuous Capture selection screen displays.
6. Assign the cine loops to the view. See ‘Activating Continuous Capture’ on *page 13-184 for more information.* (Step 12 a - f).
7. Select ***Done***.
8. Perform analysis and scoring.

Restart capture from the Continuous Capture Selection

- Press ***Restart Capture***.

  The recording in memory is deleted and the Continuous Capture starts again.

Resume Continuous Capture

- Press ***Continue Capture***.

  Resumes Continuous Capture recording (only if the Continuous Capture buffer is not full).

Assigning and storing the cine loop

The cine loops captured in the buffer are assigned to the stress protocol views and stored from the Continuous Capture selection screen.

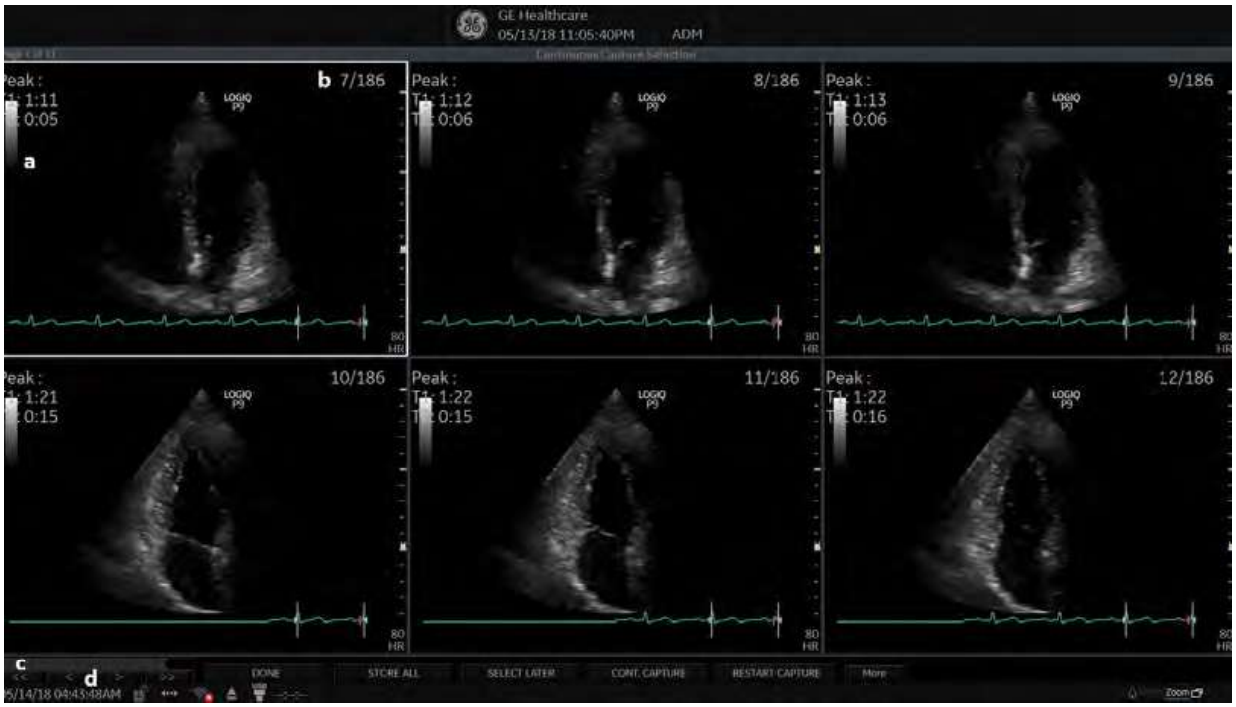


Figure 13-84. Continuous Capture Selection Screen

1. Highlighted loop
2. Cycle number and total number of cycles
3. Blue Gauge: Position of the highlighted loop within buffer area.
4. Red bar: Pause session.
5. Navigation Controls: << < > >> (back to first selection, back to previous selection, forward to next selection, and forward to final selection).

Assigning a cine loop to a view

1. Use the **Trackball** to move the cursor to the desired cine loop in order to assign it to a particular view of the stress template.

   The frame of the loop is highlighted.

2. Press **Set**.

   A pop-up menu displays with the view names of the template.

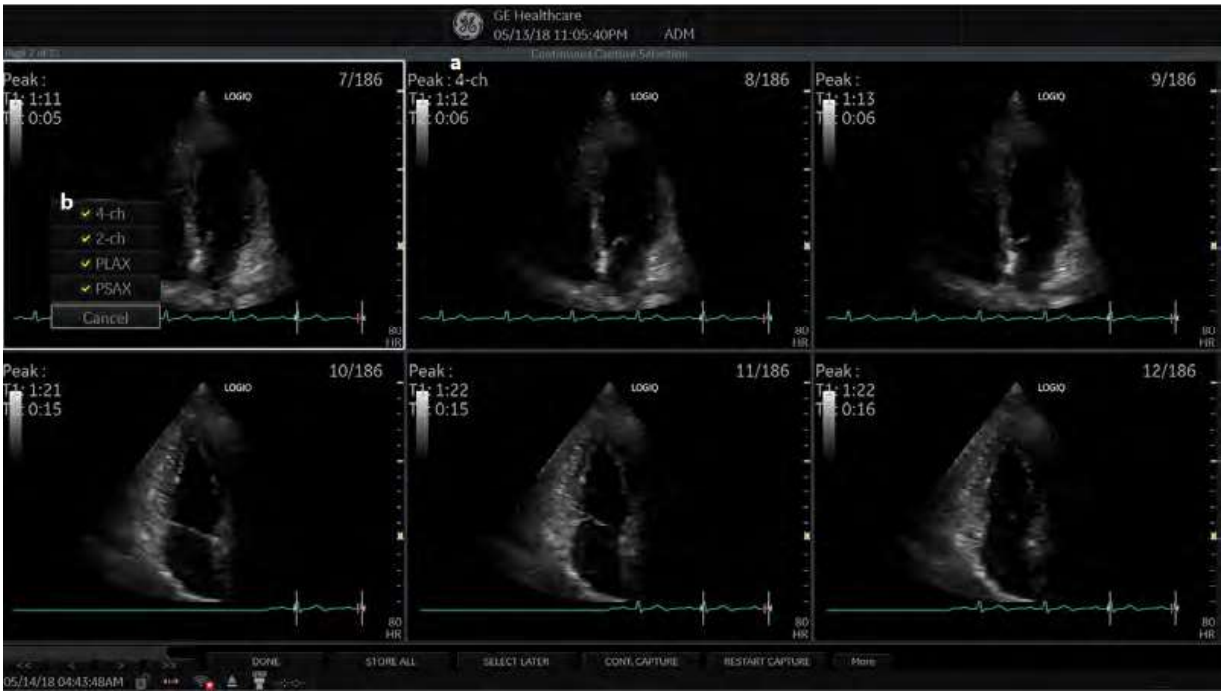


Figure 13-85. Loop Assignment

1. Already assigned view
2. Views pop-up menu
   NOTE: A checkmark appears on the Views pop-up after you have assigned a view to an image.

Assigning a cine loop to a view (continued)

3. Use the **Trackball** to select the required view name.
4. Press **Set**.

   The name of the view displays above the timers in the window.
5. Repeat steps 1 through 4 to assign loops to the other views of the level.
6. Press ***Done*** when complete.

   A dialogue window displays asking whether the entire Continuous Capture acquisition should be saved.
7. Press ***Delete*** to discard the loop or press ***Store all*** to keep the entire loop.

   The normal procedure is to discard the loop. The loop is very big and requires a lot of disk space.

Post Acquisition Features

Post acquisition, you can utilize Raw Data to adjust the following in B-Mode:

- Zoom
- SRI-HD
- Rejection
- Frame Average
- TGC
- Maps
- Dynamic Range
- Gain
- Rotation

You can also take measurements post Stress Echo acquisition.

Analysis

Analysis consists of viewing previously saved loops and assigning scores to each cardiac segment, in order to quantify the function of the muscle or wall segment.

Depending on the protocol configuration, the analysis stage can start manually or automatically after completion of the stress test. In this case, the usual procedure consists of sequentially opening all image groups (if defined) and performing scoring from image to image.

The quad screen is the standard display for comparing heart cycles. The heart cycle loops in the display are synchronized to enable comparison. Each loop in the quad screen can be magnified, using the zoom control.

Image Selection for Analysis

Images can be selected manually or from a pre-defined group in the Protocol screen.

Selection of Images from a group

If groups of images have been defined in the protocol template, you can select a group of images for analysis and sequentially analyze all images from all groups from within the Analysis screen.

1. In a stress examination, press ***Protocol***. A preview of the acquisition displays.
2. Press ***Analysis***. A pre-defined group appears in the display with a Wall Segment window on the left.
3. To advance to other groups, use the **Trackball** to move the cursor to the arrows at the bottom of the Wall Segment window. Select an arrow to advance to another group. For further clarification, see callout E in Figure 13-86.

Manual selection of images from Analysis screen

1. When currently in the protocol analysis screen in the Stress analysis quad screen, hold down the ***SHIFT*** key while performing Steps 2 through 4.
2. Use the **Trackball** to move the cursor to the first image to select in the template matrix.
3. Press **Set**. The frame of the selected loop is in the Stress analysis screen and the next window in the quad screen is automatically selected.
4. Repeat step 2 and 3 to select other images.
5. Depress ***SHIFT*** .

Manual selection of images in the Protocol screen

1. In a stress examination, press ***Protocol***. A preview of the acquisition displays.
2. Use the **Trackball** to move the cursor to the first image to select.
3. Press **Set**. The frame of the selected loop highlights.
4. Repeat Steps 2 and 3 to select other images.
5. Press ***Analyze*** to open images in the Analysis screen.

Scoring acquired loops

1. After image selection, press ***Analyze***.
   The Stress Echo analyze screen displays.

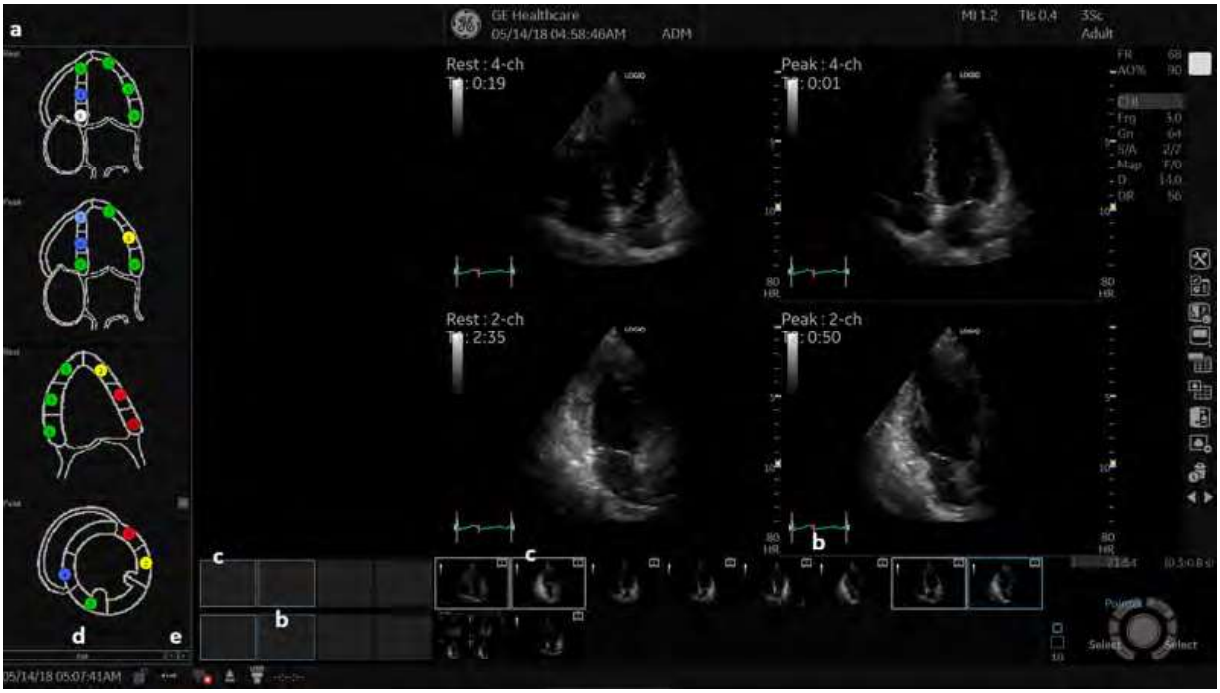


Figure 13-86. Analysis Screen

a. Wall segment diagram
b. Selected loop (Highlighted frame)
c. Displayed loops (Highlighted frames)
d. Exit Wall motion scoring
e. Change page or enter next image group

Scoring acquired loops (continued)

2. Use the **Trackball** to move the cursor to a score.
3. Press **Set**.

   The score displays in the relevant segment area in the diagram.

NOTE: To edit a score, select it and choose a new score.

4. Repeat step 1 through 3 to score relevant segments.
5. Press the **Change Page** arrow to display the next group of images.
6. Repeat step 1 through 3 to score relevant segments on the new loops.

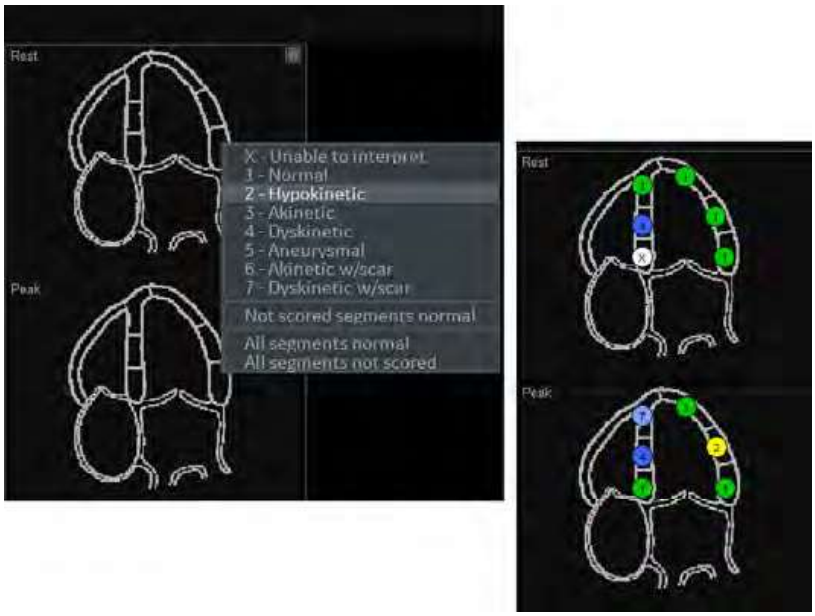


Figure 13-87. Segment Scoring

NOTE: Since Cine changes into sync mode, subsequent scans are also synchronized. Exit sync mode from the Cine menu.

Editing/Creating template

The stress package provides protocol templates for exercise as well as pharmacological stress examinations.

The user can create new templates or modify existing templates to suit the individual needs. Up to ten projections and fourteen stress levels can be created in a template.

Templates created may be temporary, used only during the current examination, or saved as new templates, for future use and reference.

The editions that may be performed include:

- Adding/Deleting levels and projections.
- Assigning new labels to levels and projections.
- Defining level options.
- Defining new groups.

Templates are edited/created from the Template editor screen.

Entering the Template editor screen

1. Press ***Protocol*** to enter the stress echo mode.
2. Press ***Template***.The template list displays.
3. Use the **Trackball** to select the Template Editor.
4. Press **Set**. The Template Editor screen displays.

OR

1. Press ***Protocol*** to enter the stress echo mode.
2. Press ***Template Editor*** on the Touch Panel. The Template Editor screen displays.

Template Editor screen overview

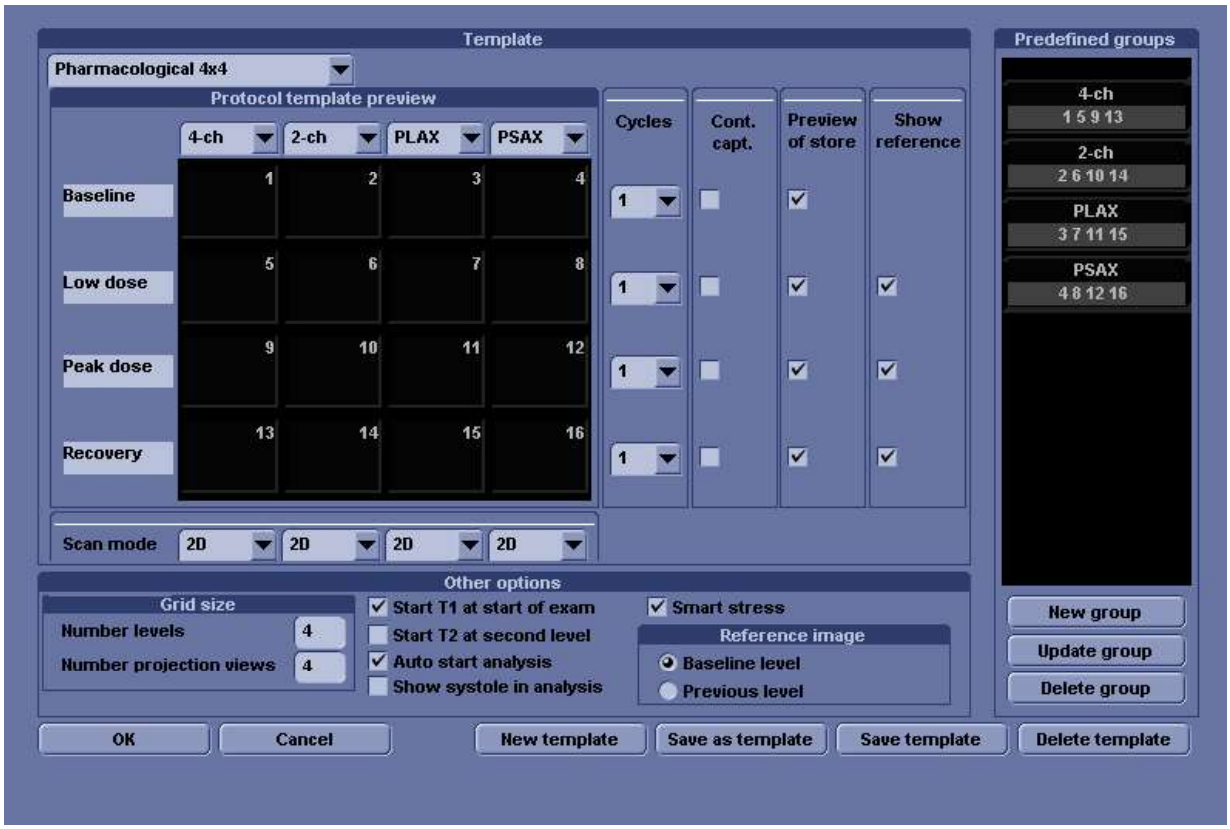


Figure 13-88. Template Editor Screen

Table 13-40: Template

Parameter	Description
Template	Select a pre-defined template from the pull-down menu. The protocol template preview updates accordingly.

Table 13-41: Protocol Template Preview

Parameter	Description
Protocol Template Preview	• Displays an updated preview of the template accordingly to the settings applied. • To change Projection and Stress level labels, select a pre-defined label from the pull-down menu or press **Set** in the actual label field and type a new name.

Table 13-42: Template Settings

Parameter	Description
Template Settings	• Cycles: select the number of cine loop heart cycles to store for each level from the pull-down menu or enter the desired value manually. • Continuous Capture: Checking this parameter enables continuous image acquisition throughout the level. The images acquired are temporarily stored in the system's storage buffer. • Preview of store: Checking this parameter enables review and adjustment of cine loops before store. • Show reference: Checking this parameter displays a dual screen with the reference level (first or previous level) on the left and the live image on the right.

Table 13-43: Scan Mode

Parameter	Description
Scan Modes	• 2D, Color, PW (Pulsed Wave Doppler), CW (Continuous Wave Doppler), MM (M-Mode), Color MM, Color PW, Color CW

Table 13-44: Other options

Parameter	Description
Other Options	• Grid Size: Enter the number of levels and projections for the selected template. • Timers: If you check this parameter, starts T1 and T2 timers automatically. • Auto-start analysis: If you check this parameter, displays the Stress Echo Analysis when the last acquisition is performed. • Show Systole in Analysis: When selected, the systolic part of the cardiac or ECG cycle is only displayed. The whole cycle is not displayed. • Smart Stress: Check Smart Stress to store and automatically reuse a subset of the image acquisition settings from a previous level in the corresponding views in the next level. When smart stress is used with "preview to store" function the timeline modes (PW, CW, M Mode, TDI) will only transfer image acquisition settings from baseline. • Reference image: When Show Reference is selected, selects either corresponding baseline loop or corresponding loop from the previous level to be displayed as reference image during acquisition.

Table 13-45: Pre-defined groups

Parameter	Description
Pre-defined groups	• Shows the image groups created. • New group: Creates a new image group. Select the desired images on the template preview. • Update group: Edits a selected group after new loop selection on the template preview. • Delete group: Deletes a selected group.

Editing/Creating a template

Selecting a base template to edit

1. Select the base template from the template pull-down menu on the upper left corner.
2. Press **Set**.

   The selected template displays in the protocol template preview field, showing the levels, projections and their labels.

Adding/Deleting levels and projections

1. Enter the number of levels and projections in the Grid size field.

   The new grid size displays in the protocol template preview field.
2. Press ***New Template*** to create a new template.

   or

   Press ***Save Template*** to update the base template.

Display timers

1. Check the box(es) to display timer(s) as specified.

NOTE: The timers can also be started or stopped at any time during stress examination by using the T1 and T2 Touch Panel key.

Start analysis automatically

1. Check ***Auto Start Analysis*** to display the Stress Echo Analysis screen when the last acquisition is performed.

Smart Stress

1. Check Smart Stress to store and automatically reuse a subset of the image acquisition settings from a previous level in the corresponding views in the next level. When smart stress is used with "preview to store" function the timeline modes (PW, CW, M Mode, TDI) will only transfer image acquisition settings from baseline.

Editing/Creating a template (continued)

Configuring levels

The following options can be set up for each level:

Number of cycles to be stored in the cine loop:

1. Enter the desired number (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20) in the Cycles field.

Continuous Capture

1. Check Continuous Capture if continuous image acquisition throughout the level is desired.

   When Continuous Capture is selected, preview of the cine loop and reference display during acquisition are not possible.

Preview of store

1. Check Preview of store if review and adjustment of cine loops before storage is desired.

Show reference

1. Check Show reference if the display of the corresponding reference loop is desired during acquisition (Dual screen mode).

Editing/Creating a template (continued)

Adding a group

1. In the Protocol template preview field, select the cells to be part of the group.
2. In the Pre-defined group field, press ***New group***.

   A dialogue box displays to ask the user to enter a name for the new group.
3. Enter the group name.
4. Press ***OK***. The new group displays in the pre-defined group field.

Updating an existing group

1. In the Pre-defined group field, select the group to edit.

   The selected cells are highlighted in the Protocol template preview field.

NOTE: A selected group is highlighted by a blue frame.

2. Either select a new cell(s) to add to the group or deselect an existing cell(s) to remove from the group.
3. Press ***Update group***.

   The display in the Protocol template preview field is updated accordingly.

Deleting a group

1. In the Pre-defined group field, select the group to delete.

NOTE: The selected group is highlighted by a blue frame.

2. Press ***Delete group***.

   The group is removed from the list in the pre-defined group field.

Specifying Scan Mode for each Projection

1. Specify the Scan Mode for each Projection: 2D (B-Mode), Color Flow Mode, M-Mode, Color M-Mode, PW Mode, Color PW Mode, CW Mode, or Color CW Mode.

Editing/Creating a template (continued)

Saving the Template

You can save the template using controls at the bottom of the Template Editor page, or use the controls on the Touch Panel.

Table 13-46: Template Editor Saving Options

Parameter	Value
New Template	Select this option to create an entirely new template.
Save As Template	If you would like to create a new template based on the existing template with your modifications, select to Save this Template As, and give it a name.
Save Template	Select this option to save the default template with your modifications.
Delete Template	Select this option to delete a template.

Wall Motion Segment Setup

You can set up the following parameters for Wall Motion Segment in the Utility screen (Utility--> Measure--> Advanced--> Cardiac).

Table 13-47: Wall Motion Segment Parameters

Parameter	Value
WMS freeze loop at ES	Specify to freeze the Loop at End Systole
WMS Segment Model	Select 16 or 18 segments
WMS initial scoring	Undefined or Normal
WMS scoring legend	ASE, ASIA or European

Utility Application Settings for Protocol

Table 13-48: Protocol Parameters

Parameter	Description
Show Protocol Tab	Show/Hide the Protocol tab for that preset (Bicycle Normal, Bicycle Sporty, Contrast Pharmacological, Pharmacological 4x4, Pharmacological 8x5, Exercise 2x4, Exercise 2x4 B, Pharmacological US 4x4, or User-configured).
Template	Select the default template.

Report

If you set up the Wall Motion Analysis field on the Report, you can insert the results.

Select Report to view either the Bull's Eye or Cut Plane Report.

Figure 13-89. Bull's Eye Report Sample

Report (continued)

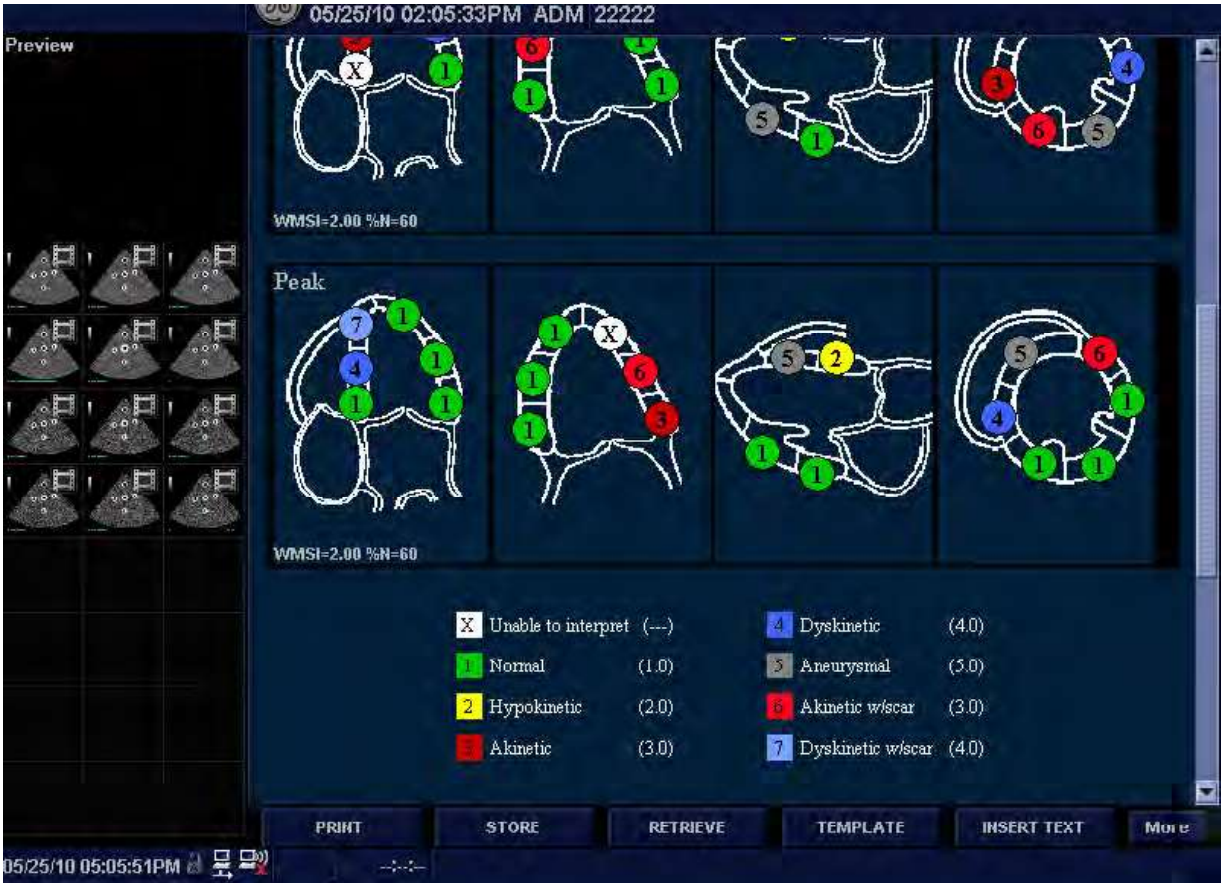
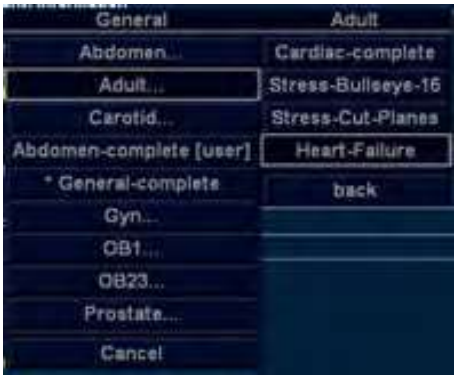


Figure 13-90. Cut Planes Report Example

HINTS

Select either Bull's Eye or Cut Plane on the Reports--> Adult Template.



Cardiac Automated Functional Imaging (Cardiac Strain)

Cardiac Strain

Cardiac Automated Function Imaging (Cardiac Strain) is a decision support tool for global and regional assessment of the LV systolic function. Cardiac Strain calculates the myocardial tissue deformation based on feature tracking on B-Mode grey scale loops.

Cardiac Strain is performed on the standard apical views, apical long-axis (APLAX), 4-chamber (A4CH) and 2-chamber (A2CH), following an on screen guided workflow. The apical views may be acquired sequentially in B-mode.

Cardiac Strain is also available for standard apical views acquired with a TEE probe.

Cardiac Strain may be launched from the Cardiac application using Transthoracic echocardiogram (TTE) images from the M5Sc-D probe, or from the Pediatric application using either the 6S-D probe.

If a complete analysis of all three views is performed, the result is presented as a Bull's eye display showing color coded and numerical values for peak systolic full wall longitudinal strain, PSS (Peak Systolic Strain), TTP (Time To Peak global longitudinal strain) and traces.

If the user approves the results, all values are stored to the worksheet. In addition, Global Strain for each view, Average Global Strain for the whole LV, standard deviation of the segmental Time To Peak Strain and the Aortic Valve Closure time used in the analysis are stored to the worksheet.

Texture is an imaging technique that enhances structural information and attenuates reverberations and other signals that do not represent the location displayed. Unlike B-mode, the brightness of the Texture image is not directly related to echo amplitude. Texture is useful for an enhanced view of layers, borders and structures. Pixels in a normal image that would be dominated by energy not coming from the target location will appear darkened. Speckle from blood signals will appear enhanced.

Images acquired with Texture have different speckle characteristics and might therefore influence the results of speckle tracking. For this reason, it will not be possible to perform Cardiac Strain analysis of images were Texture was enabled

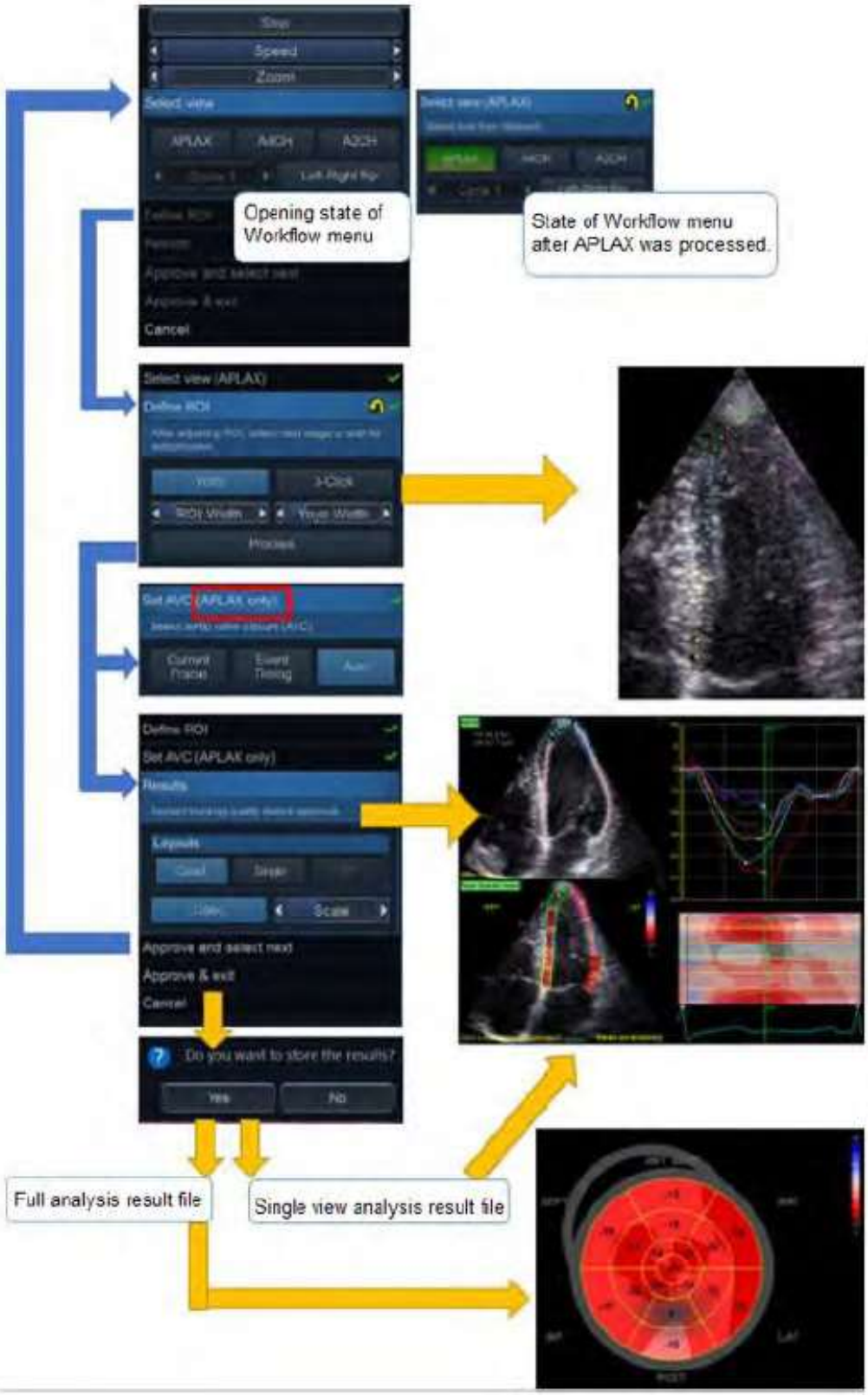


Figure 13-91. AFI Workflow

Acquisition

Create an exam, connect the ECG device and make sure to obtain a stable ECG trace.

Sequential acquisition

Acquire 2D grey scale cineloops of an APLAX, A4CH and A2CH view.

NOTE: It is recommended to acquire all three apical views sequentially to get similar heart rate in all views.

Acquisition requirements

- The frame rate should be between 37 and 80 frames per second. A higher frame rate is recommended for high heart rate.
- Heart rate variability between the recordings should not be greater than 30%.
- The system should be configured to store 100 ms before and after each heart cycle.
- If the acquisition has more than one heart cycle, the analysis will by default be done on the second to last heart cycle.
- The entire myocardium should be visible.
- A depth range that includes the entire left ventricle should be used.

CAUTION

Cardiac Strain is only recommended for adult cardiac images acquired with the M5Sc-D probe. Cardiac Strain is only recommended for pediatric cardiac images acquired with the 6S-D probe. The measurement accuracies of the longitudinal strain values reported in the Reference manual are verified with these probes.

Starting Cardiac Strain from sequential acquisition

1. Open the exam for which you want to perform Cardiac Strain analysis and select one of the apical images you would like to use for the analysis.
2. Press **Measure** on the Control panel and select the Cardiac Strain study. If the images are acquired with a transthoracic probe, the system will try to identify a suitable triplet of apical views suitable for the analysis. If this succeeded, the tool will launch and start up in the Define ROI stage with the selected view. The tool will launch and start up in the Select View stage.

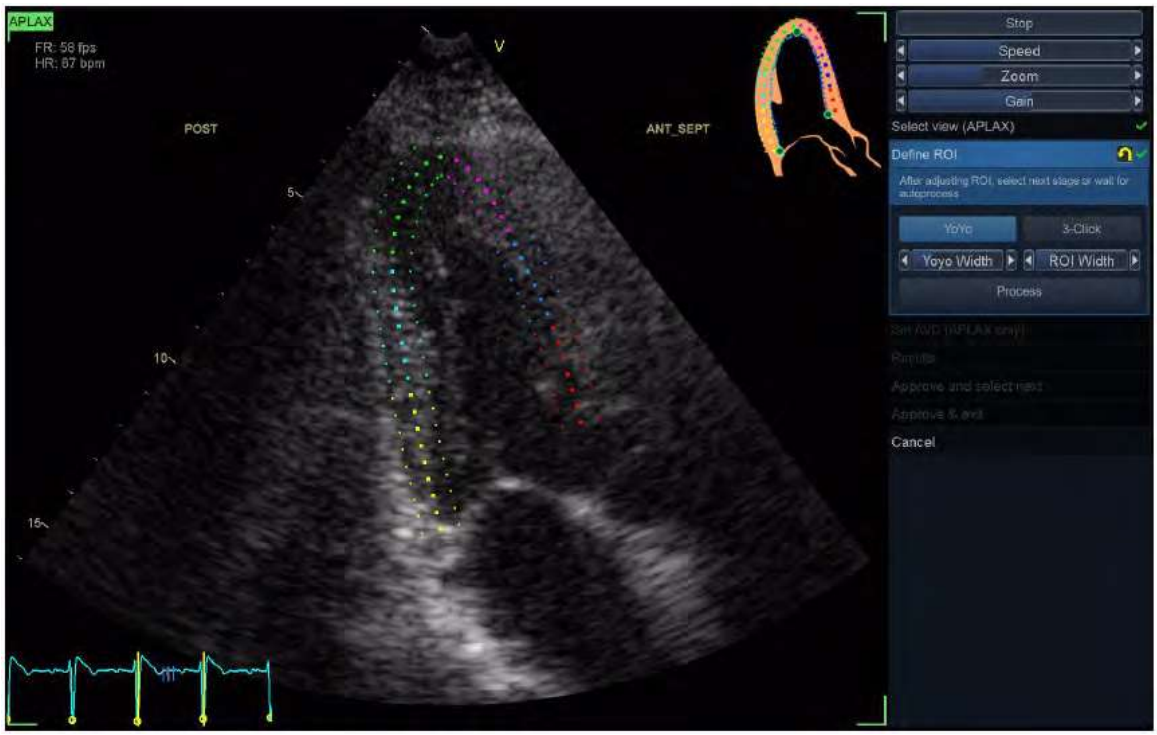


Figure 13-92. Define ROI Stage

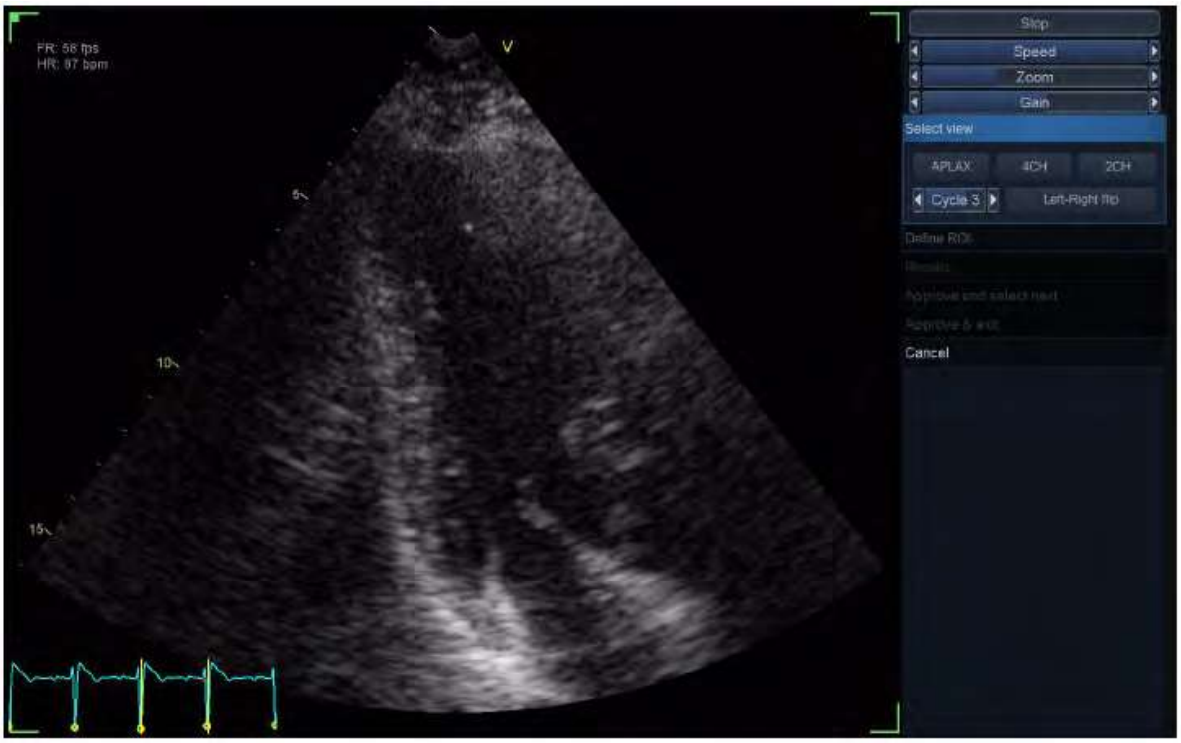


Figure 13-93. Select View stage

Cardiac Strain Stage Menu

The workflow in Cardiac Strain is controlled by the stage menu to the right in the tool window. It is possible to navigate between the stages by clicking on the stage buttons. Stages that are not accessible from the given tool state are greyed out.

Figure 13-94. AFI stage menu

The stage menu buttons also contain information about completeness state and a reset button.

	By clicking the Reset button, the stage is reset and all user entered information in that stage is cleared. Any automatic procedures are re-run.
	If a stage is labeled, it means the stage is complete and nothing more needs to be done in that tool stage.

Beneath the stage menu button, a help string for the current active state is shown.

Cardiac Strain on the APLAX view

1. The first stage when launching the tool, will be the Select View stage. The user should then:
   - Perform any Left-Right flip corrections.
   - Select Cycle and adjust Cine markers as appropriate.
   - Annotate the view by clicking one of the view labeling buttons (A4CH, A2CH, APLAX).
2. An automatic ROI is generated when entering the Define ROI stage. The ROI may be edited by clicking and dragging on the endocardial and epicardial contours. See ‘ROI adjustment’ on *page 13-216 for more information.*

NOTE: If Cardiac Strain is performed on pediatric exams, the automatic ROI is disabled. See section about 3-click ROI in ‘To create a new ROI’ on page 13-218.

3. When satisfied with the ROI, either stop moving the cursor and wait for automatic processing to start or click on the Process button, Results for A4CH/A2CH, or Set AVC for APLAX. Now the system performs feature tracking to get a temporal ROI trace. On completion, it proceeds to the next stage.
4. (APLAX only) After the ROI edit stage, the system enters the Set AVC stage. Select one of the AVC setting strategies to verify AVC time. See ‘Timing Validation’ on *page 13-222 for more information.* On completion, the Cardiac Strain tool now proceeds to the Results stage.
5. The Cardiac Strain tool is now displaying the Results stage in a Quad layout. Now the tracking quality must be inspected and verified. The tracked ROI is divided into segments. The tracking quality for each segment is automatically evaluated and applied to reject segments for which the tracking is assumed to be not reliable. Segments

that have been rejected do not have values in the segmental result ROI to the lower left in the Quad view, but instead shows an X. The strain trace (upper right), Curved Anatomic M-mode section (lower right) and parametric overlay on the dynamic ROI (upper left) are disabled for rejected segments. By clicking on a segment in the segmental result ROI it is possible to override the automatic quality assessment to either show or hide segmental values. The tracking for each segment must be visually controlled and validated as described below.

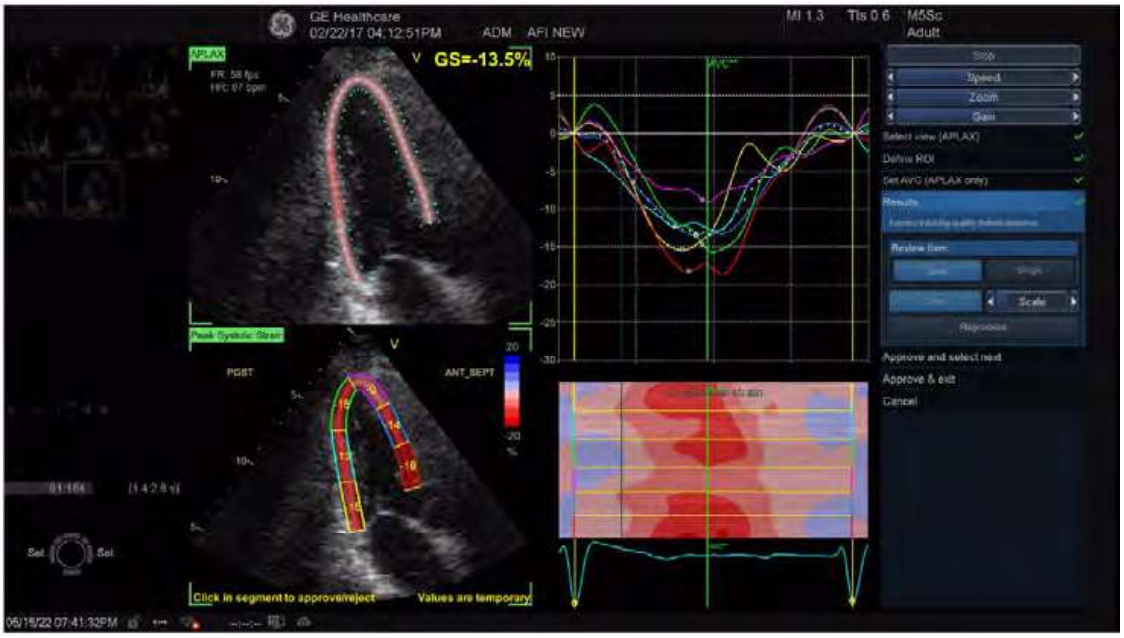


Figure 13-95. Results stage in Quad layout

Once the tracking quality has been controlled for all segments, you may choose to click:

- Reprocess – To completely reprocess the view currently being reviewed. This will take the user back to “Define ROI” stage of the workflow.
- Approve and Select Next - Proceed to the Select View stage, and the operator has to manually select the next view to process from the clipboard.
- Approve and Exit – To exit the tool and store performed measurements. No segmental strain results are stored in this case.

In case of a multi-cycle recording, the system automatically launches the second to last cycle for analysis. If during analysis, the operator wants to switch to another cycle, that is possible by entering the Select View stage and change cycle using the Cycle button.

Tracking validation

CAUTION

Poor tracking quality may lead to incorrect measurement results. The tracking for each segment must be visually controlled and validated.

Poor tracking quality could result from a variety of causes. Inspect each segment and make sure that the center line is moving together with the underlying 2D image. Use the various results layouts to examine the tracking quality (e.g. Quad layout).

The following can help examining the tracking quality:

- Turn off the color overlay by clicking Color button.
- Reduce playback speed by using the Speed slider (or the rotary on the touch panel).
- Use the Single layout to get a larger view of the dynamic mesh (especially in difficult cases).

If the tracking needs to be improved for some segments, the user can modify the ROI or create a new ROI.

ROI adjustment

If the automatic ROI is not optimal (resulting in poor tracking), the user can either adjust the ROI or create a new ROI as described below.

General ROI remarks

The calculations performed on the tracked ROI aim to find the longitudinal deformation along the cardiac muscle from the base to apex. These calculations assume the ventricle to have a horse-shoe shape.

CAUTION

If the ROI does not have a horse shoe shape, the calculated measurements may not be accurate.

To adjust the ROI

Enter the Define ROI stage. The following adjustments can be done to the existing ROI:

- Adjust ROI width by clicking the ROI Width Control.
- Click and drag on the endocardial part of the ROI. Endocardial editing edits the whole ROI
- Click and drag anchor points on the epicardial ROI (highlighted in red on mouse hovering). Epicardial editing edits the epicardial part only

In the upper right of the screen there is a pictogram indicating the core features of a good APLAX ROI.

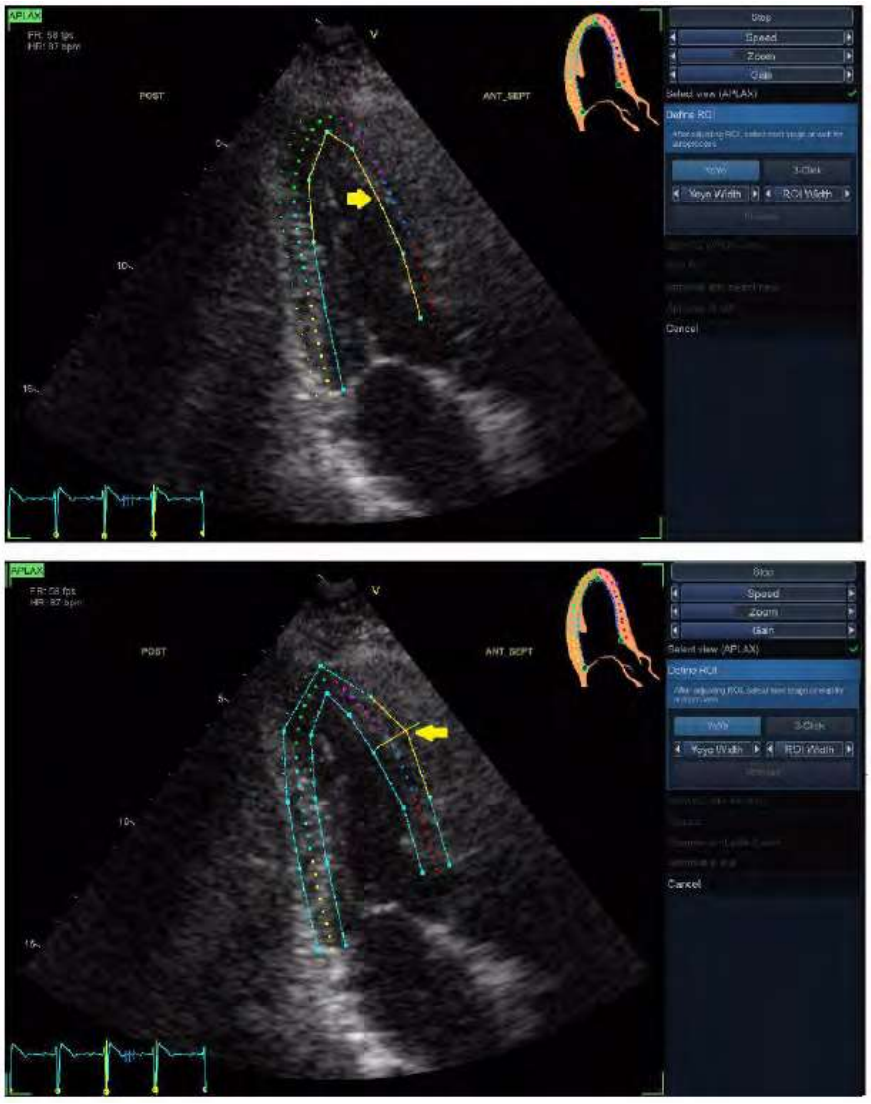


Figure 13-96. ROI Editing Options

To create a new ROI

The system automatically displays a frame where the endocardial border is usually clearly visible. To use another frame, while in Define ROI stage, pause the playback by pressing Stop. Then, use the Frame slider (or rotary) to select a different frame for ROI definition.

Creating a new automatic ROI

To create a new automatic ROI, click the Reset stage button. This relaunches the automatic segmentation.

Creating a new manual ROI

Sometimes the automatic ROI may fail to capture the correct ROI. In this case, a 3-Point ROI alternative is provided.

NOTE: The 3-Point ROI is the standard ROI method for TEE data and Pediatric exams.

To generate a ROI by this method, when in Define ROI stage, click on the button 3-Click. The AFI tool will now prompt to click 3 landmarks. Take care to select proper landmarks, as displayed close to the pointer

CAUTION

Faulty landmark selection may cause segment values to be swapped in the final results.

When the third landmark is selected, a ROI is generated and can optionally be edited as for the automatic ROI.

NOTE: If the ROI needs to be adjusted, make sure to make the changes immediately after the ROI is displayed, before the auto processing of the ROI begins.

NOTE: The timing when auto processing of the ROI will start is configurable (from Config).

NOTE: The Yo-yo function is turned on to help find correct location for the points.

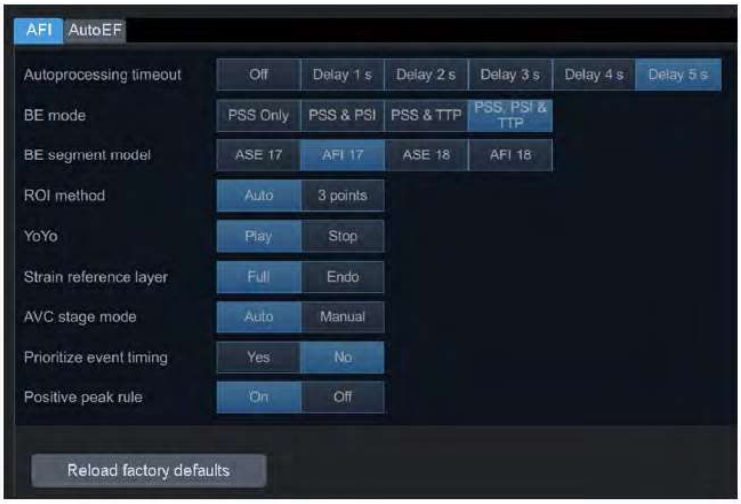


Figure 13-97. AFI Auto processing configuration

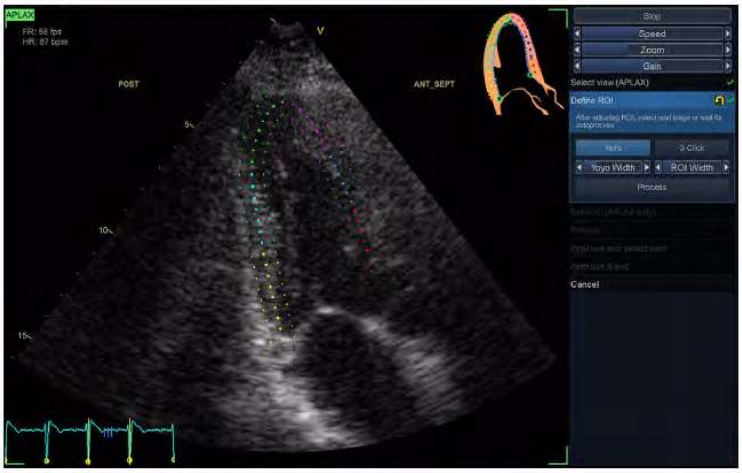


Figure 13-98. Defining a ROI

After placing the three points the ROI is displayed.

Guidelines when re-creating the ROI

Correct ROI definition is crucial to get good tracking. See use cases below for common pitfalls.

Tip: Make sure to follow the recommendations when placing the three points.

Table 13-49: Tips for re-creating the ROI

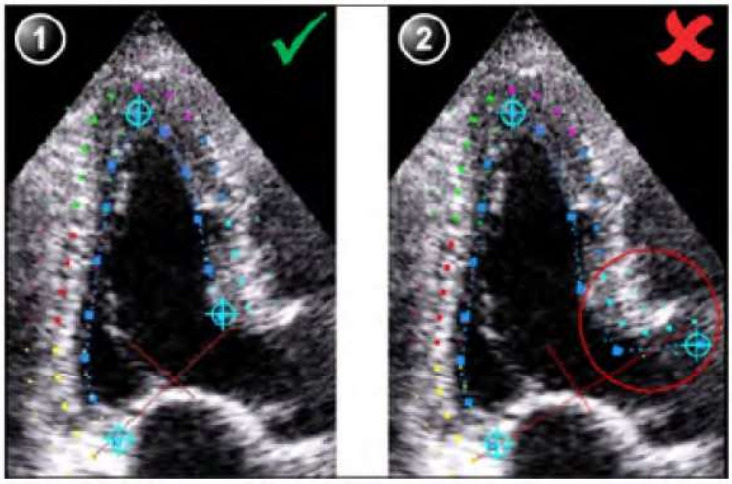
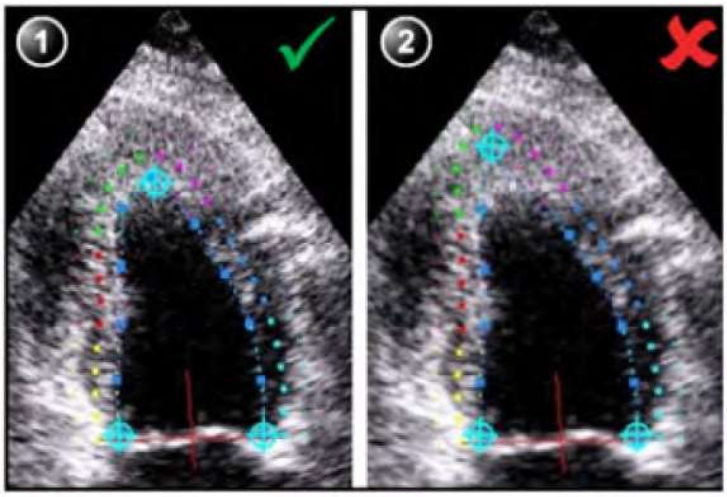
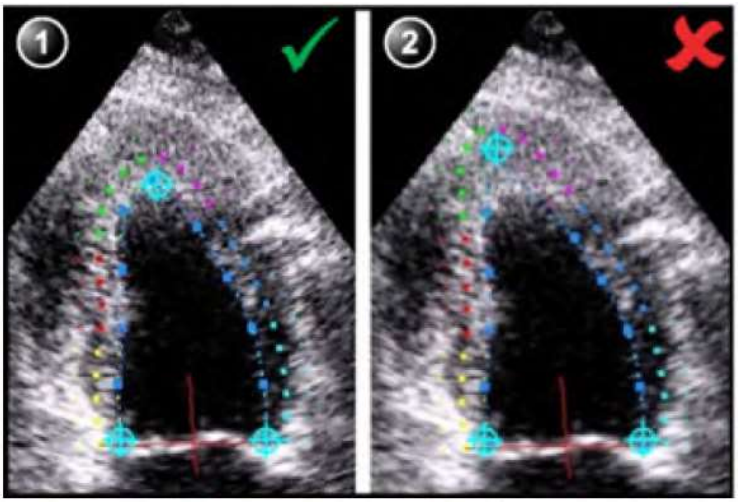
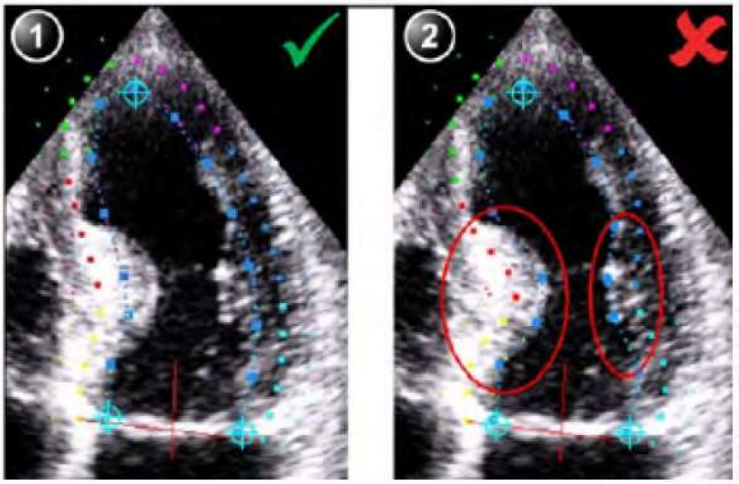
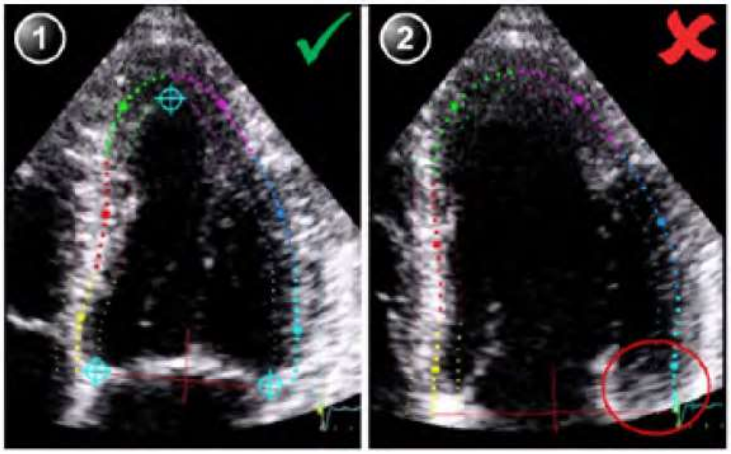
Tips	Correct	Incorrect
Base 1. Correct position of the base points. 2. The ROI extends into the aortic tract.		
Apex 1. Correct position of the Apex points. 2. The apex point is placed too high. The ROI is extending beyond the epicardium.		
Apex 1. Correct position of the Apex points. 2. The apex point is too high; the ROI is extending beyond the epicardium.		

Table 13-49: Tips for re-creating the ROI (Continued)

Tips	Correct	Incorrect
Bulges 1. Correct ROI. 2. ROI should not be bulging or follow the papillary muscle. To edit the ROI, see 'ROI adjustment' on *page 13-216*.		
General The left ventricle must be visible through the entire cycle. 1. End systole frame: the entire left ventricle is displayed. 2. End diastole frame: the annulus is not displayed.		

Timing Validation

Timing information may be crucial to accurate diagnosis. The most important event timing is the aortic valve closure (AVC), since it is part of the definition of the end systolic strain parameter.

Determination of the AVC timing by the system is as follows, depending on the situation:

- An automatic AVC estimate determined by the temporal contraction of all LV segments (Strain curves) is used.
- From the APLAX view, the user can adjust the estimated AVC timing. The adjusted AVC timing will then be used in the other apical views when running Cardiac Strain on these views.

This option is only available from the APLAX view.

AVC Timing Adjustment (APLAX only)

After tracking is performed, the system enters the Set AVC stage. The following options for AVC settings are provided:

- Automatic: AVC is set automatically based on the ROI tracking using the time of peak negative strain.
- Manual: Set the AVC time manually. The frame can be selected by the track ball.

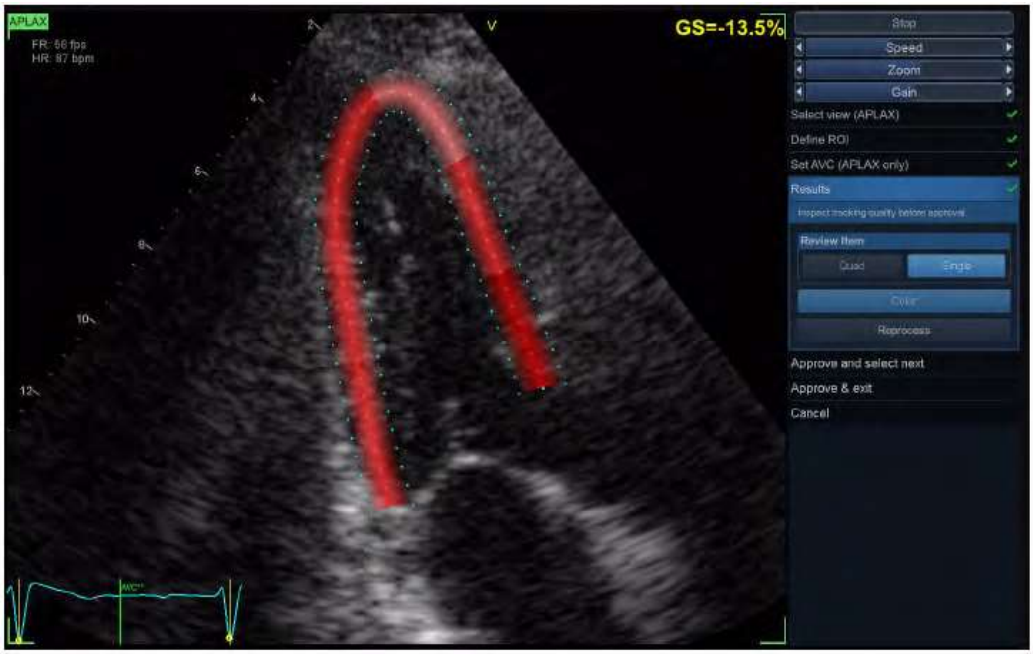


Figure 13-99. Parametric Systolic Strain APLAX View

Inspecting results

After completed tracking, and for APLAX completed AVC timing adjustment, the system displays the Quad screen layout for tracking validation (see page 8-26) and inspection of results for this view.

The screen contains the following result displays:

- Tracked ROI: A dynamic display of the tracked ROI to be used for tracking validation. The tracked ROI has a texture overlay indicating strain values according to the colormap. The overlay may be turned off/on by clicking the Color button.

NOTE: Rejected segments will not have texture overlay.

- Segmental result ROI: A static display indicating the peak strain value per segment. Rejected segments are displayed with an X instead of a value. Clicking a segment changes its rejection status (See 'Tracking validation' on *page 13-216 for more information.*)
- Strain traces: A static display indicating the segmental and global strain traces with time. The peak values are indicated.

NOTE: The peak values can be adjusted by clicking and dragging the peak markers with the mouse.

CAUTION

Segments and peak detection should be checked to make sure that non-physiological traces are excluded in the calculation of indices.

- Curved anatomic M-mode: A static display indicating a curved anatomic M-mode along the center of the ROI. The M-mode has a parametric overlay indicating peak strain values.

NOTE: Rejected segments will not have texture overlay.

NOTE: The Segmental result ROI, Strain traces and Curved anatomic M-mode are using color codes to link the different segments.

Cardiac Strain on A4-Ch and A2-Ch views

The procedure for Cardiac Strain on Apical 4-chamber and 2-chamber views is similar to the one used in the APLAX view.

Perform the steps 1,2,3 and 5 from the APLAX procedure.

Perform the tracking validation (‘Tracking validation’ on *page 13-216*) and, optionally, ROI adjustment (‘ROI adjustment’ on *page 13-216*) procedures.

CAUTION

If the APLAX view was not analyzed first, the strain values displayed in the Quad screen for the A4CH/A2CH are labeled temporary and may be different after APLAX have been analyzed. The reason for this is that for the A4CH and A2CH views, the AVC time is automatically set based on strain curve peaks (Auto mode). If, during APLAX analysis, the AVC time is manually set, the globally applied AVC time becomes different, causing segmental results to change.

CAUTION

If AVC mode is set to Auto, the final value of AVC time is not available before all three views have been analyzed. Thus, strain values displayed in Quad screen of the two views analyzed first are labeled temporary. The reason for this is that the Auto-AVC calculation derived from all three views is most accurate and may be different from the intermediate AVC calculations used for each view.

AutoEF Layout

The results screen for A4CH and A2CH views also has an AutoEF layout. In this layout, the system presents automatically generated end systolic and end diastolic traces used to calculate ejection fraction (EF), stroke volume (SV), cardiac output (CO), as well as volumes. See ‘Auto EF Measurements’ on *page 13-231 for more information.*

NOTE: If both A4CH and A2CH have been analyzed, the system also calculates biplane Simpson EF, SV, CO and volumes.

NOTE: The EF values (including volume values) provided by running the AFI tool will appear in the Worksheet, Report and in DICOM SR in exactly the same way as EF values provided by running the dedicated AutoEF tool. If first AutoEF is performed and then AFI, there will be two instances of the EF values in the Worksheet.

Completed analysis results

When all three apical views have been analyzed, the result screen provides three new Layouts to inspect global function.

- BE: Bull's eye presentation with segmental full wall Peak systolic strain color coding and segmental Peak systolic strain values.
- Traces: In addition to the Bull's eye, also displays the strain traces for all three views. In this view, it is possible to correct trace peaks by clicking and dragging peak markers or clicking the corresponding segment in the Bull's eye (Figure 8-20).
- Tracking: In addition to the Bull's eye, also displays the cineloops for all three views.
- EF: Displays EF result.

Bull's eye standards

The Bull's eye can be configured to display either 18 or 17 segments using either the AFI or the ASE standard (from Config). Consult the Advanced Reference Manual for more information regarding Bull's Eye segmentation formats.

CAUTION

If reprocessing a file with a different Bull's Eye standard, the segmental values will change. The system will warn the operator if attempting to reanalyze a stored loop with a different Bull eye's standard

Bull's eye colormaps

The tool provides a set of different colormaps for the Bull's Eye. The different colormaps are available from the Colormap dropdown menu in the Result stage menu.

The system can be configured to display other color maps (Config). The following colormaps are available:

- PSS Red-Blue: Peak systolic strain in a red-blue color coding.
- PSS-Green-Yellow-Red: Peak systolic strain in a green-yellow-red color coding.
- PSI: Post Systolic Index (PSI) color coding and segmental PSI values in the Bull's eye
- TTP: Time-to-peak strain (TTP) color coding and segmental TTP values in the Bull's eye

NOTE: PSI and TTP color maps are based on the global peaks (as supposed to systolic peaks).

Rejected segments in the Bull's Eye are identified by the peak values being replaced by a X, and that the segment is greyed out in the colorimetric display.

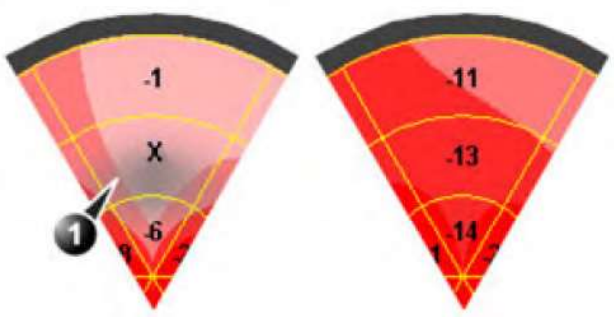


Figure 13-100. Colorimetric display

1. Segment with tracking quality scored as Not acceptable (x).

Measurements available after complete analysis

The following parameters are also available after completed analysis

- Global Strain (GS) values for all three apical views. In a given view the Global Strain (GS), also called Global Longitudinal Peak Strain (GLPS), is defined as the percentage of maximal contraction over the whole cardiac cycle of the entire myocardial wall relative to its end diastolic length.
- Averaged Global Strain value from all three apical views.
- AVC measurement (either automatic, event timing measurement or manual, see 'Timing Validation' on *page 13-222*)
- PSD: Peak Strain Dispersion is an index that displays variability in time-to-peak (TTP) longitudinal strain. The index is the standard deviation of the TTP strain (of all segments) over the whole cycle. The TTP bulls-eye is useful in association with PSD as the color scheme uses green color to indicate normal contraction with a peak around AVC, blue color to indicate early contraction, and yellow to red color to indicate late contraction.

CAUTION

Rejection of non-physiological traces and correct peak detection (see also ‘‘Inspecting results’ on *page 13-223*) is particularly important when using the TTP color map, as wrong peaks will influence the PSD index significantly. Peaks detected in very early systole and late diastole should be checked, and traces rejected if they are considered non-physiological.

Exiting AFI

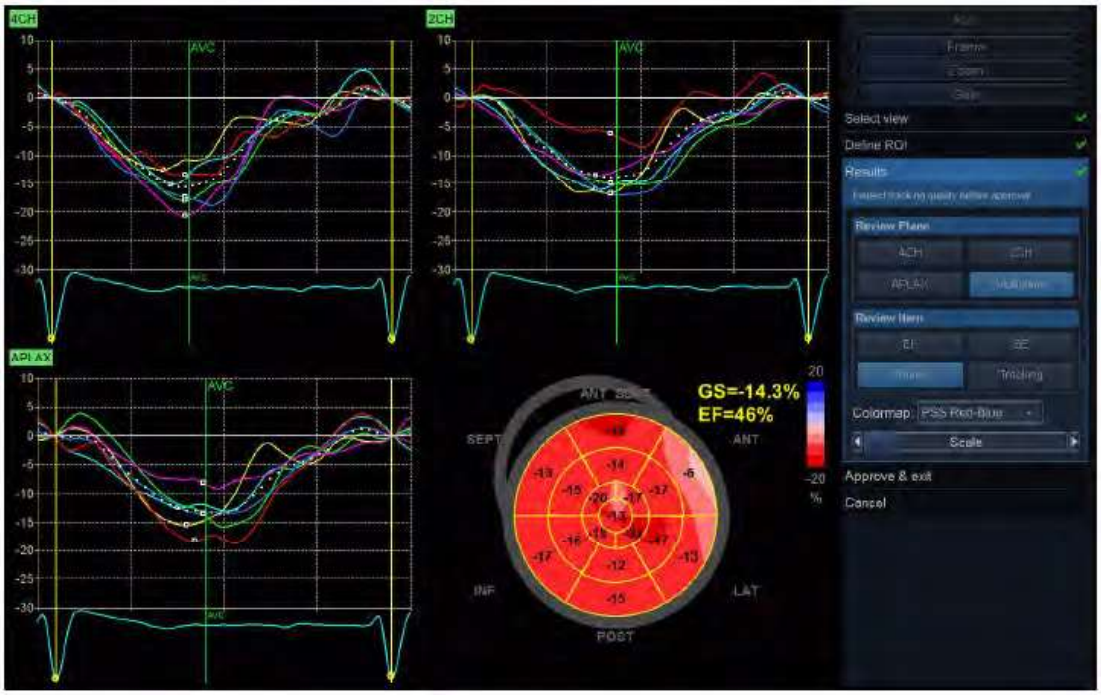


Figure 13-101. Bull’s Eye and Trace screen

At any time, the tool can be cancelled by pushing the Cancel button. The plugin will close and any unsaved data will be lost.

When in the Results stage the operator may click the Approve and Exit button. The behavior depends on the number of views analyzed:

- If all three views have been analyzed, the tool will go to the Bull’s eye only layout and prompt the operator whether the results should be stored. If Yes is selected, measurements are transferred to the worksheet, and a result file with a screenshot of the Bull’s Eye will be generated. See also ‘Reprocessing data’ on *page 13-229*.
- If only one or two views have been analyzed, the tool will enter the Quad layout of the most recently processed view

and prompt the operator whether the results should be stored. If Yes is selected, measurements are transferred to the worksheet and a result file with a screenshot of the Quad screen is generated. See also ‘Reprocessing data’ on *page 13-229*.

Peak detection

The peak systolic strain detection for each segment can be verified and manually adjusted as required. To adjust the peak detection:

1. Press Traces. The Bull's Eye and Traces screen is displayed
2. To change the peak marker position on a curve:
   - Click on the peak marker (square point) on one of the curves, move the peak marker to a new position and click again to fix the point.
   - Place the cursor on a segment in the Bull's Eye. The corresponding curve is highlighted. Click on the segment to select the corresponding peak marker and move it to a new position.

The peak type is determined by the selected color map (systolic for PSS, global for PSI and TTP). The position of the AVC marker can also be checked in the Bull's Eye and Traces screen. If needed, the APLAX view should be reprocessed to change the AVC time.

About the results

Be aware of the following:

- Clinical assessments should be made based on both color and segmental full wall Peak systolic strain values.
- The export function is intended for research purposes and should not be used to archive diagnostic data.
- No values shown in any Result screen will be transferred to the Worksheet unless either Approve and Exit or Approve and select next is pressed.
- All results shown (curves, colors and values) are based on drift compensated values. Any strain drifting is linearly compensated throughout the cycle. If the drift compensation in a given segment is too high, the segment is automatically rejected.
- If more than one segment is rejected, the Global Strain value is not calculated.

Reprocessing data

The data from one or several views from a saved AFI analysis may be reprocessed.

NOTE: When doing reprocessing, if the operator chooses to store the results, the results will be treated as new analysis with new measurements in the worksheet and a new thumbnail in the clipboard.

Reference layer for strain

The tool supports calculation of strain parameters based on either endocardial deformation or myocardial/full wall deformation.

CAUTION

Measurements based on endocardial and myocardial analysis are not comparable.

- Endocardial deformation is assessed by performing analysis of the endocardial part of the ROI trace. Measurements derived from endocardial deformation are suffixed Endo, such as for instance GPeakSysSL(Avg)_Endo
- Myocardial/full wall deformation is assessed by performing analysis of the whole ROI trace. Measurements derived from myocardial deformation are suffixed Full, such as for instance GPeakSysSL(Avg)_Full

It is possible to change the reference layer preference using the Config screen.

NOTE: If attempting to reprocess an analysis using a different reference layer a warning will be shown informing that the values in the analysis will change.

AFI configuration

It is possible to configure some of the AFI controls to modify the workflow slightly.

1. Press Utility > Scanner Apps. Select the AFI tab. The following parameters may be adjusted:
   - Autoprocessing timeout - The time the operator has to keep trackball still before automatic start of tracking.
   - BE Mode - Colormaps that shall be available for the Bulls Eye.
   - BE Segment model - Select the preferred Bulls Eye standard (ASE/AFI, 17/18 segment models).

- ROI Method - Select whether fully automatic or 3-Click ROI shall be the tool default.
- YoYo - When adjusting the ROI, select whether a limited number of frames around the selected ROI frame should be looped back and forth to ease ROI adjustment.
- Strain reference layer - Select whether the strain values shall be calculated based on endocardial or full wall tracking.
- AVC Stage mode - Select whether to always open the AVC Selection stage. If “Auto” is selected, upon analysis of the APLAX view, the user will be taken to Results stage after the ROI stage. “Auto” AVC or Event timing will be used by default. It will still be possible for the user to re-visit the AVC Selection stage to edit the chosen AVC.
- Prioritize event timing - Select “yes” to use “event timing” values for AVC if there are some in the current exam and AVC Stage mode is on “Auto”.
- Positive Peak Rule - If On, then a positive strain value will be shown if the maximum positive peak exceeds 30% of the maximum negative peak, resulting in a blue segment in the Bull’s Eye. If Off, then the negative strain value will be shown regardless of the size of the positive peak.

Figure 13-102. AFI Configuration

Auto EF

Auto EF Measurements

Automated Ejection Fraction (AutoEF) is a semi-automatic measurement tool used for measurement of the global EF (Ejection fraction). The AutoEF tool is used as an optional decision support tool.

The AutoEF tool is derived from a 2D speckle tracking algorithm which tracks and calculates the myocardial tissue deformation based on feature tracking on 2D grey scale loops.

AutoEF is performed on either one or both apical 4-chamber or 2-chamber views, in any order.

The result is presented as Ejection Fraction value, calculated by Simpson MOD for each view and MOD Bi-plane Ejection Fraction for the whole LV. All values are stored to the worksheet when approved.

Acquisition

NOTE: AutoEF is only available on the M5Sc-D probe.

1. Create an exam, connect the ECG device and make sure to obtain a stable ECG trace.
2. Acquire B-Mode cineloops of an Apical 4 chamber view (4-ch) and an Apical 2 chamber view (2-ch).

Acquisition requirements

- The frame rate should be between 37 and 80 frames per second. A higher frame rate is recommended for high heart rate.
- LOGIQ Totus should be configured to store at least 100 ms before and after each heart cycle.
- If the acquisition has more than one heart cycle, the analysis will be done on the second last heart cycle.
- The entire myocardium should be visible.
- A depth range that includes the entire left ventricle should be used

Starting AutoEF

1. Recall any one of the stored views and press **Measure**.
2. Select ***AutoEF*** either in Measure menu or on touch panel.

   The tool will launch and start up in the Select View stage.

CAUTION

AutoEF is only recommended for adult cardiac images acquired with the M5Sc-D probe. The measurement accuracies of the 2D Auto EF measurement values reported in the Reference manual are verified with M5Sc-D probe.

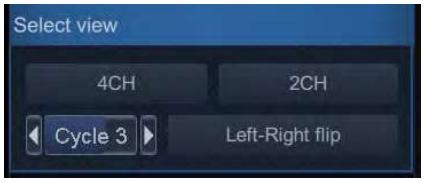


Figure 13-103. Select View Stage

AutoEF on the A4CH view

1. When in Define ROI stage: Verify that the view annotation shown to the upper left of the screen is correct. If it is not, either:
   - Click the Select View stage button to reannotate to the correct view and proceed analyzing that image.
   - Click on an A4CH image in the clipboard. This will discard analysis of the current loop and replace it with the one selected from clipboard. The tool will start in the Select view stage where it should be annotated as A4CH.

   Pay attention to the left/right orientation of the image by comparing the LV wall names with a visual inspection of the image. If the image orientation is wrong:
   - Go back to the Select view stage.
   - Press Left-Right Flip.
   - Verify the view by annotating it as A4CH again

NOTE: You may alternatively exit AutoEF, invert the image and start AutoEF again.

2. An automatic endocardial ROI is generated when entering the Define ROI stage. The ROI may be edited by clicking and dragging on the endocardial and epicardial contours. See ‘ROI adjustment’ on *page 13-216 for more information.*.

3. When satisfied with the ROI, either stop moving the cursor and wait for automatic processing or click on the Process button. Now the system tracks the ROI with time. On completion, it proceeds to show the results in the EF result screen. The tracking must be visually controlled and validated as described below.

EF results

The Results stage opens with a multi frame EF result layout.

- The running loop is shown on the left. A green dotted line marks the inner border of the chamber. In case of poor tracking, the system automatically displays parts of the border in red.
- The frames with the maximal volume (ED) and minimal volume (ES) are displayed on the right side.
  - Press EF Dual to only display the ED and ES frames.
- The End Diastolic volume (EDV), the End Systolic Volume (ESV) and the resulting Ejection Fraction (EF) are displayed. Results for each view are summarized in a table on the right side.

Tracking Validation

- Inspect the ROI traces for the end systole and end diastole.
- If the tracking results are visually correct, you may press Approve and Exit to exit the tool and store the values to the worksheet, so they can be used in a report.

Possible causes of poor tracking

Poor tracking quality could result from a variety of causes. The common causes for bad tracking are:

- Erroneous placement of the basal points when defining the border. If the basal points are placed too far from the annular region, the border segments at the annular base will not move together with the underlying 2D image throughout the entire heart beat.
- Erroneous placement of the apex point when defining the border. The point should be placed so that the resulting border trace covers mainly the endocardium. If the apex

point is placed too high, the border trace will mainly cover the epicardium resulting in poor tracking.

- Too much clutter. Images with too much static clutter will result in poor tracking.

Tracking correction

The following can be done if tracking needs correction:

- Press EF dual to display ES and ED frames side-by-side.
- Adjust ES frame and ED frame controls if different frames need to be selected for ES and ED.
- Edit misaligned points on the endocardial border trace as described on ‘Editing the endocardial border trace’ on page 8-47.
- Create a new endocardial border trace (See ‘To create a new ROI’ on *page 13-218 for more information.*)

Possible causes of poor tracking

- Erroneous placement of the basal points when defining the border. If the basal points are placed too far from the annular region, the border segments at the annular base will not move together with the underlying 2D image throughout the entire heartbeat.
- Erroneous placement of the apex point when defining the border. The point should be placed so that the resulting border trace covers mainly the endocardium. If the apex point is placed too high, the border trace will mainly cover the epicardium resulting in poor tracking.
- Too much clutter. Images with too much static clutter will result in poor tracking.

Trace adjustment of the endocardial border

If the automatic endocardial border detection is not optimal the user can either adjust the trace or create a new trace as described below.

CAUTION

Poor tracking quality may lead to incorrect measurement results. The tracking must be visually controlled and validated.

Editing the endocardial border trace

- Enter the Define ROI stage.
- Adjust the trace by moving the cursor over the endocardial border trace, select an anchor point and drag it to a new location. The shape of the endocardial border trace is updated accordingly.

In the upper right of the screen there is a pictogram indicating the core features of a good APLAX AutoEF ROI.

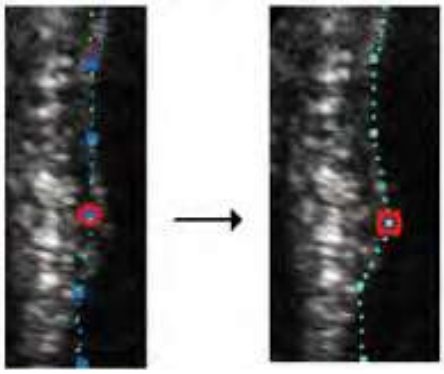


Figure 13-104. Moving an anchor on the trace

To create a new ROI trace

The system automatically displays a frame where the endocardial border is usually clearly visible. To use another frame, while in Define ROI stage, pause the playback by pressing Stop. Then, use the Frame slider (or rotary) to select a different frame for ROI definition.

To create a new automatic ROI, click the Reset stage button. This relaunches the automatic segmentation.

Sometimes the automatic ROI may fail to capture the correct ROI. In this case, a 3-Point ROI alternative is provided.

To generate a ROI by this method, when in Define ROI stage, click on the button 3-Click. The AutoEF tool will now prompt to click 3 landmarks. Follow the indications displayed on the screen when placing the three points.

When the third landmark is selected, a ROI is generated and can optionally be edited as for the automatic ROI.

NOTE: If the ROI needs to be adjusted make sure to make the changes immediately after the ROI is displayed, before the auto processing of the ROI begins.

NOTE: The timing when auto processing of the ROI will start is configurable (from Config).

NOTE: The Yo-yo function is turned on to help find correct location for the points.

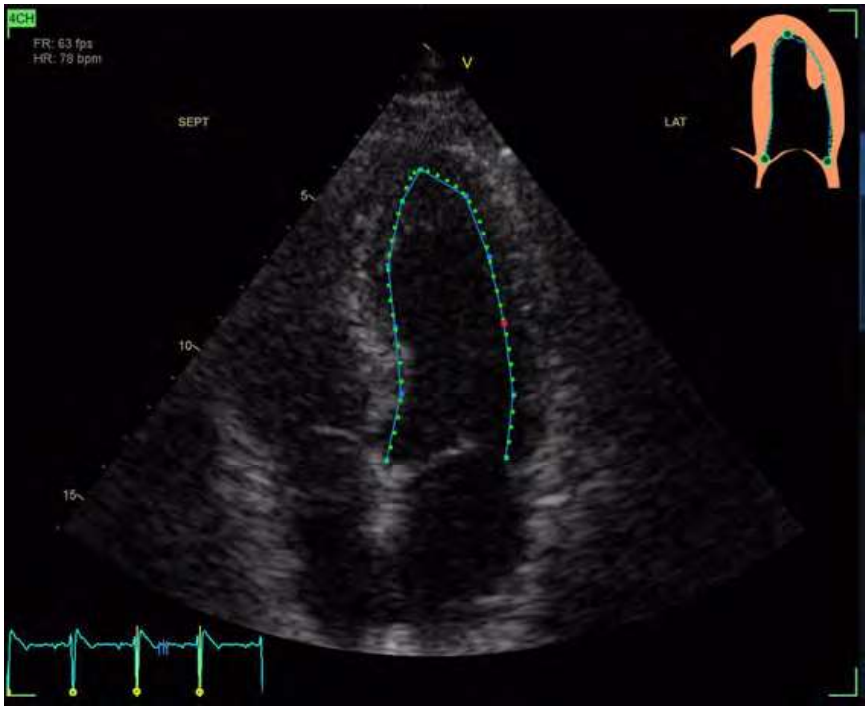


Figure 13-105. Tracing the Endocardial border

Exiting AutoEF

At any time, the tool can be cancelled by pushing the Cancel button. The plugin will close and any unsaved data will be lost.

When in the Results stage the operator may click the Approve and Exit button. The tool will enter the dual layout of the most recently processed view and prompt the operator whether the results should be stored. If yes, measurements are transferred to the worksheet and a result file with a screenshot of the dual screen will be generated. See ‘Reprocessing data’ on *page 13-229 for more information.*

Reprocessing data

The data from a saved AutoEF analysis may be reprocessed.

NOTE: When doing reprocessing, if the operator chooses to store the results, the results will be treated as new analysis with new measurements in the worksheet and a new thumbnail in the clipboard.

1. Single view analysis stored
   - Double-click on the thumbnail showing the AutoEF dual screen result layout. A dual screen is displayed,

showing the dual view result screen and the cineloop processed in that analysis.

- Launch AutoEF. The tool will proceed to the Results stage. You may choose to reprocess the view already analyzed or to complete the analysis adding the missing view to the analysis.

2. Both views analysis stored

   - Double-click on the thumbnail showing the AutoEF dual screen result layout. A quad screen is displayed, showing the dual view result screen of the last processed view and the cineloops processed in the analysis.
   - Launch AutoEF. The tool will automatically proceed to the Results stage of the last processed view. You may choose to reprocess the views already analyzed or even replace the cineloops used in earlier processed views.

ECG

Overview

A physiological input panel is available for the LOGIQ Totus. This panel has inputs for ECG signals.

The physiological module consists of this channel:

1. ECG

The scanned image that is displayed is synchronized with the ECG traces. In Doppler or M-Mode, the traces are synchronized to that particular mode's sweep.

Approved accessory cables provide the proper signals to the Physiological Panel.

CAUTION

There will be a slight time gap between the ECG signal and the Doppler waveform when the selected PRF is low (less than 1.0 kHz).

CAUTION

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

To display the ECG Signal on the monitor, go to Utility--> Imaging--> General--> ECG Display.

Overview (continued)

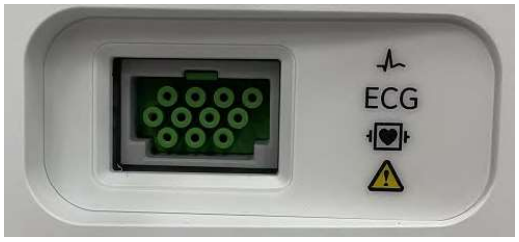


Figure 13-106. Optional Physiological Input Panel

WARNING

- Do not use with a defibrillator except with DEFIBRILLATION PROOF APPLIED PARTS.

  Only the ECG connection port is a defibrillator proof applied part.
- DO NOT USE the physiological traces of the LOGIQ Totus Ultrasound system for diagnosis and monitoring in lieu of ECG.
- Only approved and recommended peripherals and accessories should be used.
- After the defibrillator stimulates the patient, the ECG requires 4 to 5 seconds recovery time.

ECG Cable

The ECG Cable is a modular cable consisting of two different cable parts:

- Single cable with a system connection at one end and a cable splitter at the other.
- A triple color-coded electrode cable to be inserted into the splitter device. Each electrode cable hooks up to the appropriate stick-on electrode by a color-coded clip type connector.

The color-coding of the electrodes follows one of two standards that are common in different parts of the world. The cable splitter device has a drawing defining the color codes, names and body location for the two standard color codes.

Table 13-50: ECG Color Code Cable

IEC (Europe, Asia, ROW)		AHA (USA)		Position of the human body surface
Electrode Mark	**Color Code**	**Electrode Mark**	**Color Code**	
R	Red	RA	White	Right Arm
L	Yellow	LA	Black	Left Arm
F	Green	LL	Red	Left Leg

Physiological Trace Monitor Display

The scanned image is synchronized with the ECG trace. In Doppler or M-Mode, the traces are synchronized with that particular mode's sweep.

The user can control the gain, position and sweep speed of the traces using the Touch Panel controls.

Figure 13-107. Physiological Trace Monitor Display

1. ECG
2. Auto Heart Rate Display

ECG Touch Panel

The ECG Touch Panel provides for control of the physiological input signals.

Without the ECG option, the ECG Touch Panel is not displayed.

Table 13-51: ECG parameters

Parameter	Description
Sweep Speed	Change the speed of the trace. The sweep speed of the physio signal on the B-Mode image can be set independent of the timeline (Doppler and M-Mode) sweep speed. Value: 1 - 16.
ECG Lead	ECG Lead Pattern: 1, 2, 3 1: RA (-) to LA (+) (Right, Left, or Lateral) 2: RA (-) to LF (+) (Superior Inferior) 3: LA (-) to LF (+) (Superior Inferior) *NOTE: RA=Right Arm; LA=Left Arm; LF=Left Foot*
Timer Trigger	Enables intermittent imaging based on a timer. *NOTE: If Timer Trigger is turned on, the ECG Trigger is set to None.* Value: On or Off.
ECG Trigger	Enables intermittent imaging based on the ECG. The trigger location(s) relative to the R trigger are set with the Delay Time key. Adjusting: Press ECG Trigger and select one of the options and adjust the delay time using the Delay Time key. • ECG Trig 1 specifies the delay (ms) from R-wave to triggered frame. • ECG Trig 2 specifies the delay from R-wave to second frame. • Both activates ECG Trig 1 and ECG Trig 2 simultaneously. Trig 2 must be greater than Trig 1 for dual triggering (Both) to be active. *NOTE: If other than None is selected, Timer Trigger is turned off.* Value: None, Trig1, Trig2, and Both.
ECG Display	Provides the ability to turn on the ECG trace and Auto Heart Rate for display on the monitor. Adjusting: When the key is selected, the ECG trace and Auto Heart Rate toggles between on and off. Value: On or Off

Table 13-51: ECG parameters (Continued)

Parameter	Description
ECG Trigger Period	The control specifies the number of heart cycles (R-waves) that are skipped between ECG triggers. The default is 1 or no skipping; 2= skip 1 cycle. Adjusting: Adjust the corresponding control. Value: 1 - 30
Delay Time	In ECG Trigger Mode: If only ECG Trig1 or ECG Trig2 is selected via the ECG Trigger key, the Delay Time key controls the R-Delay time of the active trigger. If both triggers are selected (Both), press this key to toggle ECG Trig1 and ECG Trig2 and rotate the key to change the delay time. Once the trigger is set, the snap shot image is displayed each time the update line passes the active trigger(s). In Timer Trigger Mode: Rotating the knob changes the delay time between images. *NOTE: Delay time may be different for Trig1/2 (0-2 seconds) and Timer Trigger.* Adjusting: Adjust the corresponding control. Value: 0.10 - 10.00
ECG Gain/Position	Allows for the amplitude control of the ECG trace or allows for the vertical positioning of the ECG trace on the image display. Adjusting: Press the knob to toggle between Gain and Position. The default is Gain.

Volume Navigation

Introduction

DANGER

DO NOT use the Volume Navigation feature on any patient relying on life-sustaining electronic equipment, such as a pacemaker or defibrillator. Failure to follow this instruction could lead to interference with patient electronic device(s).

CAUTION

When performing interventional procedures, remember that the pre-acquired dataset is not live and should not be used as sole guidance for interventional procedures.

Using a position sensor attached to the probe, or using a probe with V Nav Inside, Volume Navigation Fusion (V Nav) lets you import a pre-acquired DICOM volume dataset, register the location of the live Ultrasound image with the 3D volume image, and then use the position sensing system to simultaneously show the live Ultrasound image side-by-side with the corresponding multi-planar reformatted (MPR) slice from the pre-acquired dataset.

NOTE: *DICOM datasets must have positional data to allow for V Nav to treat the datasets as a volume. Most CT, MR, and PET datasets have this information as do some X-Ray Angiography datasets.*

In addition, you can use V Nav as a type of “GPS” positioning marker to track an anatomy of interest.

The V Nav Trackers allow you to use a V Nav sensor to track where the needle/needle tip is inside the body.

V Nav is available in B-Mode, Color Flow, Elastography, PDI, and Contrast Modes; it is not available while in 3D/4D or when timeline modes are active. Biopsy capability is available while in V Nav. Dual Caliper is available while in V Nav.

You can load Auto Sweep data for V-Nav, after the data stored as volume data in Easy 3D/Advanced 3D.

Introduction (continued)

V Nav displays in Split Screen, with the Ultrasound Image on the left side of the display and the 3D Dataset on the right side of the display.

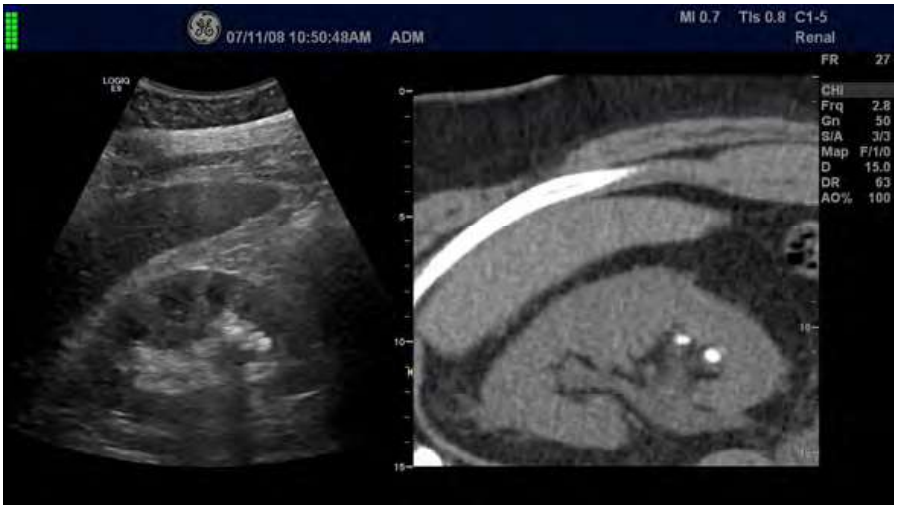


Figure 13-108. V Nav Example

V Nav-Specific Definitions

3D Datasets. Computed Tomography (CT)-, or Magnetic Resonance Imaging (MR), Positron Emission Tomography (PET), XA (X-Ray Angiography), hand held SPECT datasets (NM) and Invenia (US) series stored in DICOM format. Ultrasound datasets acquired using Tru3D and AutoSweep.

Registration. Linking the 2D Ultrasound image to the 3D dataset. You can register the 3D dataset to the Ultrasound image via two techniques, Parallel Plane Registration or Point Registration.

Auto Registration. Auto-registration is available when fusing to a Tru3D dataset. When entering V Nav directly from a Tru3D acquisition, the Tru3D volume is automatically loaded into V Nav and automatically registered.

Parallel Plane Registration. This registration technique requires that the user mark a plane parallel to the 3D dataset slices and one common anatomical point, referred to as a Translation Point since it performs an x, y, and z correction at the point.

V Nav-Specific Definitions (continued)

Point Registration. This registration technique requires that the user mark three or more anatomical point pairs. Performing a Plane Registration first may make the process of matching the anatomical point pairs easier.

Anatomical Point Pair. Marking the same anatomical location in the 2D Ultrasound and the 3D dataset creates an anatomical point pair.

Lock. After you have set the registrations between the 2D image and 3D dataset by either plane or point registration, you lock this registration in place. This means that the image content of the B-Mode image and the corresponding cut plane through the 3D dataset remains the same when you move the probe.

Magnetic Distortion. A magnetic field is generated by the position sensing system. It can become distorted in the presence of ferrous or highly conductive metal.

Environmental Quality. On-screen visual quality map that indicates distortion and proximity to the transmitter. Monitoring and controlling these two variables contribute to the highest quality environment.

RMSD, Root Mean Square Deviation. Root Mean Square Deviation, which equals the 'goodness' of fit. After the user has completed a Point Registration, there's a numeric indicator to describe the goodness of fit. The lower the number, the better the fit. <1 to 10 would be good, 30-40 not so good.

Window Levelling. Balances the brightness/contrast in the 3D Dataset.

Position Sensing System. Consists of four components: Transmitter, Receiver (2), Probe Bracket, Probe/Receiver Cable Clips.

GPS Marker. Used in GPS to track the position of an anatomical structure while scanning or while performing a biopsy.

Virtual Tracker . The V Nav Virtual Tracker allows you to attach a sensor to the shaft of the needle (away from the tip). The position of the needle tip and the projected needle path are projected onto the 2D Ultrasound image.

V Nav-Specific Definitions (continued)

Active Tracker. The Active Tracker is a device that consists of at least four markers that show up in a volume imaging dataset such as CT or MR. The markers are in known positions relative to each other such that the orientation of the Active Tracker can be uniquely determined based on the marker positions in the image. The device also holds a position sensor in a known position relative to the markers. Holes are provided in the Active Tracker so that its location can be marked on the body.

Needle Tip Tracker. The V Nav Needle Tip Tracker allows you to insert a V Nav tracker inside the Needle to track the projected path and needle tip location inside the body.

Clinical vs. Research. You can specify which V Nav controls you want to appear on the Touch Panel. You can set these via Utility -> Application -> Imaging Controls -> Clinical Controls V Nav.

Environment Quality

In order to obtain best results when registering, setting GPS markers, it is important to have the highest quality environment (minimal distortion and proximity to the transmitter).

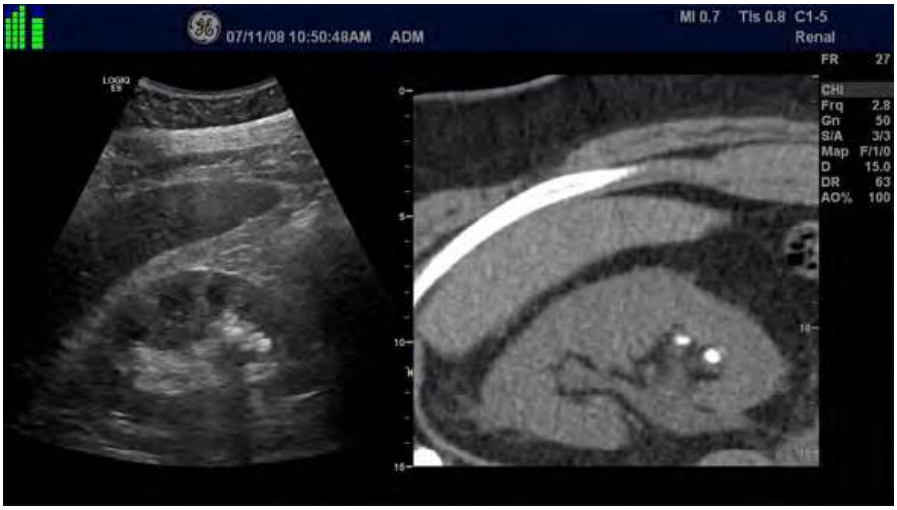


Figure 13-109. Environmental Indicator

An Environmental Quality reading for each sensor is provided via the Environmental Quality indicator (located in the upper, left-hand corner of the display).

Environment Quality (continued)

Each sensor has a quality reading from 1 (low quality) to 7 (high quality. In addition, the distance between the two probe sensors is used to adjust the environmental quality reading presented to the user.

If needle tracking is being used, an overall environmental quality reading is provided.

The Overall Environmental Quality reading is based on the environmental quality readings of the probe sensors and the needle sensor as well as the distance between the needle tip and the transducer face.

The environmental quality readings update in real time and are retained so that they can be displayed during cine scrolling.

Moving the cursor over the Environmental Quality indicator for each sensor provides the following information:

Sensor 1 displays a quality reading.

Sensor 2 displays a quality reading and a Distortion reading between the 2 probe sensors in [mm]. The magnetic distortion is represented as a measured distance between the two sensors relative to the expected distance between the two sensors.

The Needle Sensor displays a quality reading.

The Overall indicator displays an overall Quality reading, and a Probe to Tip distance in cm.

Calibration

To calibrate V Nav, contact GE HealthCare Service.

Configuration

You can specify the maximum retrospective loop length to store via Utility -> Application -> Print controls -> Time span.

Accuracy

Accuracy depends on precise registration, minimal distortion, and controlling the patient’s breathing during a scan.

Load the Volume Dataset

If you are using media to load the 3D dataset, you may want to store the CT, MR, PET, XA, DX, NM or Invenia Dataset on a USB flash drive, USB HDD so that you can clearly label the media in a way that identifies the patient information stored on the disk.

We recommend that you load the 3D Dataset onto the Ultrasound system prior to starting the V Nav exam to ensure that it loads properly and to ensure that the quality is acceptable.

Ultrasound volume datasets need to have been acquired using Tru3D, i.e., a volume dataset that was previously acquired using a position sensor.

Query/Retrieve

NOTE: For Query/Retrieve to find a patient, the patient MUST have a Patient ID.

Query

Figure 13-110. VNav Query

1. Press **Patient** and select ***Data Transfer***. The Data Transfer screen displays.
2. Select Q/R.
3. Select the Query/Retrieve server from the Transfer From pull-down menu.
4. Type Patient name in the name field.
5. Press ***Query*** in the Transfer From section.
6. All studies for that patient and that modality will list.

Retrieve

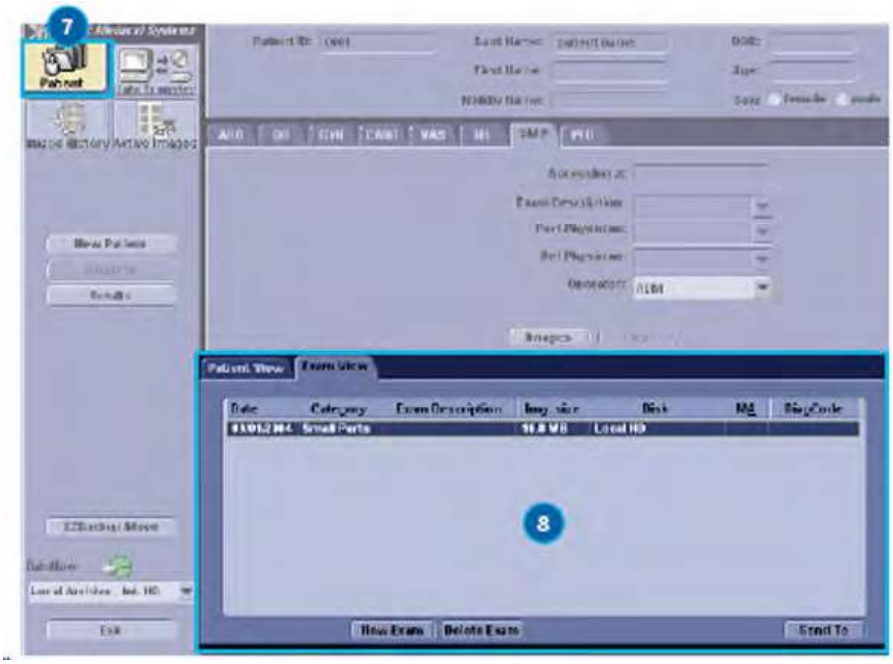


Figure 13-111. VNav Retrieve

7. Select the specific series or study which use in V-Nav exam.
8. Press ***Transfer***.

NOTE: Transfer time will vary based on network and file size.

Load DICOM Volume Dataset

Load a pre-acquired 3D DICOM volume dataset,

- Exit and re-enter V Nav and retain the 3D Dataset by pressing the V Nav control.

OR,

Discard the pre-acquired 3D Dataset,

- Press Exit and Clear on the Touch Panel.

From USB

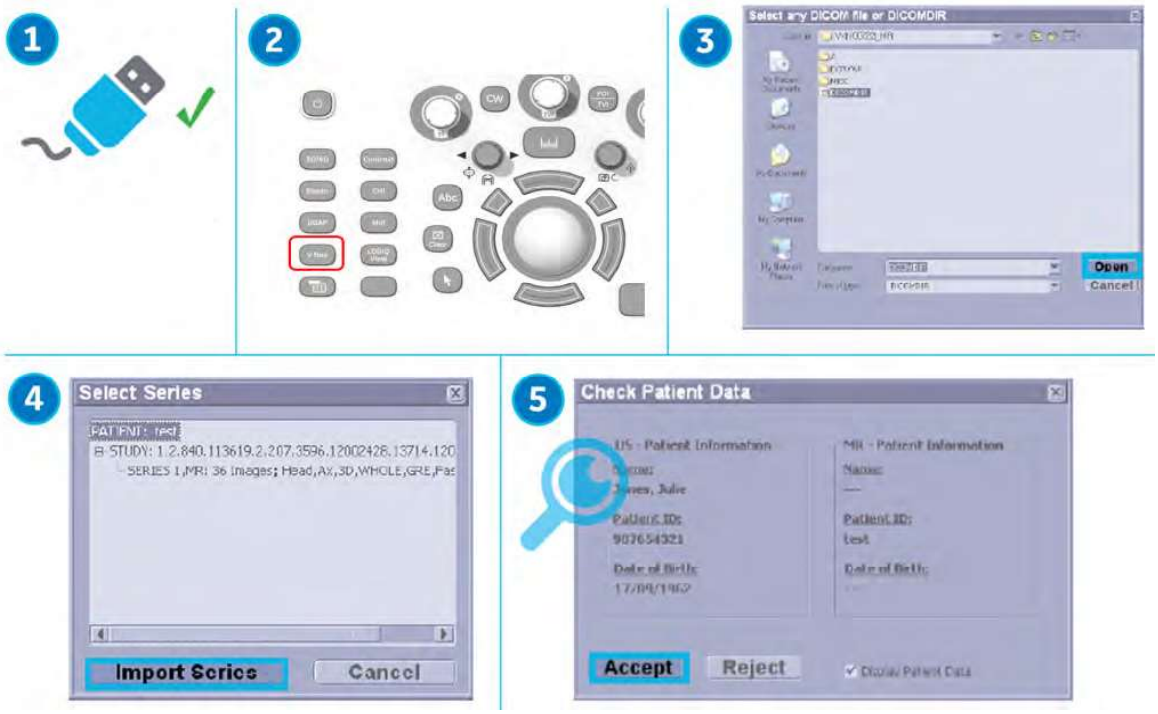


Figure 13-112. Loading Dataset From USB

1. If applicable, insert the media containing the pre-acquired 3D dataset. Volume datasets that can be loaded from disk may include CT, MR, PET, XA, DX, CBCT, and GE HealthCare ABUS (US).
2. Select VNav. Press ***Load*** and select ***From USB***.
3. Double click on the DICOMDIR or database file (or single click and select the Open button).

From USB (continued)

4. Navigate to the location of the 3D dataset. A list of patients and a list of image series for each patient displays. Highlight the Series you want to import and select ***Import Series***.
5. The Check Patient Data screen appears. Confirm that the patient information matches the patient associated with the current exam. After verifying patient information, press **Accept** (or Reject). You can also specify to display Patient Data by checking the Display Patient Data box.

   If you turn on “Display Patient Data”, Patient name, ID and birth date are displayed on the Volume data. These remain on the live scanning image.

   NOTE: If Hide Patient Data preset or Hide Date Time preset (Utility->System->General) is set to "On Store", then the patient data is removed from the volume dataset prior to image storage and then redisplayed after image storage.
6. B-Mode image displays on the left side and the loaded volume data displays on the right side.

From Database

NOTE: Volume datasets that can be loaded from the database: CT, MR, PET, XA, DX, CBCT, and GE HealthCare ABUS (US).

1. Press ***Load*** and select ***from Database***.
2. Select the desired volume from the Image History screen and press ***Load***.
3. The Check Patient Data screen appears. Confirm that the patient information matches the patient associated with the current exam. After verifying patient information, press Accept (or Reject). You can also specify to display Patient Data by checking the Display Patient Data box.

   If you turn on “Display Patient Data”, Patient name, ID and birth date are displayed on the Volume data. These are remained on the live scanning image.

Figure 13-113. Check Patient Data Dialog

NOTE: If Hide Patient Data preset or Hide Date Time preset (Utility->System->General) is set to "On Store", then the patient data is removed from the volume dataset prior to image storage and then redisplayed after image storage.

NOTE: If you load a Tru3D volume data, Check Patient Data is not displayed.

NOTE: If you Load From Database and want to cancel out, use the Exit button on the Image History screen.

4. B-Mode image displays on the left side and the loaded volume data displays on the right side.

Load Multi Volume Datasets

You can load multiple datasets (up to 10 datasets) of same study at the same time:

When loading multiple volume data at the same time, they must all be configured in the same direction (eg, Axial plane).

Sometimes there are multiple acquisitions stored within a single series. When you select Load All, these are loaded as one dataset (if they are not overlapping) or as two datasets (if two or more datasets are overlapping).

1. Load dataset From USB, check data of the Select Series pop-up.

Figure 13-114. Select Series pop-up

Load dataset from database, select one image from each exam and press ***Load*** in the Image History screen.

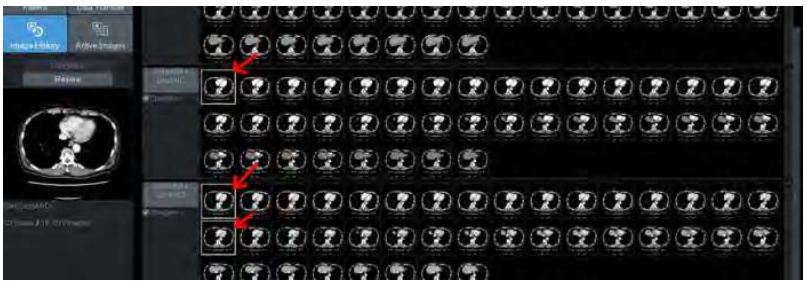
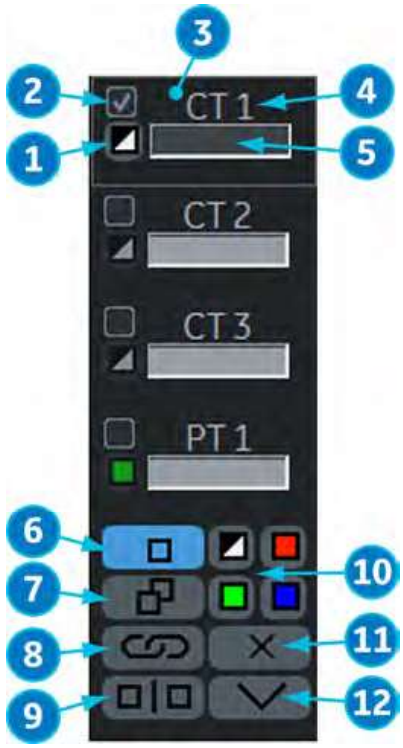


Figure 13-115. Image History screen

Load Multi Volume Datasets (continued)

2. V Nav screen and multiple dataset menu are displayed.

Table 13-52: Multiple dataset menu



Item	Description
1-5	Dataset List (CT and PT in this example)
1	Display Color
2	Active Dataset Indicator
3	Active Dataset
4	Name of dataset
5	Display Weighting
6-12	Control Area
6	Single Display
7	Multiple Overlapping Display
8	Volume-to-Volume Registration
9	Compare Volume
10	Color Control
11	Delete
12	Expand/Collapse Dataset list

Load Multi Volume Datasets (continued)

Using the Touch Panel control, you can adjust:

Table 13-53: Touch Panel Controls

Item	Description
1	Dataset number and its Weight (%)
2	Toggle Up/Down: Select the dataset.
3	Push: Fix the selected dataset.
4	Rotate: Weight Dataset. You can weight the overlay amount of the volume dataset.

*NOTE: When you select **Save Volume** on the Touch Panel, all volumes are saved to a single file on the Clipboard, including GPS Markers.*

Load additional volume datasets

Whenever a dataset is loaded and you want to load another dataset From USB, from clipboard or from a database or if you generate a Tru3D dataset and then switch then back to VNav, the system asks you if you want to add the dataset as an additional dataset or to replace the existing dataset(s).

If you choose to add the dataset, the necessary adaption of the datasets with regard to size and resolution will be performed automatically at the end of the load.

Easy Access to PACS

The LOGIQ Totus is set up to easily receive exams from PACS.

The system displays DICOM image transmission status at the bottom of the screen as:

- Incoming DICOM Images: In Progress.
- Incoming DICOM Images: Completed.
- Incoming DICOM Images: Failed - check spooler.

Refer to the Spooler to identify specific failed operations.

User operation takes precedence and will cancel any ongoing image receive operation.

Setting Up V Nav sensors

Positioning Rules

CAUTION

When using fusion or GPS Markers, it is important to place the transmitter so that its location does not move relative to the working space. If you rearrange the working space (patient or transmitter location), you need to redo the registration or replace the GPS marker.

CAUTION

Place the transmitter such that the entire area of interest is in the front hemisphere of the transmitter. The front hemisphere generates the magnetic field used by the system.

The transmitter needs to be placed such that the face of the transmitter opposite of the cable (the field side) faces the working area

To avoid magnetic distortion, the following is recommended:

- Remove all ferrous or highly conductive metal from the vicinity of the transmitter and the working area.
- If the patient's bed contains ferrous or highly conductive metal, place the transmitter 20cm or more above the bed so that the central portion of the magnetic field sits well above the bed.
- To check for magnetic distortion, place a phantom that can be scanned from multiple directions in the planned working space. Using the 2D Marker on the GPS control on the Touch Panel, select Point. Scanning the phantom, place the Windows Pointer on a specific point in the phantom and then scan the same point from different directions. The distance between the graphical point (green cross) and actual structure is an indication of the amount of error. Larger than expected discrepancies could be the result of metal distortion or the transmitter field could be facing the wrong direction or be too far away from the working area.

Setting up the Position Sensing Apparatus

To set up the position sensing apparatus,

CAUTION

For accurate image registration, ensure that you connect the two probe position sensors to the probe as described in the instructions below. Match the numbers when you attach the sensors connectors to the sensor unit.

1. Attach the receiver probe bracket to the probe. Ensure that it is attached securely.
2. Fix the position sensor to the bracket.

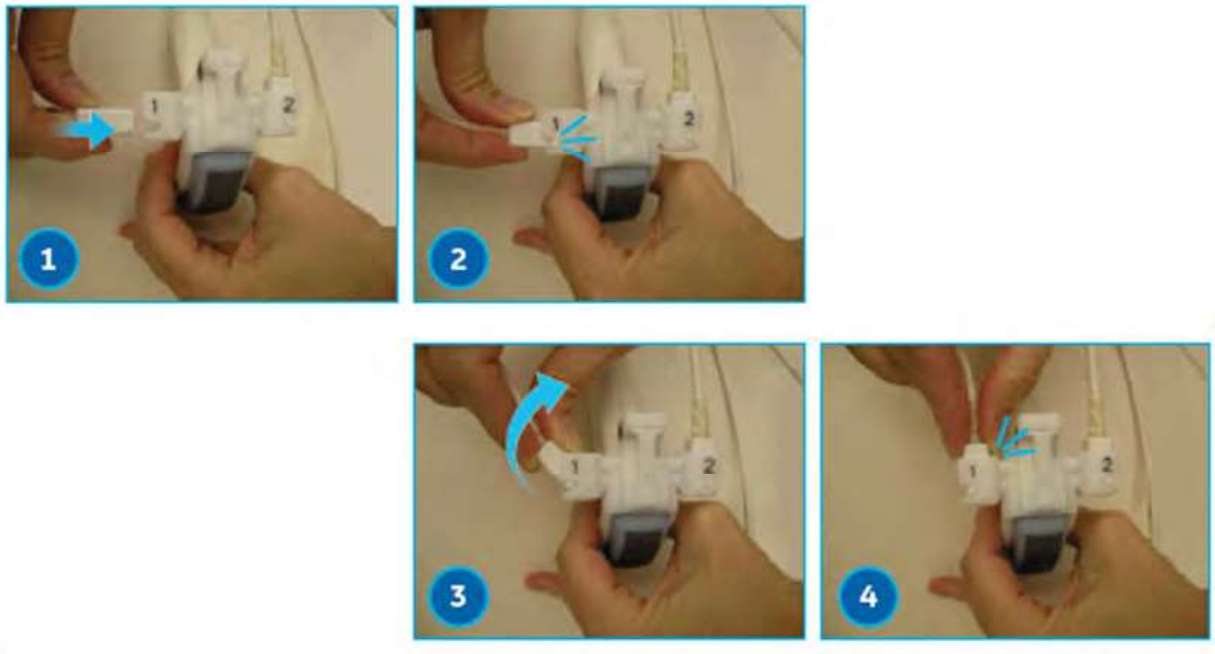


Figure 13-116. Set up the position sensor

1. Position the sensor's nub to the bracket's indentation.
2. Push the sensor into the bracket.
3. Tilt the sensor to position it in the bracket.
4. Tilt the sensor until positioned firmly in the bracket.

Setting up the Position Sensing Apparatus (continued)

3. Connect the receiver cable from the Position Sensor to the front of the Ultrasound system.

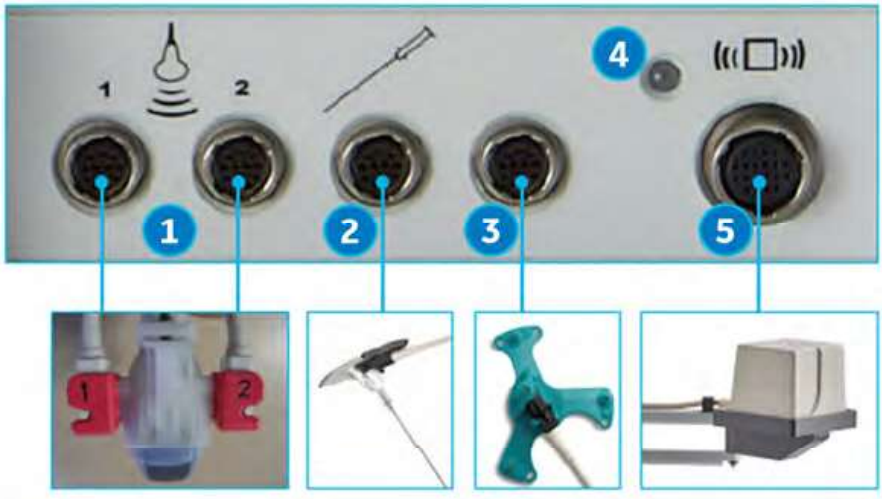


Figure 13-117. Volume Navigation Connections

1. V Nav Receiver Connector (2 cables)
2. V Nav Needle Tip Tracker/Virtual Tracker Sensor Connector
3. V Nav Active Tracker Connector
4. V Nav Transmitter Indicator
5. V Nav Transmitter Connector

4. Trace back each cable physically to insure the cable in position 1 on the probe is connected to position 1 on the console and that the cable in position 2 on the probe is connected to position 2 on the console.
5. Use the probe/receiver cable clips to hold the receiver cables to the probe cable.
6. Attach the transmitter cable to the front of the Ultrasound system where the transmitter label is shown.

CAUTION

Place the transmitter such that the entire area of interest is in the front hemisphere of the transmitter (indicated by the ‘1’ in the illustration above). The front hemisphere generates the magnetic field used by the system.

Setting up the Position Sensing Apparatus (continued)

7. Now that all the cables are connected, press the **V-Nav** key. The light above the transmitter cable blinks until the position sensing system has been initialized by the system. Once initialization is complete, the light remains green.

NOTE: Error message displays if the connection is incorrect.

8. Place electromagnetic transmitter next to patient with front toward scanning area of interest.

NOTE: Be sure patient and sensors are on the best position to start the exam.

NOTE: Patient must be in the same position as in the previous acquired exam.

CAUTION

If you need to connect/disconnect sensors, first use the V Nav key to exit V Nav. If you need to connect/disconnect the transmitter, make sure the light on the V Nav position sensing system is off. If it is on, enter V Nav and use the Exit & Clear Touch Panel control to leave V Nav.

V-Nav Inside Probe

V Nav Inside is a feature where the V Nav sensor is not external to the probe but is part of the probe.

Probes with V Nav Inside transmit/receive automatically after you activate V Nav.

Activate V-Nav

1. Begin an exam and optimize the image.
2. Press **V Nav** to activate Volume Navigation.
3. Perform Volume Navigation.
4. Press **V Nav** to exit V Nav. The following actions also exits V Nav: switching probes, recalling an image from the clipboard, starting a new patient, ending an exam, or selecting Exit and Clear from the Touch Panel.

V Nav Controls

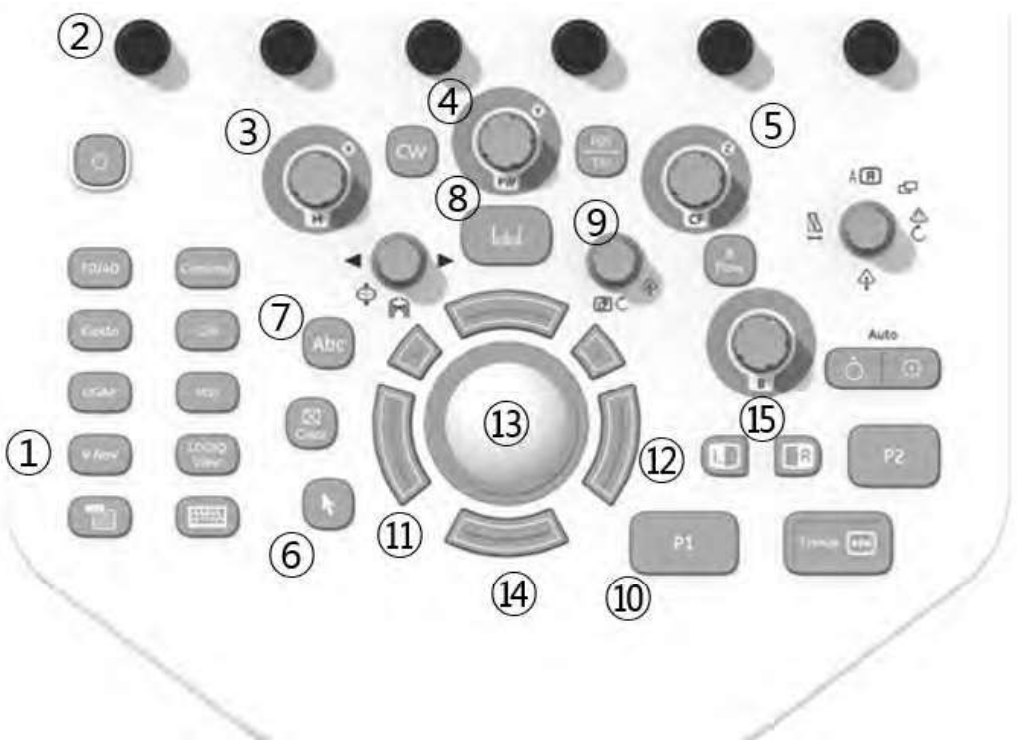


Figure 13-118. V Nav Controls

1. V Nav On/Off
2. Touch Panel and Joystick Rotary Controls
3. 3D Dataset X Axis Rotation Control
4. 3D Dataset Y Axis Rotation Control
5. 3D Dataset Z Axis Rotation Control
6. Windows Pointer
7. Comment
8. Measure
9. Zoom and Depth
10. P1
11. Left Set
12. Right Set
13. Trackball
14. Bottom Trackball key locks the V Nav Plane
15. Left/Right Key: Switches Display Mode

V Nav Touch Panel

V Nav Setup Touch Panel Menu

Prior to using V Nav, set up the following parameters:

Table 13-54: V Nav Volume Touch Panel descriptions

VNav Parameter	Description
Load	Loads the 3D Dataset From USB (USB storage device) or From Database.
Save Volume	Saves current volume, including any GPS markers shown in the volume.
Patient Data Check	Confirms patient's data
Reference Sensor	Specify which sensor you are using.
Orientation	Select Axial, Sagittal, or Coronal
Orientation Markers	Places orientation markers on the image.
Display Mode	Select Ultrasound only, 3D only, or Split Screen (both)
Clear/Reset	Allows you to clear plane registration(s), point registration(s) or reset all, which clears all registrations and resets the 3D Dataset to its initial position.
Exit and Clear	Clears the current 3D Dataset and exits V Nav; the 3D dataset is no longer available.
Virtual Tracker	Setup and select the Virtual Tracker. [Appears when the Virtual Tracker is present.]
Active Tracker	Select the Active Tracker sensor.
Window/Level (or Center/ Width) Rotary	Set the brightness/contrast for the 3D Dataset. To set the brightness, adjust the Level; to set the contrast, adjust the Window.

V Nav Touch Panel Menus

Table 13-55: V Nav Touch Panel 1 Descriptions

V Nav Parameter	Description
Scan	Specifies which image is moving with probe motion: Ultrasound (US), 3D, or Both
Registration	Select the type of Registration, Plane, Point/All, Point/Best 3, or None. Auto Registration is an additional choice if a Tru3D Ultrasound dataset is loaded using auto registration.
Save Current Registration	Select to save the current registration
Control Priority	Specifies the priority of shared image controls: Ultrasound image or 3D Dataset.
Restore Registration	Select to restore a stored registration.
Display Mode	Select Ultrasound only, 3D only, or Split Screen (both)
Clear/Reset	Allows you to clear plane registration(s), point registration(s) or reset all, which clears all registrations and resets the 3D Dataset to its initial position.
Overlay	Displays the 3D dataset superimposed on top of the Ultrasound image.
Overlay Brightness	Adjusts the intensity level of the 3D Dataset.
Overlay Weight	Adjusts the intensity level of the 3D Dataset.
Show Needle Tip	Shows or hides the needle graphics. [Appears when the Needle Tracker is present.]

V Nav Touch Panel Menus (continued)

Table 13-56: V Nav Touch Panel 2 Descriptions

V Nav Parameter	Description
Save Volume	Saves current volume, including any GPS markers shown in the volume.
Measure Accuracy	Press Measure Accuracy, then select a point on both the 2D Ultrasound image and on the 3D Dataset to tell you the distance as an indication of accuracy.
Calibration Delete	Used for calibration purposes, which is only available with a service key and performed by GE HealthCare Service.
Store Registration to File	Press to save the current registration to a file. This is useful when you want to load another dataset with the same geometry. For example, both a T1 and T2 weighted MR series may be available.
Read Registration from File	Press to read a stored registration from a file.
Read Markers from File	Press to recall saved GPS markers from a file.
Show Scan Area	Shows or hides the Ultrasound scan area on the 3D Dataset.
Cut Mode	Select the cut mode: Cubic Plane, the 3D dataset slice in reference to the whole volume of data; Overview, fixed orientation slice; or Detailed, a slice in the same orientation as the current Ultrasound image.
Exit and Clear	Clears the current 3D Dataset and exits V Nav; the 3D dataset is no longer available.

DICOM and Image Storage

Still Images

To store a still image, press **Freeze**, and then press P1. If you want to CINE back to find an image, you may need to set the Priority on the Touch Panel to Ultrasound.

Loops

To store a loop after you have frozen the image, CINE back, change the Priority to Ultrasound (if necessary), indicate the start and end points, Run the CINE Loop, Press P1.

Image-by-Image

To store individual images to a USB memory stick or external hard drive via the USB port, recall the image from the Clipboard, select Menu -> SaveAs. Type in the file name. We recommend that you select Image Only, Jpeg compression, Quality level 99. For CINE Loops, save as WMV. For stills, save as type Jpeg. Then press Save. Repeat for as many images as desired. When you take the USB device to another computer, the images are stored in the Export directory.

Save Volume

The system can save the volume and associated GPS markers as an image file in the exam.

The Save Volume key on the Touch Panel stores using the settings of whichever print key has Copy to Dataflow associated with it.

A saved volume can be loaded from the database and used as the pre-acquired volume.

HINTS

The Volume is stored in Raw Data format. If you send the volume to PACS without the raw data, the volume will not be available if you later Query/Retrieve it from PACS.

Measurements and Comments

You can measure distance, angle, circumference, or area on the 3D Dataset. You can annotate and perform any system measurement on the Ultrasound image.

Using V-Nav

Magnetic field range of V-Nav Transmitter

The position of the V-Nav sensor can be detected correctly within the range shown below. Make sure that the V-Nav sensor is within this range.

Check the Environmental Quality indicator on the monitor for the detection accuracy while scanning.

NOTE: Remove the metal product from the region of the magnetic field to increase accuracy of position detection.

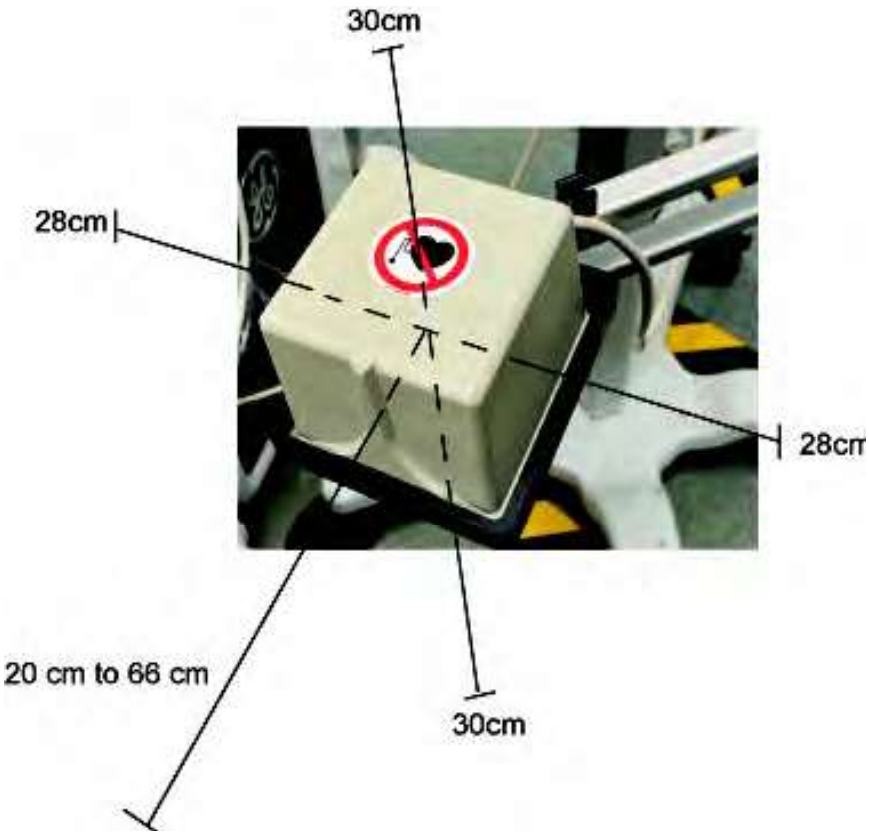


Figure 13-119. Magnetic Field Range from the Transmitter

From the center of the transmitter,
1. 30cm above and below
2. 28cm left and right
3. 20 - 66cm forward

Perform V-Nav Exam

In order to perform a V-Nav exam, you need to have acquired the 3D Dataset and set up the position sensing apparatus.

The workflow for V-Nav is to:

1. Import the dataset if using Query/Retrieve.
   See ‘Query/Retrieve’ on *page 13-250 for more information.*
2. Perform the Setup (attach the sensors) as needed.
   See ‘Setting Up V Nav sensors’ on *page 13-258 for more information.*

NOTE: Probes with V-Nav Inside transmit/receive automatically after you activate V-Nav.

3. Begin an exam; optimize the image.
4. Enter V-Nav.
5. Load the dataset.
6. Perform the registration.

NOTE: Confirm that the plane orientation of the ultrasound image is the same as that of the loaded volume data before starting registration.

7. Perform the exam.
8. Take measurements and store images via the Print key.

HINTS

Since Volume Navigation uses magnetic field to acquire probe position information, it may be affected by surrounding metal products.

If the image is flicked or misaligned, check the surroundings, such as the bed, the IV stand or the accessory, and move away those metal products from the magnetic field. If you use the bed with metal frame, it is desirable to be able to secure the distance from the metal frame using a thick mattress.

Ending an Exam

Press **V-Nav**, select ***End Exam***, select ***End Current Patient***, then select ***Store all***. The system is ready for the next patient.

Perform the registration

Orient the Dataset and Pick a Slice

You can manipulate the 3D Dataset the same way you adjust any 3D volume.

Manipulate the dataset to pick a slice that most closely matches the area where you will hold the probe initially.

1. After the dataset has loaded, use the Zoom rotary to see the dataset in a larger size.
2. Use the Orientation key to select Axial, Sagittal, or Coronal to easily view the Dataset from different orientations.

   You want the orientation that best matches the orientation of the patient.

NOTE: *If the data appears unacceptably blurred or smeared in one of these views, the dataset was not acquired with the appropriate settings for viewing the data in 3D.*

3. Pushing the X rotary rotates the dataset 90 degrees about the X-axis. Dialing the X rotary rotates the dataset about the X-axis in smaller increments. Same for Y and Z.

Note which points are identifiable in both the live Ultrasound image and in the 3D dataset. Remember that a point needs to be identifiable in all three dimensions. A point along a surface is often difficult to identify in three dimensions; but intersections of vessels, calcifications, or centers of structures can often be identified clearly in three dimensions.

Registering, Locking, and Translating the Image with the 3D Dataset

After you've loaded the 3D Dataset, you need to link the 2D Ultrasound image to the 3D dataset via Registration. You can register the 3D dataset to the Ultrasound image by Parallel Plane Registration or Point Registration.

Lock Plane: Align the section of displayed volume data with the vertical and horizontal orientations of the ultrasound scan plane. Match the state of inspiration and expiration with the loaded volume data and setting the probe orientation correctly to reduce the misalignment during the examination.

Lock Point: The position in the depth direction is adjusted at Lock Point. Synchronous display starts after setting Lock Plane. Set the reference point (Landmark) on the ultrasound and volume data. It can be set repeatedly.

NOTE: Confirm that the plane orientation of the ultrasound image is the same as that of the loaded volume data before starting registration.

NOTE: DO NOT move the patient once you have registered the image; if you move the patient, you lose registration.

Select the type of registration on the Touch Panel.

NOTE: When switching probes in V Nav, the registration is maintained. You can register with one probe, then scan with any probe.

Parallel Plane Registration

A plane registration constitutes a plane lock and a translation point.

To perform a Parallel Plane Registration,

1. Select ***Registration*** -> ***Plane*** from the Touch Panel.
2. Hold the probe parallel to the acquired (imported) 3D dataset, being careful not to tilt, twist, or rotate the probe.
3. Press the ***Lock Plane*** (bottom Trackball key) to lock the plane as parallel.
4. Define a translation point, by marking a common point in each image (Ultrasound and 3D Dataset) using the Windows Pointer and Trackball key labelled ***Lock Point***. This allows the system to do an x, y, and z correction at that point.
5. Move the probe and ensure that this registration is correct.
6. Press ***Save Current Registration*** on the Touch Panel to save this registration. You can save up to five (5) registrations.

Adjusting the Registration

To adjust the registration, you could try several things.

1. Save the registration. It's always a good idea to save the registration first.
2. Update the translation point in the area of interest.
3. Turn on Overlay and use the Z Rotary to adjust the 3D overlay relative to the Ultrasound image.
4. Holding the probe still during the following steps: move the windows pointer over the overlay image, select the Overlay XY Trackball control, move the overlay relative to the Ultrasound image, press the Overlay XY key to lock in the adjustment.
5. Manually adjust the parallel plane lock. Use the scan key on the Touch Panel to select only the 2D Ultrasound or the 3D dataset. Adjust the probe to make the scanned image match the locked image and then press ***Lock Plane***.
6. Start over by using the Clear/Reset -> All control on the Touch Panel.

Point Registration

To perform a Point Registration,

1. Select ***Registration*** -> ***Point*** from the Touch Panel.
2. Find a common point on both the 3D Dataset and Ultrasound image. Use the Windows Pointer to select each point, then press Set Point each time. Do this 3 times.

NOTE: You can select either a Point/Best 3 or Point/All. If you identify more than three point pairs, Point/Best 3 takes the best 3 point pairings. Point/All uses all point pairs that you identify when calculating the Point Registration.

3. Move the probe and ensure that this registration is correct.
4. Press ***Save Current Registration*** on the Touch Panel to save this registration. You can save up to five (5) registrations.

NOTE: Point and Plane registrations are stored separately.

To switch between Point and Plane Registration, change the registration via the Touch Panel.

HINTS

Performing a plane registration is not necessary to do a point registration, but is recommended because it simplifies the process as the probe can easily be used to search for the point pairs in both the Ultrasound image and in the 3D Dataset.

HINTS

When using a point pair to complete or update a registration, registration error is minimized at that point and will increase further away from that point. Therefore, registration accuracy near the anatomy of interest may be improved by marking the last point pair, or adding a point pair, in close proximity to the anatomy of interest.

Auto Registration with Tru3D

Auto-registration is available when fusing to a Tru3D dataset.

When entering V Nav directly from a Tru3D acquisition, the Tru3D volume is automatically loaded into V Nav and automatically registered.

When a Tru3D data set from the current exam is loaded into V Nav from the clipboard or by loading from the database, the user shall be prompted to automatically register to the data set.

NOTE: Tru3D auto registration is possible if the magnet and patient have not been moved since the Tru3D data set was acquired. If the magnet or the patient have moved since the Tru3D dataset was acquired, you need to perform a parallel plane or point registration.

Auto Registration appears as a choice on the Registration control only if auto registration was initially used. You can manually select a different registration method even if Auto registration was initially selected when the volume was loaded.

Overlay

Use the Overlay control on the Touch Panel to overlay the 3D Dataset image onto the Ultrasound image. Use the Overlay Brightness and Overlay Weight joysticks to adjust the intensity level of the 3D Dataset.

By pointing at the overlay (Overlay XY) with the Windows pointer and clicking on it with the Left Set Key, the overlay can be dragged via the Trackball in X and Y directions in an effort to achieve a better registration. To lock in the adjustment, press the Left Set Key again.

By pointing at the overlay with the Windows Pointer and clicking on it with the Right Set Key (Overlay Z), the overlay can be dragged via the Trackball in the Z direction in an effort to achieve a better registration. To lock in the adjustment, press the Left Set Key again.

One technique to improve registration is to adjust the overlay in X and Y as stated above and to also do any necessary Z axis rotation as well. Then, turn the probe 90 degrees and repeat these same adjustments. These steps can be repeated iteratively.

HINTS

In an area with bony structures that show up bright with the 3D Dataset, applying an overlay with a low percentage can be a nice way to show bone structure with an Ultrasound tissue image.

HINTS

When performing Overlay XY or Overlay Z adjustments, it is important to hold the probe still from the time the adjustment key is pressed until it is pressed a second time to lock in the change.

Volume to Volume Registration

Datasets can come from different exams, can be from different orientations, and can be from different imaging modalities. Because datasets are not registered to one another, the system allows auto or manual volume-to-volume registration

To register multiple volumes,

1. Load multiple volumes (not restricted to one exam).
2. Clicks on the “link” icon. The “Select volumes for registration’ pop-up window appears.
3. Select the primary and secondary moving volumes. The primary volume is used for registration, the secondary volumes are transformed using the registration parameters of the primary volume.

   For example, If the user has a CT1 volume and a CT2 + PET volume loaded, they would select the CT1 as the fixed and the CT2 as primary, and the PET as the secondary moving volumes. After the registration they will have CT2 + PET registered to CT1.
4. Specify if the result should be added as a new registered volume or overwrite the moving dataset. You can also or create the result as an additional volume (‘Add registered volume’ is not an option if 5 volumes already exist).

   A user can perform two types of manual registration: a registration based off of a single common point pair identified in each volume (Translation); or a registration based off of three or more common point pairs identified in each volume (Registration).

Volume to Volume Registration (continued)

5. Choose Manual, Auto, Semi Auto or Indirect volume to volume registration.

Figure 13-120. Select volumes for registration

NOTE: *If you select Auto registration, also choose the type (bone, tissue or some combination). If you select Manual registration, identify three point pairs between the two volumes. Only one point pair is usually needed for datasets with different orientations from the same exam.*

During manual volume to volume registration, the user is able to scroll through either the fixed volume (shown on the left) or the moving volume (shown on the right) by moving the Windows Pointer over the image, pressing the trackball key labeled Scroll Z and then using the trackball to perform the scrolling.

Volume to Volume Registration (continued)

NOTE: During manual volume to volume registration, the user is able to move the volume up and down or left and right on the screen by moving the Windows pointer over the image, switching from Primary to Secondary with the top trackball key, pressing the trackball key labeled Move XY and then using the trackball to perform the XY movement.

When doing manual registration, the left volume is the fixed volume and the right volume is the moving volume. The right trackball key is used to scroll through the datasets and find anatomical points while the left trackball key is used to mark the points. Once a single point pair is marked, the bottom trackball key is labeled Apply Translation which is all that is needed to register the moving volume (oblique, e.g.) to the fixed volume (axial, e.g.).

NOTE: A single point pair is sufficient if the two datasets have the same orientation but are shifted with respect to each other.

Once three point pairs are marked, the bottom trackball key is labeled Calculate Registration which then registers the moving volume to the fixed volume.

NOTE: Three point pairs or more are needed if the datasets do not have the same orientation or are at oblique angles with respect to each other.

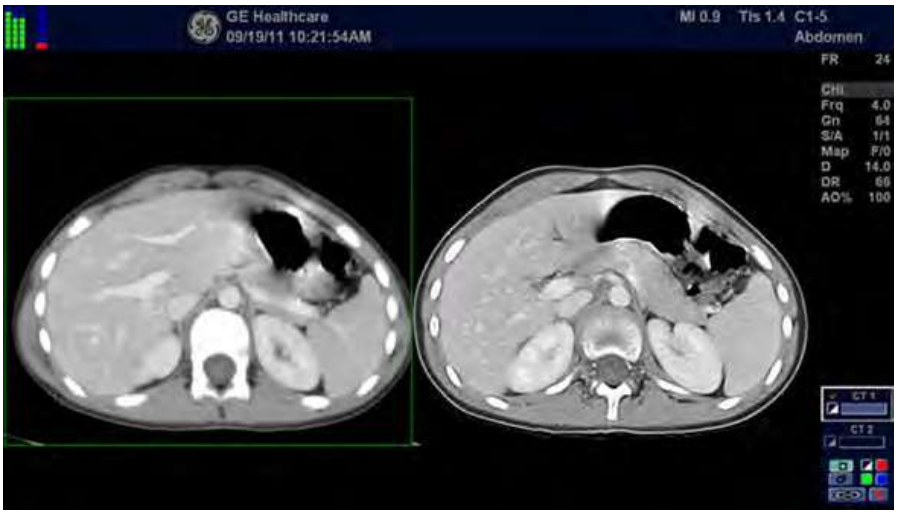


Figure 13-121. Volume to Volume Registration

Volume to Volume Registration (continued)

Once three point pairs are marked, the bottom trackball key is labeled Calculate Registration which then registers the moving volume to the fixed volume.

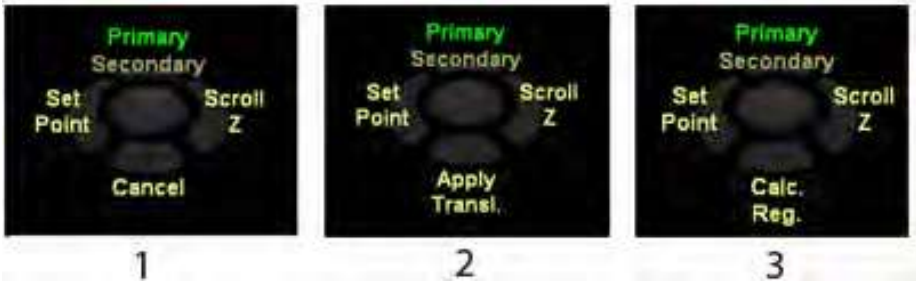


Figure 13-122. Trackball key status

1. No point pairs identified
2. One point pairs identified
3. Three or more point pairs identified

Compare Volume

You can compare pre-registered volumes in a side by side display.

1. Press ***Volume Compare*** button in the multi volume menu.
2. The dialog for selecting left and right side volumes displays. Multiple selection is possible.

NOTE: Volumes need to be from the same group of pre-registered volumes.

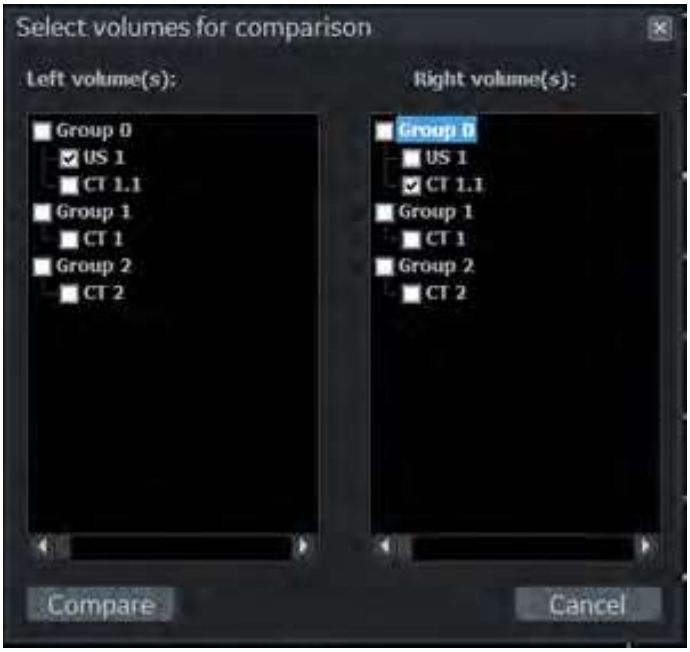


Figure 13-123. Select volumes for comparison

3. The selected volumes is shown side by side and any interaction (scroll, zoom, rotation etc.) is applied to both sides simultaneously.

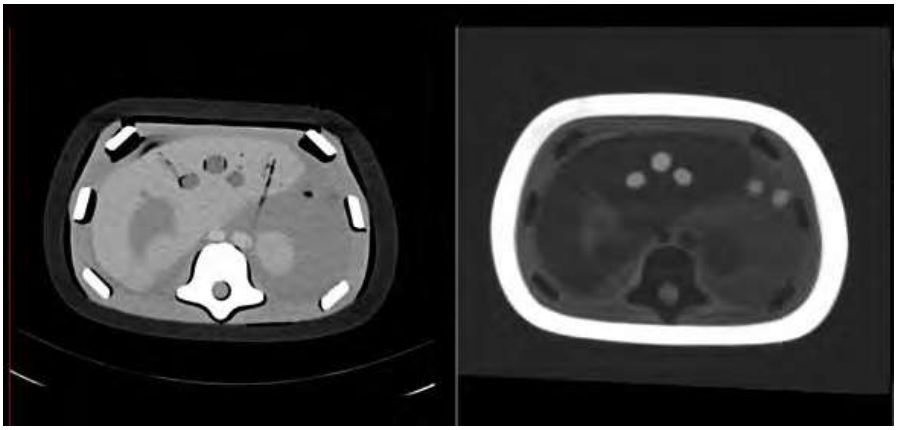


Figure 13-124. Compare Volume

Advanced GPS Markers

"GPS" -- Position Marking V Nav

Position markers can be ‘placed’ on a stationary anatomical structure within the body and then tracked with the existing position sensing system. The marker position is projected onto the current Ultrasound image in a graphical way that indicates the relative position of the point compared to the image. GPS markers track a particular point in space.

Controls

Selecting the GPS tab switches trackball control to GPS markers with 2D Marker or 3D Marker activated.

Table 13-57: GPS Controls

Preset Parameter	Description
2D Marker	Allows the user to select between a Point Marker and a Target Marker.
3D Marker	Allows the user to select between an Ellipsoid and Spherical Marker.
Show All Markers	Shows all markers, independent of Active State.
Show Active Markers	Shows/Hides all markers with Active State "On".
Active State	An individual GPS marker can be shown/hidden using the Active State control (turn to select, push to toggle state).
Delete	Rotate the control to select a specific GPS Marker to delete; then push the control to delete the marker.
Delete Markers	Deletes all active GPS Markers following the user's confirmation.
Mark Needle Tip	Mark Needle Tip allows a 2D or 3D GPS Marker (whichever is selected) to be put at the current tracked needle tip location. The marker is not attached to the needle and will not move as the needle moves.
Show Distance	Toggles between showing and hiding all defined distances.
Attach to Needle	If the 3D Marker key is selected and needle tracking is active, the "Attach To Needle" key initiates a 3D GPS Marker whose center (in the case of a sphere) or whose first long axis point (in the case of an ellipsoid) is placed at the needle tip.
3D Edit	The 3D Edit key is available only if a 3D GPS Marker is currently selected via the Delete or Active State rotaries. Selecting the Edit key causes the Edit GPS Touch Panel menu to appear.

Table 13-57: GPS Controls (Continued)

Preset Parameter	Description
Dist Start/Dist End/Clear	Rotating the Distance Start and Distance End rotaries cycles through the list of GPS markers including the Needle Tip if needle tracking is active. When two different GPS markers are identified on the Distance Start and Distance End Rotaries, the Distance End rotary is labeled "Define" or "Clear". If the distance is not already defined, the label is "Define". If the user then pushes the rotary, the distance between the Start and End GPS Markers is defined, and the label to switches to "Clear". The initial value of the Distance Start rotary is the first GPS marker. The initial value of the Distance End rotary is the needle tip if needle tracking is active or the 2nd GPS marker if not. In the case of a 3D GPS Marker, it's center point is used for all distance calculations.

2D GPS Markers

GPS Markers track a particular point in space. As you adjust the probe/image position, the point is projected onto the current image. If the point intersects the current image, it is displayed as a green cross. As the point gets further away from the current image, the cross turns into a bigger and bigger square. The color of the square indicates the direction; red represents one direction and blue represents the other direction. You can use ’GPS’ to track an anatomical marker on the Ultrasound image or for biopsy needle guidance, for example.

You can use GPS Markers with an imported dataset, or independently of an imported dataset.

There are two types of GPS Markers: Point and Target. A Point Marker assigns a number. Each point marker you set has a unique number. A Target Marker only allows one target point. If you try to place another target marker, the target moves to the newly-indicated position.

To place a Target or Point Marker, use GPS Marker to specify Target or Point. Place the Windows Pointer in the location where you want to set the marker, then press the Set GPS Key.

3D GPS Markers

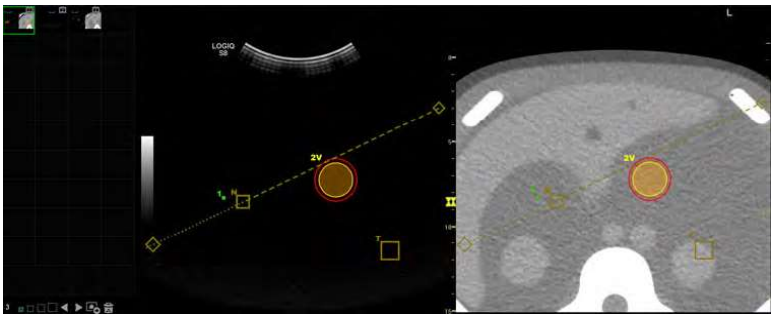


Figure 13-125. 3D GPS Marker example

NOTE: When using GPS Markers with a registered 3D dataset, a point marked in either image shows up in both images. GPS Markers are stored with the image.

NOTE: All 3D GPS Markers are appended with the letter "V" (for volume).

NOTE: The inner surface of the 3D GPS marker and margin contours can be colored using the colors of the marker/margin. This color is transparently overlaid on top of the US image below.

Type of Markers

- Ellipsoid

  The user places one GPS Marker (Set GPS on the right trackball key) at one end of the desired long axis. The point is marked with a marker named LA that behaves like a point marker. The distance between this first long axis point and the current cursor position is displayed in the status bar to allow the user to mark an ellipsoid with a defined long axis length. The user then places a second GPS Marker (Set GPS on the right trackball key) at the other end of the desired long axis. The ellipsoid will be drawn and the long axis endpoints will be marked with crosses that will be displayed only if they are hit by the plane.

- Spherical

  The user places the GPS Marker (Set GPS key on right trackball key) at the center point of the anatomical structure of interest. The center of the sphere is marked with a cross, that is only displayed if the plane hits the center.

Editing a 3D Marker

Upon creating a 3D GPS marker, the Edit GPS menu appears on the Touch Panel.

Table 13-58: Edit GPS Marker - Sphere/Ellipsoid

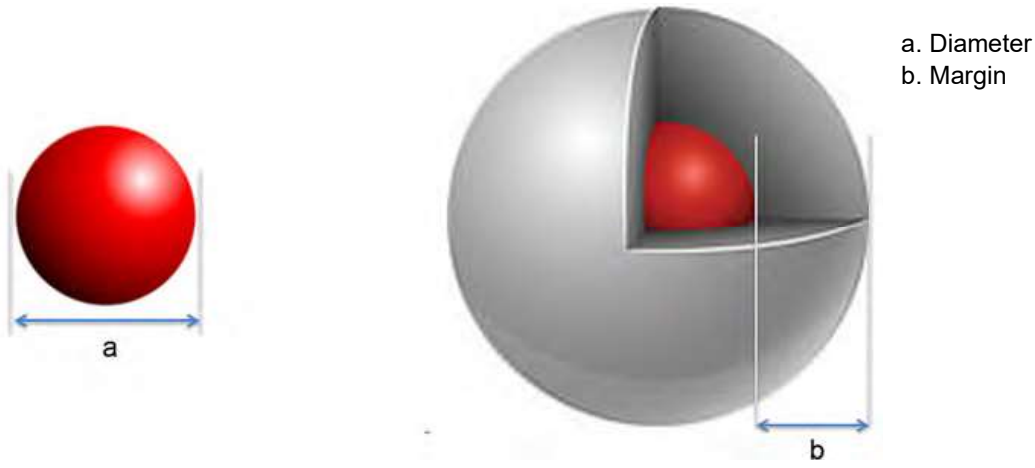
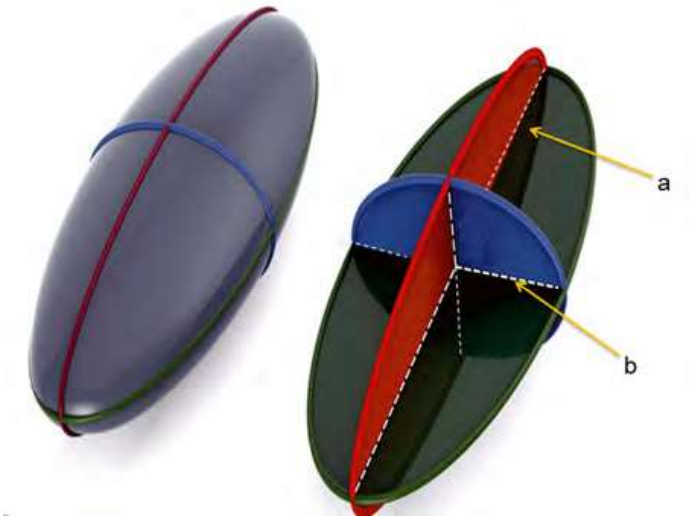
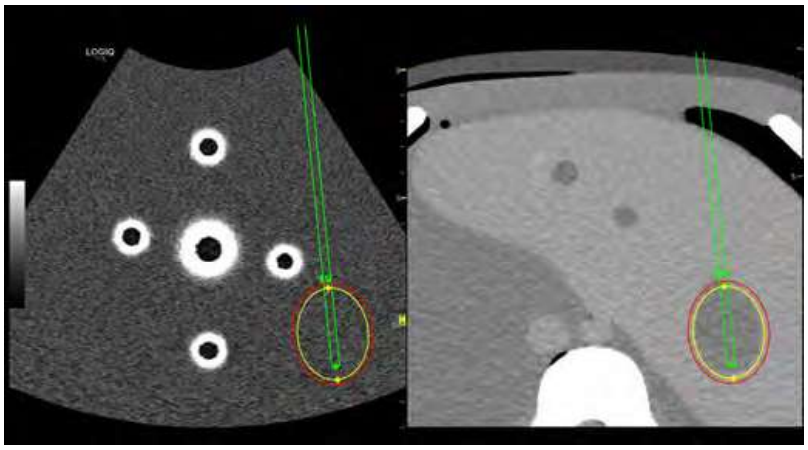
Preset Parameter	Description
Done	Return to main GPS Touch Panel.
Reposition	Set Key on the image will reposition the sphere when Reposition key is on (otherwise Set Key creates a new sphere).
Select	Select attributes that were previously saved.
Save As	Save and name the current sphere attributes (size, margin, colors and transparency).
Color	Change color (yellow, Red, orange, blue, purple, pink or white).
Margin Color	Change margin color.
Margin Dist.	Adjust margin size.
 a. Diameter b. Margin	
Diameter	Adjust sphere diameter.
Inner Alpha/Margin Alpha	Adjust transparency of main area and margin in percent i.e. between 0 (= only ultrasound image) and 100 (= only marker/margin color).
Detach from Needle	The Detach From Needle key is only available if the 3D GPS Marker being edited is attached to the needle. Pressing the key causes the 3D GPS Marker to be removed from the needle and placed at the current location of the tracked needle tip. It will no longer move with the needle tip.

Table 13-58: Edit GPS Marker - Sphere/Ellipsoid (Continued)

Preset Parameter	Description
	a. The length of the red ellipse is the long axis of the ellipsoid. b. The diameter of the blue circle is the short axis of the ellipsoid.
Shift/Rotate (Ellipsoid)	Shift along long axis or rotate about end of long axis.
Short Axis/Long Axis (Ellipsoid)	Adjust short and long axis lengths.
Show Ablation Needle Path	For ellipsoids, the user can display the needle path and tip position. 

NOTE: Default of the parameters is configurable in Utility -> System -> System Imaging -> V Nav 3D Marker.

Editing a 3D Marker (continued)

Move XY GPS allows the 3D Marker to be dragged to a new location in the current image plane.

Repos. GPS allows the 3D Marker to be recentered on the current image plane.

Figure 13-126. Trackball key for GPS Marker

NOTE: The initial attributes of a 3D GPS marker match the last 3D GPS marker that was created.

NOTE: While on the Edit Menu, the 3D GPS marker being edited is shown in its normal color while all other 3D GPS markers are dimmed. After exiting the Edit Menu, all markers are returned to their normal color appearance.

Saving and Selecting a 3D GPS Marker

To save a 3D GPS Marker,

1. For markers that are used often, such as kill zones associated with a particular ablation needle, select ***Save As*** from the Edit GPS Touch Panel.
2. The Save 3D GPS Marker pop-up menu appears. Name the GPS Marker.

Figure 13-127. Saving a 3D GPS Marker

To select a 3D GPS Marker,

1. Select ***Select*** from the Edit GPS Touch Panel. The Select 3D GPS Marker pop-up menu appears.

Figure 13-128. Select 3D GPS Marker

2. Highlight the desired Sphere or Ellipsoid, then press **Select**.

Attach to Needle/Detach from Needle

The user attaches (and detach) 3D GPS markers to (from) a tracked needle tip and places a 2D GPS marker at the location of a tracked needle tip.

If the 3D Marker key is selected and needle tracking is active, the ***Attach To Needle*** key initiates a 3D GPS Marker whose center (in the case of a sphere) or whose first long axis point (in the case of an ellipsoid) is placed at the needle tip.

In the case of an Ellipsoid, it's long axis is aligned with the needle direction, i.e. both long axis points are placed on the needle axis. The 3D GPS Marker is not in a fixed location, but is attached to the needle and therefore moves with the needle tip.

The key is only available if needle tracking is enabled and the 3D Marker key is selected.

To detach the 3D Marker from the needle, the user can either press the ***Detach from Needle*** button on the GPS Edit page or the Mark Needle Tip on the GPS page.

Mark Needle Tip

Mark Needle Tip allows a 2D or 3D GPS Marker (whichever is selected) to be put at the current tracked needle tip location. The marker is not attached to the needle and will not move as the needle moves.

NOTE: You must use Tip Tracking or Virtual Tip Tracking.

1. Place a needle.
2. Before extracting the needle, select ***Mark Needle Tip*** to get a 2D or 3D GPS marker at the needle tip.

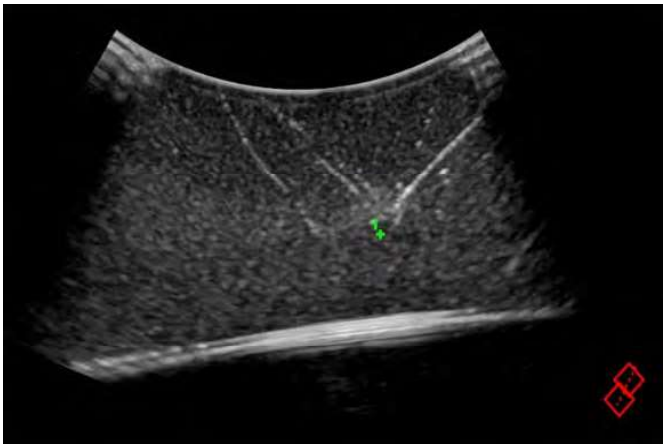


Figure 13-129. Mark Needle Tip - Example

GPS Distance

The user displays the distance between two GPS markers or a GPS marker and a tracked needle.

- Between any two GPS markers (2D Point, 2D Target, 3D Sphere, 3D Ellipsoid)
- Between any GPS Marker and the tracked needle tip (Tip-Tracked, virtual tip-tracked)

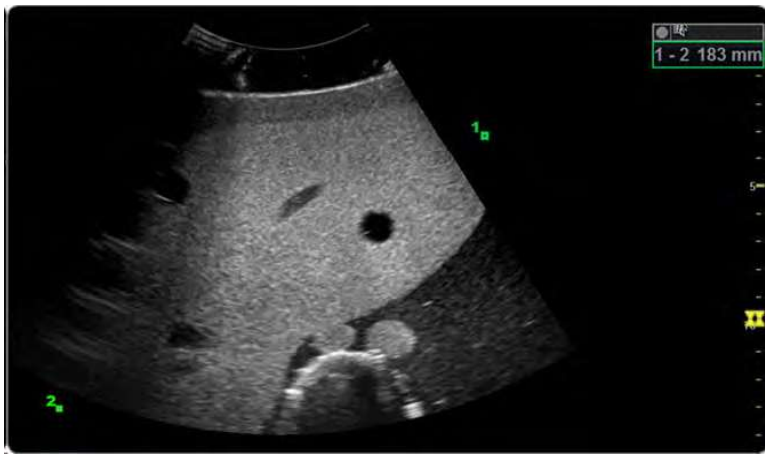


Figure 13-130. GPS Distance - Example

Procedure

1. After marking GPS locations, rotate Dist. Start to select 1st marker.

NOTE: Cycle through the list of GPS markers including the Needle Tip if needle tracking is active.

2. Rotate Dist. End to select 2nd Marker. Push Define to display the distance.

NOTE: If the distance is not already defined, the label is "Define". If the user then pushes the rotary and the distance between the Start and End GPS Markers is defined, the label switches to "Clear".

In the case of a 3D GPS Marker, it's center point is used for all distance calculations.

When distances are defined to be displayed, they are displayed in the same location as 3D measurement results. When regular 3D measurements are displayed, the distance measurements are not shown. The label of a distance measurement is the numerically lowest GPS Marker followed by the numerically larger GPS Marker. If the needle tip is one of the markers, it is listed second. Some examples are "1-2V", "3X-Needle", and "5-7P".

V Nav Trackers

V Nav supports the V Nav Needle Tip Tracker, the Virtual Tracker and Active Tracker.

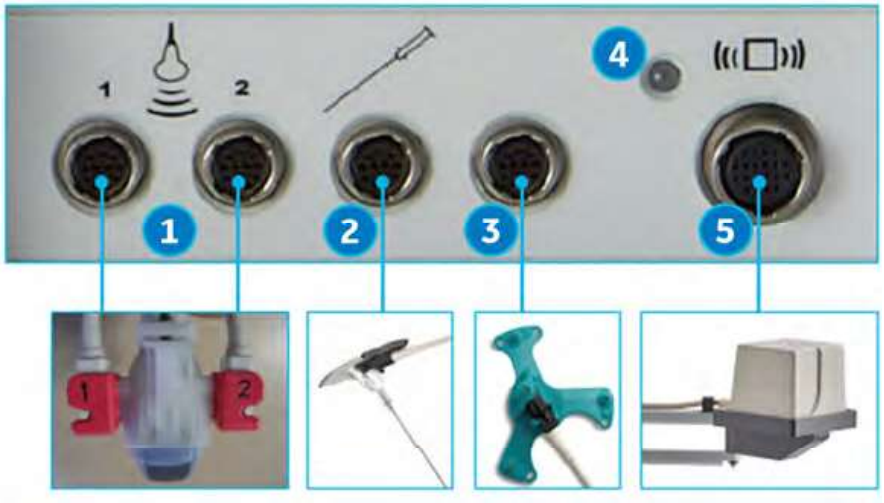


Figure 13-131. Volume Navigation Connections

1. V Nav Receiver Connector (2 cables)
2. V Nav Needle Tip Tracker/Virtual Tracker Sensor Connector
3. V Nav Active Tracker Connector
4. V Nav Transmitter Indicator
5. V Nav Transmitter Connector

NOTE: Pink probe brackets and sensors are necessary when using the Needle Tracker or Virtual Tracker

V Nav Trackers (continued)

HINTS

- Remember to exit V Nav with the V Nav control BEFORE disconnecting and connecting the V Nav Trackers.
- With the V Nav Trackers attached, tracking can be turned on/off using the Show Needle Tip button.
- When using V Nav Tracking, it is important to have high Environmental Quality readings.
- When Needle Tracking is turned on, the Needle Tracking graphics show the:
  - Needle Tip and projected path on the live image
  - The intersection point with the current image when not in plane
  - Markers to assist with guiding the needle in plane with the current image
- The combination of Fusion and Needle Tracking is available once the volume dataset is registered. By selecting the Needle in Plane button, the volume dataset can show the needle in plane rather than the same plane as the live Ultrasound image.
- You can push the Z-Rotation Rotary to rotate the needle path plane about the needle axis (coarse adjustments). Rotating the Z-Rotation Rotary can be used for fine adjustments.

Setting up the V Nav Needle Tip Tracker

The V Nav Needle Tip Tracker allows you to insert a V Nav tracker inside the Needle to track where the needle tip is inside the body. The Needle Tip Tracker makes use of a needle assembly (combination of stylet and sheath) where the stylet has a hollow core in which a position sensor receiver may be placed, thereby placing the sensor near the tip of the stylet. The Needle Tip Tracker tip is annotated with an “N.”

To set up the V Nav Needle Tip Tracker, you need the CIVCO eTRAX Needle System Starter Kit.

1. The Kit includes the eTRAX Sensor as well as 5 sterile packages. Each sterile package contains a needle assembly (combination of stylet and sheath) and a cover for the sensor handle and cable.

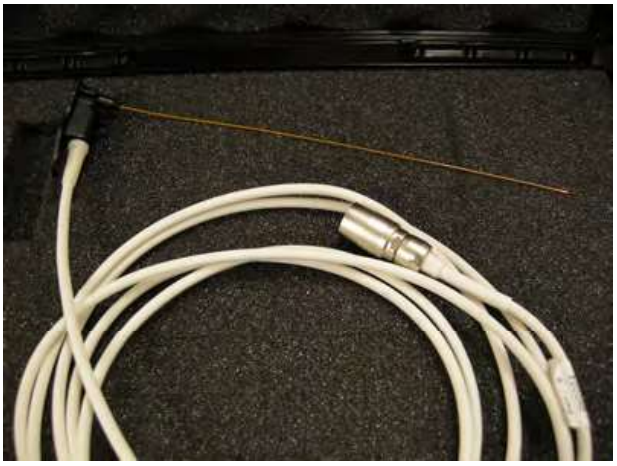


Figure 13-132. Needle Tip Sensor and Cable Close-up

2. The Needle Sensor fits inside the needle assembly. Prior to performing the procedure, you need to cover the sensor handle and cable.
3. Advance the sensor all the way into the needle assembly.

Setting up the V Nav Needle Tip Tracker (continued)

4. The Needle assembly locks into place with the Sensor handle.

CAUTION

For illustration purposes only, the needle sensor is shown without a cover. Always place a cover over needle sensor to protect patients and users from cross-contamination.

5. Using proper sterile technique, insert needle sensor through opening in cover, taking care to minimize bending of needle sensor.
6. Extend cover over needle handle.
7. Inspect cover to ensure there are no holes or tears.
8. After you have the Needle Assembly placed at the desired anatomical location, you can unscrew the stylet from the sheath and remove the stylet (and sensor). The procedure needle can be placed in the sheath to perform the procedure.
9. Remove the Sensor and Needle
10. The site is now ready for the procedure (core biopsy, ablation, etc.).

Setting up the V Nav Needle Tip Tracker (continued)

NOTE: Dispose of the needle assembly and sensor cover. The Needle sensor should not be disposed.

NOTE: You DO NOT need to sterilize the Needle Sensor. Instead, clean and disinfect the needle sensor the same way you would a probe, taking care not to bend the sensor.

NOTE: The Tracker must be used in conjunction with a probe that has a V Nav Bracket. You need three (3) sensors: two (2) sensors attached to the probe and one (1) Tracker sensor. However, if you are using a V Nav Inside probe, no sensors need to be attached to the probe and only the sensor for the tracker is needed.

V Nav Virtual Tracker (Part of V Nav Option)

The V Nav Virtual Tracker allows you to attach a sensor to the shaft of the needle (away from the tip). The position of the needle tip and the projected needle path are projected onto the 2D Ultrasound image. The virtual needle tip is annotated with a “V.”

Setting up the V Nav Virtual Tracker

To set up the Virtual Tracker, you need the CIVCO VirtuTRAX Starter Kit.

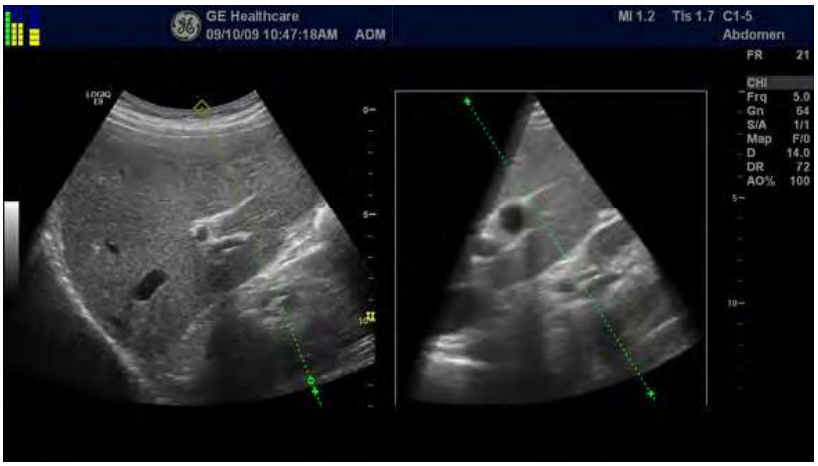
Figure 13-133. V Nav Virtual Tracker

1. The kit includes the VirtuTRAX Sensor as well as 5 sterile packages. Each sterile package contains a sensor bracket, a cover for the sensor, and rubber bands for the cover.

   Insert sensor inside cover. Place covered sensor in sensor bracket. Push down on sensor. Push down until sensor snaps into place.

Setting up the V Nav Virtual Tracker (continued)

2. Insert needle into insertion point of the bracket, making sure that the arrow on the side of the bracket points toward the needle tip. Rotate knob to tighten needle holder to adjust it to the needle's gauge.
3. Assembled V Nav Virtual Tracker
4. Attach Virtual Sensor to the system. Connect V Nav sensors to the system.
5. You are ready to calibrate the Virtual Tracker. See Calibrating the V Nav Virtual Tracker procedure below.
6. To track the needle, the system needs to know the distance from the sensor bracket to the needle tip.
7. To provide the distance, select the V Nav Virtual Tracker control. Details are provided below.



8. On the display the virtual needle tracker appears like the needle tip tracker except that the needle tip is annotated with a "V."

NOTE: Dispose of the sensor bracket and sensor cover. The sensor should not be disposed.

NOTE: You DO NOT need to sterilize the sensor. Instead, clean and disinfect the sensor the same way you would a probe.

NOTE: The Tracker must be used in conjunction with a probe that has a V Nav Bracket. You need three (3) sensors: two (2) sensors attached to the probe and one (1) sensor attaching to the needle sensor bracket.

CAUTION

Because the sensor is away from the tip of the needle, the system cannot detect needle bending. When the needle bends, the projection of the needle trajectory and the representation of the needle tip will vary with respect to the actual needle trajectory and tip position.

Calibrating the V Nav Virtual Tracker

Method 1. You enter the needle length.

1. Select Virtual Tracker.
2. Enter a device name and specify a length. Press OK (Length is measured from the tip of the needle inserted to the far surface of the sensor bracket, measured along the needle shaft).
3. Check the length by placing the needle tip on the center of the probe face.
4. There should be a ‘V’ on the probe face in the image.

Method 2. You define the needle length via the image.

1. Select Virtual Tracker.
2. Enter a device name, and click on Define via Image. Press OK in the dialog.
3. Set the tip on the center of the probe face, move windows cursor to that point on the image and press Set.
4. The tip becomes marked with a ‘V’ on the image, initially on the probe face.

Existing Virtual Tracker devices can be selected and their calibrations modified if needed.

Active Tracker

The Active Tracker is a device that consists of four markers that show up in a volume imaging dataset such as CT or MR. The markers are in known positions relative to each other such that the orientation of the Active Tracker can be uniquely determined based on the marker positions in the image. The device also holds a position sensor in a known position relative to the markers. Holes are provided in the Active Tracker so that its location can be marked on the body.

When the Active Tracker sensor is attached to the Active Tracker device, it can be used as a reference sensor. This means that all tracking is done in relationship to this sensor rather than in relationship to the transmitter.

Figure 13-134. Left, Active Tracker - Right, CT of Active Tracker

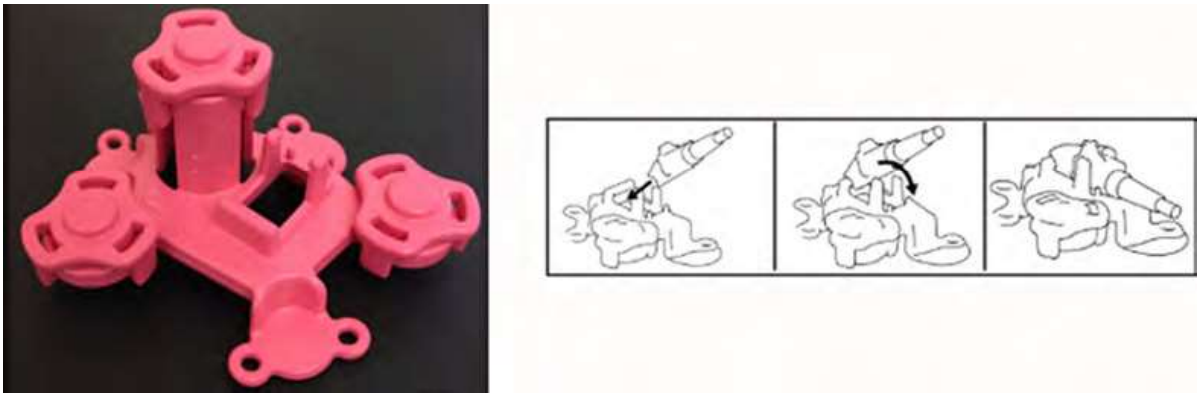


Figure 13-135. MR Active Tracker

Active Tracker (continued)

The Active Tracker adds sensor-based auto registration for CT/MR. An Active Tracker device, which can hold a sensor, is placed on the patient during the CT/MR scan and then detected in the CT/MR images to facilitate an auto registration. CT/MR uses the same Active Tracker device as a Reference Sensor, meaning that tracking is done relative to the sensor attached to the Active Tracker. Provides some breathing compensation, and allows registration and GPS markers to be maintained in case the transmitter/patient moves.

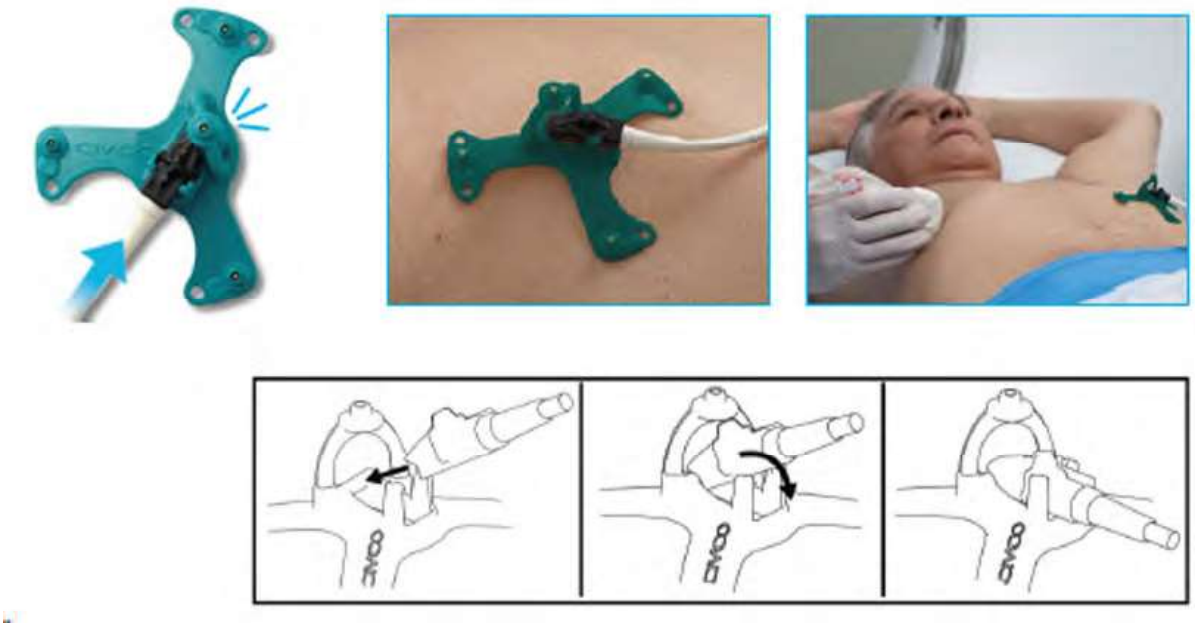


Figure 13-136. Active Tracker Setup and Positioning

1. Connect the following sensors to the V Nav Module. V Nav Probe Connectors (into Slots 1 and 2). Active Tracker Connector. Transmitter Connector.
2. Ensure that the probe has the V Nav attachment in place, along with the two V Nav Sensors.
3. Attach the CT/MR Active Tracker to the sensor.
4. Position the Active Tracker on the patient.

Using the Active Tracker

Perform CT/MR exam.

1. Apply sensor.

   For an MR Exam, avoid having the MR coil touch the MR Active Tracker.

   a. Place the MR Active Tracker where there is a gap in the coil.

NOTE: The MR Active Tracker must be in the area being scanned during the MR. It is good to place the Active Tracker on a rigid area, such as the xyphoid, and good to place it in the vicinity of the intervention, but still out of the way.

   b. Use pads (available in the MR suite) to keep the coil from touching the MR Active Tracker.

2. Perform CT/MR scan.

Scanning the patient,

1. Use the Active Tracker to hold the sensor.
2. Tape the sensor to the body. First, clean the area, then peal and stick the sensor to the body.
3. Choose the reference sensor on the Touch Panel.

NOTE: If you choose the Active Tracker for Auto Registration, the sensor is automatically selected as the reference.

4. Load MR/CT dataset.

With Sensor and Active Tracker

In order to acquire an ultrasound volume and auto register live ultrasound to it at a future time, perform the following steps:

1. Use a probe with VNav position sensors attached to or built into the ultrasound probe.
2. Attach the Active Tracker device to the patient and connect the active tracker sensor to the device.
3. Using a body marking pen, mark the position of the Active Tracker on the body using a body marking pen and the four holes in the base of the Active Tracker.
4. Enter Tru3D and select the acquisition as "With Sensor + Active Tracker"
5. Perform a Tru3D sweep as usual and store it as usual.

Entering VNav directly from Tru3D or entering VNav and then loading the saved Tru3D data set will allow automatic registration of the live ultrasound to the Tru3D data set. If you want to automatically register to the Tru3D data acquired with Active Tracker at a future time, perform the following steps:

1. Follow steps 1 and 2 above except when placing the Active Tracker device use the four body marks to recreate the same position as before.
2. Enter VNav and load the Tru3D data set that was previously acquired with the active tracker attached. Perform sensor-based auto registration in the same way as for CT/MR.
3. Manually adjust the registration as needed.

Breast Productivity Package

Overview

There are three features in the Breast Productivity Package:

- Breast Lesion M&A — includes lesion measurement folders, show features, summary, etc.
- Breast Measure Assistant — contains the Auto Contour feature. It also has measurements related to Breast (distance to nipple, ratio).
- Breast Assistant, Powered by Koios DS — breast lesion analysis option.

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).

ACR BI-RADS® lesion classification can be notated via Show Features and Show Assessment.

The Breast Measure Assistant (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 Application Preset, select the Breast Application. Next, select the Right/Left Lesion (Select RtSide/ LtSide below the Touch Panel).

Table 13-59: Breast Lesion M&A Touch Panel Controls

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 Trackball. 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 (-) • Echo Pattern: Anechoic, Hyperechoic, Complex, Hypoechoic, Isoechoic, Heterogeneous, None(-) • Posterior Features: No posterior features, Enhancement, Shadowing, Combined Pattern, None(-) • Associated features: Architectural distortion, Duct changes, Skin thickening, Skin retraction, Edema, Absent, Internal vascularity, Vessels in rim, Soft, Intermediate, Hard, None(-) • Calcifications: Calcifications in a mass, Calcifications outside of mass, Intraductal calcifications, None(-) • Special Cases: Simple Cyst, Clustered microcysts, Complicated cysts, Mass in or on skin, Foreign body including implants, Lymph nodes-intramammary, Lymph nodes-axillary, Vascular abnormalities AVMs, Vascular abnormalities, Mondor disease, Postsurgical fluid collection, Fat Necrosis, None(-)
Show Assessment	Specify the ACR BI-RADS Assessment: None (-), 0, 1, 2, 3, 4a, 4b, 4c, 5, 6. A comment field is available directly below the ACR BI-RADS Assessment.
Return	Press to return to the previous Touch Panel.
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.

Table 13-59: Breast Lesion M&A Touch Panel Controls (Continued)

Preset Parameter	Description
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 (-), Homogeneous background echotexture-fat, Homogeneous background echotexture-fibroglandular, or Heterogenous background echotexture.
Delete Lesion	Press to delete this lesion.

Worksheet and Summary Worksheets

Worksheets and Summary Worksheets are provided for all documented Breast Lesions.

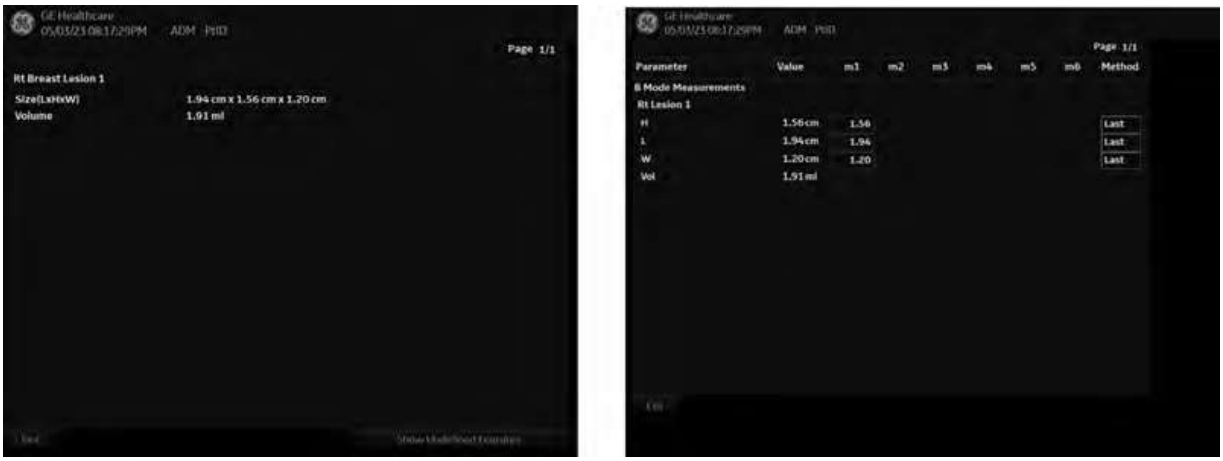


Figure 13-137. Breast Lesion Worksheet and Summary

To move to the next page, select the Page Change control beneath the Touch Panel.

NOTE: Only defined features are displayed on the Summary. To display the undefined features, select "Show Undefined Features" at the bottom of the Summary Worksheet.

Breast Measure Assistant (Auto Contour)

You can request that the system trace/outline the border of a breast lesion using Breast Measure Assistant (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.

To automatically detect the breast lesion on the display,

1. Press **Measure**.
2. Press ***Auto Contour (HxW)*** on the Touch Panel.
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 up and to the left.

NOTE: Include the entire lesion, even if additional surrounding tissue is included.

4. Press **Set** on the Trackball. A trace appears around the lesion.

NOTE: Multiple breast lesion traces may be generated by the system. To cycle through the generated contours, use the Select Contours rotary on the Touch Panel.

5. Inspect the generated contour for accuracy. If edits are necessary, execute steps 6-7 to edit the contour prior to accepting the measurement. Otherwise, skip to step 8.
6. To edit the selected contour, move the Trackball to appropriately size the edit region and then press **Set** on the Trackball.
7. 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.

8. After you have completed your edits, press Done on the bottom Set Key or press Print to accept the measurement.

Breast Assistant, Powered by Koios DS (not available in all countries)

Breast Assistant, Powered by Koios DS is a Breast Lesion Analysis Option. Koios DS is integrated with the LOGIQ Totus via DICOM. Koios DS is configured similar to a DICOM Service. The user can accept/dismiss analysis results. If accepted, these results are included in the DICOM Structured Report.

To perform Breast lesion analysis using Koios DS:

1. In B-Mode in the Breast Application, select the Breast Productivity Package Lesion # then press **Koios** via the Touch Panel.

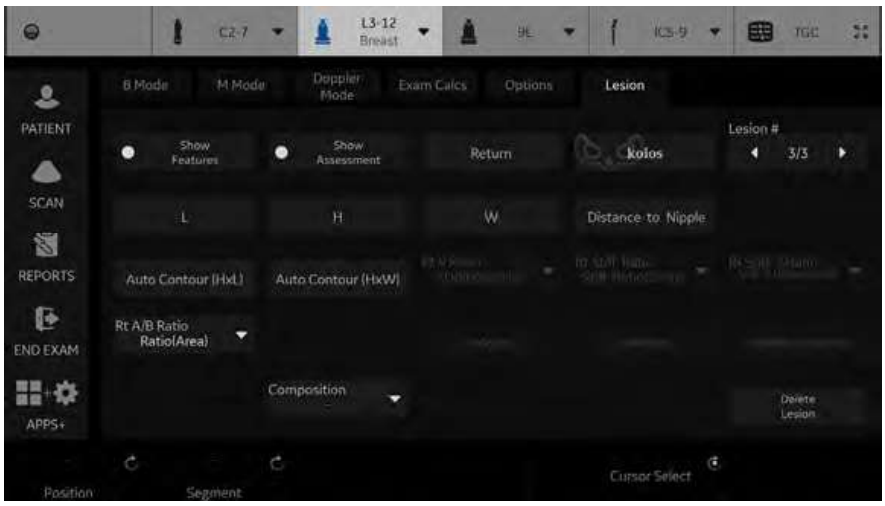


Figure 13-138. B-Mode Touch Panel in Breast Application

NOTE: Koios DS analysis requires a frozen dual B-Mode image with a Length, Width, and Height measurement.

2. Measure the breast lesion (Length, Width, Height) over 2 orthogonal scan planes; or measure the lesion using Auto Contour.
3. Using the Trackball control, press **Analyze**.

Breast Assistant, Powered by Koios DS (not available in all countries) (continued)

4. Koios DS analyzes the lesion (a pop-up appears, “Analyzing”).

Figure 13-139. Koios DS Analysis

5. A pop-up appears with the result of the Koios DS risk assessment and its alignment to an ACR BI-RADS® or U1-U5 risk category.
6. If the assessment is accepted, it becomes part of the exam including being displayed on the exam's Summary Report and included in the DICOM SR data associated with the exam. If the assessment is dismissed, the results are not stored as part of the exam.

NOTE: For additional details of the Koios DS assessment, refer to Koios Medical's Koios DS product documentation.

Thyroid Productivity Package

Overview

A Thyroid Productivity Package is available.

Table 13-60: Thyroid/Parathyroid/Lymph Node/Nodule Touch Panel Controls

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/Isthmus Lymph Node Rt/Lt/Isthmus Nodule	To initiate a Left/Right Thyroid/Parathyroid or Left/Right/Isthmus Lymph Node/Nodule, select the corresponding folder on the Touch Panel. 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: Supraclavicular fossa, Lower cervical, Middle cervical, Upper cervical, Parotid, Submandibular, Submental, Posterior triangle Nodule: • Location A: Upper, Lower, Mid, None • Location B: Lateral, Medial, Midline, None

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 (Top Level Touch Panel)
	  • Resected: Totally, Partially, None (-)
	  • Appearance: Within normal limits, Abnormal, Symmetric, Asymmetric R>L, Asymmetric L>R, None (-)
	  • Comment

Table 13-60: Thyroid/Parathyroid/Lymph Node/Nodule Touch Panel Controls

Preset Parameter	Description

Show Features - Lt/Rt Thyroid / Parathyroid and/ Lt/Rt/Isthmus 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/Isthmus Lymph Node
	  • Appearance: Within normal limits, Suspicious, Pathologic, None (-)
	  • Composition: Cystic, Complex, Solid, None (-)
	  • Vascularity: Normal, Increased hilar, Increased non-hilar, None (-)
	  • Comment

Table 13-60: Thyroid/Parathyroid/Lymph Node/Nodule Touch Panel Controls

Preset Parameter	Description
Show Features - Lt/Rt Thyroid / Parathyroid and/ Lt/Rt/Isthmus Lymph Node / Nodule	• Lt/Rt/Isthmus Nodule The selections for each category/feature and associated points match the ACR® TI-RADS™ (Thyroid Imaging Reporting & Data System) risk-stratification system as published in 2017 by ACR*. Once one or more values are assigned for each feature, the points are summed and the corresponding ACR TI-RADS level is determined. Additional information including feature assignment guidelines and criteria for fine needle aspiration or follow up ultrasound can be found at the American College of Radiology website at: https://www.acr.org/-/media/ACR/Files/RADS/TI-RADS/TI-RADS-chart.pdf?la=en • Composition (choose one): Cystic (0 point), Spongiform (1 point), Mixed cystic and solid (1 point), Solid (2 points), - • Echogenicity (choose one): Anechoic (0 point), Hyperechoic (1 point), Isoechoic (1 point), Hypoechoic (2 points), Very hypoechoic (3 points), - • Shape (choose one): Wider-than-tall (0 point), Taller-than-wide (3 points), - • Margin (if more than one type, choose the most suspicious one): Smooth (0 point), Ill-defined (0 point), Lobulated (2 points), Irregular (2 points), Extra-thyroidal extension (3 points), -. Note: If more than one type, choose the most suspicious. • Echogenic foci (choose all that apply): None (0 point), Comet (0 point), Macrocalcifications (1 point), Peripheral calcifications (2 points), Punctate echogenic foci (3 points), - • Comment • TI-RADS level: TR1, TR2, TR3, TR4, TR5 - TR1 - 0 points - Benign - TR2 - 2 points - Not Suspicious - TR3 - 3 points - Mildly Suspicious - TR4 - 4-6 points - Moderately Suspicious - TR5 - 7+ points - Highly Suspicious NOTE: Although it is possible for a nodule to be awarded zero points and hence be characterized as TR1, all other nodules merit at least two points because a nodule that has a mixed cystic and solid composition (one point) will also gain at least one more point for the echogenicity of its solid component. • Koios DS Assessment * Tessler FN, Middleton WD, Grant EG, Hoang JK, Berland LL, Teefey SA, Cronan, JJ, Beland MD, Desser TS, Frates MC, Hammers LW, Hamper UM, Langer JE, Reading CC, Scoutt LM, Stavros AT. ACR Thyroid Imaging, Reporting and Data System(TI-RADS): White Paper of the ACR TI-RADS Committee. J Am Coll Radiol. 2017May;14(5):587-595. doi: 10.1016/j.jacr.2017.01.046. Epub 2017 Apr 2. PubMed PMID:28372962.
Return	Press to return to the previous Touch Panel.
H	Height
W	Width
L	Length
Isthmus AP	Used to measure the Isthmus anterior to posterior distance.

Table 13-60: Thyroid/Parathyroid/Lymph Node/Nodule Touch Panel Controls

Preset Parameter	Description
Cortical Thickness	Cortical thickness of the lymph node.
Delete	Press to delete this anatomy.

Worksheet and Summary Worksheets

Worksheets and Summary Worksheets are provided for all documented Thyroid anatomies.

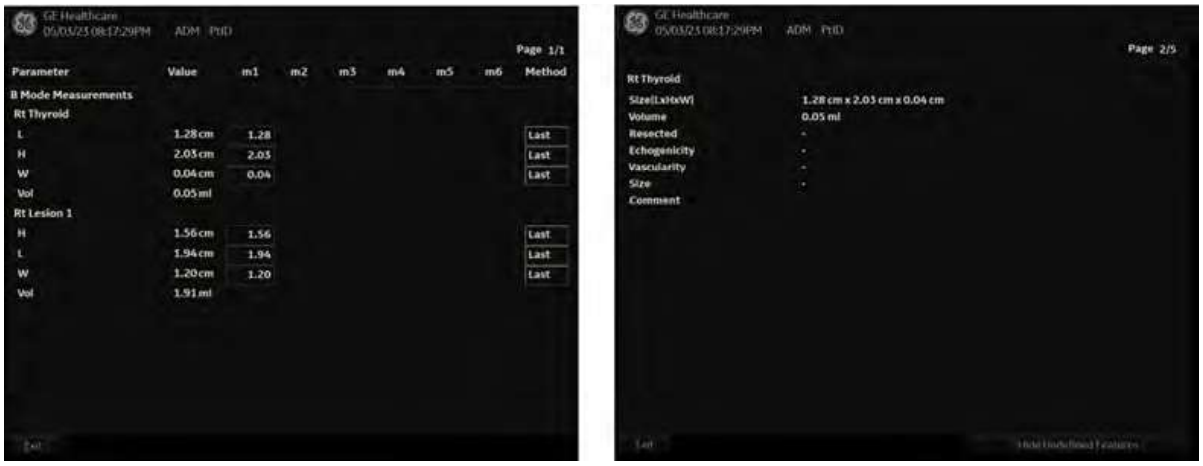


Figure 13-140. Thyroid Worksheet

To move to the next page, select the Page Change control beneath the Touch Panel.

NOTE: Only defined features are displayed on the Summary Report. To display the undefined features, select "Show Undefined Features" at the bottom of the Summary Worksheet.

NOTE: To exit back to the previous measurement screen, press Set on exit.

NOTE: To exit back to the scan screen, press Worksheet/Summary on the Touch Panel.

Thyroid Assistant, Powered by Koios DS (not available in all countries)

Thyroid Assistant, Powered by Koios DS is a Thyroid Nodule Analysis Option. Koios DS is integrated with the LOGIQ Totus via DICOM. Koios DS is configured similar to a DICOM Service. The user can accept/dismiss analysis results. If accepted, these results are included in the DICOM Structured Report.

To perform Thyroid nodule analysis using Koios DS:

1. In B-Mode in the Thyroid Application, select the Thyroid Productivity Package Nodule # then press **Koios** via the Touch Panel.

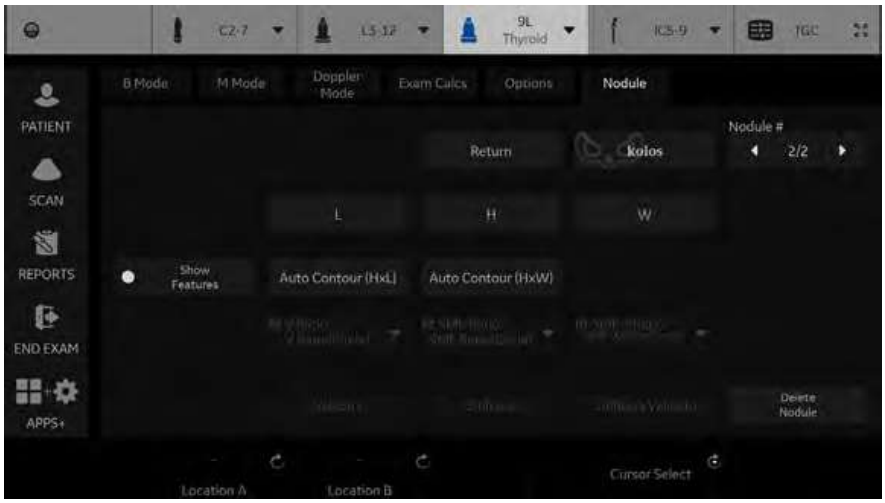


Figure 13-141. B-Mode Touch Panel in Thyroid Application

NOTE: Koios DS analysis requires a frozen dual B-Mode image with a Length, Width, and Height measurement.

2. Measure the thyroid nodule (Length, Width, Height) over 2 orthogonal scan planes; or measure the nodule using Auto Contour.
3. Using the Trackball control, press **Analyze**.
4. Koios DS analyzes the nodule (a pop-up appears, “Analyzing”).

Thyroid Assistant, Powered by Koios DS (not available in all countries) (continued)

Figure 13-142. Koios DS Analysis

5. A pop-up appears with the result of the Koios DS risk assessment and its alignment to an ACR TI-RADS® risk category.
6. If the assessment is accepted, it becomes part of the exam including being displayed on the exam's Summary Report and included in the DICOM SR data associated with the exam. If the assessment is dismissed, the results are not stored as part of the exam.

NOTE: For additional details of the Koios DS assessment, refer to Koios Medical's Koios DS product documentation.

Start Assistant

Introduction

Start Assistant automatically saves exam settings as Exam Mappings when the first image is acquired during an exam. Saved Exam Mappings are automatically recalled when a Worklist item is loaded, keying off the Worklist Exam Description.

Start Assistant has two functional modes:

- On: Use Exam Description (default mode)
- On: Use Scan Assistant only

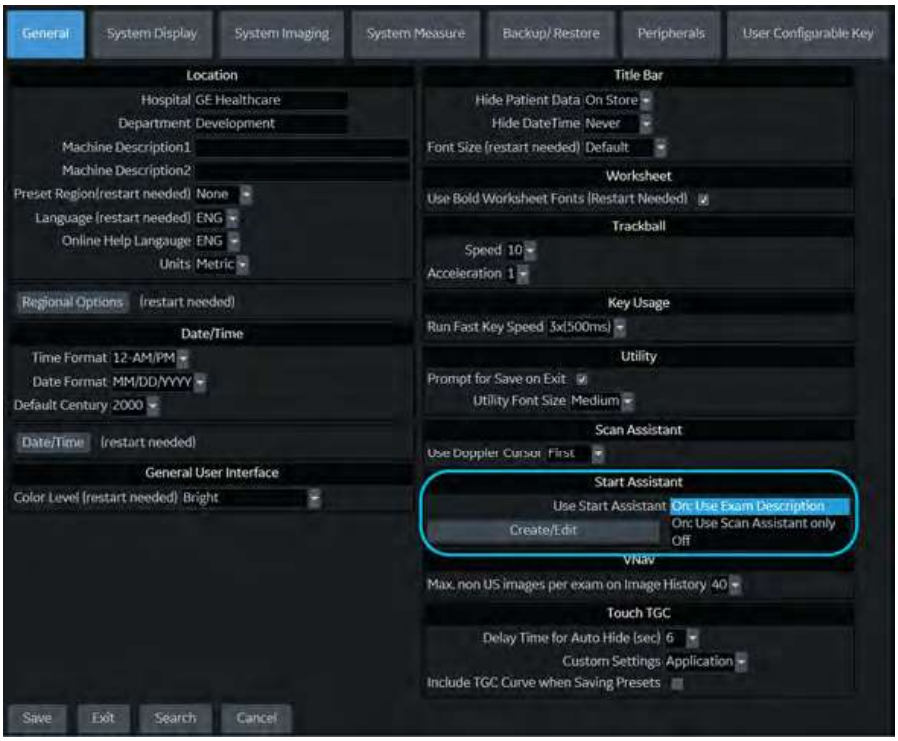


Figure 13-143. Start Assistant Modes

NOTE: An Exam Description or Scan Assistant program entry must be present for Start Assistant to save the Mapping.

On: Use Exam Description Mode

In *On: Use Exam Description* mode, Start Assistant saves and loads the following exam settings:

- Exam Description - Populated from the Worklist item, the Exam Description is the default key by which the exam Mapping is saved.
- Category
- Scan Assistant
- Preset
- Probe

If a new Patient is entered manually (without using a Worklist), and no Exam Description is entered, Scan Assistant will become the key by which the Mapping is saved.

On: Use Scan Assistant only Mode

In *On: Use Scan Assistant only* mode, the exam description is ignored and the selection of the Preset and Probe is based on the Scan Assistant protocol only. The Exam Category and Scan Assistant program are not automatically selected and Start Assistant Editor does not show the Exam Description column. Manual entry of an Exam Description for table entry is prevented.

Saved Start Assistant Exam Mappings can also be added, edited or deleted with the Start Assistant Mapping Editor - See ‘Start Assistant Mapping Editor’ on *page 13-317 for more information.*

NOTE: When using Start Assistant Mapping Editor in “On: Use Scan Assistant only” mode, the Exam Description field will not appear on the Start Assistant Mapping Editor, Add Start Assistant Mapping or Edit Start Assistant Mapping screens.

Start Assistant Mapping Editor

The Start Assistant Mapping Editor can be accessed from the Utility->System->General screen by selecting “Create/Edit” under the Start Assistant section (see Figure 13-144).

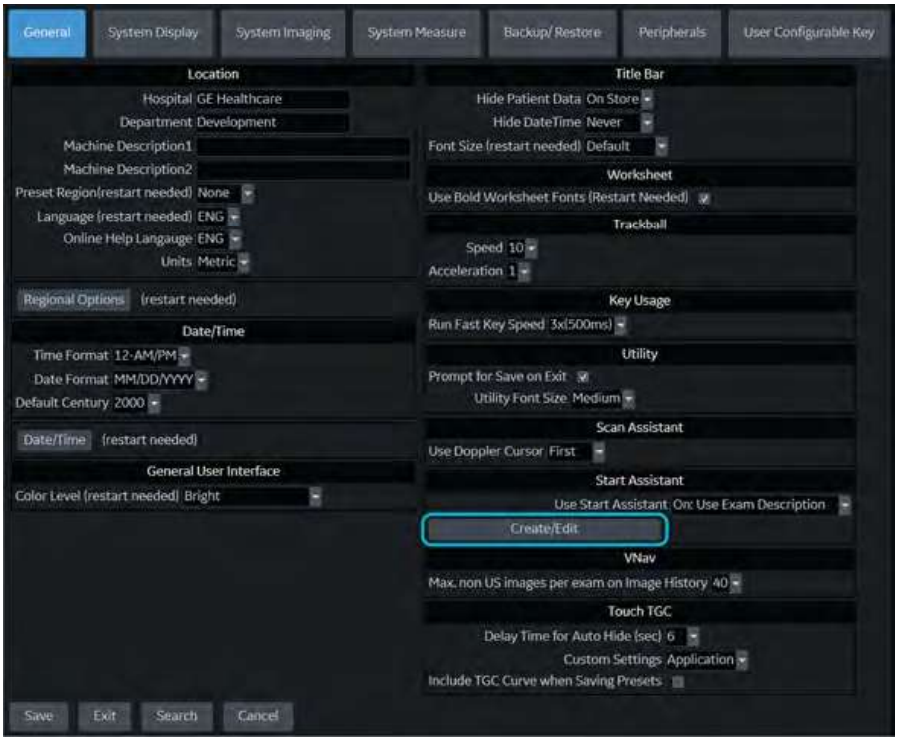


Figure 13-144. Start Assistant Create/Edit

On the Start Assistant Mapping Editor screen you can Add, Edit or Remove a Start Assistant map (see Figure 13-145).

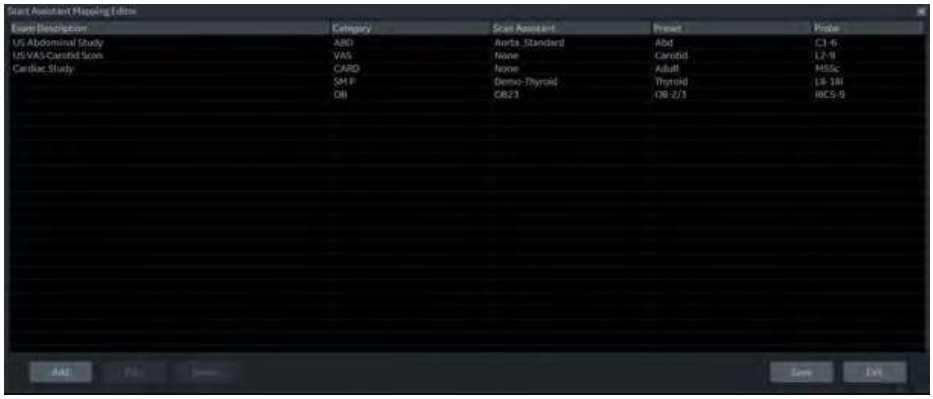


Figure 13-145. Start Assistant Mapping Editor

NOTE: When using Start Assistant Mapping Editor in “On: Use Scan Assistant only” mode, the Exam Description field will not appear on the Start Assistant Mapping Editor, Add Start Assistant Mapping or Edit Start Assistant Mapping screens.

Add a Start Assistant Mapping

Select **Add** from the Start Assistant Mapping Editor screen to add a new mapping (see Figure 13-146).

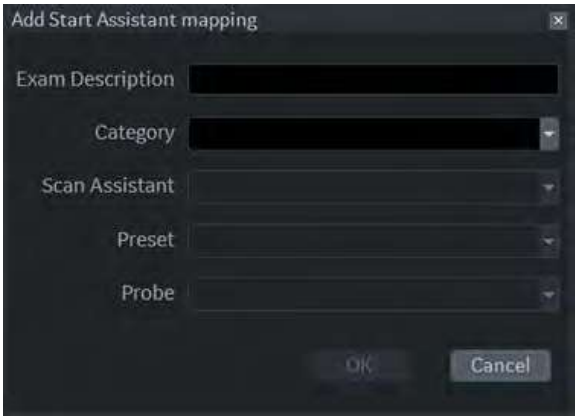


Figure 13-146. Add Start Assistant Mapping

Edit a Start Assistant Mapping

Highlight an existing mapping on the Start Assistant Mapping Editor screen and select **Edit** or double-click the item to edit a mapping (see Figure 13-147).

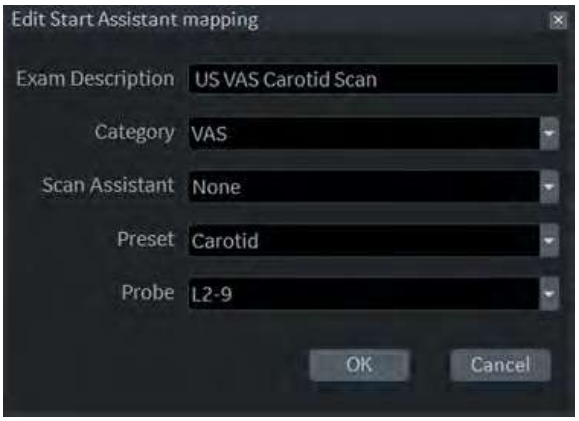


Figure 13-147. Edit Start Assistant Mapping

Delete a Start Assistant Mapping

Highlight one or more existing mappings and select **Delete** to delete.

Save and Exit Start Assistant Mapping Editor

Before exiting Start Assistant Mapping Editor, select **Save** to save any changes you have made.

Select **Exit** to exit Start Assistant Mapping Editor.

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.

NOTE: Scan Assistant Creator (off-board) only supports 64-bit Windows.

Availability

The following additional imaging parameters and preferences are available for use in a Scan Assistant program: Contrast, Contrast Clock, 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 LOGIQ Totus.
- **Export**. Used to move Programs from one LOGIQ Totus system to another LOGIQ Totus.
- **Scan Assistant Creator**. Used to create Scan Assistant Programs.

Scan Assistant Description

Figure 13-148. Scan Assistant Display Description

1. Program name, completed steps/out of total number of steps, and step description area.
2. 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.
3. This column indicates the mode or when a measurement needs to be made.
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. Navigation: Stop, Pause, Pause/Resume. Edit (Pencil Icon). Also available via the left/right keyboard arrow keys. Stop also allows the program to be stopped, restarted, or a new program selected.

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 LOGIQ Totus program.
   a. Insert the media with the saved Program from the Scan Assistant Creator or exported program from another LOGIQ Totus.
   b. Press Utility -> Scan Assistant.
   c. Select Import from the Scan Assistant Manager page.
   d. In the Source field at the top of the Import Programs pop-up, select the media that the Program is stored on.
   e. Highlight the Program(s) to be imported. If a folder is highlighted, all programs in the folder are selected.
   f. Select Import. The Program(s) you selected are stored to the LOGIQ Totus. You can add it to the exam category and user.
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 press the right arrow button to move the imported Program to the exam category and user selected above.

Setting up Scan Assistant (continued)

4. The Program list you created in Utility ->Scan Assistant is visible in the Program field on the Patient menu. Pressing **New Patient** erases any patient data and Scan Assistant program you entered. First press **New Patient** and then set up patient data, Scan Assistant program, and finally, press **Register** Patient.

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, left-hand corner 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.

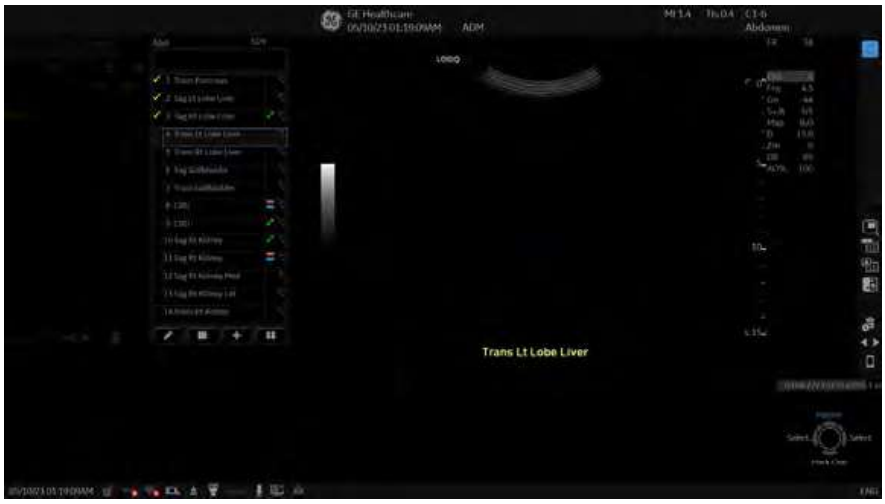


Figure 13-149. Scan Assistant Display

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 or press the left/right arrow on the keyboard.
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 keys.

Reference Images

Overview

Reference images can be attached to a step of Scan Assistant protocol. The reference image is displayed in an extra window on the scan screen during scanning with the protocol.

Any image (JPEG/DICOM) can be attached to (or removed from) a protocol with Scan Assistant Creator.

Using Reference Images

A reference image window appears when a protocol with a reference image attached is active. The window is positioned over the preview window and can be moved anywhere on the screen (the system will remember the last image position).

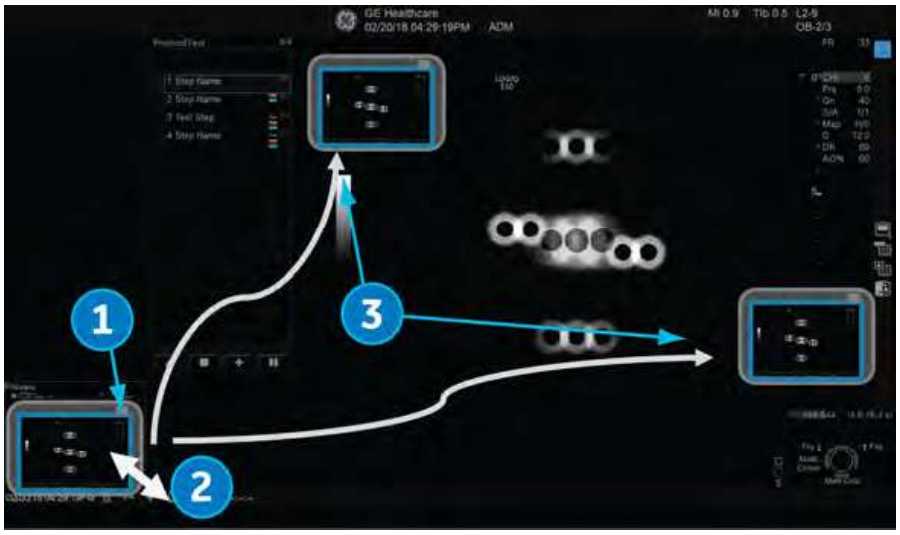


Figure 13-150. Reference Image Window

1. Minimize window by clicking minimize button in upper left window corner.
2. Change window size by dragging window corners.
3. Drag to move window anywhere on screen.

Inserting a step

1. To insert a pre-defined step to the active Scan Assistant Program, press the Plus Sign (+) on the Scan Assistant Display.

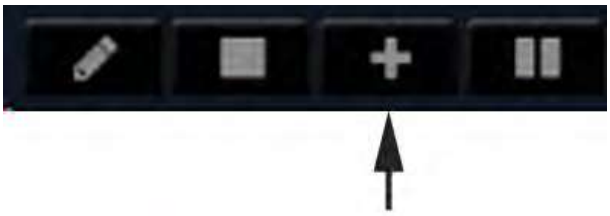


Figure 13-151. Insert Steps

The Insert Steps Pop-Up Menu appears.

2. Select the steps to be inserted via the pull-down Scan Assistant menu.

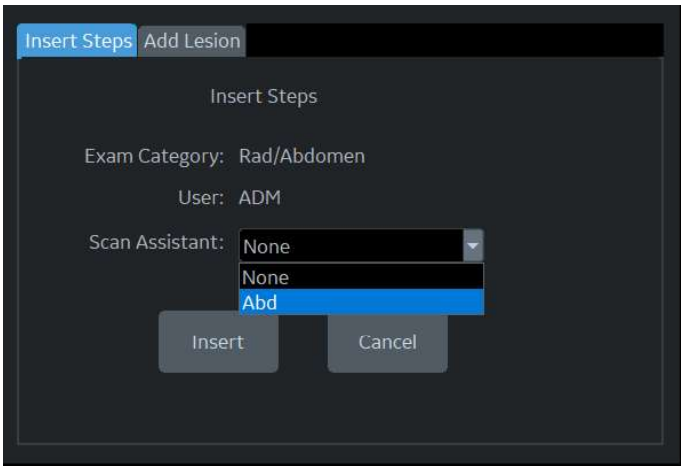


Figure 13-152. Select from pull-down menu

3. Press Insert. All the steps in the inserted program are added immediately after the active step in the current program.

   To undo inserted steps, use Edit button to edit the program and delete the recently inserted steps.

NOTE: After the exam is completed, the system removes the temporarily saved Scan Assistant program with inserted steps.

NOTE: The inserted steps is not adapt the annotation and body pattern from the active step.

Breast Measurement Auto Insert Steps

To add a program to be inserted whenever the Add Lesion key is selected,

1. Press the Plus Sign (+) on the Scan Assistant Display.

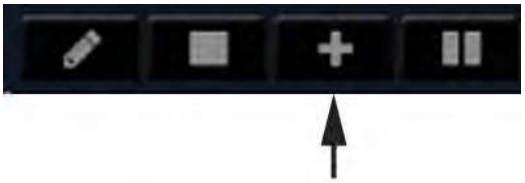


Figure 13-153. Insert Steps

2. Select the "Add Lesion" tab.
3. Identify a breast lesion while using a breast scan assistant program. Freeze on the lesion and press “Add Lesion” on the measurement menu.
4. Complete the length measurement of the lesion. Unfreeze the image.
5. Upon unfreeze, the predefined program is inserted into the existing program and the next step is started.

Figure 13-154. “BreastLesionAssess”

In this example, BreastLesionAssess contains four (4) steps, as indicated within the brackets on the figure above.

Exporting Scan Assistant Programs to Another LOGIQ Totus

Exporting Scan Assistant Programs allows them to be imported to another LOGIQ Totus or to be edited offline with the Scan Assistant Creator tool. To export a Program,

1. Insert the media to save the Program to.
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. Highlight the Program(s) to be exported. If a folder is highlighted, all programs in the folder are selected.
7. Select Export. The Program(s) you selected are stored to the media. You can now import it to a new LOGIQ Totus.

Scan Assistant Creator

Overview

Scan Assistant Creator is used to build customized Programs that can be imported onto the LOGIQ Totus. These Programs automate many of the steps normally performed manually by the user, thereby reducing the number of user actions and the amount of time to perform an exam.

The Scan Assistant Creator tool can be used both on the scanner and as an off scanner tool.

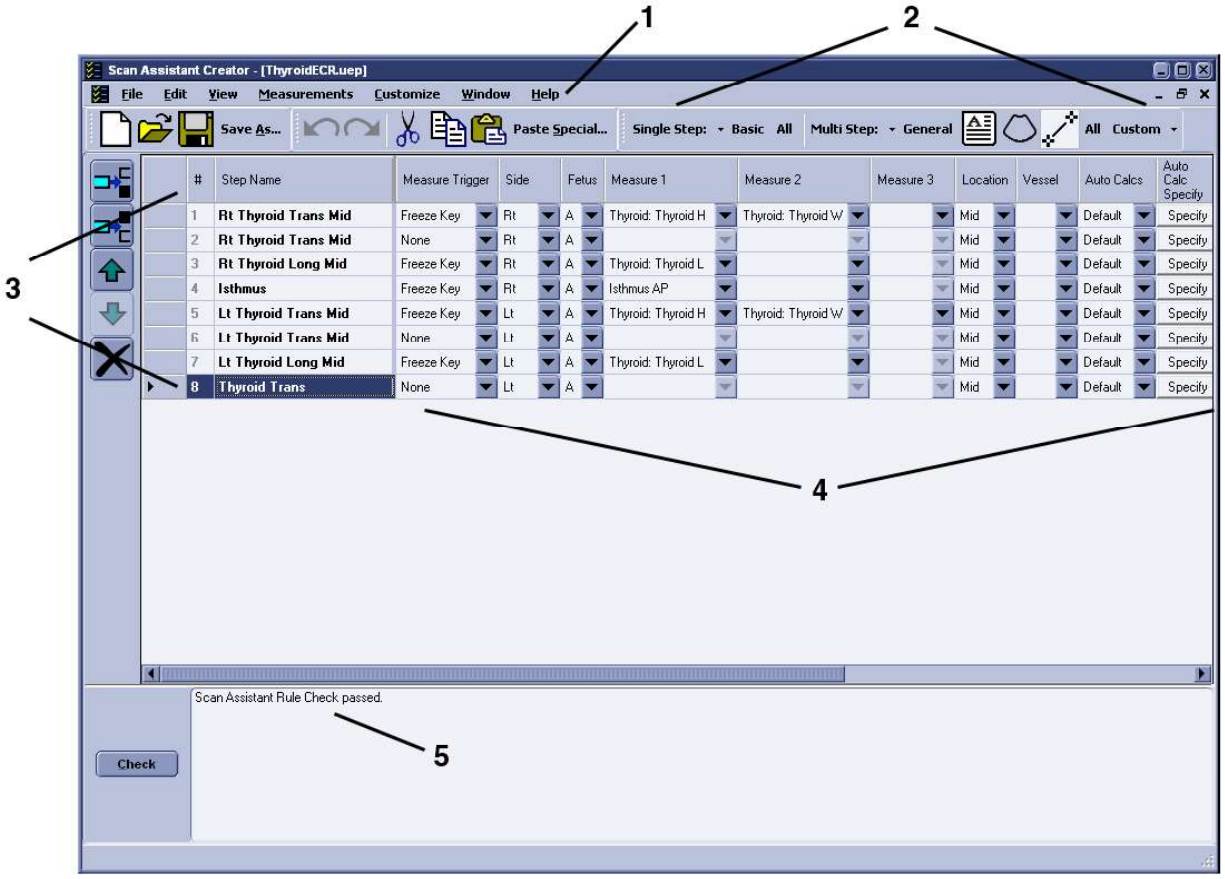


Figure 13-155. Tool Layout Overview

1. Menu
2. Toolbars
3. Steps
4. Step Attributes
5. Rule Checking

Help

Help is available via the F1 key.

File Handling

When using Scan Assistant Creator off the scanner, it is very important to organize the programs in a way that will make it easy to import the programs onto the scanner. Each Program is a computer file. While these computer files can be copied, pasted and deleted like any other computer file, the Program files are only viewable using the Scan Assistant Creator.

File Extensions

Factory defined Programs have an .ep (exam Program) extension while user-defined Programs have an .uep (user exam Program) extension. Both factory and user-defined Programs can be read into the Scan Assistant Creator, but only user-defined Programs are created. If a factory Program is read into the Scan Assistant Creator and then edited, it is saved as a user-defined Program.

Off-Scanner Directory Structure

The Scan Assistant Creator organizes the Programs in a directory structure that allows easy importing into the LOGIQ Totus. In order to be imported, all Programs must be stored in a LOGIQ_SCAN_ASSISTANT Programs Directory. Within this directory, one or more user-specified directories are created. Within each of these user-specified directories are the category directories (VAS, ABD, etc.) that hold the actual Programs.

The dialog in the figure below allows the user to specify the location of the LOGIQ_SCAN_ASSISTANT directory (root directory) and to either select an existing User Program Directory or create a new one.

Figure 13-156. Directory Structure

Exporting Programs from LOGIQ Totus

Factory or user-defined Programs on the LOGIQ Totus are easily exported for editing with the Scan Assistant Creator.

On the LOGIQ Totus:

1. Insert a USB storage device.
2. Select ***Utility*** -> ***Scan Assistant***.
3. Select **Export**.
4. Select the media type and specify a directory. If a directory is specified that already exists, the Export adds the Programs along with any existing Programs. If the names of Programs are the same, use the resulting dialog to decide how to continue.
5. Select the Program to be exported and export them.

On the computer with the Scan Assistant Creator installed:

1. Insert the USB storage device used above.
2. Copy the LOGIQ_SCAN_ASSISTANT directory from the USB storage device to the hard drive. The hard drive directory that you copy to is the root directory. If you want to work with the Programs directly on the USB storage device, this step can be skipped.
3. Either open a Program by double-clicking it or selecting File ‘-> Open from the Scan Assistant Creator.

Importing Programs to LOGIQ Totus

Programs created with the Scan Assistant Creator are easily imported to the LOGIQ Totus.

On the computer with the Scan Assistant Creator installed:

Copy the complete LOGIQ_SCAN_ASSISTANT directory from the computer hard drive to a USB device. The LOGIQ_SCAN_ASSISTANT directory needs to be at the top level (not in a subdirectory) on the USB device.

Table 13-61: Directory Structure Example

LOGIQ_SCAN_ASSISTANT
MyUserNameDirectory
ABD
CARD
GYN
OB
PED
SMP
UR
VAS

On the LOGIQ Totus:

1. Insert the USB device.
2. Select ***Utility*** -> ***Scan Assistant***.
3. Select **Import**.
4. Select the media type.
5. Select the Programs to be imported and import them. If you attempt to import Programs that already exist with the same name, use the resulting dialog to decide how to continue.

Sharing Programs

To share a program with someone else, the file can be sent via e-mail as an attachment or copied onto a media. If the person receiving the program has the Scan Assistant Creator tool installed, open the file and use “Save As” to save it to an appropriate directory.

If the person receiving the program does not have the Scan Assistant Creator tool installed, the program can still be loaded onto a scanner by creating the following structure at the top level directory on a media device, copying the file to one of the category directories and then importing the protocol onto the scanner.

Table 13-62: Media Directory Structure

LOGIQ_SCAN_ASSISTANT
User Program Directory (Any user name)
Category Directories (e.g. ABD, CARD)

To share an entire portfolio of programs with someone else, the entire user program directory can be zipped. Make sure to set the options to include subfolders and to include relative path information. On the receiving end, the user can unzip the directory into a LOGIQ_SCAN_ASSISTANT directory.

Exporting the Scan Assistant Creator to a PC

To export the Scan Assistant Creator to a PC,

1. Insert a USB Flash Drive in a USB port on the Control Panel.
2. Press ***Utility*** -> ***Scan Assistant***.
3. Press ***Export***.
4. Place a checkmark in the Export Scan Assistant Creator Installation.
5. Press ***Export***.

Creating and Editing Programs

To access Scan Assistant Creator on the LOGIQ Totus:

1. Select ***Utility*** -> ***Scan Assistant***.
2. Select **Creator** on the Scan Assistant Manager tab on the monitor.

Creating New Programs

1. Select File -> New.
2. Before creating a New Program, select ***Single Step*** or ***Multi Step*** in the Toolbar.

Figure 13-157. File Toolbar

3. Proceed to add/update your settings for the Step: Step Name, Instructions, etc.
4. Once finished, highlight the finished Step.
5. Select **Edit** -> **Copy**
6. In the Toolbar along the left, select **Insert Step Before Selected** or **Insert Step After Selected**.

Figure 13-158. Insert Step

7. Highlight the copied step and proceed to edit accordingly.
8. Proceed to follow the same procedure to add more steps to your Program.

Creating New Programs (continued)

9. When done, select **Check** to verify your Steps.

Figure 13-159. Rule Check and results area

10. The results are listed as to whether the Scan Assistant Rule Check Passed or if any Issues were detected. Issues found when running the check do not mean the Program is unusable.

NOTE: The rule check may report an unequal number of left and right steps. This may or may not be the expected result. If a change is made in response to the rule check results, a new rule check can be run to see if the issue has been resolved.

Editing Programs

When editing Programs, changes can be made at both the step level and the step attribute level. Steps can be added, inserted, moved, deleted, copied and pasted. Step attributes can be modified for a given step or across multiple steps.

Editing Steps

The step toolbar allows steps to be inserted, moved up and down, and deleted. For steps to be moved, one or more consecutive steps must be selected.

When the last step in a Program is selected, the Enter key automatically appends a new step to the end of the Program and selects the new step. When the Enter key is pressed on any other step, the next step is activated. The up and down arrows can also be used to move between steps.

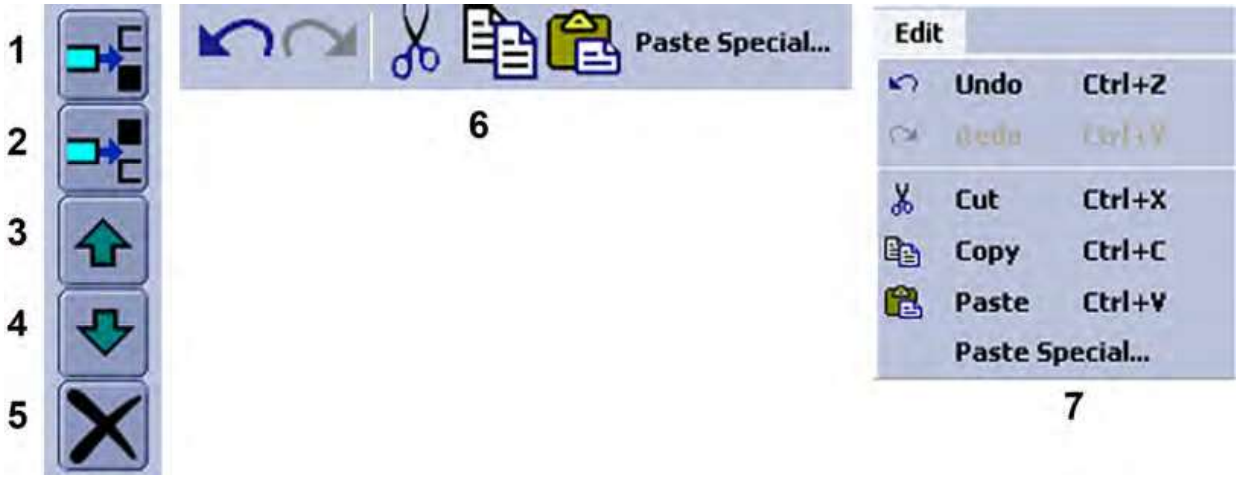


Figure 13-160. Step Toolbar and Edit Toolbar and Menu

1. Insert Step above selected step (Ctrl+I)
2. Insert Step below selected step
3. Move selected step(s) up (Ctrl+Up Arrow)
4. Move selected step(s) down (Ctrl+Down Arrow)
5. Delete selected step(s)
6. Edit Toolbar (Undo, Redo, Cut, Copy, Paste and Paste Special)
7. Edit Menu (same toolset as the Edit Toolbar)

When selecting multiple steps for Cutting or Copying, the Shift + Left Mouse and Ctrl + Left Mouse key combinations can be used.

Editing Steps (continued)

Paste Special

The Paste Special control allows copied steps to be pasted with some modification. Select the desired Conversion and select **Paste**. An added feature to the Paste Special control is the Define Conversions function, which is used to define the text that is converted. An example is shown in the figure below. If an exact case match is found, it is used for the conversion. If there is a match, but with a different case, it is used only if there is not an exact case match.

There are 3 user-defined conversions that can be edited and named. These user-defined conversions can also be used to perform a find and replace capability.

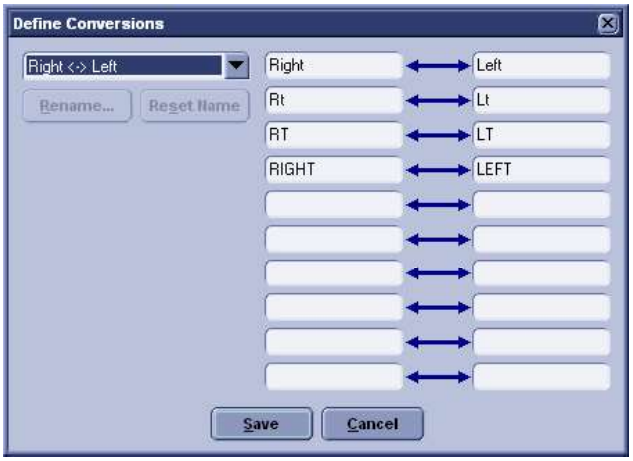


Figure 13-161. Define Conversions Dialog

Editing Step Attributes

To edit a step attribute, select the step attribute and edit it, such as picking from a drop down menu, checking or unchecking a box, or typing in text. To edit multiple steps in a Multi Step view, select the step attribute of choice and do the following actions:

- Set the value of the step attribute as desired.
- Left click (and release) in the square in the bottom right-hand corner of the attribute.
- Drag to highlight the other steps to be changed in the same way.
- Left click (and release) again.

This will take the original step's content and copy it down the highlighted steps. This is also available when multiple attributes are selected within the same step.

To edit multiple steps in the single step view, highlight the multiple steps that you want to edit and then change the step attribute. If a step attribute is highlighted in green, this indicates that its current value varies across the selected steps.

If a step attribute is not editable, it may be because the attribute requires a different attribute to be set a particular way in order to become enabled. These dependencies are outlined below.

Table 13-63: Step Attribute Dependencies

Step Attribute	Dependency
PDI	Color step attribute must be checked
Color / Dop Steer	Color or PW step attribute must be checked
Measure 1	Measure Trigger must not be set to None
Measure 2	Measure 1 must be set
Measure 3	Measure 1 and Measure 2 must be set

Editing the Current Program on the Scanner

If you are currently using a Scan Assistant program and choose to edit that program while using it (by selecting the pencil icon at the bottom of the Scan Assistant steps), the program will be reloaded when scanning is restarted. If the number of steps is changed, the checkmarks that were in place before editing are cleared. If the number of steps in the program has not changed, the checkmarks that were in place before editing are maintained.

The current program can be restarted at any time by selecting the Stop button on the Scan Assistant navigation window and selecting restart.

Opening Existing Programs

Multiple Programs can be open at the same time by selecting File -> Open. Each Program will open within the primary Scan Assistant Creator window. Finding the Program file (.ep or .uep) and opening the file automatically opens the file in the Scan Assistant Creator.

To switch between Programs, the title banner of the window is selected or the Program is selected from the Window Menu. An asterisk indicates that the Program has been edited but not saved.

With multiple Programs open, steps copied from one Program can be inserted into another Program via the paste or paste special features.

Saving Programs

Programs are saved via Save or Save As.

When Saving a Program, the Scan Assistant Creator provides an opportunity to run a rule check on the Program before saving.

NOTE: The name of a Program is appended with an asterisk (*) when the Program has been changed, but those changes have not yet been saved

Views

A Program is made up of a series of steps. Each step is made up of various step attributes. The step and step attribute data can be viewed in many ways using the Scan Assistant Creator. The different ways to look at the data are called Views.

Single Step Views

There are two Single Step views: Basic and All. The Basic view shows the most common attributes of the selected step. The All view shows all of the attributes of a given step.

For both views, the step names are shown on the left with the active step highlighted. The step attributes appear on the right and are separated into four groupings:

- General attributes at the top
- Imaging and Comment attributes on the left
- Measure attributes on the right.

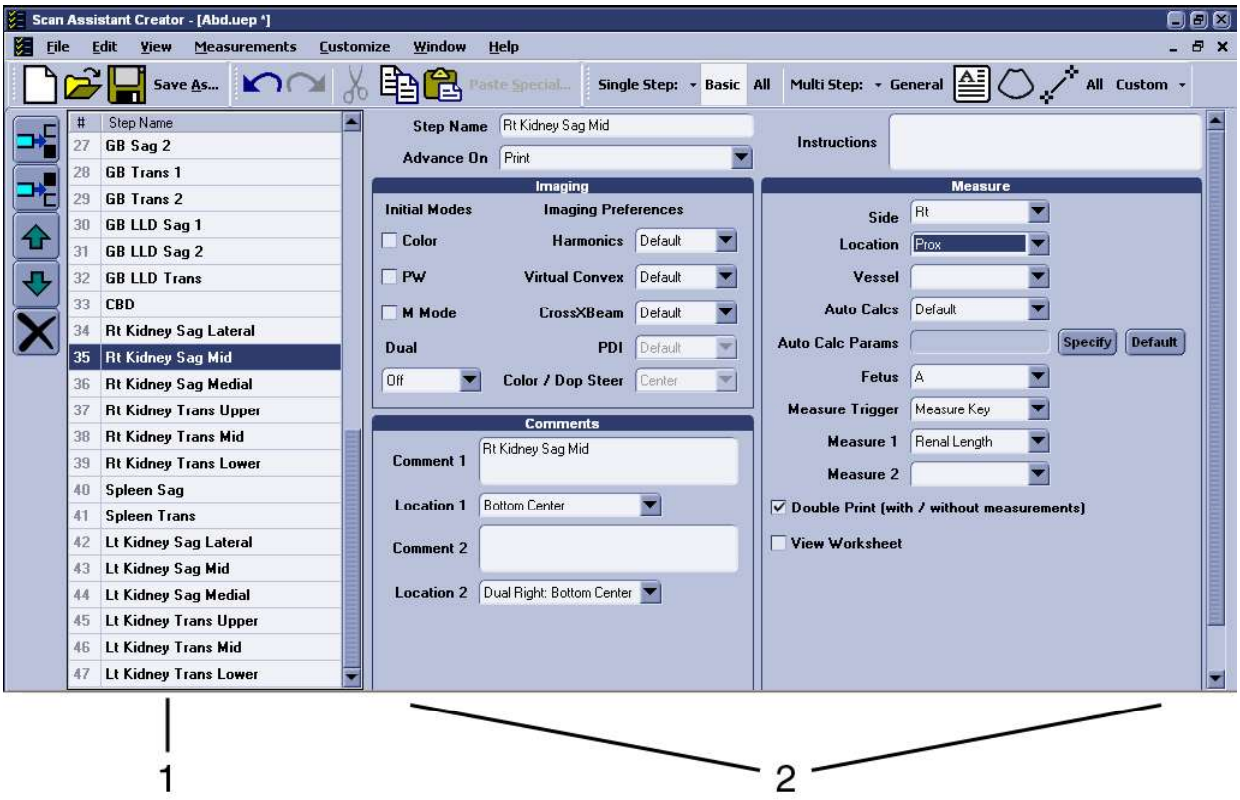


Figure 13-162. Basic Single Step View

1. Steps
2. Step Attributes

Multi Step Views

Multi Step views show certain step attributes for all the steps in a Program. There are six Multi Step views: General, Comment, Scan, Measure, Custom and All.

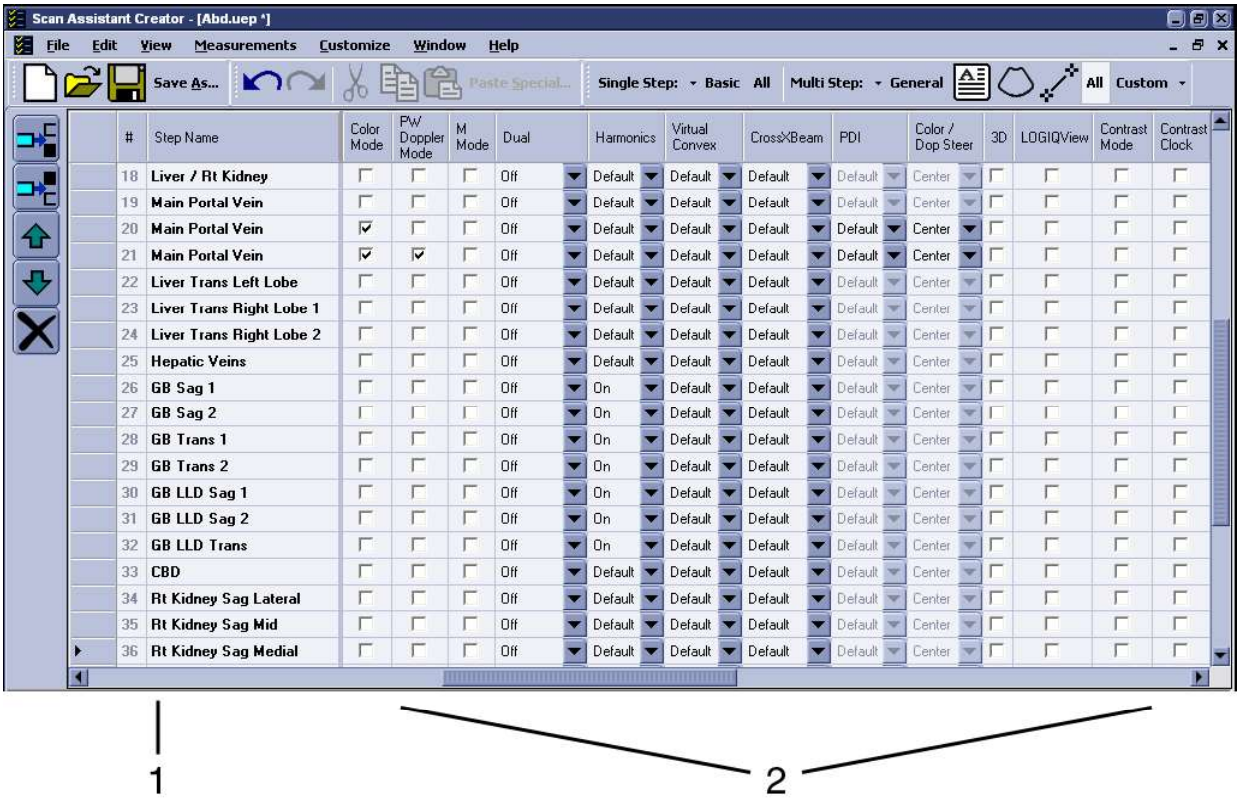


Figure 13-163. Multi Step Scan View

1. Steps
2. Step Attributes

Customizing Multi Step Views and HTML Export

The contents of the Multi Step Views and the HTML Export is configurable via the Customize Menu or the small downward pointing arrow next to the word "Custom" on the View Toolbar Menu.

Figure 13-164. Customize Menu

The Language selection allows the Scan Assistant Creator language to be configured.

The column widths of the steps and step attributes are customizable. The desired width is set by selecting and dragging the line separating column headers. These adjustments are remembered for the next time the Scan Assistant Creator is used.

The locations of the toolbars are customizable. The location is set by selecting and dragging the toolbar gripper as shown in the figure below. The toolbars can be placed at the top, left, right or bottom of the Scan Assistant Creator.

Figure 13-165. Gripper used for Toolbar placement

1. Toolbar Gripper

Customizing Multi Step Views and HTML Export (continued)

Multi Step View

In the Customize Multi Step Views dialog, each tab represents a different Multi Step view. Within a tab, the checked boxes are the step attributes that are displayed in that Multi Step view. The views are independent of one another, so if a step attribute is desired in both views, it needs to be selected in both views.

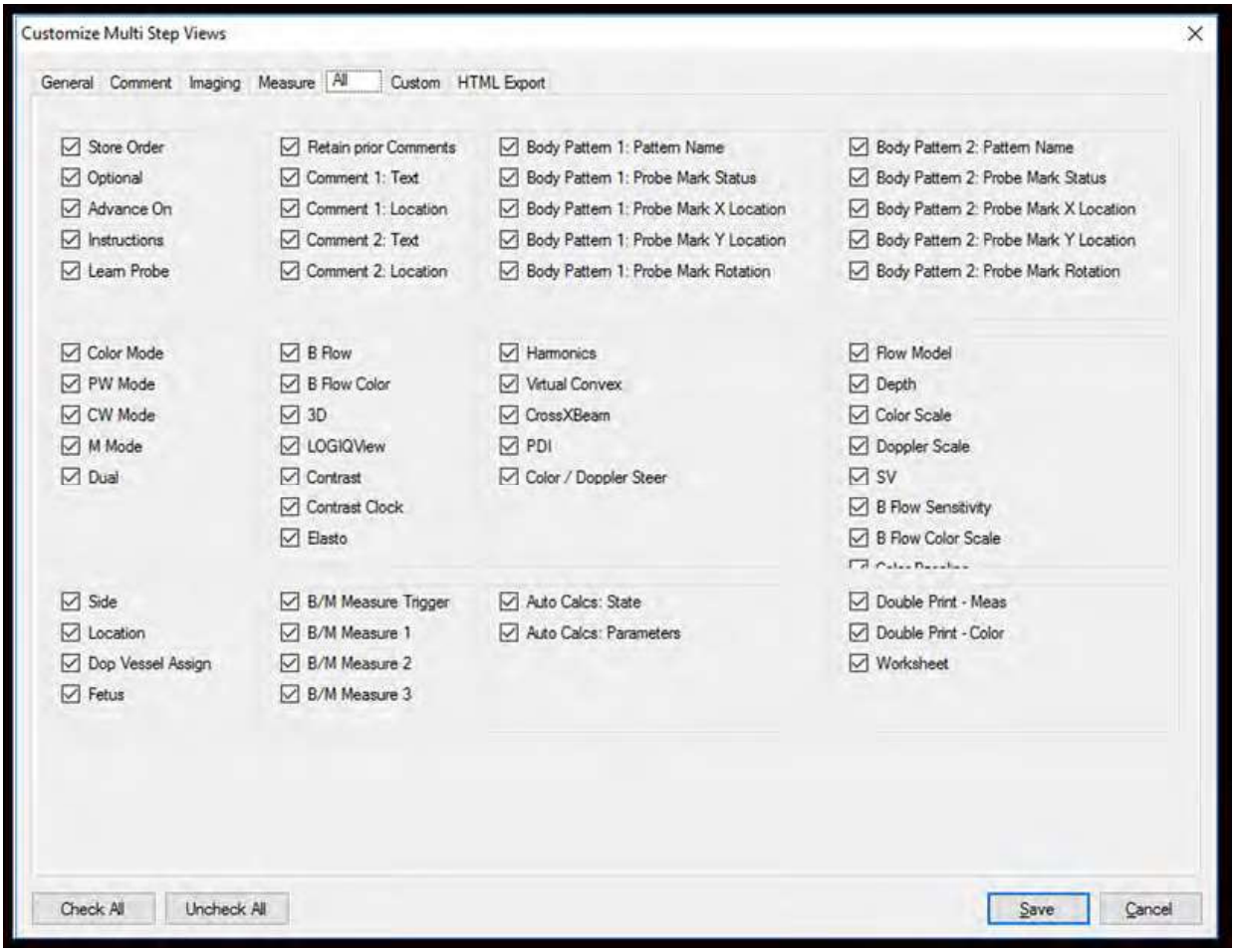


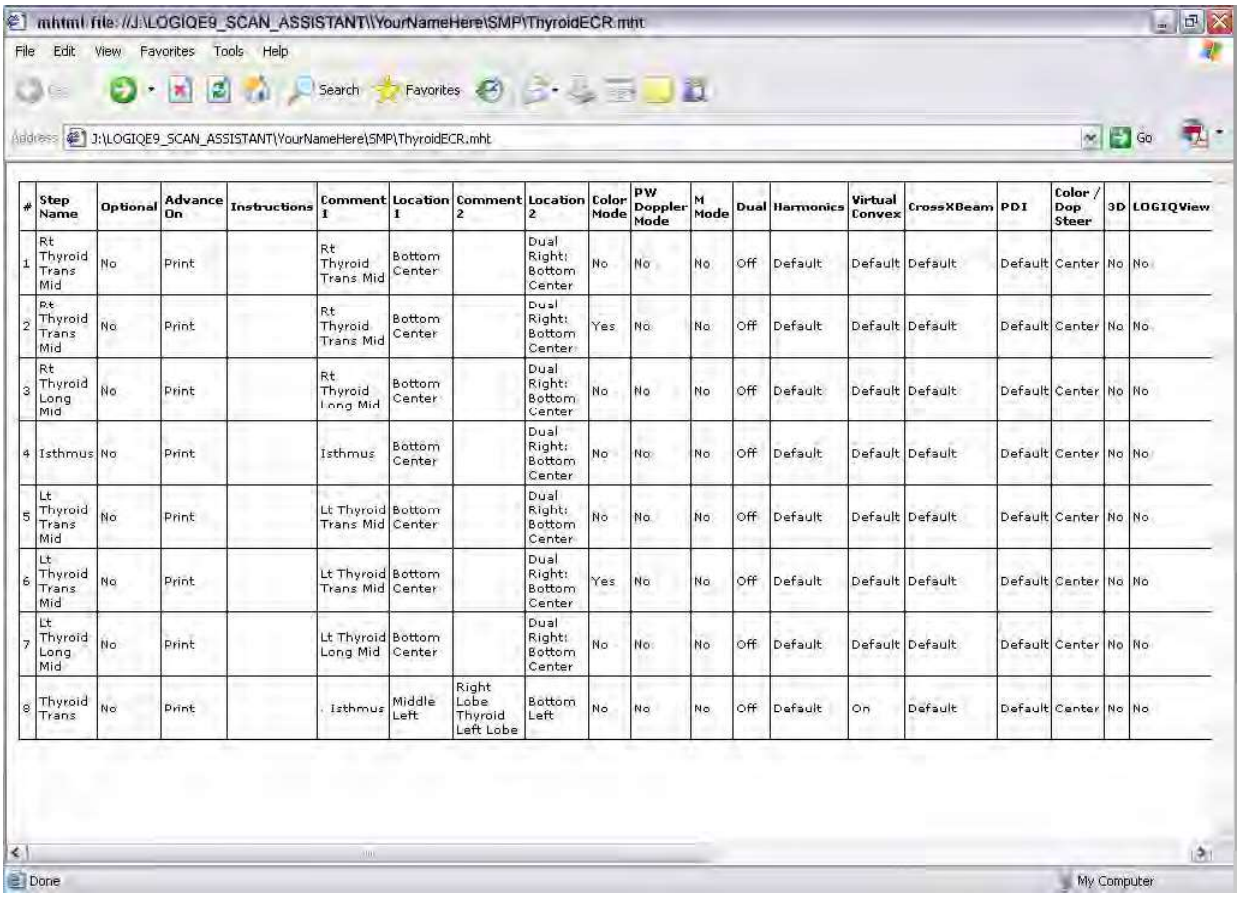
Figure 13-166. Customize Multi Step Views Dialog

Customizing Multi Step Views and HTML Export (continued)

HTML Export

The HTML Export feature allows a Program to be stored in a file format (*.mht) that is compatible with Windows Internet Explorer. This file is useful for printing the Program or viewing the Program, but is not useful for editing the Program. HTML Export is available via the File Menu.

An example of how a Program looks in HTML format is shown below.



#	Step Name	Optional	Advance On	Instructions	Comment 1	Location 1	Comment 2	Location 2	Color Mode	PW Doppler Mode	M Mode	Dual	Harmonics	Virtual Convex	CrossXBeam	PDI	Color / Dop Steer	3D	LOGIQView
1	Rt Thyroid Trans Mid	No	Print		Rt Thyroid Trans Mid	Bottom Center		Dual Right: Bottom Center	No	No	No	Off	Default	Default	Default	Default	Center	No	No
2	Rt Thyroid Trans Mid	No	Print		Rt Thyroid Trans Mid	Bottom Center		Dual Right: Bottom Center	Yes	No	No	Off	Default	Default	Default	Default	Center	No	No
3	Rt Thyroid Long Mid	No	Print		Rt Thyroid Long Mid	Bottom Center		Dual Right: Bottom Center	No	No	No	Off	Default	Default	Default	Default	Center	No	No
4	Isthmus	No	Print		Isthmus	Bottom Center		Dual Right: Bottom Center	No	No	No	Off	Default	Default	Default	Default	Center	No	No
5	Lt Thyroid Trans Mid	No	Print		Lt Thyroid Trans Mid	Bottom Center		Dual Right: Bottom Center	No	No	No	Off	Default	Default	Default	Default	Center	No	No
6	Lt Thyroid Trans Mid	No	Print		Lt Thyroid Trans Mid	Bottom Center		Dual Right: Bottom Center	Yes	No	No	Off	Default	Default	Default	Default	Center	No	No
7	Lt Thyroid Long Mid	No	Print		Lt Thyroid Long Mid	Bottom Center		Dual Right: Bottom Center	No	No	No	Off	Default	Default	Default	Default	Center	No	No
8	Thyroid Trans	No	Print		Isthmus	Middle Left	Right Lobe Thyroid Left Lobe	Bottom Left	No	No	No	Off	Default	On	Default	Default	Center	No	No

Figure 13-167. HTML Export

Keyboard Navigation

In addition to moving the windows pointer and selecting an item, there are several keyboard controls to help navigate through the Views.

Table 13-64: Keyboard Program Navigation

Keyboard Entry	Step Selected	Step Attribute Selected
Enter	Moves to next step. If on the last step, it creates a new step and selects it.	Single Step View: Varies based on the step attribute selected. Multi Step View: Moves to same step attribute in the next step. If on the last step, it creates a new step and selects it.
Tab	Single Step View: Moves to next step. On the last step it moves to the first step attribute. Multi Step View: Moves to the first step attribute.	Moves to next step attribute. If last attribute for the step, moves to next step.
Alt+Tab	Single Step View: Moves to previous step. On the first step it moves to the last step attribute. Multi Step View: Moves to the last step attribute of the previous step.	Moves to next step attribute. If first attribute for the step, moves to previous step.
Up Arrow	Moves to previous step	Single Step View: Varies based on the step attribute selected. Multi Step View: Moves to same step attribute in the previous step.
Down Arrow	Moves to next step	Single Step View: Varies based on the step attribute selected. Multi Step View: Moves to same step attribute in the next step.
Left Arrow	No action	Single Step View: Varies based on the step attribute selected. Multi Step View: Moves to the previous step attribute.
Right Arrow	Single Step View: No action. Multi Step View: Moves to the first step attribute.	Single Step View: Varies based on the step attribute selected. Multi Step View: Moves to next step attribute.
Page Up	Scrolls to previous page of steps	Single Step View: Varies based on the step attribute selected. Multi Step View: Moves to same step attribute in the previous step.
Page Down	Scroll to next page of steps	Single Step View: Varies based on the step attribute selected. Multi Step View: Moves to same step attribute in the next step.

Scan Assistant Features

Scan Assistant allows the user to program the steps in an exam and to program certain attributes for each step. The attributes are what give the Scan Assistant Program behavior. The tables below provide the names of all attributes along with a description.

General Attributes

Table 13-65: General Attributes

Attribute Name	Description
Store Order Specify	Used to enable the Store Order Definition dialog so that the Store Order can be set
Store Order	Specifies the Store Order number associated with the Step
Step Number	Number of the step that appears in the Scan Assistant Navigation menu
Step Name	Name of the step that appears in the Scan Assistant Navigation menu
Advance On	• Print: Advance to the next step and go live after Print / Image Store (e.g P1 key). This can be a single image store or a loop store. • Print & Unfreeze: Advance to the next step after Print / Image Store (e.g. P1 key) and unfreeze. This can be a single image store or a loop store. • User Selection: Advance to next step only after next step is manually selected (e.g. down arrow)
Instructions	User notes displayed in the Scan Assistant Navigation menu when the step is active
Optional	Optional: An optional step is given a check mark during Program execution even if no image is acquired Mandatory: A mandatory step is give a check mark only if an image is acquired for the step
Learn Probe	On or Off. Learn and change the probe for the user, when selected.

Comment Attributes

Table 13-66: Comment Attributes

Attribute Name	Description
Comment 1, Comment 2	User annotation associated with the step. When editing in a Multi Step View, use Alt+Enter to create a new line.
Location 1, Location 2	Choose where the annotation is located on the image area for single or dual screens.
BP 1,2	Blank: Body Pattern not specified. Selected Body pattern graphic with or without probe position will be set, if selected
BP Specify	Used to enable the Body Pattern Selection dialog so that the Body Pattern graphic can be selected and probe position can be set
BP Clear	Clears BP 1, BP 2 defined for the step
BP Probe	BP Probe mark set by Scan Assistant, when selected
BP X/Y/Rot	Displays the X/Y/Rot information of the Probe mark set from Body Pattern Selection dialog

Imaging Mode and Imaging Preference Attributes

The probe and application associated with a program is not configurable. Instead, the scanner remembers the last probe and application used for a given Scan Assistant program and automatically selects them the next time the program is started.

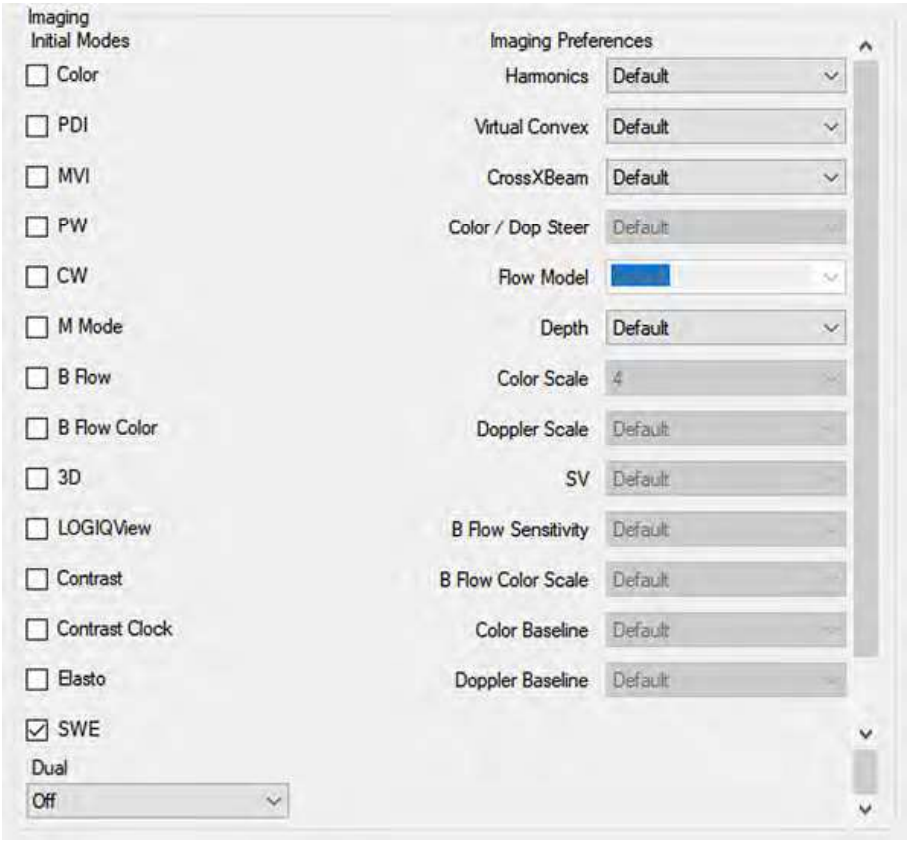


Figure 13-168. Imaging Mode and Imaging Preference Attributes

Table 13-67: Imaging Mode Attributes

Attribute Name	Description
Color, PDI, MVI, PW, CW, M Mode, B Flow, B FLow Color, 3D, LOGIQView, Contrast, Contrast Clock, Elasto (Strain Elastography) and SWE (Shear Wave Elastography)	• On - when selected, the mode is on. • Off - when not selected, the mode is off.
Dual	• Off - Dual screen is not in use. • Left Active - Dual screen is active and the left image is the active image. • Right Active - Dual screen is active and the right image is the active image. • DualView (simul) - DualView is active (both left and right images are live).

Imaging Mode and Imaging Preference Attributes (continued)

NOTE: B Flow Color is not supported by the LOGIQ Totus. It still exists in Scan Assistant Creator because other products that offer B Flow Color use the Scan Assistant Creator program.

Imaging Preferences work slightly different than other attributes. For example, if an abdomen Program has 20 steps and all steps have the Harmonics attribute set to Default, then Scan Assistant will not affect the harmonics setting. Now, assume that steps 10-12 are gallbladder steps and that the harmonics attribute has been set to on for these steps. When transitioning into this group of steps (step 9 to step 10), harmonics will be turned on (or remain on if it was previously on). If harmonics is then manually turned off in step 10 then Scan Assistant will not turn it back on when advancing to step 11. In other words, a group of consecutive steps with the same Imaging Preference are treated as a group by Scan Assistant and not as individual steps.

Table 13-68: Imaging Preference Attributes

Attribute Name	Description
Harmonics	• On - when selected • Off - when unchecked • Default - Not specified so Scan Assistant does not set this attribute.
Virtual Convex	
CrossXBeam	
Color/Doppler Steer	• Left - Color/Doppler steered to the left • Center - Color/Doppler not steered • Right - Color/Doppler steered to the right
Flow Model	• Specified Flow Model is selected - Aorta, Renal, Penetration, Slow Flow, Med Flow, Fast Flow • Default - Not specified so Scan Assistant does not set this attribute.
Depth	• 2.0 to 36.0. • Default - Not specified so Scan Assistant does not set this attribute.
Color Scale	• 1 to 200. • Default - Not specified so Scan Assistant does not set this attribute.
Doppler Scale	
SV	• 1 to 16. • Default - Not specified so Scan Assistant does not set this attribute.
B-Flow Sensitivity	• 1.0 to 50. • Default - Not specified so Scan Assistant does not set this attribute.
B-Flow Color Scale	• 0.02 to 1.5. • Default - Not specified so Scan Assistant does not set this attribute.
Color Baseline	• 0 to 100. • Default - Not specified so Scan Assistant does not set this attribute.
Doppler Baseline	• 5 to 95. • Default - Not specified so Scan Assistant does not set this attribute.

Measurement Attributes

Figure 13-169. Measurement Attributes

Table 13-69: Measure Attributes

Attribute Name	Description
Side	When selected, the side measurement qualifier is set to: • Rt - Right side of the body • Lt - Left side of the body • None - Not used (neither Right nor Left) • Default - Side not specified so Scan Assistant does not set Side
Location	When selected, the location measurement qualifier is set to: • Prox - Proximal • Mid - Middle • Dist - Distal • None - Not used • Default - Location not specified. Scan Assistant does not set Location
Dop Vessel Assign	Various Doppler measurement Vessel folders Specifies the Vessel folder to assign auto calcs to. The assignment happens when the image is stored / printed (e.g. P1 key).
Auto Calcs	When selected, the Auto Calcs state is set to: • Frozen • Live • Off • Default - Auto Calcs state not specified. Scan Assistant does not set Auto Calcs state.
Auto Calc Params	• Various Auto Calc parameters - specifies the auto calc parameters to be used. • Default - Auto Calc parameters are not specified. Scan Assistant does not set the Auto Calc parameters.
Auto Calc Specify	Used to enable the Auto Calcs Parameter Selection dialog so that the Auto Calc Params attribute can be set
Auto Calc Default	Used to set the Auto Calcs Params attribute to Default.

Table 13-69: Measure Attributes (Continued)

Attribute Name	Description
Fetus	When selected, the fetus measurement qualifier is set to: • A - Fetus A • B - Fetus B • C - Fetus C • D - Fetus D • Default - Fetus not specified so Scan Assistant does not set Fetus
B/M Measure Trigger	When selected, the following action initiates the “Measure 1” attribute: • Measure Key • Freeze Key • Image Store - when the Measure key is manually selected or the image is stored. This is used to store / print an image and then measure on it and then store it again. Therefore, the Advance On Print attribute is ignored on the first store / print when the Measure Trigger attribute is set to Image Store. • None - Measurements are not triggered by Scan Assistant. The "Measure 1" attribute is ignored.
B/M Measure 1	Various 2D or M-Mode measurements Specifies the first 2D or M-Mode measurement to be initiated. The point at which the measurement is initiated is based upon the Measure Trigger attribute.
B/M Measure 2	Various 2D or M-Mode measurements Specifies the second 2D or M-Mode measurement to be initiated after the measurement associated with the Measure 1 attribute is completed.
B/M Measure 3	Various 2D or M-Mode measurements Specifies the third 2D or M-Mode measurement to be initiated after the measurement associated with the Measure 2 attribute is completed.
Double Print - Meas	• On - If an Image Store / Print (e.g. P1 key) is performed on an image with measurements, the image is stored / printed two times, once with the measurements and once without. • Off - No special Store / Print behavior.
Double Print - Color	• On - If an Image Store / Print (e.g. P1 key) is performed on an image with color, the image is stored / printed two times, once with color and once without. If double print on color and double print on measurements are both configured to be on, the image is stored / printed two times, once with the measurements and once without. • Off - No special Store / Print behavior.
View Worksheet	• On - The worksheet is turned on • Off - The worksheet is not turned on

Measurements

Because there are many measurements available on the LOGIQ Totus and because the measurement package is highly customizable, there is some special handling for measurements. The Measurement attributes affected by this special handling are Measure 1-3 and Vessel.

Selecting a Measurement Package

The Measurement selection menu can be used to specify which measurement package is to be used for the Program. The Measurements packages are organized by category and subcategory. The choices for the Measure 1-3 and Vessel attributes are limited by the selection of category and subcategory. To select a subcategory, select a category, move to the subcategory list and select a subcategory. To select all subcategories for a given category, select the category and then reselect the Measurements menu item to remove the menu.

A single Program is not allowed to have measurements from multiple categories, but it may have measurements from multiple subcategories.

Figure 13-170. Measurements Menu

User-Defined Measurements

User-defined subcategories and individual measurements can be used with the Scan Assistant feature. To do so, the Scan Assistant Creator needs to know about the user-defined measurements on the LOGIQ Totus.

On the LOGIQ Totus, use the Scan Assistant utility menu to Export Programs to a USB storage device. On the export menu, check the "Export user config data" checkbox to store the user-defined measurement information to the Program User Directory on the media. The name of the file is UserConfigSystemFile.res. When this file exists in the Program User Directory, then it is used. Otherwise, the default file installed with the Scan Assistant Creator is used.

Rule Checking

Scan Assistant Creator allows Programs to be checked. During a rule check, Scan Assistant Creator applies a series of rules against the Program being checked and reports any inconsistencies between the rules and the Program. This rule check is intended to find potential issues in the Program before it is tested on a LOGIQ Totus. Issues found when running the check do not mean the Program is unusable. It means that if there happens to be a problem with running the Program, the first place to look would be at the Issue noted when you ran the Check.

For example, if there is a step name Right Kidney and the Measurement Location is set to "Left", the rule check would report this inconsistency.

Running a Rule Check

The "Check" button below the Program area is used to initiate a rule check. The results are displayed in the Rule Check Results window to the right of the button. A rule check is also initiated when attempting to save a Program that has not previously passed a rule check.

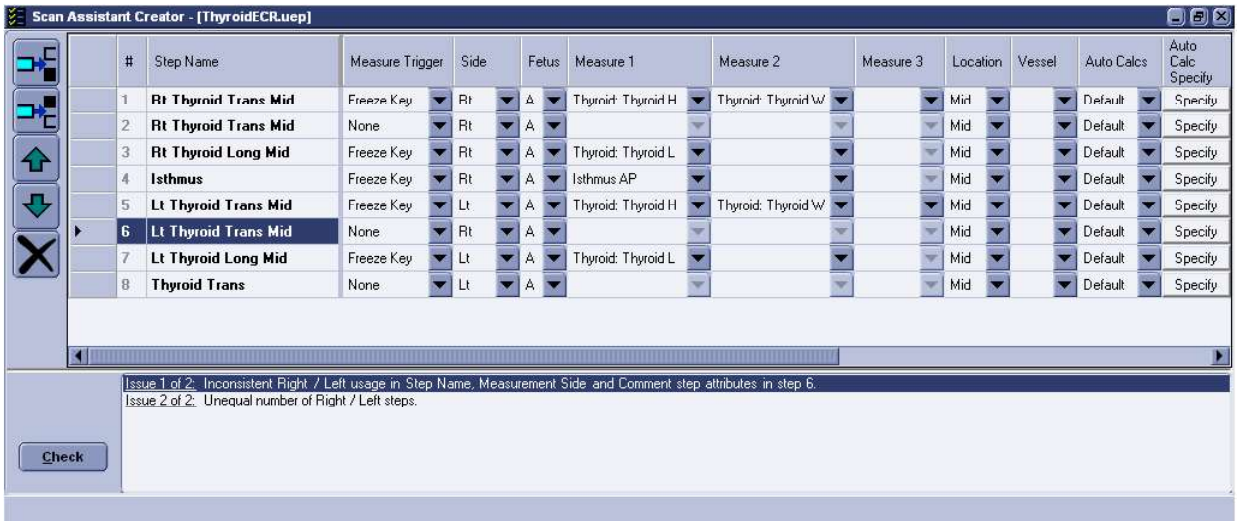


Figure 13-171. Rule Check Button and Rule Check Results

Rule Check Results

If the issue is specific to a particular step, double-clicking on the issue number in the Rule Check Results window selects the step associated with the issue. The results are intended to be potential issues and therefore may be ignored at the discretion of the user. For example, the rule check may report that there are an unequal number of left and right steps. For a particular Program, this may be the expected result. If a change is made in response to the rule check results, a new rule check can be run to see if the issue has been resolved.

Compare Assistant

Overview

Compare Assistant allows you to perform serial scans on a patient when you can compare the images from a patient's previous exam(s) to the patient's current exam.

NOTE: In order to reload imaging parameters from a previous exam, the image must have been stored as raw data.

NOTE: Side-by-side scanning comparison is present whether or not you are able to import the scanning parameters.

In Comparison Mode the system can automatically reload scanning parameters from a previous exam performed on a LOGIQ Totus archived as raw data and allow for side-by-side scanning for image comparison. This allows you to use consistent scanning parameters from exam to exam on the same patient and may assist in assessing the progress of the patient.

Compare Assistant is available in B-Mode, Harmonics, Contrast, and in Color Flow and Power Doppler Imaging Modes.

In B-Mode the following parameters can be transferred from the Compared Image to the Active B-Mode Image: Gain, Depth, Frequency, CrossXBeam, Virtual Convex (linear probes), SRI, Frame Averaging, Map, Dynamic Range, Acoustic Output, Harmonic state, Focal Zone Number and Position, Width, and Line Density.

In Color Flow/PDI Mode the following parameters can be transferred from the Compared Image to the Active Color Flow/ PDI Mode image: Gain, ROI Size/Position, Frequency, Frame Averaging, Packet Size, Flow Model, Scale (PRF), Wall Filter, Spatial Filter, Acoustic Output, Invert, Threshold, Sample Volume, Color Map, Virtual Convex (linear probes), and Line Density.

Overview (continued)

Image parameter copy is supported for the following additional modes: Contrast (supports depth, focal zone position, acoustic output, and frequency), Elasto (supports ROI size, ROI position, frequency, and scale), and B-Flow (supports depth, frequency, focal zones, and sensitivity).

Annotations and Body Patterns can also be transferred from a patient's previous exam to the patient's current active exam.

Up to four (4) exams, three (3) other exams and the current active exam, can be compared. Each exam is displayed on the bottom of the display, with Tabs indicating each exam. Tabs are shown in chronological order with the most recent exam displayed on the left.

Compare Assistant is not supported with V Nav, 3D/4D, Quantitative Analysis, Stress Echo, or LOGIQView.

Only measurements taken during the active exam are transferred to the current exam's Worksheet; previous exam measurement information is not included on active worksheets.

In order to utilize the Compare Assistant tool, images should have RawDICOM data. The RawDICOM data is saved locally when available. Some scanning modes do not provide raw data. If the raw data associated with the comparison image cannot be displayed in dual image format, the DICOM image data is used to display the image. RawDICOM data is typically removed when images are sent to PACS; therefore, images that are loaded using Query/Retrieve will likely be standard DICOM only.

NOTE: Images from some other 'unsupported' modes (PW Mode, CW Mode, and M-Mode) can be recalled in Compare Assistant, but the tool will not attempt to copy over imaging parameters unless it is one of the types listed above (it will still attempt annotation copy). Imaging parameter copy will also not be attempted unless the current probe is the same as the probe used to capture the original image and RawDICOM data for the original image is available.

Workflow example

NOTE: If you use DICOM images for comparison, check the "Compare" checkbox on the DICOM Image folder and press Compare on the Image History page.

1. Place the cursor on the Compare Assistant icon and press Set to activate Compare Assistant.
2. Place the cursor on the date tab of the desired comparison exam and press **Set**.
3. Place the cursor on the desired comparison image and press **Set**.
4. Start scan and freeze the image at the same position to make a comparison.

   Use Copy Setting Icon as necessary. Comparison Image parameters transfer to the Active Image based on your preset (automatic or manual)
5. Place the cursor on the Compare Assistant icon and press Set to deactivate Compare Assistant.

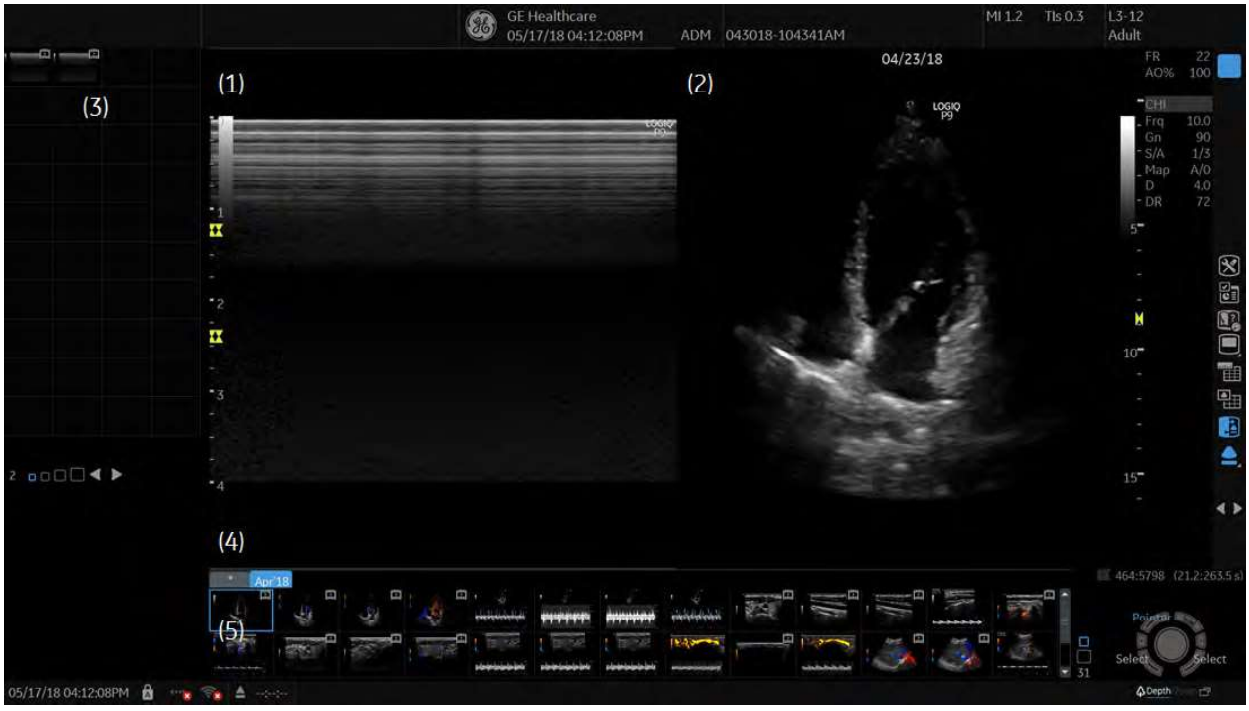


Figure 13-172. Compare Assistant Screen (example)

1. Active Image
2. Comparison Image
3. Active Exam clipboard
4. Date tab of comparison exam
5. Comparison exam clipboard

Setting Up Compare Assistant

Compare Assistant allows you to set the following parameters:

- Side to place the compared image (left/right)
- Date settings for the compared image
- Imaging and Annotation parameters to be copied from the patient's Compared to the Current image
- Clipboard, Active Image, and Image History Label Layout and Color

You can set these parameters on the System Imaging page via Utility--> System--> System Imaging.

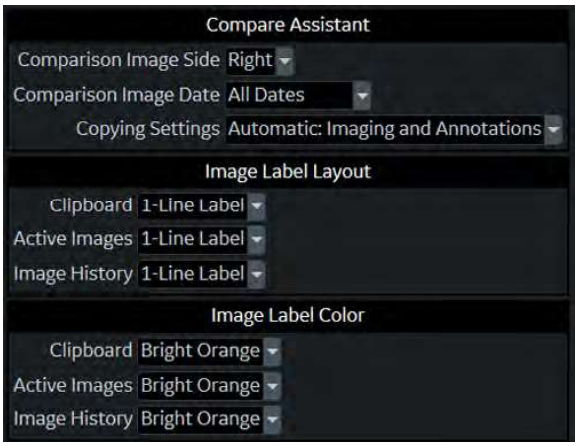


Figure 13-173. Setting Up Compare Assistant Parameters

Table 13-70: Compare Assistant Parameters

Parameter	Settings
Comparison Image Side	• Left • Right (Default)
Comparison Image Date	• All Dates (Default): The date is always displayed on the comparison image. • Different Date: Date only displayed when the date of the comparison image is different than the active exam date. • None: No comparison image date is displayed.

Table 13-70: Compare Assistant Parameters

Parameter	Settings
Copying Settings	You can set the default Compare settings on the System Imaging Utility page or you can select the Compare setting via the On-screen controls. Comparison Image parameters transfer to the Active Image based on your preset (automatic or manual). **Automatic Settings** are copied from the Comparison Image to the current image as soon as the comparison image is loaded. • **Automatic: Imaging & Annotations** (Default): Imaging Parameters, Annotations, and Body Patterns copied • **Automatic: Imaging Only:** Only Imaging Parameters copied • **Automatic: Annotation Only:** Only Annotations and Body Patterns copied **Manual Settings** are copied from the Comparison Image to the current image when you manually select the control. • **Manual: Imaging & Annotations:** (Default) Imaging parameters, Annotations, and Body Patterns copied • **Manual: Imaging Only:** Only Imaging Parameters copied • **Manual: Annotations Only:** Only Annotations and Body Patterns copied **Off**: No parameters copied.
Note: Copy settings are restored to the default whenever Compare Assistant is turned on and the active exam or current patient has changed since the last time it was on.	
Image Label Layout: Clipboard Active Images Image History	• No Label • 1-Line Label (Default) • 2-Line Label
Image Label Color: Clipboard Active Images Image History	• Bright/Soft White • Bright/Soft Yellow • Bright/Soft Red • Bright/Soft Orange • Bright/Soft Blue • Bright/Soft Purple

To set Compare Assistant print parameters, select Utility--> Connectivity--> Button--> Advanced. You can set the system to print the Comparison image only, to store the New Image only; or to store both the Comparison and New Image.

Compare Assistant Controls

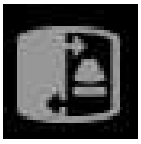
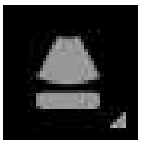
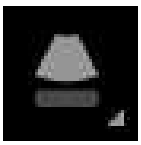
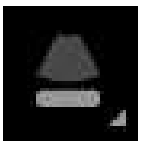
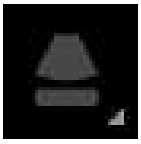
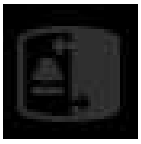
The following controls can be used while in Compare Assistant:

Table 13-71: Compare Assistant Controls

Control	Description
	1. Image Display Area Icon 2. Worksheet 3. Active Image Screen 4. Compare Assistant On/Off. Select the Compare Assistant Icon to activate Compare Assistant. 5. Copying Settings 6. Save As Menu 7. Next/Previous Image, or Press [Ctrl]+[Next Image Arrow] to start a Slide Show.
Keyboard Arrow Keys	You can also use the Arrow Keys on the Keyboard to move to the next/ previous clipboard image.
Operator Panel L/R Keys	If comparison mode is on and the single image display is active, to enter dual comparison display press the L (Left) or R (Right) key. If dual comparison display is on and the dual comparison display is active, to enter single image display, press the L (Left) or R (Right) key.
Freeze Key	To deactivate Comparison Mode, select the comparison image side while in Dual Comparison Display and press Freeze.
Print Key	When you store an image while in Dual Comparison Display, the system automatically switches to the active exam side prior to storing the image.

Compare Assistant Controls (continued)

Table 13-72: Compare Assistant icon and Copy Setting icon

	Compare Assistant On. Copy to Right.		Compare Assistant On. Copy to Left.
	Off		Off
	Automatic: Imaging and Annotations		Automatic: Imaging Only
	Automatic: Annotation Only		Manual: Imaging & Annotations
	Manual: Imaging Only		Manual: Annotations Only
	Off. No parameters copied.		Disabled.

NOTE: Compare Assistant icon is disabled when the system does not have Compare Assistant Option.

Comparison Clipboard

In Comparison Mode two (2) image clipboard areas display images from the active exam and the selected comparison exam. The Comparison Clipboard can display up to four (4) exams, including the active exam. Each exam has a tab that you click on to select the desired comparison or active exam. The active exam is always displayed.

Figure 13-174. Comparison Clipboard

The comparison exam(s) are identified by the date of the exam on the tab; the active exam is identified by the word, “Active” and by the asterisk (*). You can activate the Image History screen by clicking on the “...” tab.

Each image clipboard has its own scroll bar that can be used to scroll through all the images.

The highlighted image in the clipboard is the image that’s displayed along with the exam’s active image.

Query/Retrieve

You can use DICOM Query/Retrieve to search for a patient's previous exams. When you select a patient on the Patient Screen, select the "Query" button. This automatically registers the patient (if needed) and initiates a query via the Data Transfer page. Select the exams you wish to be transferred and press the "Transfer" button.

After the retrieve completes, the system automatically returns to the Patient Screen with the same patient and exam active as when you selected to Query this patient.

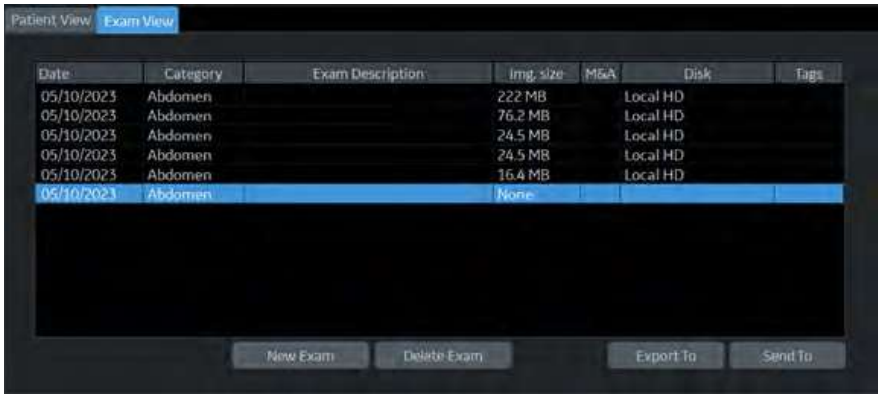


Figure 13-175. Patient Exam View

You can also push the data from the PACS device to the system.

Activating Compare Assistant

Compare Assistant displays an image associated with the active exam (live, frozen, or CINE) and the other side contains an image from the comparison exam.

Comparison Image parameters transfer to the Active Image based on your preset (automatic or manual). You can also use the Display Copying control adjacent to the clipboard to copy settings from the comparison image to the active image.

NOTE: If an imaging parameter is not available for the current probe, a message in the status bar indicates that this parameter is not available.

You activate Compare Assistant via the Comparison Mode Key adjacent to the Image Clipboard and On-screen Trackball Controls or you can activate Compare Assistant via the Patient Image History screen by selecting the image and pressing “Compare.”

Figure 13-176. Image History

At the start of an exam the system automatically checkmarks the three (3) most recent exams, excluding active exams and exams without any images as the comparison exams. You can adjust this by placing a checkmark next to the exam you wish to include in Compare Mode (the system automatically deselects the oldest checked exam). To activate Comparison Mode, select which specific image you would like to compare to the current image from the clipboard on the Image History screen. Select the image and press the “Compare” button.

Exiting Compare Assistant

To exit Compare Assistant Mode, select the Comparison Mode Key adjacent to the Image Clipboard, or change the exam Application Preset, change active exam, change patient, or recall an image from the active clipboard.

OB Measure Assistant

Overview

The user can request the system to trace/outline the borders of specified OB measurements using the OB Measure Assistant feature. You can auto-detect the Biparietal Diameter, Head Circumference, Abdominal Circumference, Femur Length and Humerus Length.

To automatically trace the fetal anatomy on the display,

1. Press ***Measure Assist Settings*** on the OB Touch Panel to set OB Measure Assistant parameters.

Table 13-73: OB Measure Assistant Touch Panel

Touch Panel Settings	Description
Default	When you first activate the Measure Assistant Touch Panel, the following measurements are highlighted: BPD, HC, AC, and FL. This means that OB Measure Assistant is active for all these measurements.
There are four (4) BPD Auto Custom Settings:	
1. BPD Highlighted	BPD and HC OB Measure Assistant is generated one at a time. BPD is auto generated--> Edit/Set--> HC is auto generated--> Edit/Set--> Done
2. BPD + AutoSet BPD	BPD and HC generated at the same time. BPD and HC are auto generated--> Edit/Set HC--> Edit/Set BPD--> Done.
3. BPD + BPD Only	Only the BPD is auto generated--> Edit/Set--> Done.
4. No Highlight	User must perform these measurements manually

2. Press the measurement (BPD, HC, AC, FL or HL). The trace is auto generated on the display.

Overview (continued)

3. To edit the selected measurement graphics:
   - Move the Trackball to appropriately size the edit region of interest
   - Edit the Calipers via Cursor Select.
   - Adjust the circumference using the Ellipse key.

   Press Set on the Trackball to complete the measurement.

NOTE: *Specify the mode to measure the BPD: Outer to Inner, or Outer to Outer via Utility--> Measure--> Advanced--> Obstetrics--> Measure Assistant BPD Method.*

If the system was not able to detect the anatomy automatically, measurement calipers are displayed in the center of the screen in an editable state and a message is displayed on the status bar.

Hepatic Assistant

Overview

Hepatic Assistant is supported on C1-6-D and C1-6VN-D (Abd (Abdomen), AbdPen (Abdomen Penetration) and AbdDetail (Abdomen Detail)) to measure SWE and UGAP simultaneously.

See ‘Shear Wave Elastography’ on *page 13-111* and ‘Ultrasound-Guided Attenuation Parameter (UGAP) Option’ on *page 13-141* for detailed workflows.

Activate Hepatic Assistant

1. Configure presets for Hepatic Assistant in Utility > Imaging > UGAP > Abdomen/Abdomen Pen/Abdomen Detail - C1-6 (Hepatid Assistant), as needed.
   - **Visualization:**
     UGAP/SWE (A/E)
     UGAP Q/SWE (A Qual./E)
     B/SWE & UGAP/UGAP A (BE -> A/Att.)
     SWE Q/SWE & UGAP Q/UGAP (E Qual./E -> A/Qual.)
     SWE Q/SWE & UGAP Q/UGAP (Qual./E -> Qual./Att.)
   - **SWE Display Side:** Right or Left.
   - **Frames to store:** UGAP frames to store for Auto Measurement Multi can be configured in increments of 10 from 0 to 300 (0, 10, 20, etc.).
   - **UGAP ROI Display in PreMode:** On or Off.
   - **Pause before beginning UGAP acquisistion:** The Pause functionality can be selected On or Off on the Touch panel prior to entering UGAP when using Multi-Measurement configuration.

Figure 13-177. Presets for Hepatic Assistant

2. Assign Hepatic Assistant to any User Defined key in Utility -> System -> User Configurable key. Press ***Save***.
3. Select C16-D/C1-6-VN-D probe and Abd, AbdPen or AbdDetail for application.

Activate Hepatic Assistant (continued)

4. Press assigned User Defined key. Pre Mode is displayed.

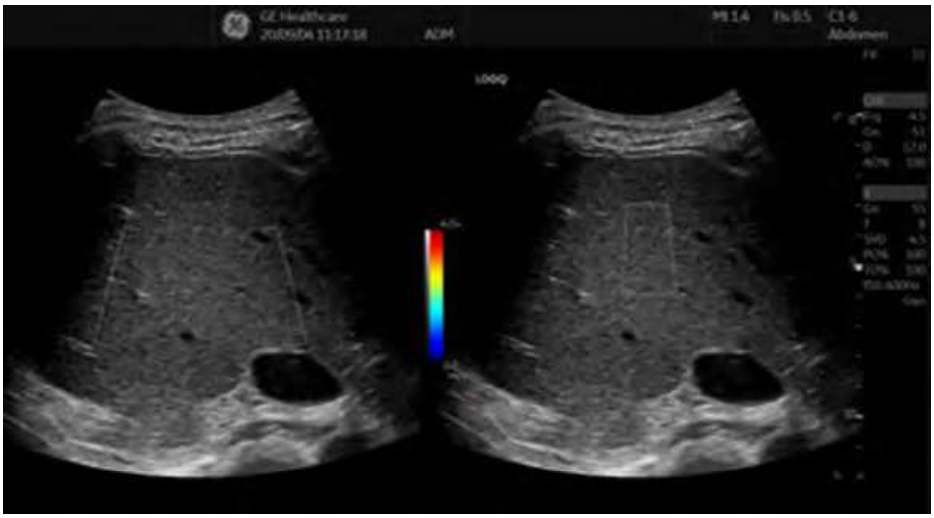


Figure 13-178. Pre Mode

5. Move SWE ROI to desired position, if needed.
6. Press ***Start*** to begin SWE and UGAP live data acquisition.

   The UGAP measurement is activated when the SWE measurement is completed.

   - The LOGIQ Totus acquires one SWE frame data and one UGAP frame data for Auto Measurement Single.
   - The LOGIQ Totus acquires SWE frames data until the user presses **Freeze,** and the specified number of UGAP data frames for Auto Measurement Multi.
   - The LOGIQ Totus acquires SWE data frames until the user presses **Freeze,** and UGAP data frames until the user presses ***Store*** (when Auto Measurement is set to Off).
7. Press assigned User Defined Key to exit Hepatic Assistant.

Visualization

The below Visualizations are selectable in Utility.

- Dual view of UGAP and SWE

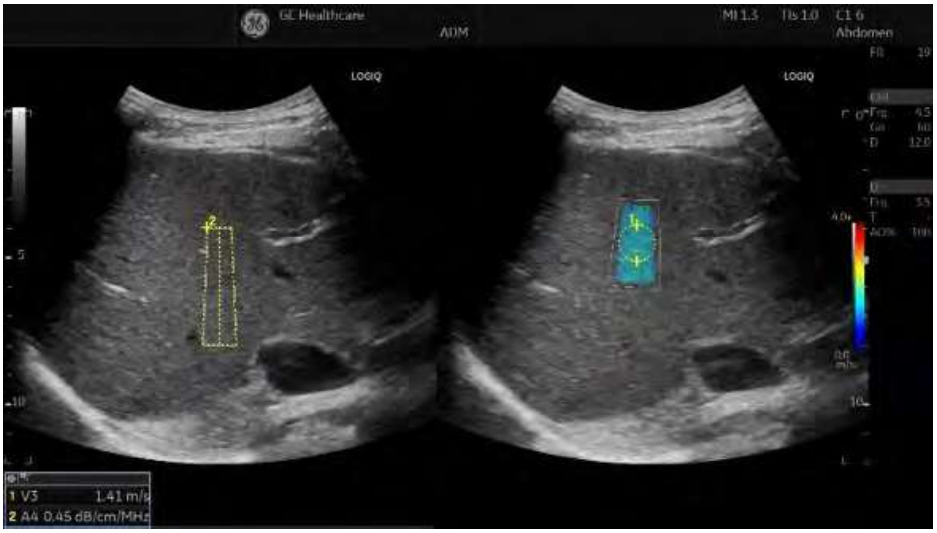


Figure 13-179. Example - UGAP/SWE (A/E)

- Dual view of UGAP Quality Map and SWE

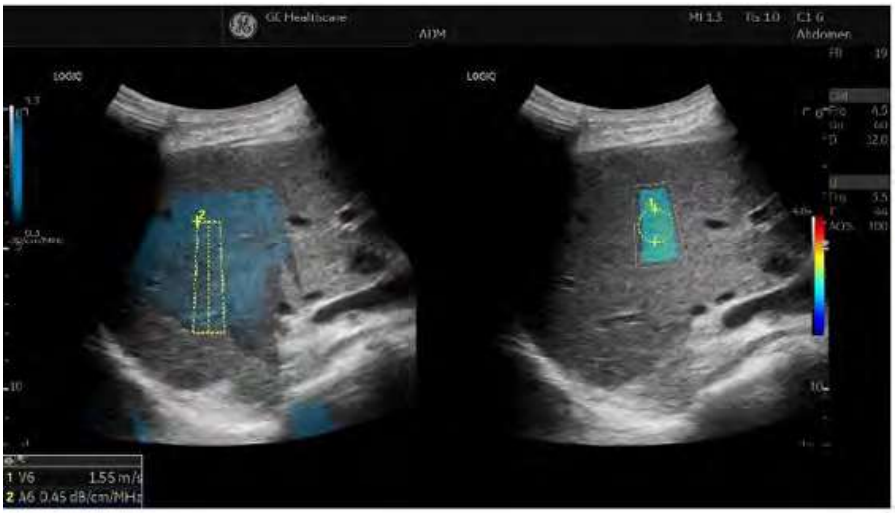


Figure 13-180. Example - UGAP Q/SWE (A Qual./E)

Visualization (continued)

- Dual view of B-Mode and SWE to UGAP and UGAP Attenuation Map

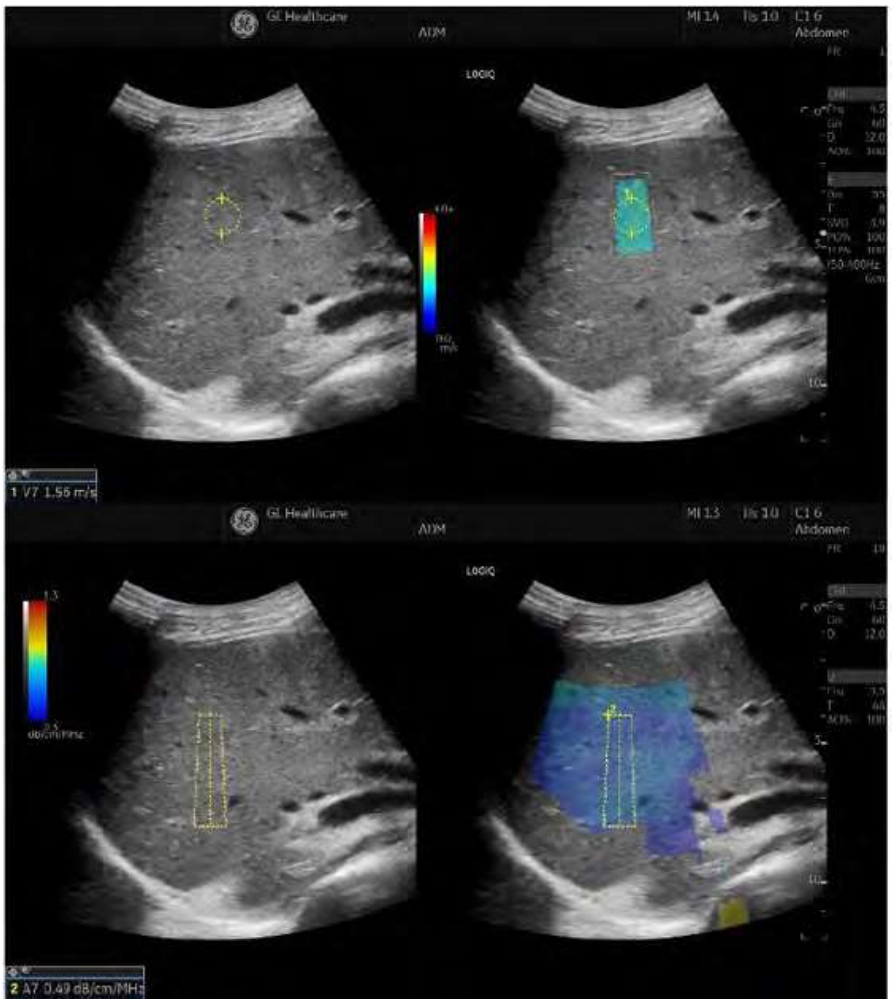


Figure 13-181. Example - B/SWE & UGAP/UGAP A (B/E ¨ A/ Att.)

Visualization (continued)

- Dual view of SWE Quality Map and SWE and dual view of UGAP Quality Map and UGAP

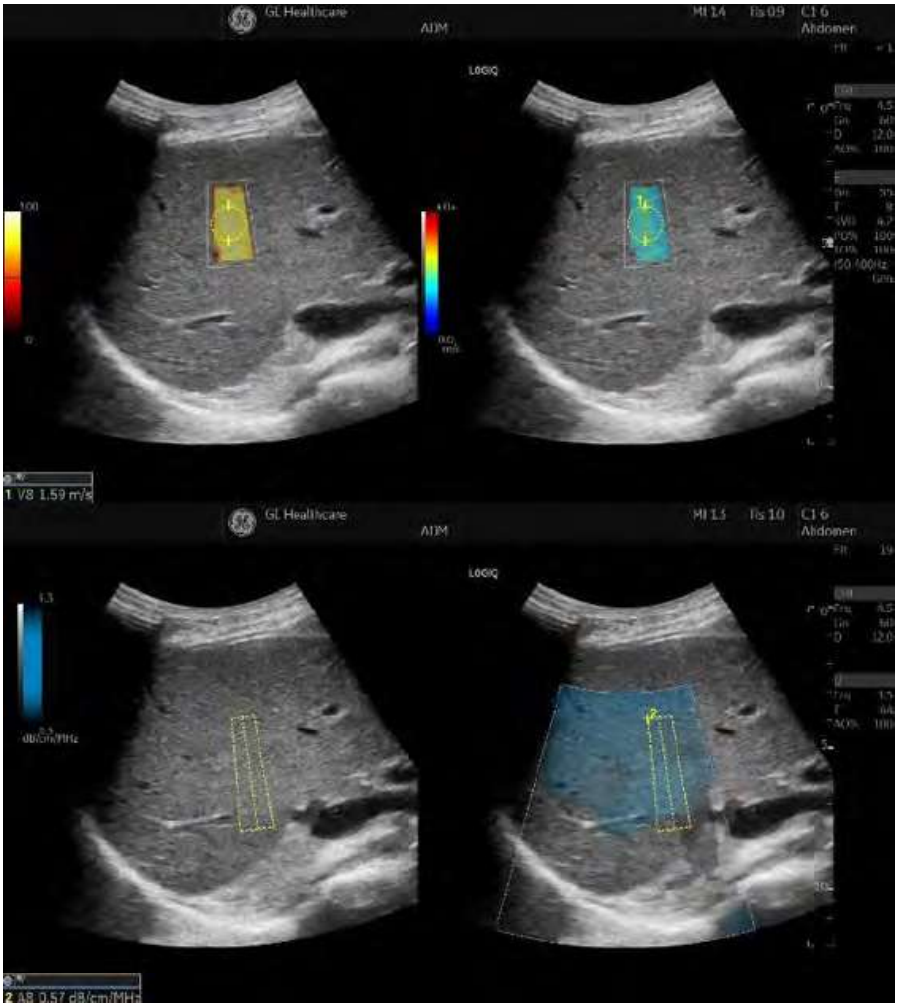


Figure 13-182. Example - SWE Q/SWE & UGAP Q/UGAP (E Qual./E ¨ A/Qual.)

Visualization (continued)

Dual view of SWE Quality Map and SWE to UGAP Quality Map and UGAP Attenuation Map

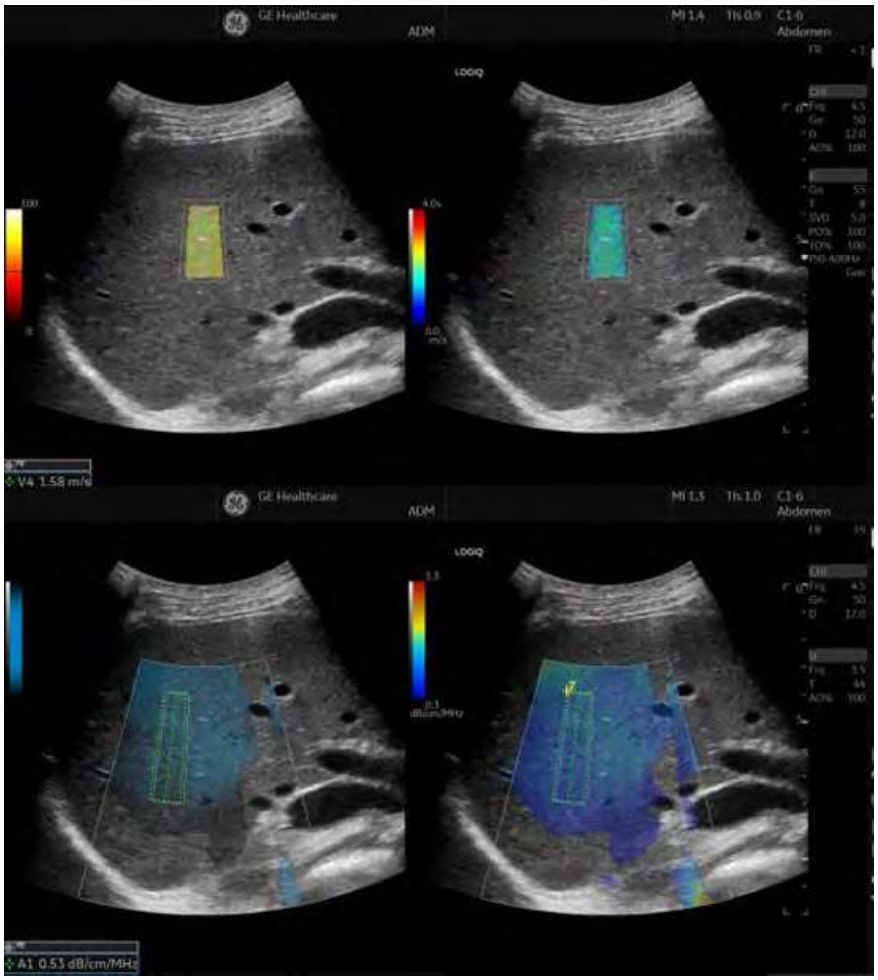


Figure 13-183. Example - SWE Q/SWE & UGAP Q/UGAP (Qual./E -> Qual./Att.)

Vscan Air™ CL (Option)

Overview

LOGIQ supports Vscan Air™, - The Vscan Air is a battery-operated, wireless, general-purpose diagnostic handheld ultrasound imaging system which consists of a dual-headed probe. More information about the Vscan Air CL, care and handling, can be found in the Vscan Air™, User Manual on the GE HealthCare Customer Documentation Portal website at: http://gehealthcare.com/usermanual

The Vscan Air CL acquires and forms the ultrasound image, sends the image data in real time through Wi-Fi to the ultrasound system, and the console displays the image. LOGIQ console provides the needed software to use the console as the display and the UI control unit.

Figure 13-184. Vscan Air and Ultrasound System as Display and User Interface

The Vscan Air CL probe supports B mode and Color flow mode. Currently, PW and M mode are not supported on LOGIQ systems

Table 13-74: Clinical Applications - Additional Capabilities and Features

	Clinical Applications	Additional Capabilities and Features
Curved probe	• Abdomen (incl.Pleural) • OB/GYN • Pediatric • Peripheral Vascular • Musculoskeletal	Overwrite and create application presets Retain FOV Easy3D LOGIQ View LOGIQ Apps ATO (B Mode) Auto Doppler (Colorflow Mode - Linear) Rawdata (B & CF) Scan Assistant Compare Assistant Measurement Package (by application) Annotation package (by application) Body Pattern (by application) Imaging controls on Utility page Imaging display (dual/quad, B|CF simultaneous) Print / Recall / change order Patient page/Exam Category
Linear probe	• Abdomen (incl.Pleural) • OB/GYN • Small Parts • Pediatric • Peripheral Vascular • Musculoskeletal	

Prepare the Vscan Air CL Probe for Use

CAUTION

The ultrasound system with Vscan Air CL is not intended for ophthalmic use or any use causing the acoustic beam to pass through the eye.

CAUTION

Only use GE HealthCare provided chargers or a Qi compliant charger with the Vscan Air CL probe. Failure to use a compliant charger may result in the probe not charging, or possible damage to the probe.

CAUTION

Scanning stops within 10 seconds if the Wi-Fi link to the Vscan Air CL probe is lost. Ensure the Wi-Fi connection is sufficient to avoid loss of image and delay of care.

CAUTION

The probe will not begin a scan if the Vscan Air CL probe battery is critically low. Ensure probe is sufficiently charged before beginning scan to avoid delay of care.

CAUTION

Scanning stops within 10 seconds when the Vscan Air CL probe battery becomes critically low. Ensure probe is sufficiently charged before beginning scan to avoid delay of care.

NOTE: Ensure only one Vscan Air CL is around the console. The ultrasound system will try to pair with the VScan Air CL with strongest signal.

NOTE: To guarantee the maximum performance with Vscan Air CL on the ultrasound system, check the environment and avoid other Wi-Fi devices.

NOTE: Make sure the ultrasound system is connected to an access point (if needed) BEFORE pairing with Vscan Air CL. Connecting to an access point after pairing with Vscan Air CL will result in significant performance degradation.

NOTE: Connect to the network infrastructure through an ethernet connection, if possible, to avoid any possible Wi-Fi interference.

NOTE: The VScan Air CL must be activated from a mobile (Android, iOS) device first through the Vscan Air app. The ultrasound system does not provide a workflow for activating a new VScan Air CL.

Vscan Air CL Probe Charger

CAUTION

The Vscan Air CL probe charger must ONLY be used to charge the Vscan Air CL probe. DO NOT charge a mobile phone or any other device with the Vscan Air CL probe charger. Failure to follow these instructions may damage the charger or other device.

FCC Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

WARNING

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: *This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.*

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: (1) Reorient or relocate the receiving antenna. (2) Increase the separation between the equipment and receiver. (3) Connect the equipment into an outlet on a circuit different from that to which the receiver is connected. (4) Consult the dealer or an experienced radio / TV technician for help.

Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20cm between the radiator and your body.

IC Statement

This device complies with RSS-216 of Industry Canada. Operation is subject to the condition that this device does not cause harmful interference.

This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada’s license-exempt RSS(s). Operation is subject to the following two conditions:

(1) This device may not cause interference.

(2) Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

RF exposure statement: The equipment complies with IC Radiation exposure limit set forth for uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

Install the Vscan Air CL Probe Charger

1. Install the probe holder onto the probe charger by sliding down until it latches into place.

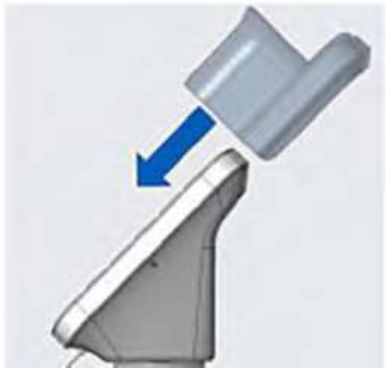


Figure 13-185. Install Probe Holder on Charger

2. Select the probe holder location on the system to install the charger assembly and insert the probe charger post through the holder location.
3. Thread the nut onto the bottom end of the charger mounting post and tighten the nut by hand until the charger is secured firmly to the system.
4. Connect the USB charging cable to a USB port under the control panel.

Figure 13-186. LOGIQ Totus USB Ports with Vscan Air CL Probe charger Installed

5. Place the Vscan Air CL probe into the charger to begin charging.

Charge the Vscan Air CL Probe

To charge the Vscan Air CL probe, place the probe inside of the plastic probe holder on the probe charger.

Table 13-75: Vscan Air CL Battery Charger LED Charging Status Indicator

LED Color	Charging Status
Blue	Charger initially plugged in - no probe on charger.
Blinking Green	Probe battery charging.
Blinking Green and Static Blue	Probe battery fully charged - probe on charger.
Blue	No probe on charger.
Orange	Charging failure. Probe battery not full, charging paused.

Pair Vscan Air CL to the Ultrasound System

To pair the Vscan Air CL to the ultrasound system:

1. Turn the ultrasound system on.
2. Press and hold the Vscan Air CL power button for approximately two seconds, while watching the probe LED lights.

NOTE: Do not continuously hold the button for longer than 5 seconds, or the probe will shut down after booting up.

The LED lights will first briefly display the battery level (green, yellow, or orange), then the display power up (two blue lights). Release the Vscan Air CL power button when you see the power up light.

3. Touch the first probe connector (Vscan Air CL shares the probe port menu with the CW-only probe) to start the pairing process.
4. The LED lights will enter the booting up state (two white lights blinking alternately), followed by the searching state (two white lights blinking synchronously). Tap the power button to allow connection during searching state.

Pair Vscan Air CL to the Ultrasound System (continued)

5. Pairing will take 5-30 seconds to complete. When pairing is complete, the two LED lights will shine steady blue, indicating the connection is established. At the same time, the Vscan Air CL probe icon will appear on the ultrasound system Touch Panel

Figure 13-187. Vscan Air Cl Touch Panel Icon

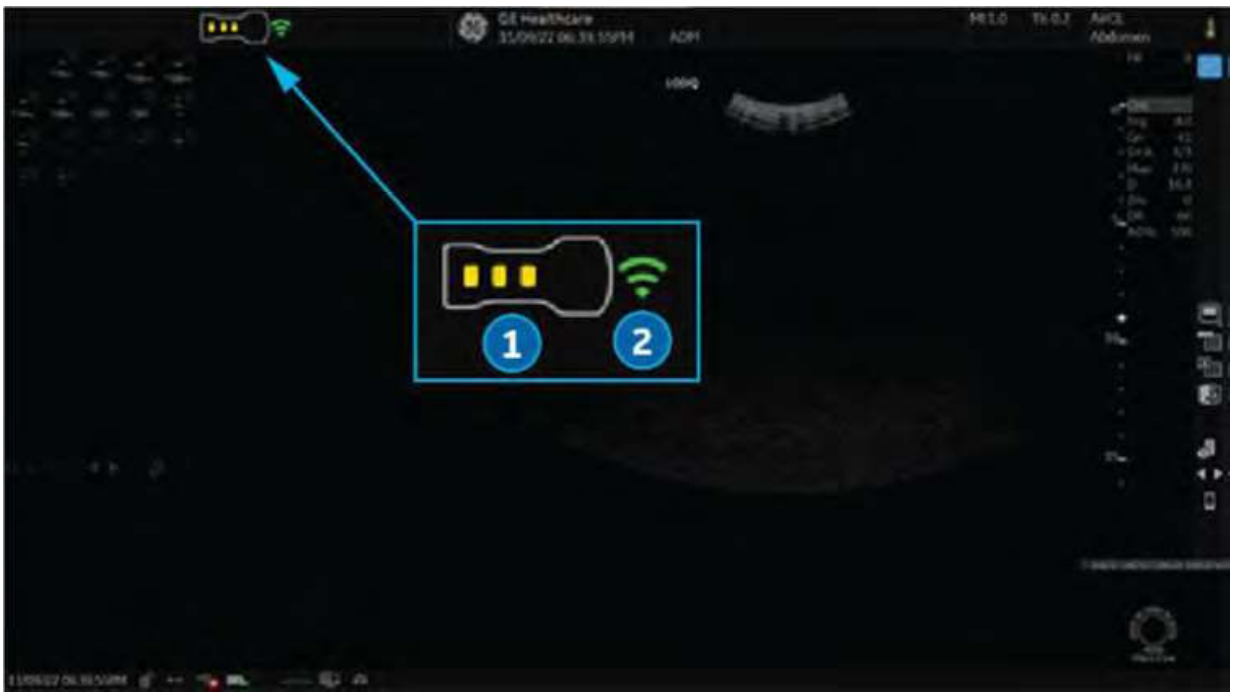


Figure 13-188. Vscan Air CL Battery and Wi-Fi Icons

1. Battery Level
2. Wi-Fi Signal Strength

Vscan Air CL Battery Indicator

Table 13-76: Vscan Air CL Battery Indicator

Icon	Description
	Battery charged 90-100%
	Battery charged 60-80%
	Battery charged 40-60%
	Battery charged 20-40%
	Battery charged <20 - prepare to recharge the a batter.

Wireless Connection Quality Indicator

A wireless probe has a limited inherent risk of a disrupted connection due to various factorsn that could lead to loss of real time imaging. The ‘Wireless Connection Quality Indicator’ provides a visual indication of the connection quality between the probe and the ultrasound system during scanning. An unstable connection may result in loss of image quality or slow image update during real time imaging.

Figure 13-189. Wi-Fi Connection Quality Indicator Icons - Left: Compromised, Right: Good

Vscan Air CL Temperature Indicator and Thermal Management

When the Vscan Air CL operating temperature is increased, the thermal management system inside the probe may automatically decrease frame rates and/or reduce image width, to keep the probe temperature within optimal functional levels to support continuous scans up to 50 minutes. There are five thermal management levels (0-4). Level 0 is the initial state when starting with a cool probe, and at Level 4 the probe temperature reaches the maximal allowed level. At Level 4 a user notification will appear on screen and the probe will automatically shut down.

The ‘Probe temperature indicator’ tracks and displays changes in the operating temperature of the probe during scanning. Factors affecting probe temperature are:

- **Transducer**: The curved array transducer gets warm more quickly than linear array due to higher power consumption.
- **Preset:** Certain presets like Abdominal and Cardiac have higher power requirements, depending on the image settings, causing the probe to warm up faster than other presets.
- **Mode**: Operating in Color Flow mode warms up the probe faster than Black and white mode.
- **Length of scan**: The duration of continuous scanning.
- **Ambient temperature**: Higher ambient temperatures can cause the probe to warm faster.

NOTE: The probe temperature and related user notifications are independent of the probe battery status.

Figure 13-190. Thermal Status Icons - Level 0 to 4

Scanning

To begin scanning with the Vscan Air CL:

1. Select the Vscan Air CL probe icon on the Touch panel.

Figure 13-191. Vscan Air CL Touch Panel Icon

2. Select the Curved or Linear tab on the Touch Panel.

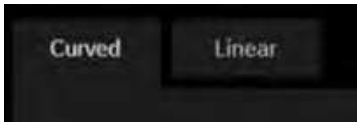


Figure 13-192. Vscan Air CL Curved and Linear Applications

Figure 13-193. Vscan Air CL Curved and Linear Applications

3. Select a preset on the Touch Panel. The Vscan Air CL probe begins scanning and the system displays the images.

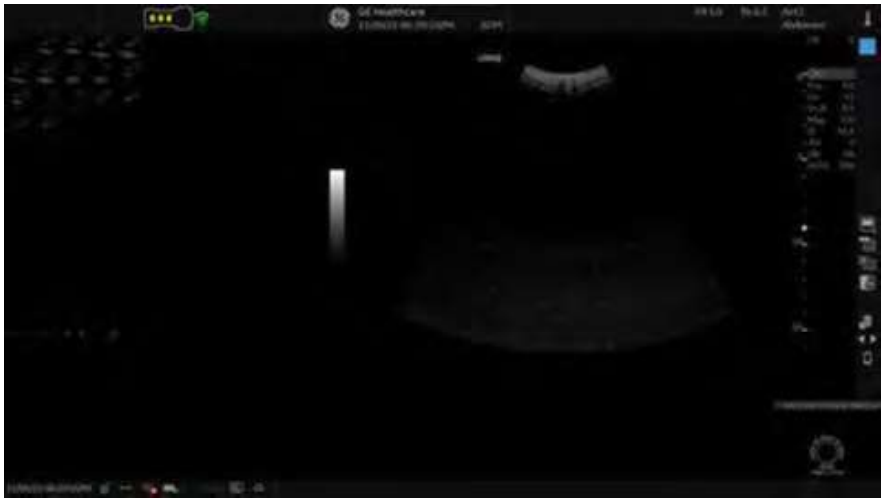


Figure 13-194. Vscan Air CL Image Display on Ultrasound System

HINTS

The power button on the Vscan Air CL probe can be configured as a Freeze/Unfreeze button during scanning.

Preparing for a Guided Procedure with Vscan Air CL

A wireless probe has a limited inherent risk of a disrupted connection due to various factors that could lead to loss of real time imaging.

WARNING

If a temporary, unexpected disruption to real time imaging is determined to have a severely negative adverse effect on the patient's health, outweighing the benefits of using an ergonomic wireless probe at the point of care, it is recommended to consider using a wired ultrasound device for the specific procedure guidance.

CAUTION

When performing a guided procedure or a freehand biopsy (without a biopsy guide), it is the user's responsibility to use the appropriate equipment. Ensure that the needle (especially the needle tip) is always visible in the ultrasound image during the entire procedure.

CAUTION

Always use only B-Mode when performing guided procedures or a freehand biopsy.

Prepare Vscan Air CL probe and check Wi-Fi connection prior to a procedure

Prior to setting up for a guided procedure, it is recommended to prepare the Vscan Air CL probe to be in optimal condition, and if assess if a stable Wi-Fi connection can be maintained during the procedure. Follow the below steps for the assessment.

Use a Cool Probe

Ensure the probe is sufficiently cooled down after any previous scanning. Disruption or reduced scan quality may occur due to the probe overheating if a lengthy procedure is anticipated. Leaving the probe on a desk (outside the pocket or the case) after it is powered off will cool it down faster. It should take approximately 30-60 minutes to get to a reasonably cool state, depending upon how warm it was from the previous scan, and the ambient temperature. If accelerated cooling of the probe is required, place the probe, while turned off, in front of a fan, run under cold water, or apply a cooling pack.

Ensure the Probe is Sufficiently Charged

Ensure the probe battery is sufficiently charged before beginning a procedure. Battery levels of 50% and above are recommended before starting. The battery level of the probe can be checked on the top left of the imaging screen after connecting with the system. A green battery icon indicates sufficient battery level.

Figure 13-195. Battery Icon - Fully Charged

Check Wi-Fi Environment

Whenever possible, check the Wi-Fi connection between the probe and ultrasound system in the environment where the procedure is expected to be performed. This will help detect any unexpected challenges before the actual procedure.

Select Small Parts from the Linear presets menu (Small Parts is the most Wi-Fi-challenging preset due to its high image data rate) and turn up the B-Mode gain. Ensure that the connection quality indicator is steadily green on the imaging screen. Observe the noise pattern, and the random movement of noisy pixels should not appear to pause occasionally.

Figure 13-196. Wi-Fi Icon

The probe temperature indicator is also visible on the right upper corner of the image screen. A gray colored thermometer icon confirms a cool probe.

Figure 13-197. Probe Temperature Indicator

Disconnect the Vscan Air CL Probe

To disconnect the Vscan Air CL probe from the ultrasound system, simply turn off the probe by pressing and holding the power button until the LED lights appear purple, which indicates the probe is powering down.

You can also shut down the Vscan Air CL probe by selecting the Vscan Air power button on the Touch Panel, or by selecting the battery icon on the title bar and selecting Yes in the Vscan Air Battery Icon dialog box.

Figure 13-198. Vscan Air Power Button

Figure 13-199. Vscan Air Battery Icon Dialog Box

Supported Features

Most features on the ultrasound system (measurement, annotation, image tag, etc.) are supported on the Vscan Air CL probe.

Table 13-77: Features Available on the Vscan Air

Feature Name
Scan Mode: B Mode
Scan Mode: CF Mode
Overwrite and create application presets
Retain FOV
Easy3D
LOGIQ View
LOGIQ Apps
ATO (B Mode)
Auto Doppler (Colorflow Mode - Linear)
Rawdata (B & CF)
Scan Assistant
Compare Assistant
Measurement Package (by application)
Annotation package (by application)
Body Pattern (by application)
Imaging controls on Utility page
Imaging display (dual/quad, B|CF simultaneous)
Print / Recall / change order
Patient page/Exam Category

Charger Cleaning and Disinfection

For approved charger cleaners and disinfectants, refer to "Cleaning and Disinfecting the System" in Chapter 12 "User Maintenance" of this manual.

CAUTION

Avoid using ALCOHOL (ISOPROPANOL) 70% on the Vscan Air probe holder and charger. ALCOHOL (ISOPROPANOL) 70% may compromise the durability of the probe holder and charger.

CAUTION

To prevent cross-contamination, clean and disinfect the Vscan Air probe holder and charger after every exam.

To clean and disinfect the Vscan Air probe holder and charger:

1. Remove the Vscan Air probe from the charger probe holder and place in a safe location.
2. Remove the clear probe holder from the charger.

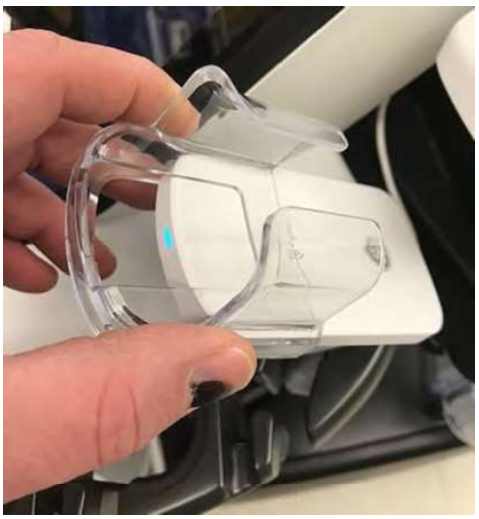


Figure 13-200. Remove Vscan Air Probe Holder

3. Clean the probe holder and the charger with an approved cleaning agent.
4. Disinfect the probe holder and the charger with an approved disinfectant; allow to dry for the manufacturer's recommended contact time.
5. Reassemble the probe holder on the charger.

Regulatory Requirements

CAUTION

The Qi compliant wireless charger supplied as an accessory with the product is verified for use with the Vscan Air CL probe. The wireless charger is considered to be information technology equipment that does not affect the basic safety or essential performance of the Vscan Air CL product. The wireless charger is compliant to the IEC/EN 62368-1 standard, which applies to audio/video, information and communication technology equipment.

CAUTION

To prevent cross-contamination, clean and disinfect the Vscan Air probe holder and charger after every exam.

The Vscan Air CL probe complies with regulatory requirements of the European Directive 93/42/EEC concerning medical devices.

NOTE: Regulatory information regarding the Vscan Air can be found from Utility > Admin > Vscan Air.

NOTE: All applications may not be supported with the different variations of the Vscan Air (e.g. Vscan Air SL - Sector/Linear). Check which VScan Air products are supported from Utility > Admin > Vscan Air.

Vscan Air On Console Charger Rating Plate

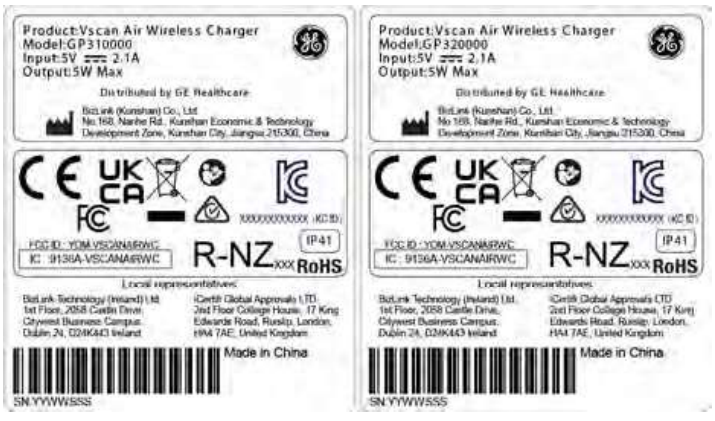


Figure 13-201. Vscan Air CL Charger Rating Plates

Acoustic Output Reporting Tables for Track 3/EN/IEC 60601-2-37

The ultrasound system does not control any acoustic output for the Vscan Air CL. For acoustic output reporting tables for the Vscan Air CL, refer to the manual provided by the manufacturer of the Vscan Air CL probe or on http://gehealthcare.com/usermanual.

NOTE: These acoustic output reporting tables are produced according to IEC 62359 Ed.2.

NOTE: The Acoustic Output tables are in English only.

EZ Imaging

Overview

EZ Imaging provides an efficient workflow to complete exams with minimal operator button input. EZ Touch Panel allows the operator quick access to change model, flow modes and Doppler modes without searching through multiple pages or many different parameters.

Quick Patient Change allows you to start a new exam without entering the patient page.

Activate EZ Touch Panel

1. Check **EZ Touch Panel Page** in Utility > System > System Imaging > EZ Settings.
2. Select “By Probe” (Default) or “By Category” for MyPreset Shortcuts.

Figure 13-202. EZ Settings

Activate EZ Touch Panel (continued)

3. EZ Touch Panel appears on the first page of B, flow and Doppler mode tabs.

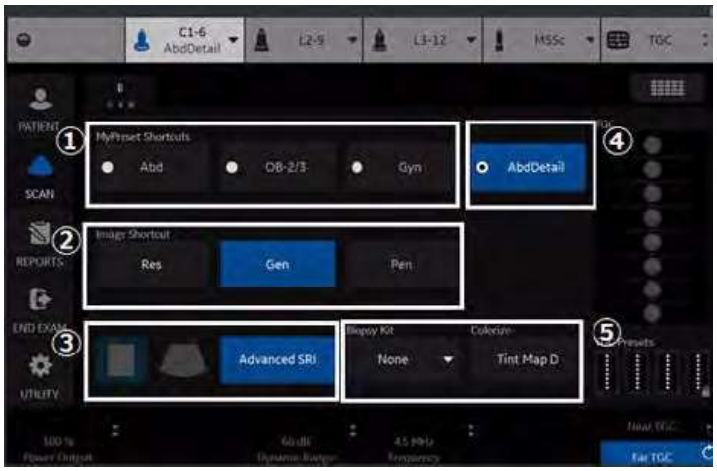


Figure 13-203. B-Mode - EZ Touch Panel (Example)

1. MyPreset Shortcuts
   • Change model quickly on the Touch Panel.
2. Image Shortcut
   • Change imaging frequency (Res > Gen > Pen). (Frequencies are not editable.)
3. Essential Control: Virtual Convex (or Max Angle), Advanced SRI
4. MyPreset Shortcut: Last used or current model displays in the 4th position.
5. Essential Control (Configurable) - Configurable essential controls display in the 3rd and 4th positions. A desired control can be assigned in the 3rd and 4th positions.

Activate EZ Touch Panel (continued)

Figure 13-204. CF/PDI/MVI/TVI - EZ Touch Panel (Example)

1. Flow mode buttons
   • Change Flow Technology quickly on the Touch Panel.
2. Flow Shortcut
   • CF/PDI: Displays available existing shortcuts.
   • MVI/TVI: No shortcut.
3. Essential Control
   CF/PDI/MVI: Virtual Convex, Invert, Simultaneous
   TVI: Map Compress and Map
4. Essential Control (Configurable) : Configurable essential controls display in the 4th and 5th position. A desired control can be assigned in the 4th and 5th position.

Activate EZ Touch Panel (continued)

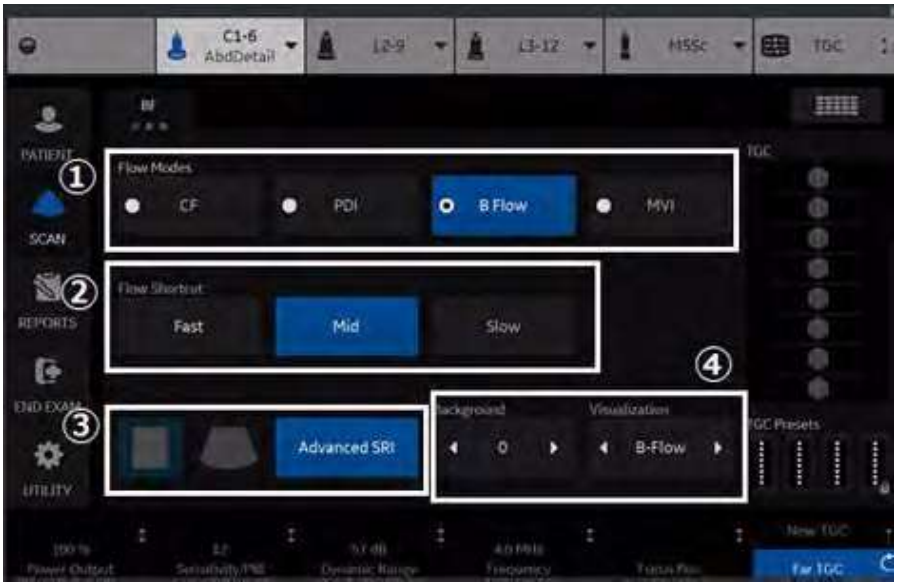


Figure 13-205. B-Flow - EZ Touch Panel (Example)

1. Flow mode buttons - Change Flow Technology quickly on the Touch Panel.
2. Flow Shortcut - Displays flow shortcut to change Sensitivity/PRI
3. Essential Control - Virtual Convex, Advanced SR
4. Essential Control (Configurable) - Configurable essential controls display in the in the 4th and 5th position. A desired control can be assigned in the 4th and 5th position.

Activate EZ Touch Panel (continued)

Figure 13-206. Doppler Mode - EZ Touch Panel (Example)

1. Doppler mode buttons - Change Doppler Technology quickly on the Touch Panel (if both PW and CW are supported).
2. Essential Control (Non-Configurable)
   • Invert, Sweep Speed, SV Length (for PW)
   • Wall Filter, Sweep Speed, Colorize (for CW)
3. Essential Control (Configurable) - Configurable essential control displays in the 4th position. You can assign a desired control in the 4th position.

Activate EZ Touch Panel (continued)

4. Switch to conventional Touch Panel by selecting to turn the Touch Panel page.

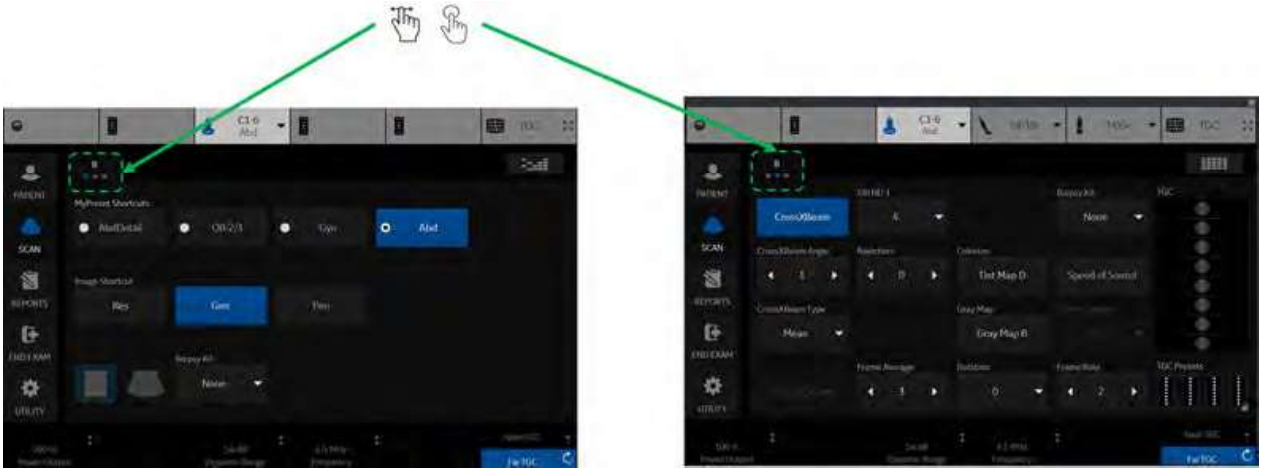


Figure 13-207. Switch between EZ Touch Panel and Conventional Touch Panel

MyPreset Shortcuts “By Probe”

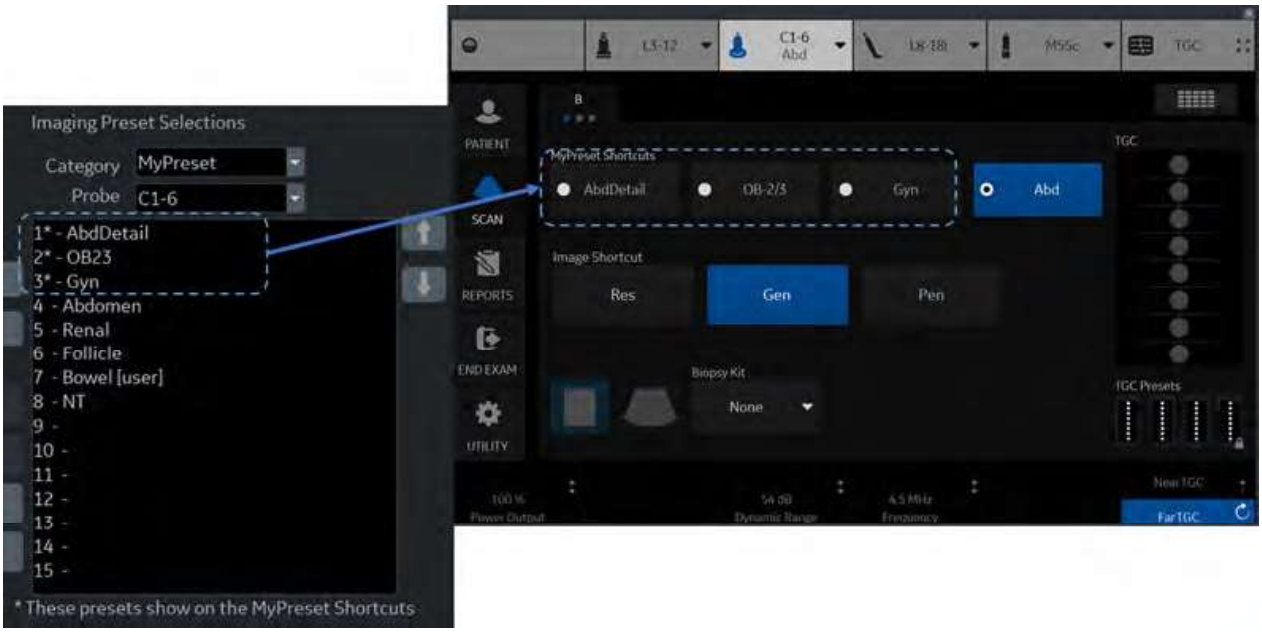


Figure 13-208. By Probe

- TOP 3 models on My Preset for the probe is displayed on the Touch Panel.
- * (Asterisk) indicates the preset appears on the MyPreset Shortcut.

MyPreset Shortcuts “By Category”

Figure 13-209. By Category

• TOP 3 models in same exam category on My Preset for the probe is displayed on the Touch Panel.

Quick Patient Change

1. Complete current patient exam.
2. Press the BT key assigned to Quick Patient Change.
3. All Patient data is stored for the current patient and the Patient ID for the next patient is generated automatically.

NOTE: If you turn off Auto Patient Archive, a Confirmation Dialog for Data Archive appears. Select Store All, Delete All, or Cancel.

Figure 13-210. Confirmation Dialog for Data Archive

4. An information dialog displays to inform the user that the patient has been created.

Figure 13-211. Information Dialog

5. Start the exam for the new patient. The B-Mode screen displays with the default preset for the connected probe.

Anonymize the patient

Overview

The LOGIQ Totus offers an option to extract all measurements and DICOM tags from a selected patient in the Patient List when that patient is not active. This option makes the exam(s) anonymous and attaches this information to a newly created Anonymous Patient.

The LOGIQ Totus warns the user on possible data loss, data mismatch and data that cannot be copied anonymously, including:

- Image data may have patient information burned into the pixel data. This information wil not match the updated patient data in the DICOM tags.
- Patient identification on image pixel data which the user annotated. This information cannot be removed.
- Links to Reports will be lost.
- Non-ultrasound exams will not be anonymous.

Anonymize the patient

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 left click to bring up the “Anonymize” pop-up menu.
4. A confirmation dialog displays. Select ***OK***.
5. The “Anonymize Patient” dialog displays. All the fields inherit the values from the original patient’s exam, except for Patient ID.

   Fill in the Patient information fields.

   Press ***OK*** to continue.

NOTE: If the newly entered Patient ID is not unique in the database, the Patient ID turns to red and an error message displays on the status bar.

- ***Empty Other DICOM Tags***: Check to clear all DICOM Tags.
- ***Manage DICOM Tags***: Manage DICOM tags dialog displays. Select DICOM tags individually.

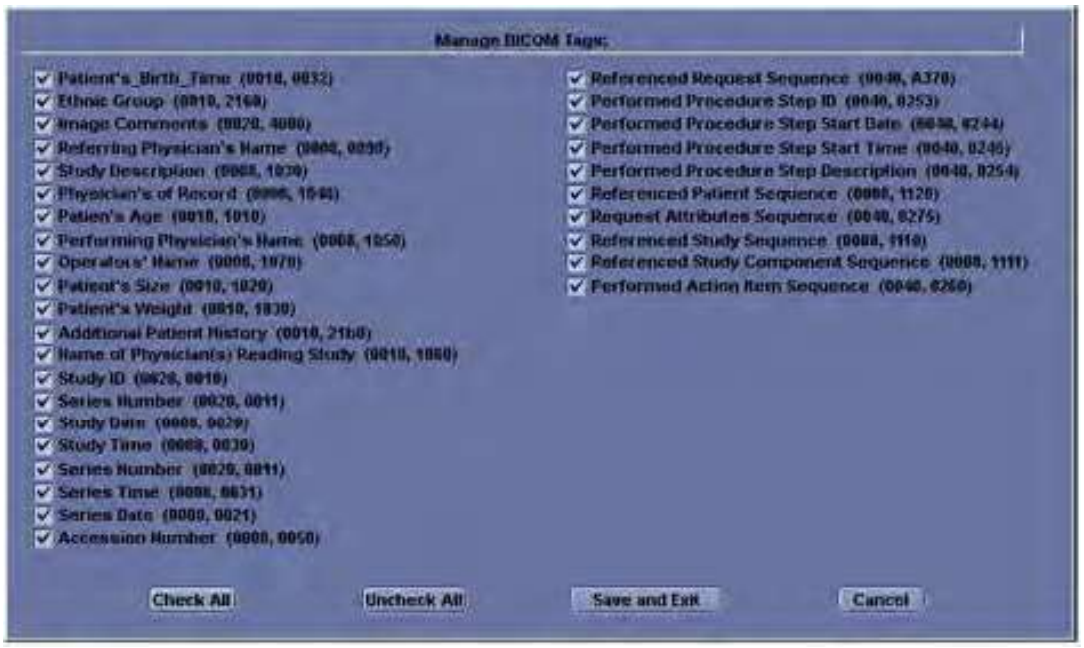


Figure 13-212. Manage DICOM Tags

Report Writer

Introduction

The LOGIQ Totus enables the generation of patient reports based on the examination performed and the analyses that were made during the exam. The reports are generated using the data stored in the system with pre-selected templates.

You may edit a report while performing the exam; customize, delete, or add measurements; and save changes until you use the Store command. Once Stored, the reports are read-only.

It is recommended that the data be saved often, and then carefully reviewed before the report is Stored. Use the worksheet to facilitate the review and adjust data before storing a report. The final report can be printed on a standard printer.

Creating a report

Reports summarize the data obtained in the examination. They can contain data, images, and cine loops.

Once generated, the report can be viewed, images can be added, and the patient's personal data can be modified. The examination data itself CANNOT be changed.

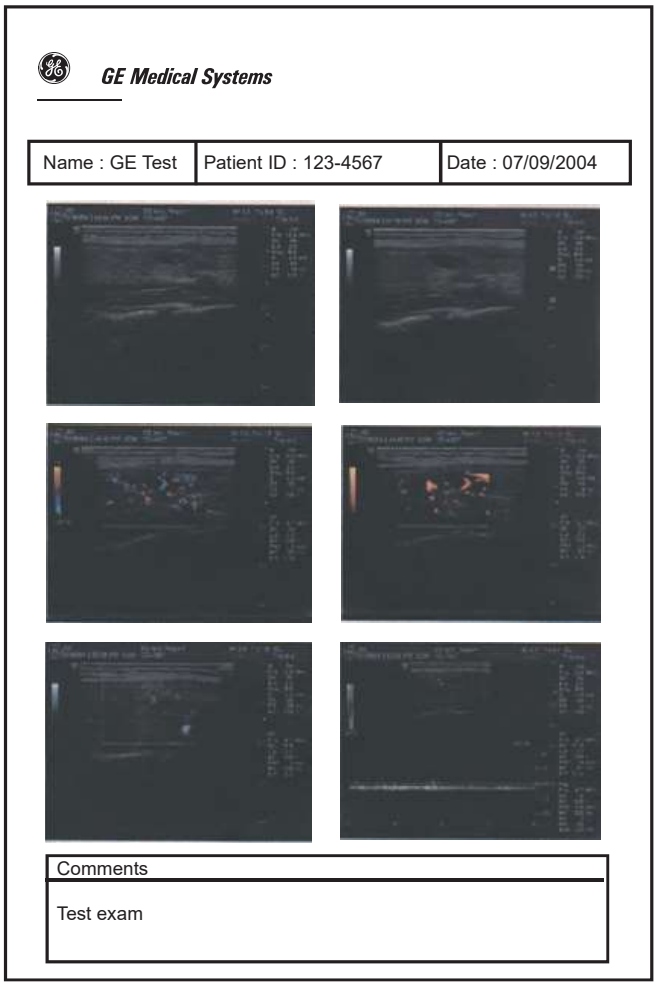


Figure 13-213. Report Example

Activating the Report

1. Select ***Reports*** on the Touch Panel.
2. The system displays the default report for the current application on the monitor.

   The information entered during the examination is automatically filled in the appropriate fields (e.g. demographic, diagnosis, comments).

   The preview image appears when the cursor is over the clipboard image.

NOTE: The template is the skeleton of your report. It is composed of different objects that can be customized by the user.

3. Adjust the ***Page Change*** control to move down the page.

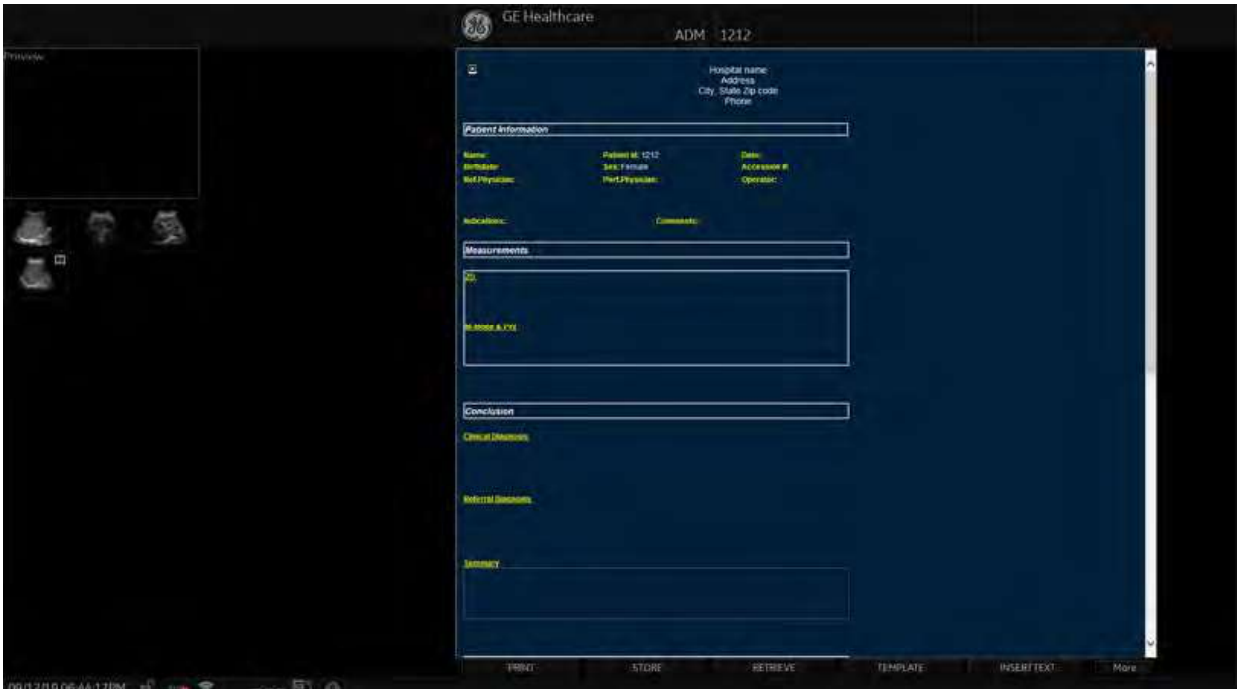


Figure 13-214. Report Page Example

Activating the Report (continued)

Table 13-78: Report Button Controls

Button	Description
Print	Prints out the report to the default printer.
Store	Stores the report page into Archive as CHM* file.
Retrieve	Retrieves the report page from Archive. Stored Date/Time is appended to the name of stored report.
Template	Selects template from the list of selected applications.
Designer	Accesses template editor screen.
Save As	Exports the report page to storage media as CHM or PDF format.
Delete	Deletes the report page from Archive.
Worksheet	Accesses Worksheet Page.
Graph	Accesses OB Graph page (applies only to OB).
Anatomical Page	Accesses Anatomical Survey page (applies only to OB).
*CHM is a compressed HTML help file.	

Selecting another template

You can select another template for the current patient:

1. Select ***TEMPLATE*** at the bottom of the monitor display or the Touch Panel.
2. A list of available templates and exam categories (Abdomen, Adult, Carotid, etc.) displays.
3. Select the desired template using the **Trackball/Trackball** and press **Set**.

   The selected template displays on the monitor.

NOTE: *If you select another exam category, the template list of the selected category displays. Select the desired template.*

Figure 13-215. Available Template list

4. Select the desired template name and press **Set**.
5. The report changes to the selected template.

Factory Templates

The system has factory templates for each application. You can modify these templates or create user-defined templates. You need to save revised/new templates with unique names.

A template may include one or more of the following:

- Measurements
- Worksheet or Vessel Summary Images
- Anatomical Surveys or Biophysical Profiles
- Anatomical Graphics
- Graphs
- Images areas
- Score Boxes

NOTE: Additional factory templates can be added from the Utility-->Report menu (OB for multiple gestation, Renal, etc.).

Editing a Report

Entering the hospital address

When using a factory template, the area for the hospital information is usually placed in the upper portion of the report.

To make a new area, see ‘Fixed Text’ on *page 13-453* for more information.

To modify the factory template:

1. Select ***Reports***.
2. Select ***Designer***.
3. Double-click on the area for the hospital information in the template. The Fixed Text dialogue box displays.

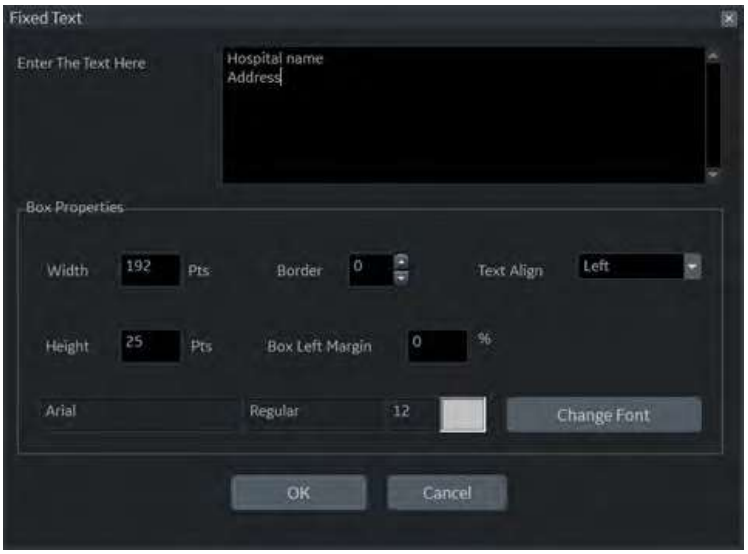


Figure 13-216. Fixed Text Dialogue Box

4. Make changes as necessary.
   a. Enter the hospital address in the text area.
   b. Modify Box Properties (box width, box border line width, text align, box height, box left margin, and font).
5. Select ***OK***.

Entering the hospital address (continued)

6. Save the template.

   To keep the same template name:

   - Select ***Save*** from the File menu, and press **Set**. The Save Template dialog box opens.
   - Select ***Yes***. The template retains the same name and appends “[user]”. For example, OB23-Basic[user].

   To save the template with a new name:

   - Select ***Save As*** from the File menu, and press **Set**. The Save Template As dialog box opens.
   - Enter the name of the new template, and press **Set**. The template receives the new name and appends “[user]”. For example, NewReport[user].

7. Exit the Report Designer. The report with the hospital address displays.

Inserting the hospital logo

When using a factory template, the area for the logo is usually placed in the upper left portion of the report.

To make a new area, see ‘Fixed Text’ on *page 13-453* for more information.

To modify the factory template:

1. Save the preferred hospital logo in either a jpeg or bmp format on USB.

NOTE: *Label the logo with a unique name (e.g. HospitalNameLogo.bmp).*

2. Insert the USB into the USB drive.
3. Select ***Reports***.
4. Select ***Designer***.
5. Double-click the GE HealthCare Logo so that the frame is highlighted. The logo box displays.

Figure 13-217. Logo Box

Inserting the hospital logo (continued)

6. Select ***Import Logo*** (1). Select the USB drive first and then the hospital logo.
7. Select ***OK***. The hospital logo displays in the logo list (2). Click the logo to select.

NOTE: Scroll the logo list using the left/right arrow key (3).

8. Modify Appearance (4).
9. Select ***OK***.
10. Save the template.

    To keep the same template name:

    - Select ***Save*** from the File menu, and press **Set**. The Save Template dialog box opens.
    - Select ***Yes***. The template retains the same name and adds “[user]”. For example, OB23-Basic[user].

    To save the template with a new name:

    - Select ***Save As*** from the File menu, and press **Set**. The Save Template As dialog box opens.
    - Enter the name of the new template, and press **Set**. The template receives the new name and adds “[user]”. For example, NewReport[user].

11. Exit the Report Designer. The template with the hospital logo displays.

NOTE: If a different logo prints on the report, rename the logo image which you want on the report and insert it into the report template again.

Changing the Archive Information

When using a factory template, the Archive Information is usually placed below the hospital name and logo.

The contents of the Archive Information is inserted through the related page automatically. If you want to change the description, such as Information or Comments that was entered in the patient menu:

1. Select the yellow text to be changed, e.g. Information or Comments.

   The area where the description was entered (e.g. Patient menu) displays.
2. Change the existing data as necessary.
3. Select ***Report*** to return to the report.

Figure 13-218. Patient Information Area (Example)

Modifying the displayed objects of Archive Information

1. Select ***Designer***.
2. Double click on the area for the Archive Information in the template. The Archive Information Box displays.

Figure 13-219. Archive Information Box

3. Click the checkboxes to select and deselect the objects.
   Objects with checkmarks will appear in the report template.
4. Select Box Properties to change the font, font size, font color, or box size, and select ***OK***.
5. Select ***OK*** to return to the Report Designer.

Modifying the displayed objects of Archive Information (continued)

6. Save the template.

   To keep the same template name:

   - Select ***Save*** from the File menu, and press **Set**. The Save Template dialog box opens.
   - Select ***Yes***. The template retains the same name and adds “[user]”. For example, OB23-Basic[user].

   To save the template with a new name:

   - Select ***Save As*** from the File menu, and press **Set**. The Save Template As dialog box opens.
   - Enter the name of the new template, and press **Set**. The template receives the new name and adds “[user]”. For example, NewReport[user].

7. Select File -> Exit to leave the Report Designer.

Entering free text

You can enter free text to the report using the alphanumeric keyboard.

The factory template terms their text area as “Summary or Comments”.

1. Move the cursor to the text field and press **Set**.

NOTE: You can enter the text only to the field set as free text in the Report Designer.

NOTE: DO NOT enter “%s” in a free text field and then try to edit/ save the template in the Report Designer.

2. Type the text.

Inserting Text

1. Select **Designer**.
2. Move the cursor where the text is to be inserted and press **Set**.
3. Select the Text Field from the Insert menu. The Text Field dialog box displays.

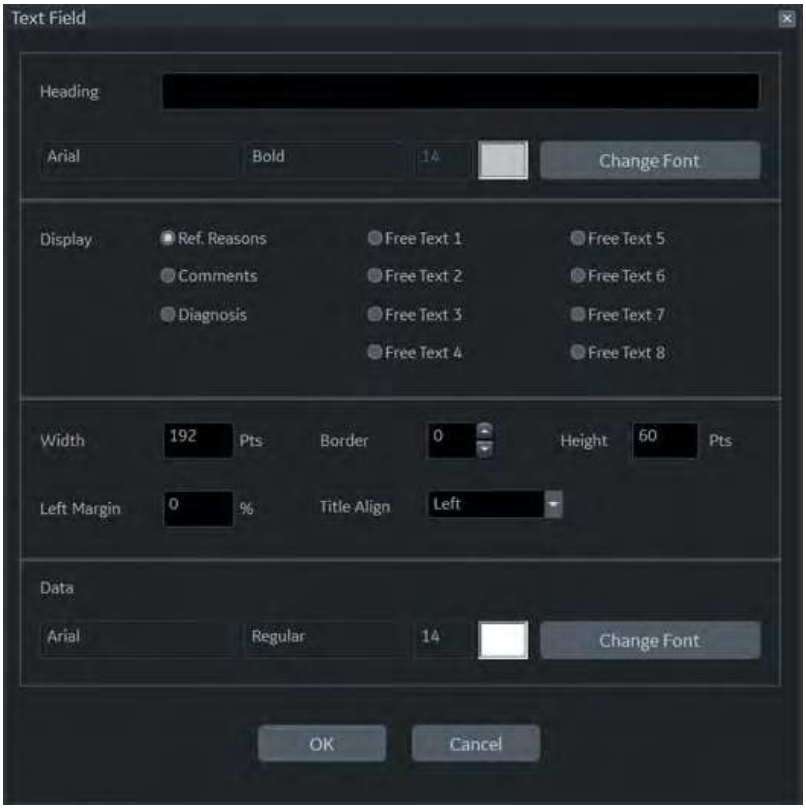


Figure 13-220. Text Field Dialogue Box

4. Select the appropriate display items:
   - Ref. Reasons: Retrieves this information from the Direct Report
   - Comments: Retrieves this information from the Comment field of the patient screen and the Exam Comment field of the worksheet.
   - Diagnosis: Retrieves this information from the Direct Report
   - Free Text 1 - 8

Inserting Text (continued)

5. Type the heading Text.
6. Modify box properties, the heading text and font, and data.
7. Select ***OK*** or Cancel.
8. Save the template.

   To keep the same template name:

   - Select ***Save*** from the File menu, and press **Set**. The Save Template dialog box opens.
   - Select ***Yes***. The template retains the same name and adds “[user]”. For example, OB23-Basic[user].

   To save the template with a new name:

   - Select ***Save As*** from the File menu, and press **Set**. The Save Template As dialog box opens.
   - Enter the name of the new template, and press **Set**. The template receives the new name and adds “[user]”. For example, NewReport[user].

Inserting an image to the report

Some factory templates include an image area. If you want to insert or modify the image area, see ‘Image Display Fields’ on *page 13-445* for more information.

To insert images from clipboard into the image field of the report:

1. Move the cursor to the desired image on the clipboard.

NOTE: The preview image appears when the cursor is over a clipboard image.

2. Press and hold down the **Set** key and drag the selected image to the report by using the **Trackball** or double click the **Set** key on the desired image.
3. To move images between image areas, press and hold down the **Set** key and using the **Trackball**, drag the selected image to the new location.

   To remove an image from the report, press and hold down the **Set** key and using the **Trackball**, drag the select image back to the clipboard.

Measurement result section

Measurement results for the current patient display automatically if you have the measurement section in the report template.

The factory template has an appropriate measurement result area. If you want to insert or modify the measurement area, see ‘Measurements’ on *page 13-451* for more information.

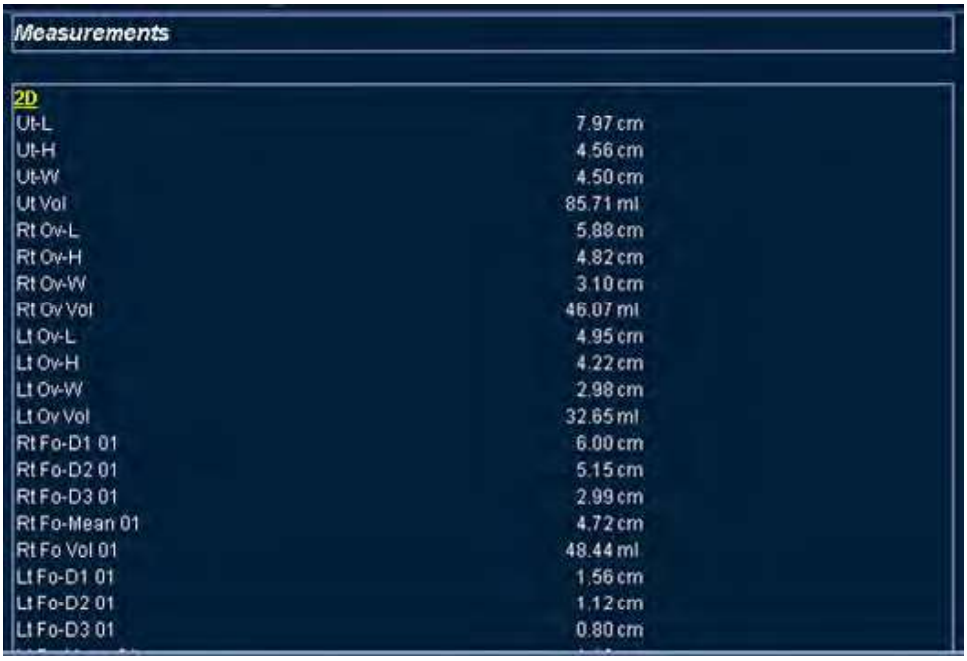


Figure 13-221. Measurement section

Inserting the worksheet

You can insert the worksheet (like you can insert an image) to the image display field. To set an image display field in the report template, see 'Image Display Fields' on *page 13-445* for more information.

1. Display the worksheet on the monitor display.
2. Save the worksheet using the **Print** key.
3. Press ***Report***.
4. Drag the worksheet into the report.
   a. Move the cursor to the desired worksheet on the clipboard.
   b. Press and hold down the **Set** key. Use the **Trackball** to drag the selected worksheet into the Image Display Field.
   c. Release **Set**.

*NOTE: You can also move the cursor to the desired worksheet on the clipboard, double-click the worksheet, move the cursor to the Image Display Field, and select **Set**.*

5. The worksheet displays on the report.

NOTE: You can double-click the worksheet in the report to change the background color to white to save ink during printing. Double-click the worksheet again to return the worksheet to the original color.

Placing objects side-by-side

If you want to place images, the image and comment, anatomical graphic and comment, etc. side-by-side, you must first place a table, which has two (or more) columns, into the report template.

1. Select ***Report***.
2. Select ***Designer*** to display the Report Designer.
3. Place the cursor where you want to insert the object.
4. Select ***Table*** from the Insert menu. Insert Table box displays.

Figure 13-222. Insert Table Box

5. Set the number of columns to 2 (or more, as required) and change the table parameters, if needed. Select ***OK***.

NOTE: If you do not need a table border, set the Border to 0. Add additional rows if required.

6. Place the cursor in the column and select the desired items from the Insert menu (e.g. logo, image, free text). Specify those items.
7. Repeat step 6 for each column as required.
8. Save the template.

   To keep the same template name:

   - Select ***Save*** from the File menu, and press **Set**. The Save Template dialog box opens.
   - Select ***Yes***. The template retains the same name and adds “[user]”. For example, OB23-Basic[user].

Placing objects side-by-side (continued)

To save the template with a new name:

- Select ***Save As*** from the File menu, and press **Set**. The Save Template As dialog box opens.
- Enter the name of the new template, and press **Set**. The template receives the new name and adds “[user]”. For example, NewReport[user].

You can insert the images in the order preferred, by row or column, on the factory templates. See ‘Inserting the Table’ on *page 13-437 for more information.*

Accessing Worksheet, OB Graph and Anatomical Survey Pages

If the Worksheet, OB Graph, and/or Anatomical Survey pages have been saved for the current patient, you can access these pages from the report page.

NOTE: OB Graph and Anatomical Survey pages applies to OB, GYN and Abdomen.

1. Select either ***Worksheet***, ***Graph*** or ***Anatomical Page*** on the Touch Panel.

*NOTE: There is also Fixed Text set up as hyperlinks for these pages. Cursor to the fixed text and press **Set**.*

2. The system displays the appropriate page (Worksheet, OB Graph or Anatomical Survey) with the corresponding Touch Panel.
3. Select ***Report*** to return to the Report page.

Storing the Report

1. Select ***Store***.

   The Report is saved as a CHM file to Archive.

NOTE: The archived report cannot be edited; therefore, it is recommended that the data is carefully reviewed before the report is saved.

Retrieving an Archived Report

1. Select ***Retrieve***. The Retrieve menu displays.

Figure 13-223. Retrieve Menu (Prefix “User1\” may not appear)

2. Select the desired report and press **Set**.

NOTE: The retrieved report cannot be edited.

Deleting a Report from Archive

1. Select ***Delete***. The Retrieve menu appears on the screen.

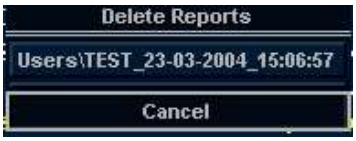


Figure 13-224. Delete Reports Menu (Prefix “User1\” may not appear)

2. Select the report to delete and press **Set**.

Printing the Report

To preview the Print Layout before printing, see ‘Preview the Print Layout’ on *page 13-435* for more information.

NOTE: Double-click the worksheet and/or image in the report to change the background color to white A white background will save ink during printing. Double-click the worksheet or image again to return to the original color.

1. Select ***Print*** to print out the report.

   The Report is printed on the default printer.

Exporting the Report to Media

1. Select More.
2. Select ***Save As***.

   The Save As dialog box appears on the screen.
3. Enter the Report title and select the file format.
4. Select the media to export the Report. The system supplies a name (numeric DICOM UID, unique identifier).

Figure 13-225. Save as Dialog Box

5. Select ***Save***.

Exiting the report

1. Select ***Store*** to save the report.

NOTE: If the user is working on a report and leaves the report screen for any reason, all information added to the report is automatically saved without loss of data.

2. Select another key to close the report page.

Designing Your Own Template

Template Designer

You can design and create your own customized template from a blank template page, or you can use an existing template (factory or user-defined) and save the changes.

Display the desired template and select ***Designer*** to open the Template Designer page.

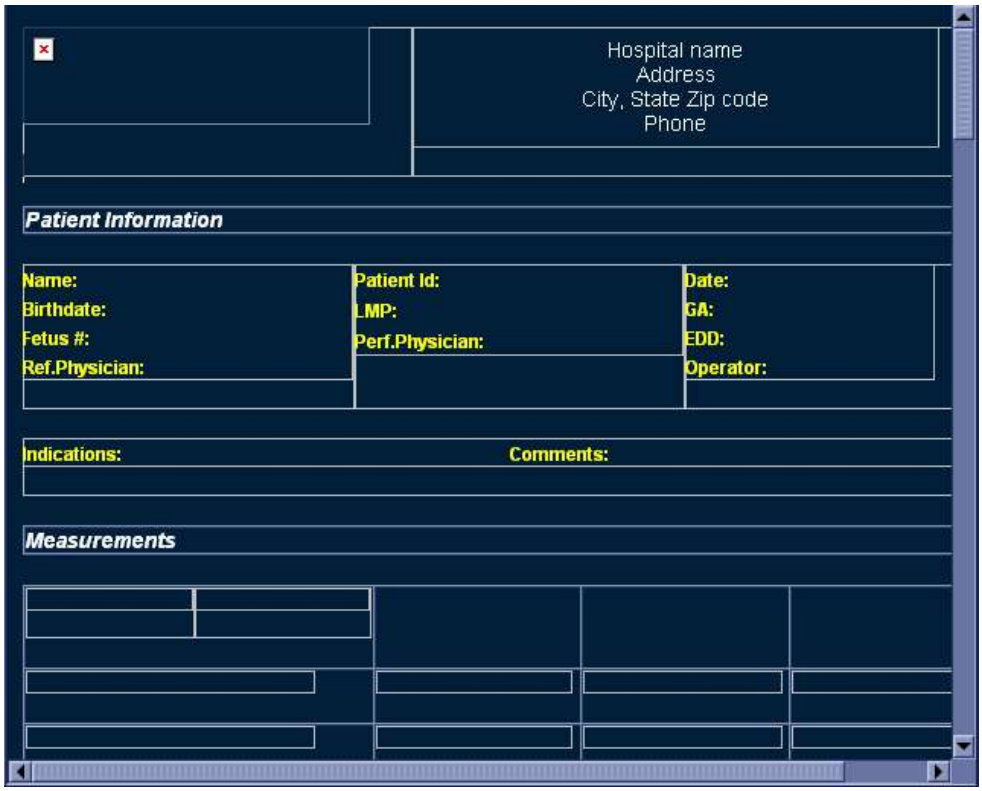


Figure 13-226. Report Designer

File Menu

Table 13-79: File Menu

	Description
New	Creates a new template. A blank template appears.
Save	Overwrites the existing template.
Save As	Saves as a new name.
Page Setup	Enters Print Layout screen.
Print Preview	Executes print preview.
Exit	Exits Report Designer page.

Create a new template

To design a new template without using a pre-existing factory template:

1. Select ***Designer*** to open the Report Designer.
2. Select ***New*** from the File menu, and press **Set**.
   The blank template displays.
3. Create the report template as needed.
4. Select ***Save*** from the File menu, and press **Set**.
   The Save Template As dialogue box displays.
5. Enter a template name and click ***OK***.
6. To exit Report Designer, select **Exit** from the File menu, and press **Set**.
   - Yes: Saves changes and exits Report Designer.
   - No: Does not save changes and exits Report Designer.
   - Cancel: Returns to Report Designer.

Create a new template and save as a factory template name

To design a new template by modifying an existing factory template and keeping the same name of the factory template:

1. Select and display the existing factory template.
2. Select ***Designer*** to open the Report Designer.
3. Modify the report template as needed.
4. To save changes, select **Save** from the File menu, and press **Set**.

   The Save Template dialog box displays.

   - Yes: Saves changes.
   - No: Does not save changes.
   - Cancel: Returns to Report Designer.

NOTE: The template name displays in the template list, retains the same name, and adds "[user]". For example, "OB23-Basic[user]". You do not lose the original factory template.

5. To exit Report Designer, select **Exit** from the File menu, and press **Set**.

   - Yes: Saves changes and exits Report Designer.
   - No: Does not save changes and exits Report Designer.
   - Cancel: Returns to Report Designer.

HINTS

Save changes frequently as you modify your template. Saving often reduces the risk of losing all your changes.

Create a new template and save with a new name

To design a new template by modifying or copying an existing factory template and saving it with a new name:

1. Select and display the existing factory template.
2. Select ***Designer*** to open the Report Designer.
3. Modify the report template as needed.
4. Select ***Save as*** from File menu and press **Set**.
   The Save Template As dialog box displays.
5. Type the new template name and click OK.
6. Select ***Exit*** from the File menu and **Set**.
7. The Report Designer closes and returns to the Report Page.

NOTE: The template receives the new name and adds "[user]". For example, NewReport[user].

Page Setup

1. Modify the factory template as necessary in **Designer**.
2. Select **Page Setup** from File menu and press **Set**.
3. Change the paper size or orientation to fit the print layout, as necessary.
   To define the header and footer for the printed report, type text and enter the required variables listed in the table below. Select "Different for first page" and enter a specific header/footer for that page.

Table 13-80: Variable and Definition

Variable	Definition	Variable	Definition
{pid}	Patient ID	{prt}	Current time (printing time)
{pnm}	Patient name	{cp}	Current page
{pbd}	Patient date of birth	{tp}	Page count
{exd}	Examination date	{c}	Subsequent text is centered
{prd}	Current date (printing date)	{r}	Subsequent text is right aligned.
{inm}	Institution name		

NOTE: Default is left aligned. Report will appear as black ink on white background.

Page Setup (continued)

4. Select ***OK*** or Cancel.

Figure 13-227. Page Setup with Header Example

Preview the Print Layout

1. Select ***Template*** to choose the Report Template.
2. The Print Preview screen displays.

   If changes need to be made, select **Close** to exit the Preview page. Modify the template or return to the Report and modify the contents.

Edit Menu

Table 13-81: Edit Menu

	Description
Delete	Deletes the selected object from the report template.
Undo	Restores the previous state(s) of the report template.

Deleting a template object

1. Select the object to be deleted.
2. Select ***Delete*** from the Edit menu, and press **Set**. The object is deleted from the template.

Undoing the operation

1. Select ***Undo*** from the Edit menu, and press **Set**.
2. Repeat as required.

Insert Menu

Table 13-82: Insert Menu

	Description
Page Break	Inserts a Page Break.
Table	Inserts a Table.
Logo	Inserts a Logo Bitmap File.
Archive Info	Inserts Archive Information.
Anatomical Graphics	Selects anatomical graphics by category to be inserted into a field.
Anatomical Survey	Selects OB, GYN or Abdomen.
Image	Inserts the image display field to the template.
Wall Motion Analysis	Selects Cut Planes, Bull's Eye, or Score Table Box.
OB/GYN	Selects OB Graph, Bar Graph or Anatomy.
Small Parts	Selects Breast or Thyroid.
Measurements	Inserts the measurement display field in the template.
Text Field	Edits text field.
Fixed Text	Enters any comments as Fixed Text.

Inserting the Page Break

1. Place the cursor where the Page Break is to be inserted and press **Set**.
2. Select Page Break from the Insert menu and press **Set**. The page break line displays on the template.

*NOTE: To edit the page break line, select the line and double click the **Set** key.*

Inserting the Table

1. Place the cursor where the table is to be inserted and press **Set**.
2. Select Table from the Insert menu and press **Set**. The Insert Table dialog box displays.

Figure 13-228. Insert Table Dialog

3. Specify each parameter as required.

NOTE: To set the table border as not visible, set "Border" parameter to 0 (zero)

4. Select ***OK*** to insert the table or Cancel.

*NOTE: To insert/delete a row/column from the table or access table properties, double click the **Set** key in any empty area inside the table. A table menu appears with those options.*

Inserting Images in a Table

You can choose the order in which images are inserted into tables: by row (default) or by column.

Image Order by Row

The system default inserts images in the cells of the first row, then to the next row.

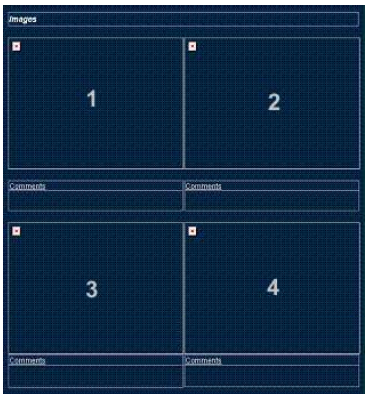


Figure 13-229. Image Order—Row Preference (System Default)

1. Follow the instruction for inserting a table. When specifying parameters, specify:

   No. of Columns=2; No. of Rows=2

2. After inserting the table, insert an image box in each cell of the table.

   a. Move the cursor to the first cell and select Insert -> Image.

   b. Repeat this step for each cell in the table.

After the template is saved and you are working in the ReportWriter, when you select images to be inserted in the table, they are placed in the default order.

Inserting Images in a Table (continued)

Image Order by Column

If you prefer to have the image placement by column, images are inserted in each cell of the first column, then the next column.

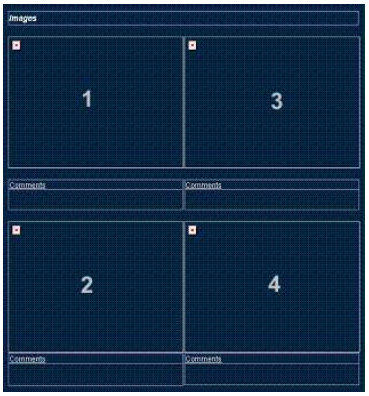


Figure 13-230. Image Order—Column preference

In order to achieve the column preference, you need to create a table with 2 columns and 1 row. In each cell of this table, you need to insert another table.

1. Follow the instructions for inserting a table. When specifying parameters, specify:

   No. of Columns=2; No. of Rows=1
2. After inserting the table, create a table inside each of the existing table's cells.
   a. Move the cursor to the left column's cell and press **Set**.
   b. Select Table from the Insert menu and press **Set**.
   c. When specifying parameters, specify:

      No. of Columns=2; No. of Rows=1; Width=290 pixels.

      Select ***OK***.
   d. Repeat steps a-c for the next column.
3. Insert an image box to each table cell.
   a. Move the cursor to the first cell and select Insert -> Image.
   b. Repeat this step for each cell in the 2 tables.

After the template is saved and you are working in the ReportWriter, when you select images to be inserted in the table, they are placed with your column preference.

Inserting Logos

1. Place the cursor where you want to insert the logo and press **Set**.
2. Select Logo from the Insert menu and press **Set**. The Logo Box displays.

Figure 13-231. Logo Box

3. Select a logo that you want to insert (1). or import a bmp or jpg file from the removable media (2). Scroll the images using the arrow key (3). Specify the appearance (4).
4. Select ***OK*** to insert the logo or Cancel.

Changing a logo:

1. Place the cursor on the logo to be changed and press **Set** twice. The Logo Box displays.
2. Select a different logo. If the desired logo is not shown, select Import Logo to import a different logo.
3. Specify the appearance.
4. Select ***OK*** or Cancel.

Inserting Archive Information

Archive information contains all the objects from the different information menus (Patient, Exam, and Site Information). This box accumulates different information menu selections that can be grouped together and displayed in one table.

1. Place the cursor where you want to enter the archive information and press **Set**.

   If you use a factory template, double click on the current archive information area to display the Archive Information Box.

2. Select ***Archive Info*** from the Insert menu and press **Set**. The Archive Info Box displays.

Figure 13-232. Archive Information Box

3. Type the Heading, select a heading link from the pull-down menu, and select the parameters you want to display in the report.

Inserting Archive Information (continued)

4. Select Box Properties to change the Font, Alignment, Appearance, etc.

NOTE: To set the same font to all fields, select Set All fields.

Figure 13-233. Table Properties

5. Select ***OK*** or Cancel. The contents of the Archive Information is inserted to the related page automatically.

Figure 13-234. Patient (Archive) Information Example

Inserting Archive Information (continued)

Editing displayed Archive Information:

1. Select ***Designer***.
2. Move the cursor to Archive Information field to be edited.
3. Press **Set** twice. The Archive Information Box displays.
4. Edit the heading, the Heading Link and Information parameters, as necessary.
5. Select ***OK*** to save or Cancel.

Anatomical graphics

1. Place the cursor where you want to insert the Anatomical Graphics and press **Set**.
2. Select ***Anatomical Graphics*** from the Insert menu.
3. Select the desired category and press **Set**. The graphic box displays.

Figure 13-235. Anatomical Graphics Box Example

4. Select the graphic to be inserted to the template or import a bmp or jpg file from the removable media. Scroll the images using the arrow key.
5. Select Appearance.
6. Select ***OK*** or Cancel.

Image Display Fields

1. Place the cursor where you want to insert the image.
2. Select image from the Insert menu and press **Set**. The Ultrasound Image Box displays.

Figure 13-236. Ultrasound Image Box

3. Type the Heading text, modify the box properties, and change the heading text font, as necessary.

NOTE: For no heading, type a Space in the Heading text.

To keep the monitor image appearance, the ratio of width to height (W:H) should be 4:3. So, basically 640:480 for large images and 300:225 for two side-by-side images.

4. Select ***OK*** or Cancel.

Cardiac Studies Wall Motion Analysis

1. Place the cursor where you want to insert the wall motion analysis and press **Set**.
2. Select Wall Motion Analysis from the Insert menu.

Cardiac Studies Wall Motion Analysis (continued)

3. Select and set up the desired parameter.

   - Bull's Eye

Figure 13-237. Bull's Eye Dialog Box

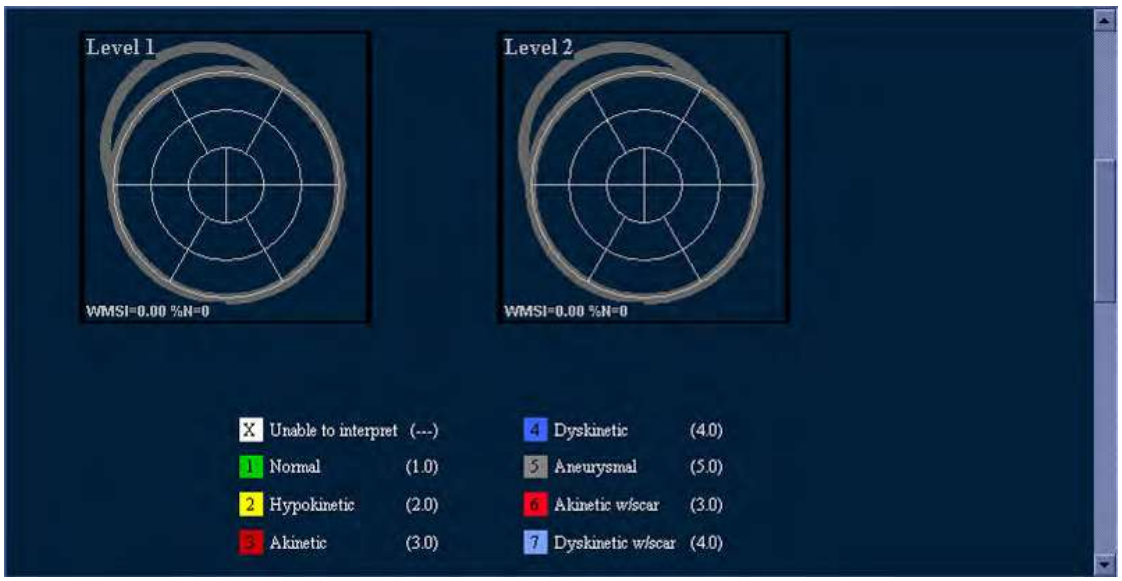


Figure 13-238. Bull's Eye Report Example

Cardiac Studies Wall Motion Analysis (continued)

- Cut Planes

NOTE: The Cut Planes dialog box parameters are similar to the Bull's Eye Dialog Box shown previously.

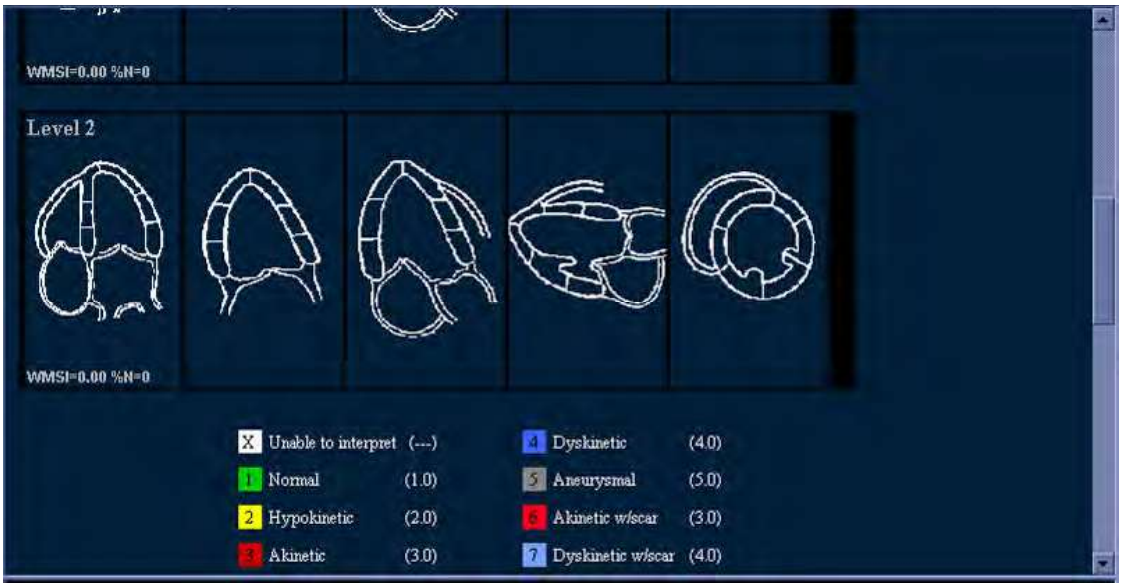


Figure 13-239. Cut Planes Report Example

- Score Table Box

Figure 13-240. Score Table Box Dialog Box

OB/GYN (OB and GYN Only)

The OB Graph, Bar Graph and Anatomy can be entered into the Report.

1. Place the cursor where you want to insert the graph or anatomy and press **Set**.
2. From the Insert menu, select OB/GYN. The selection menu displays.
3. Select the appropriate item as necessary. A dialog box displays.

   - OB Graph

Figure 13-241. OB Graph Dialog Box

   a. Select the Measurement and Fetus Number.
   b. Check Fetus Trending and Fetus Compare, if appropriate.
   c. Modify the Layout, if necessary.
   d. Select ***OK***

OB/GYN (OB and GYN Only) (continued)

- Bar Graph

Figure 13-242. Bar Graph Dialog Box

a. Select the exam and fetus number.
b. Modify the Layout, if necessary.
c. Select ***OK***.

NOTE: The Bar Graph already contains default application measurements.

OB/GYN (OB and GYN Only) (continued)

- Anatomy

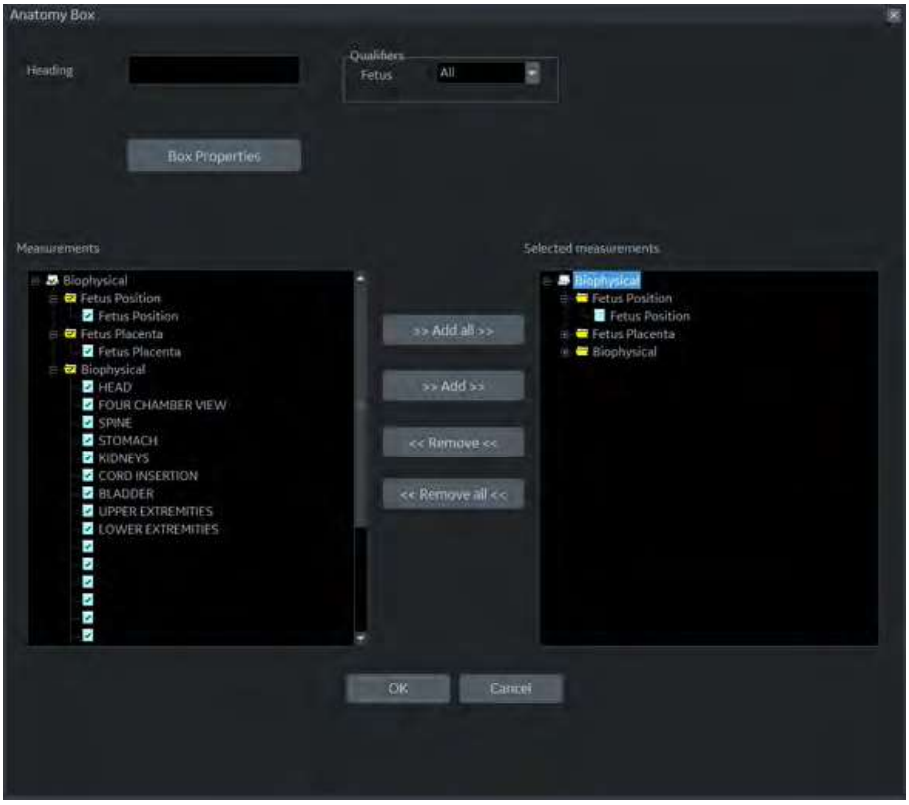


Figure 13-243. Anatomy Dialog Box

a. Type the Heading.
b. Select qualifiers from the pull-down menu.
c. Select "***Add all***" to copy all measurements to the right column
d. Check the box in front of the measurement you need in the left column and select "***Add***". The select measurements copy to the right column.
e. To remove measurements you do not need, check the boxes in front of those measurements in the right column, and select "***Remove***" or "***Remove all***".
f. If you want to modify the properties, select Box Properties and set required parameters.

Measurements

Insert a field to display the measurements. The measured parameters displayed in the measurement display field are configured.

1. Place the cursor where you want to insert the measurement and press **Set**.
2. Select Measurements from the Insert menu and press **Set**. The Measurements Box displays.

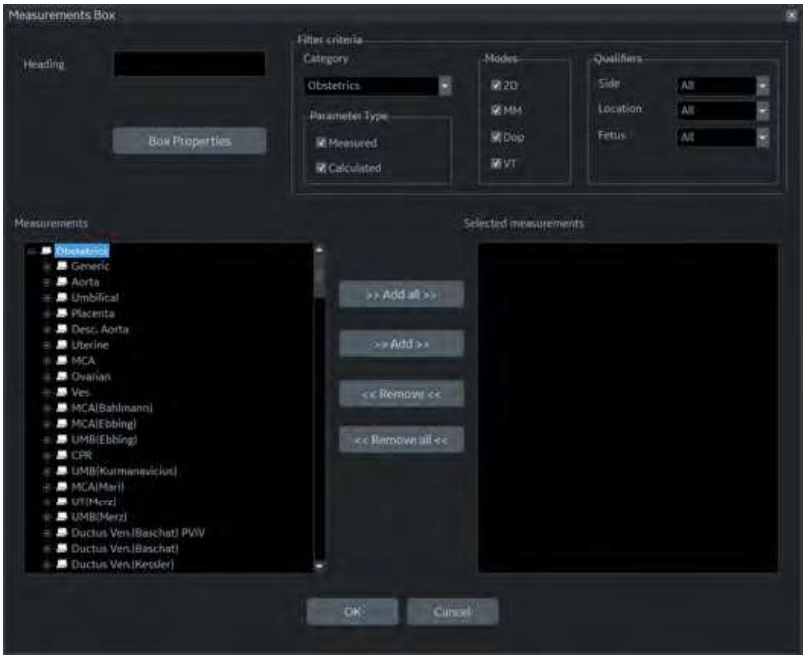


Figure 13-244. Measurement Box

3. Type the Heading text, select the Filter Criteria and measurements from the tree, as necessary.
4. Select ***OK*** or Cancel.

Text Fields

1. Place the cursor where you want to insert the text and press **Set**.
2. Select Text Field from the Insert menu and press **Set**. The Text Field dialog box displays.

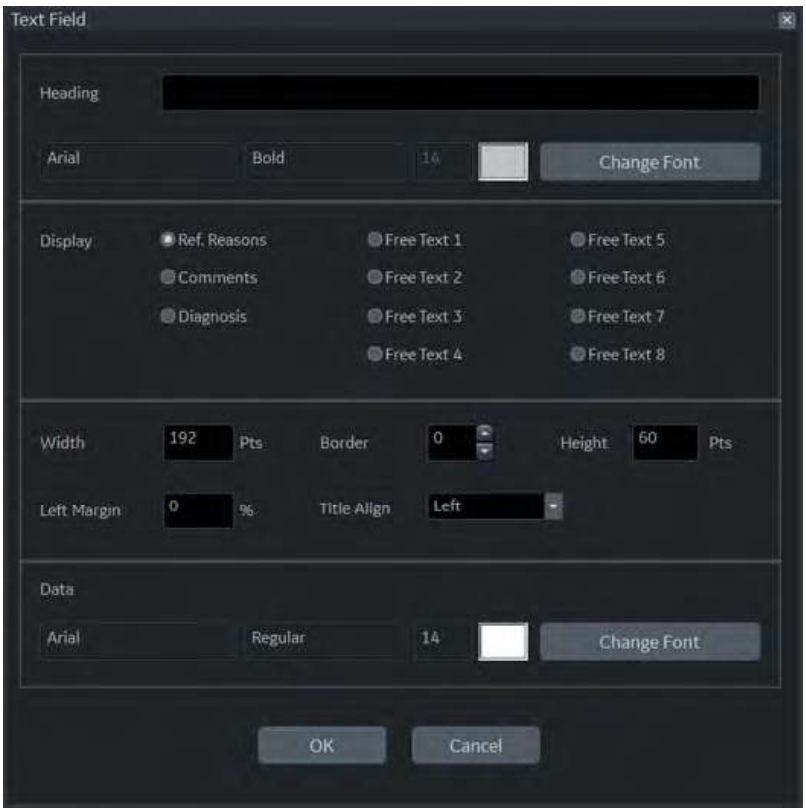


Figure 13-245. Text Field Dialog Box

3. Type the Heading Text. If you do not need the heading, type a space.
4. Select Display item.
   - Ref.Reason: Reason for Referral.
   - Comments: Gets information from the Comment field of the Patient screen and the Exam Comment field of the Worksheet.
   - Diagnosis.
   - Free Text: 1 - 8
5. Specify the border of the Text Field and Font as necessary.
6. Select ***OK*** or Cancel.

The text is saved automatically into the corresponding area selected on this dialog box.

Text Fields (continued)

Editing an existing text field:

1. Move the cursor to the Text Field to be edited.
2. Press **Set** twice. The Text Field dialog box displays.
3. Edit the heading, the settings, or font, as necessary.
4. Select ***OK*** or Cancel.

Fixed Text

1. Place the cursor where you want to insert the fixed text and press **Set**.
2. Select Text Field from the Customize menu and press **Set**. The Fixed Text dialog box displays.

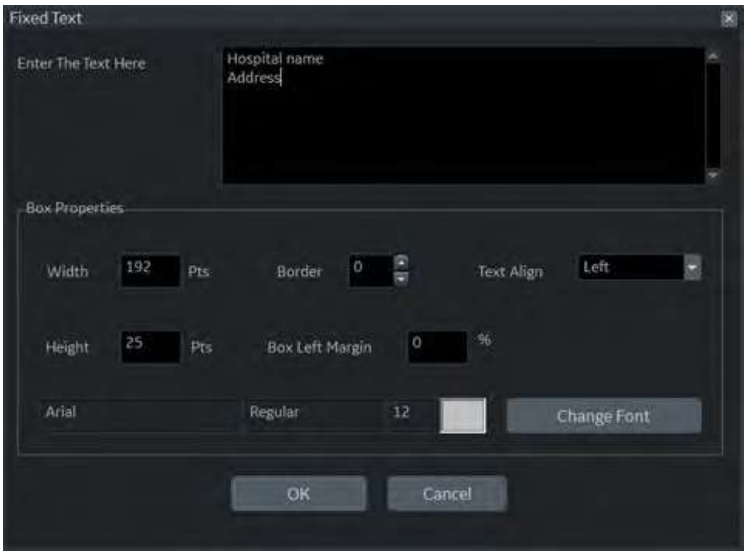


Figure 13-246. Fixed Text Dialog Box

3. Type the text (e.g. hospital information, report title, or table title) and specify the border and font.
4. Select ***OK*** or Cancel.

Editing existing Fixed Text:

1. Move the cursor to the Fixed Text to be edited.
2. Press **Set** twice. The Fixed Text dialog box displays.
3. Edit the text, the border or font, as necessary.
4. Select ***OK*** or Cancel.

Customize Menu

Table 13-83: Customize Menu

	Description
Page Color	Changes the template color.
Preference	The Preference menu for Archive Information field displays.

Page Color

1. To change the page color, select Page Color from the Customize Menu and press **Set**. The Color dialog box displays.

Figure 13-247. Color Dialog

2. Choose the desired color or create a new color.
3. Select ***OK*** or Cancel.

Setting Preferences

To set preferences for the Archive Information:

1. Select Preferences from the Customize menu and press **Set**. The Preference Box displays.

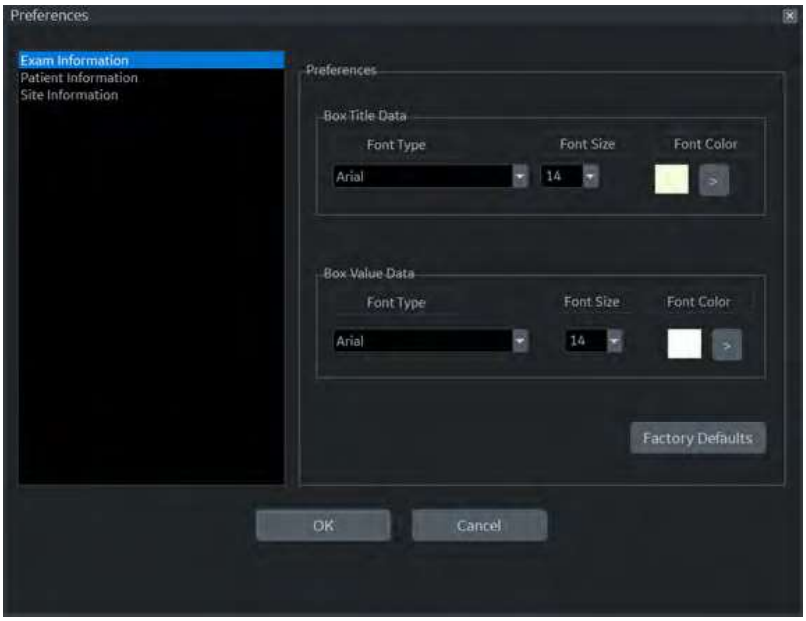


Figure 13-248. Preferences Box

2. Select the information to be modified and set the desired preferences.
3. Select ***OK*** or Cancel.
4. Save the template.

Direct Report

Direct Report

You can use Direct Report to enter Comments, Diagnosis, and Referral Reasons at any time during the examination that will be part of the final report. The comments are reflected on the Report if the Report is configured for those parameters.

1. Select ***Direct Rep.*** on the measurement Summary window. The Direct Report displays on the left side of the monitor display.

Figure 13-249. Measurement Summary Window

Direct Report (continued)

2. The Direct Report displays on the left side of the screen.

Figure 13-250. Direct Report

1. Select the type of information
   NOTE: Comments entered under Diagnosis appear in the Clinical Diagnosis section of the final report. Commentes entered under Referral Reasons appear in the Referral Diagnosi section of the final report.
2. Create/insert pre-defined text
3. Text field
4. List of measurements completed
   The measurement results display on the Measurement Overview field.
   Double Click: inserts value only for selected line, e.g. 5.98 cm
   Shift + Double Click: inserts whole line for selected line, e.g. BPD 5.98 cm
5. Exits the Direct report

Direct Report (continued)

3. Select the appropriate parameter and type the free text with the alphanumeric keyboard or use Insert Text.

NOTE: You can configure the pre-defined text at the Utility Report screen.

a. Select ***Insert Text*** to display the Insert Text Window.

b. Use the **Trackball** to select the text to be inserted.

c. Press **Set**. The selected text displays on the Direct Report.

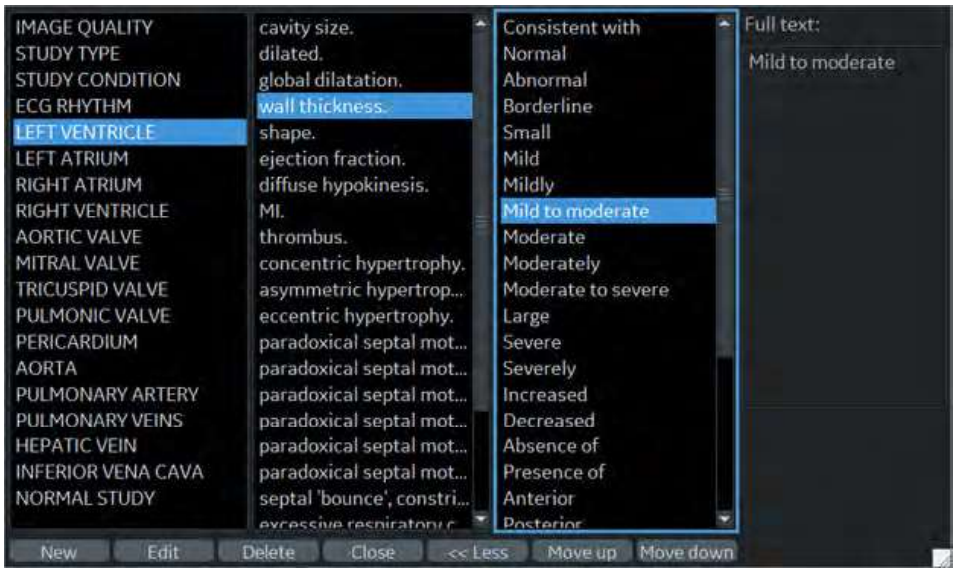


Figure 13-251. Full Insert Text Window

- New: Enters the new text
- Edit: Edits the existing text
- Delete: Deletes the existing text
- Close: Closes the insert text window
- More>>: Displays the Full Insert Text Window
- <<Less: Minimizes the insert text window
- Move up/Move down: Moves the text up or down

4. Move the cursor over the measurement result displayed in the overview window, and double click the **Set** key.

Direct Report (continued)

5. Select ***Done*** at the bottom of Direct Report to exit.

   If you configure the field of comment, diagnosis, referral reasons or Measurement on the Report, the text and/or measurement results entered in the Direct Report are automatically displayed on the Report.

Figure 13-252. Direct Report and Report (Example)

Report Presets

Utility Report Page

You can edit the report template, diagnosis code, and text on the Utility Report page.

Templates

Left Column: The list of all templates (Factory Default, User defined, etc)

Right Column: The list of templates displayed on the template list.

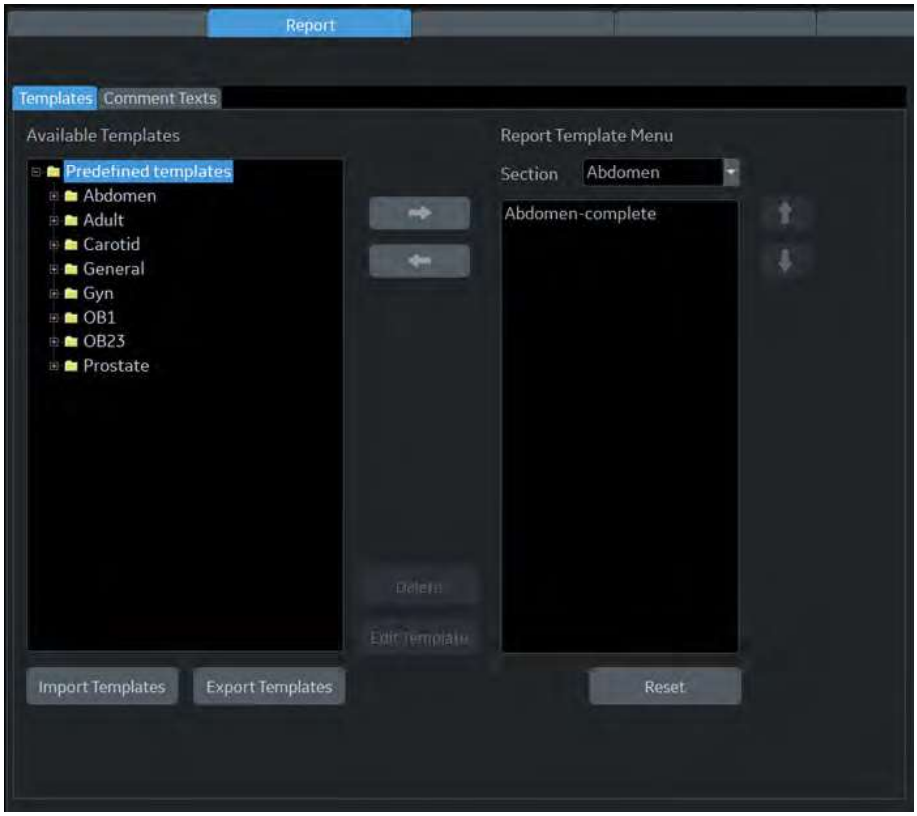


Figure 13-253. Report Template Tab

Templates (continued)

- To insert the template on the template list:
  a. Select the application which you want to insert into the template from the pull-down menu above the right column.
  b. Select the category (categories) and/or the template(s) in the left column by the check the box.
  c. Select the right arrow to copy the template to the right column.
- To remove the template from the template list but not from the system):
  a. Select the template in the right column.
  b. Use the left arrow to remove the template from the right column.
- To edit the template or to make a new template:
  a. Enter Utility -> Report -> Template tab.
  b. Select the appropriate template in the left column.
  c. Select ***Edit Template***. The Template Designer page displays.
  d. Edit the template and save or save as with a new name.

  If you use Save As with a new name, the new template is added to the left column. See ‘Designing Your Own Template’ on *page 13-431 for more information.*
- To delete the template:
  a. Select the template to be deleted.
  b. Press ***Delete***.

Templates (continued)

- To export the template:

HINTS

Export templates to removable media (USBs) so, at a later time, you can import those templates to a different system or a system with a different software version. Export only works on templates, not data.

a. Insert the removable media in the drive.

b. Move the cursor to “Export Templates” and press **Set**. The available user-defined templates display in the Export Templates window.

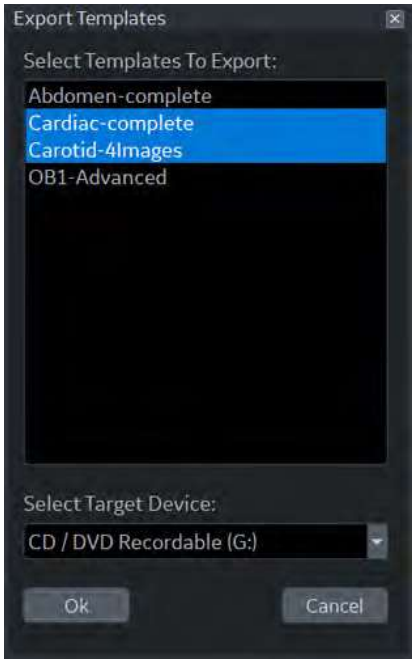


Figure 13-254. Export Templates

c. Select the template(s) to be exported.

*NOTE: To select multiple templates, use the **Ctrl** or **Shift** keys.*

d. Select the desired removable media under the Select Target Device field.

e. Select ***OK***.

f. Press ***F3*** to eject the media.

Templates (continued)

- To import the template:


HINTS

Import templates from a different system or a system with a different software version. Import only works on templates, not data.

a. Insert the removable media with the report template(s) to be imported.
b. Select ***Import Template***. The Import Template window displays.
c. Select the Source Device from the pull-down menu. Select ***OK***.
d. Press ***F3*** to eject the media.

NOTE: Imported templates are stored in the User defined templates\General directory.

- To move the template from the left column to the right, or from the right to the left:
  a. Select the template to be moved.
  b. Select the Right Arrow or Left Arrow button.
- To move the template up or down in the right column:
  a. Select the template to be moved.
  b. Press the Up Arrow or Down Arrow button.

Comment Texts

You can edit the comment text on the Comment Texts tab.

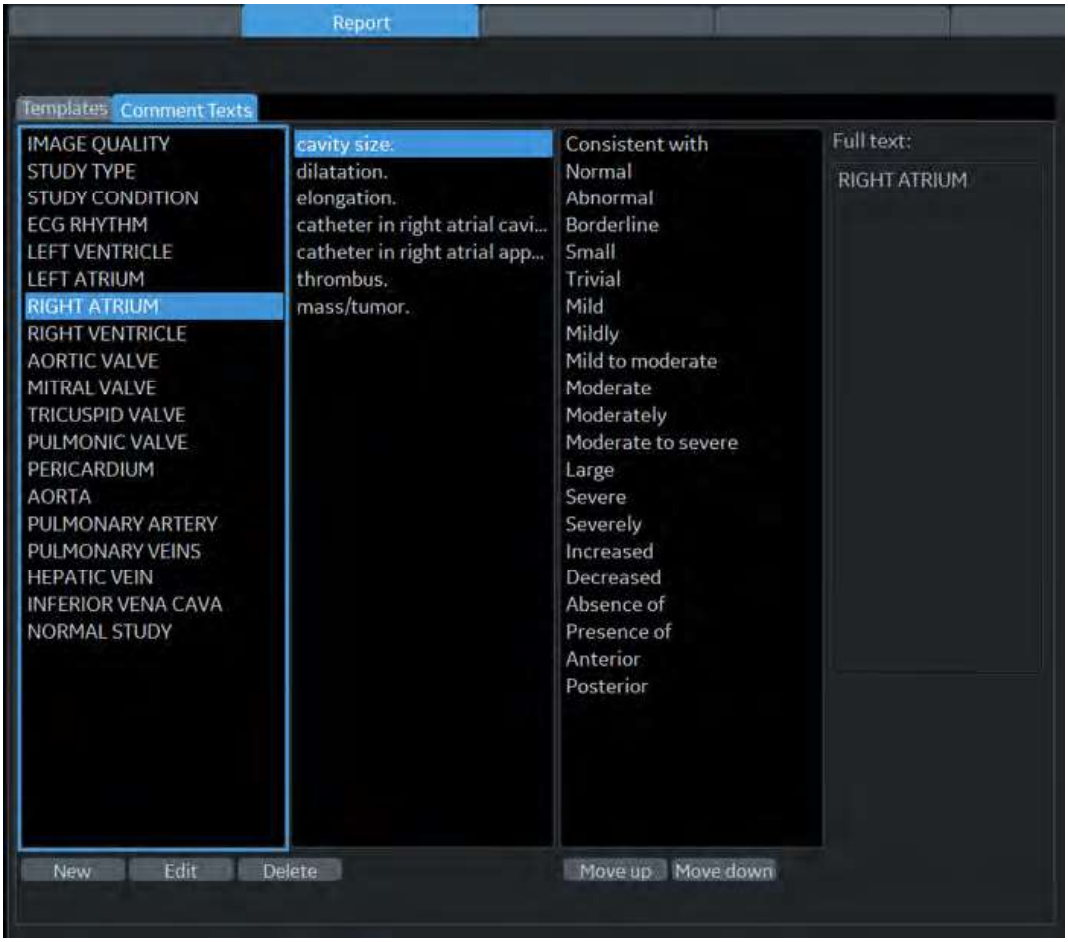


Figure 13-255. Comment Texts Tab

- New: Enters the new comment.
- Edit: Edits the existing comment.
- Delete: Deletes the existing comment.
- Move up/Move down: Moves the comment up or down.

Backup/Restore Report Templates

Backup moves templates to removable media (USBs).

Restore moves templates, that were backed up onto media, to a similar system or a system with the same software version. For example, it allows templates to move from one LOGIQ Totus to another LOGIQ Totus.

To backup the report template:

1. Select ***Utility***.
2. Select ***System*** and select the Backup/Restore tab.
3. Select the media.
4. Check User Defined configuration box of the Backup field.
5. Select ***Backup***.
6. Select ***Save*** and eject the media.

To restore the report template:

1. Insert the media.
2. Select ***Utility***.
3. Select ***System*** and select Backup/Restore tab.
4. Check Report Template box of the Detailed Restore of User Defined.
5. Select ***Restore***.
6. After the system reboot, select ***Utility*** and ***Report***.
7. Select the Template tab.
8. Select the appropriate template (See ‘Templates’ on *page 13-460 for more information.*)

Configuring DICOM

Overview

If you follow these instructions, you will be able to set up a DICOM PACS environment suitable for a typical daily routine in a typical Ultrasound clinical environment:

In these instructions, you will ensure that your LOGIQ Totus and DICOM PACS are connected to and communicating back and forth on the hospital/clinic's network and between the devices. We will be setting up the most commonly used DICOM features typically used in a clinical setting.

NOTE: For additional information on the DICOM parameters, detailed information is provided in Chapter 10, Customizing Your System.

NOTE: To set up the connectivity configuration, See 'Configuring Connectivity' on page 10-61 for more information.

DICOM Job Spooler

To check the status of each job, open the DICOM Job Spooler by pressing F4 (see Figure 13-256).

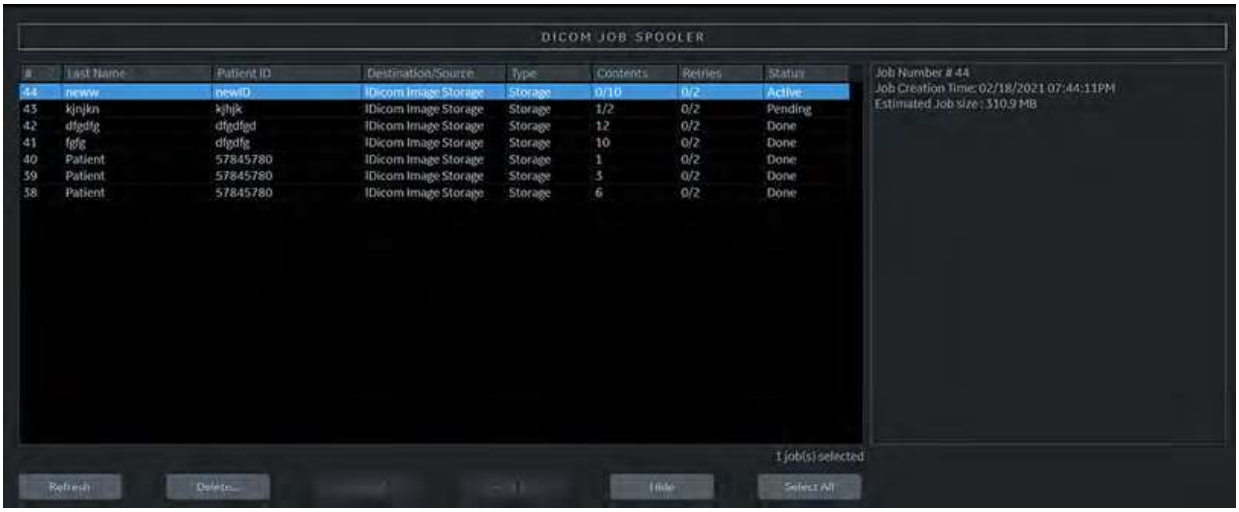


Figure 13-256. DICOM Job Spooler Active Jobs

The DICOM Job Spooler lists Pending, Active, Completed (identified as “Done”) and Failed jobs, with the status listed in the “Status” column on the far right. Select the desired job to see the job details in the Details Pane on the right side of the screen.

Failed jobs will include an Error Description and Recommendations to correct the error in the Details Pane (see Figure 13-257 *on page 13-467*).

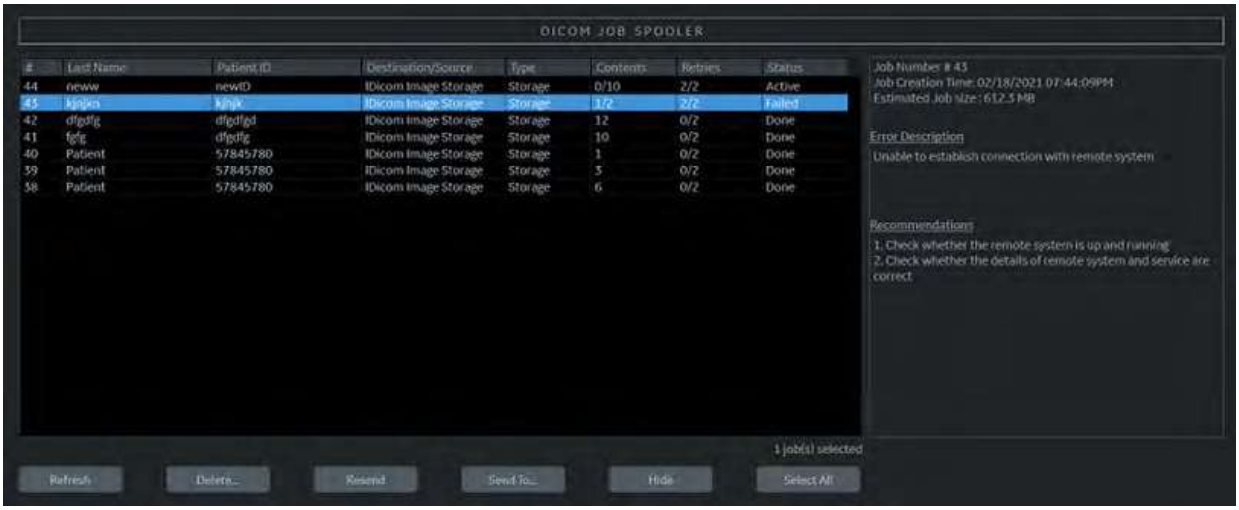


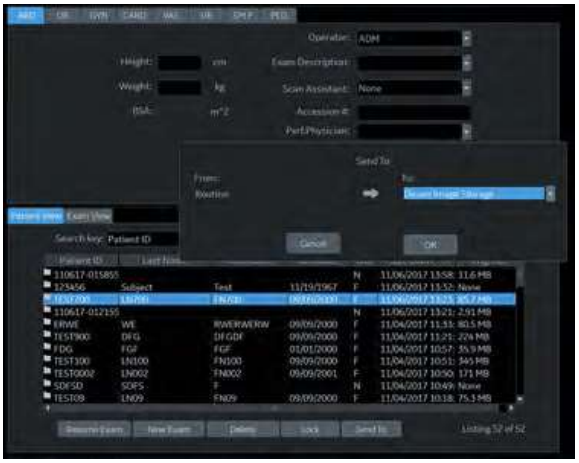
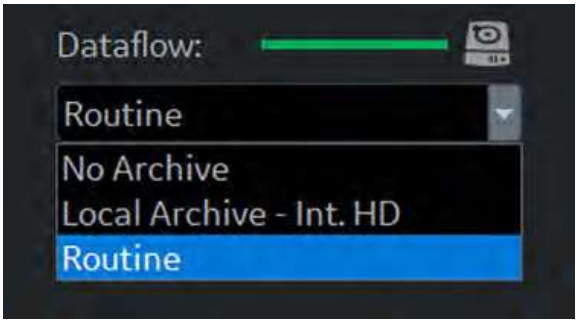
Figure 13-257. DICOM Job Spooler Failed Job

NOTE: Deleting jobs from the spooler does not delete images from the hard drive. They can be re-sent via the “Send To” function on the Patient--> Patient View, Exam View, or Image Review.

Patient Menu DICOM Functionality

Additional DICOM functionality can be performed via the Patient Menu:

Table 13-84: Patient View Functions

You can also send studies to the DICOM destination by selecting Send To. :	
And, access the Worklist or perform Query/Retrieve to/from the PACS via the Patient screen. To start Query/Retrieve for a patient: Select the patient, select Query, the LOGIQ Totus then displays a list of exams. Select the desired exam, then select Transfer.	
You can also specify which Dataflow to use on the Patient page. This is the dataflow that will be used for Copy to Dataflow on print keys.	

Troubleshooting DICOM Connectivity Issues

- If you ping/verify the device and receive a frown, confirm with your IT Team that you are using the correct IP Address, AE Title, Port Number, etc.
- If the image/clip is stuck in the Print Spooler, select the job and resend or send to an alternate device.

For Detailed descriptions of every DICOM parameter, refer to Chapter 10 of the Basic User Manual's (Configuration chapter). For more detailed instructions on setting up each DICOM page, refer to Chapter 3 of the Basic Service Manual (System Setup).

Configuring the Wireless Network

Wireless LAN (WLAN)

A Wireless Network (WLAN) is available on the LOGIQ Totus. When the WLAN is active, an icon appears in the status bar to indicate whether the WLAN is installed or disconnected. See ‘Network and Spooler Status Icons’ on *page 13-474* for a description of the network icons.

Wireless LAN (WLAN) Specifications

The Wireless LAN (WLAN) supports the following network protocols:

Supported Standards

- Conforms to IEEE 802.11 a/b/g/n/ac Wi-Fi with Bluetooth 5.2 Standard.
- FCC Part 15 Class B
- Japan’s Radio Law
- Radio Equipment Directive
- Canada Requirements

Security Methods

- WPA2
- WPA3

Encryption

- 128-bit AES-CCMP
- 256-bit AES-GCMP

Internet Protocol

- The LOGIQ Totus supports IPv4 or IPv6.

Intel declaration of conformity

You can find the Intel Declaration of Conformity at this web link:

https://www.intel.com/content/dam/support/us/en/documents/network-and-i-o/wireless-networking/ax210ngw-eu-red-doc.pdf

Wireless LAN (WLAN) Specifications (continued)

Authentication

- None
- Microsoft PEAP using MSCHAP v2
- Username/password
- Limited support for server certificate verification using pre-installed trusted root CAs
- Client certificates not supported
- User authentication/confirmation prompts not supported

Antenna

- 2 integrated internal wireless antenna

Radio Data Rate

- 1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, 54, 08, 140, 246, and 300 Mbps (Auto Rate Sensing)

Frequency

- 2.4, 5, 6 GHz (160MHz)

Country Compliance

The WLAN subsystem automatically detects location and adjusts the output to be compliant to country regulations. The following is a partial list of countries that the product is compliant with:

- United States: FCC Part 15 Class B
- Canada: Industry Canada Radio Standards Specification (RSS) license-exempt
- European Union: Radio Equipment Directive (RED) 2014/53/EU
- Japan: Japan Radio Law
- Brazil: National Telecommunications Agency (Anatel)
- Malaysia: Malaysian Communications and Multimedia Commission (MCMC)
- Singapore: Infocomm Development Authority of Singapore (IDA)

Connecting to the WLAN

To connect the LOGIQ Totus to the WLAN,

1. Press Utility --> Connectivity --> TCP/IP --> Wireless Network --> Configuration (located under Wireless Network).

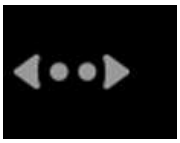
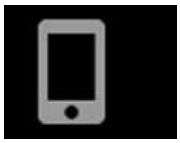
   The Wireless Network Configuration tool appears. If enabled, Wireless Networks broadcasting in your area appear in the list.
2. If necessary, check the box for “Enable Wireless Connection”.
3. Select the wireless network you want to use or set up.
4. Press ***Connect*** from the bottom of the Configuration tool. If prompted, enter the correct settings for this wireless network.

NOTE: If the WLAN fails to connect, review and/or recreate the Wireless connection on the Security Tab.

Network and Spooler Status Icons

The following icons identify network and spooler statuses:

Table 13-85: Network and Spooler Status Icons

Network and Spooler Status Icons				
Ethernet Active 	Ethernet Error 	Ethernet Active Spooler Active 	Ethernet Active Spooler Error 	Mobile 
Mobile Error 	Mobile Bluetooth 	Mobile Wifi 	Spooler Active 	Spooler Active Error 
Spooler Inactive 	Spooler Inactive Error 	Wifi 1 Bar 	Wifi 2 Bars 	Wifi 3 Bars 
Wifi 4 Bars 	Wifi Alert 	Wifi Spooler Active 	Wifi Spooler Error 	Wifi Error 

Adding a Wireless Network

To add a WLAN profile (even for a network which is not yet available),

1. Press Utility--> Connectivity--> TCP/IP--> Wireless Network--> Security. The Wireless Network Configuration tool appears. Available Wireless Networks appear.
2. Select the ***Security*** tab.
3. Select ***Add...***
4. Obtain and enter the correct information for each wireless network setting:
   a. Enter a Network Name (SSID), pre-select the security type, then press OK.

      A new window appears so you can enter the settings for this network.
   b. On the connection page, check the appropriate boxes based on how you want the LOGIQ Totus to connect to this network.

      The LOGIQ Totus attempts to connect to available wireless networks based on the options you enable. If multiple networks are available, connection attempts begin with the network appearing topmost on the list.
   c. Select the Security page.
   d. Select the Security Type from the available options.

NOTE: *Dialog boxes vary, depending on the Security Type selected.*

   e. Select the Encryption Type from the available options.
   f. For Personal networks, enter the Network key.

Adding a Wireless Network (continued)

g. For Enterprise networks, choose the network authentication method and press Settings.

Detailed settings for Enterprise networks are complex and must be correct for the connection to succeed. Ensure you have all the required information/settings and work with your site's IT Network Administrator as needed.

NOTE: Credentials must be entered at this time. The LOGIQ Totus does not support automatic prompting for user credentials.

- For Microsoft PEAP networks, press Advanced and enter User authentication credentials (username and password).
- For Cisco networks, enter user credentials in the PEAP Properties dialog after pressing the Settings button.

NOTE: IMPORTANT: User credentials are not validated until you attempt to connect to the network.

h. When you have correctly entered all required settings, press OK in the Wireless Network Properties dialog.

Your settings will be validated and you may be prompted about certain settings which are not recommended or supported.

Examples: "Automatic connection to unencrypted networks is not recommended. Reminder to enter user credentials for Enterprise networks."

i. If changes are necessary, press Customize. Make corrections, then press OK. Settings will be validated again.

5. After you have filled in all the required information, press ***OK***. To cancel adding this profile, press ***Cancel***.

Removing a WLAN

To remove a WLAN profile (even for a network which is not available),

1. Press Utility--> Connectivity--> TCP/IP--> Wireless Network--> Security. The Wireless Network Configuration tool appears. Available Wireless Networks appear.
2. Select the ***Security*** tab.
3. Select ***Remove***.

Customizing Wireless Network Settings

To customize an existing WLAN profile,

1. Press Utility--> Connectivity--> TCP/IP--> Wireless Network--> Configuration. The Wireless Network Configuration tool appears. Available Wireless Networks appear.
2. Select the ***Security*** tab.
3. Select ***Customize...***
4. Obtain and enter the correct information for each wireless network setting:
   a. Enter a Network Name (SSID), then press OK.

      A new window appears so you can enter the settings for this network.
   b. On the connection page, check the appropriate boxes based on how you want the LOGIQ Totus to connect to this network.

      The LOGIQ Totus attempts to connect to available wireless networks based on the options you enable. If multiple networks are available, connection attempts begin with the network appearing topmost on the list.
   c. Select the Security page.
   d. Select the Security Type from the available options.

NOTE: *Dialog boxes vary, depending on the Security Type selected.*

   e. Select the Encryption Type from the available options.
   f. For Personal networks, enter the Network key.

Customizing Wireless Network Settings (continued)

g. For Enterprise networks, choose the network authentication method and press Settings.

Detailed settings for Enterprise networks are complex and must be correct for the connection to succeed. Ensure you have all the required information/settings and work with your site's IT Network Administrator as needed.

NOTE: Credentials must be entered at this time. The LOGIQ Totus does not support automatic prompting for user credentials.

- For Microsoft PEAP networks, press Advanced and enter User authentication credentials (username and password).
- For Cisco networks, enter user credentials in the PEAP Properties dialog after pressing the Settings button.

NOTE: IMPORTANT: User credentials are not validated until you attempt to connect to the network.

h. When you have correctly entered all required settings, press OK in the Wireless Network Properties dialog.

Your settings will be validated and you may be prompted about certain settings which are not recommended or supported.

Examples: "Automatic connection to unencrypted networks is not recommended. Reminder to enter user credentials for Enterprise networks."

i. If changes are necessary, press Customize. Make corrections, then press OK. Settings will be validated again.

5. After you have filled in all the required information, press ***OK***. To cancel adding this profile, press ***Cancel***.

Setting an IP Address

To set an IP Address (Static or Dynamic), select Utility--> Connectivity--> TCP/IP--> Properties.

Refreshing a WLAN

Refreshes the list of available Wireless Networks. To refresh the Wireless Network,

1. Press Utility--> Connectivity--> TCP/IP--> Wireless Network--> Configuration. The Wireless Network Configuration tool appears. Available Wireless Networks appear.
2. Press Refresh from the bottom of the Configuration tool.

Managing Connectivity to a Wireless Network

You can control which wireless networks can be connected to and which networks are preferred over other networks.

- Networks appearing on the Security page, Preferred Wireless Networks list are listed in decreasing preference.

  The network listed at the top of the list is the most preferred, and therefore the most likely to get connected.

  The network listed at the bottom of the list is the least preferred, and therefore the least likely to get connected.
- Networks with the check box unchecked for automatic connection will never connect unless you manually press the Connect button.
- Non-broadcasting networks will never connect unless the corresponding checkbox is checked; or, you manually press the Connect button.
- Once connected to a network, the system will not automatically switch over to a more preferred network unless the check box is checked.

Monitoring the WLAN

If there are wireless network communication problems, you can monitor the wireless network events.

To monitor Wireless Networking events,

1. Press Utility--> Connectivity--> TCP/IP--> Wireless Network--> Configuration. The Wireless Network Configuration tool appears. Available Wireless Networks appear.
2. Select the Monitor Tab.

WLAN Diagnostics

If the wireless network is connected, you can run diagnostics to determine how well, or poorly, the network itself is working. The diagnostic information displayed can help pinpoint causes of networking problems. Tests which pass are shown in green; tests which fail are shown in red.

To run diagnostics for the Wireless Network,

1. Press Utility--> Connectivity--> TCP/IP--> Wireless Network--> Configuration. The Wireless Network Configuration tool appears. Available Wireless Networks appear.
2. Select the Diagnostics Tab.
3. Select ***Run Diagnostics***.

Repairing the WLAN

Occasionally you may need to repair a WLAN that has lost its connection to the LOGIQ Totus. To repair the Wireless Network,

1. Press Utility--> Connectivity--> TCP/IP--> Wireless Network--> Configuration. The Wireless Network Configuration tool appears. Available Wireless Networks appear.
2. Select the Diagnostics Tab.
3. Select ***Repair***.

NOTE: DO NOT cancel the Repair operation after you have selected to repair the Wireless LAN connection.

Available WLAN Channels

The available WLAN channels show availability of wireless connect points that the scanner can talk to. Each channel supports a finite number of users and has limited signal strength. This may effect the ability to connect, the throughput and the connection dropping out.

To check the available WLAN channels,

1. Press Utility--> Connectivity--> TCP/IP--> Wireless Network--> Configuration. The Wireless Network Configuration tool appears. Available Wireless Networks appear.
2. Select the Properties Tab.
3. Select ***Available Channels...***.

Disconnecting from the WLAN

To disconnect from the Wireless Network,

1. Press Utility--> Connectivity--> TCP/IP--> Wireless Network--> Configuration. The Wireless Network Configuration tool appears.
2. Select ***Disconnect***.

Tricefy Uplink

Introduction

Tricefy is a cloud-based image viewer and a platform to archive, collaborate, and share. The Tricefy DICOM server may be used in the way any DICOM server on the product may be used, i.e., Print keys, Send To, etc. The corresponding DICOM destinations can be used via the Print keys. An internet connection is necessary for uploading data to Tricefy.

NOTE: To engage in service offerings with Tricefy, confirm that your country has entered into an agreement with Tricefy.

NOTE: Tricefy DOES NOT support IPV6 and cannot be used in conjunction with Tricefy.

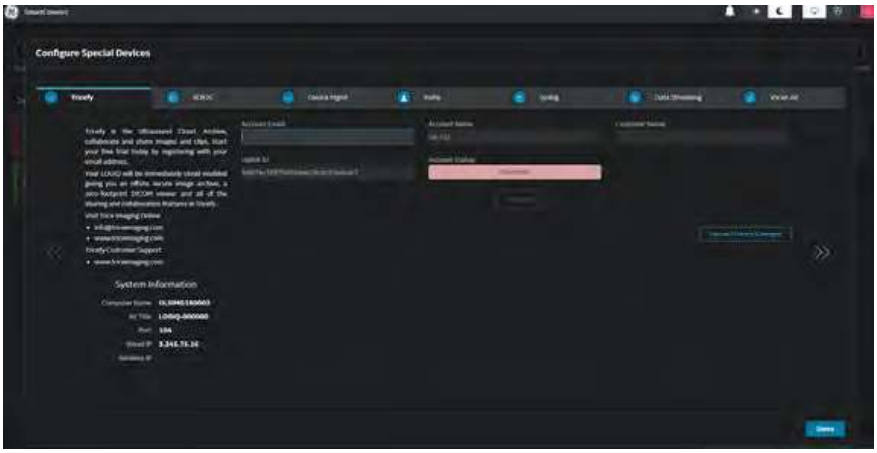


Figure 13-258. Tricefy Account

Introduction (continued)

The tab displays a general info area with a short description of Tricefy, an uplink ID, and an info badge for how to configure Print buttons on system setup (only available when an account is active). Furthermore the account area displays controls and information about the Tricefy account while the test connection area enables you to test a connection and gives detailed information about it.

Uploading Exam Information to the Tricefy Cloud

Enabling Tricefy

1. To enable Tricefy, fill out the information on Utility -> Connectivity -> Special Devices -> Tricefy. As soon as this option is enabled, relevant Tricefy items are displayed (e.g. email text field, Activate button,.... and options within the system setup to share or store data to Tricefy via the print key or status bar icons (described below).
2. Enter your email address to register and click Activate account. (If you want to deactivate an active account, click Deactivate account.)
3. Depending on the account status, different account information is displayed:
   - green badge containing the account info, email address, account name, customer name and account status-account activated
   - blue badge - information about a disconnected account
   - orange badge - connection to Tricefy™ failed (due to timeout,...)
4. For testing the connection click Activate. Depending on the connection status, different information is displayed:
   - green badge - connection ok
   - blue badge - instruction for testing the connection (only displayed as long as Activate is not pressed)
   - orange badge - connection failed
5. Upon success activation, you will receive an Uplink ID.

NOTE: When tricefy is successfully activated an image storage and Query//Retrieve service will be created with port number 8104.

Configuring Tricefy

1. Set up the Tricefy Service via Utility > Connectivity > Service. Set the DICOM Image Storage and Query/Retrieve ports to Port 8104. Refer to the DICOM sections in this chapter and in Chapter 10 for more information. Verify the service.
2. Set up a Dataflow for Tricefy. Refer to the DICOM sections in this chapter and in Chapter 10 for more information. Verify the Dataflow.
3. Configure the Print buttons via Utility > Connectivity > button. Refer to the DICOM sections in this chapter and in Chapter 10 for more information. Verify the Print button(s).

Using Tricefy

You can send a patient's exam to the Tricefy Image Storage service via the Exam Tab.

1. Select the patient's exam and press the Send To button. Select the Tricefy Image Storage service. Press OK.

   You can check the job status by pressing F4 (DICOM Job Spooler).

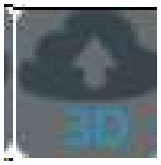
   You can confirm the exam is on the Tricefy Server via a web browser. Navigate to https://tricefy4.com. Log in with your account information. The patient and image(s) you sent are on the Tricefy cloud.

2. To Query patient information on the Tricefy cloud, on the Patient page, go to the Data Transfer page. Select the Q/R radial button, then press Query. A list of patients on the Tricefy cloud is displayed. Select the patient you want to retrieve, then select Transfer.

Tricefy Icons

Tricefy icons are explained below.

Table 13-86: Tricefy Icons

Connection Icons	Store Icons	Share Icons
Connected to Tricefy. Ready to Store and Share 	Upload Image to Tricefy 	Share Image with Patient via Tricefy. 
Disconnected from Tricefy. 	Upload CINE to Tricefy 	Share CINE with Patient via Tricefy. 
Registration incomplete. 	Upload 4D Image to Tricefy 	
	Upload 3D Image to Tricefy 	

Tricefy Activation

Refer to Chapter 10 for more information.

Device Mgmt

Overview

Device Mgmt is a remote device management tool that enables bi-directional management capabilities on the device.

Device Mgmt allows Cloud management of system preset configurations to a fleet of systems on network, as well as one to one system preset configuration Cloud backup and restore.

NOTE: For Cloud operation please refer to Device Mgmt online user manual after sign-up at http://AVURI.gehealthcare.com/signup

Device Mgmt Fleet Management

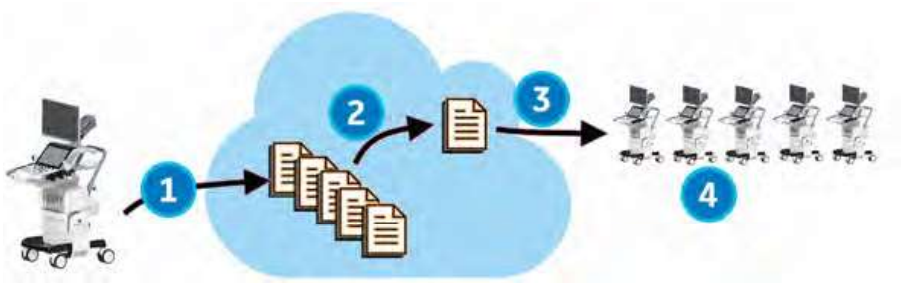


Figure 13-259. Device Mgmt Fleet Management

An account on the Cloud with access to Device Mgmt is required.

1. Upload preset configurations for fleet of systems
2. On the Cloud, assign configuration to fleet of systems
3. Receive installation notification (on each system in the fleet)
4. Install preset configuration (on each system in the fleet)

Device Mgmt Cloud Backup/Restore

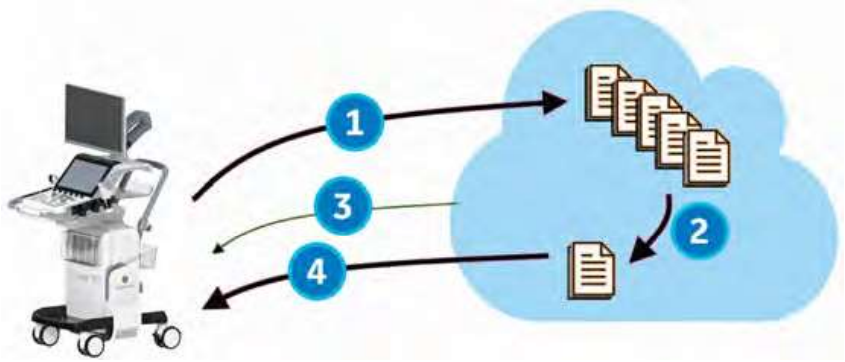


Figure 13-260. Device Mgmt Cloud Backup/Restore

An account on the Cloud with access to Device Mgmt is required.

1. Backup to the Cloud
2. On the Cloud, assign configuration to restore to originating system
3. Receive restore notification
4. Restore on system

NOTE: Restoring to a system other than the originating system is not allowed.

NOTE: Cloud Backup jobs are queued and processed in the background and do not disturb user operation.

Upload For Fleet and Manual Backup (Cloud Backup)

To upload preset information from the master system for the fleet:

1. Go to Utility > System > Backup/Restore.
2. Select **Upload For Fleet**.
3. Set Comment to identify configuration on the Cloud.
4. Press **Upload**.
5. The system displays the result in the status bar and the Notification dialog.

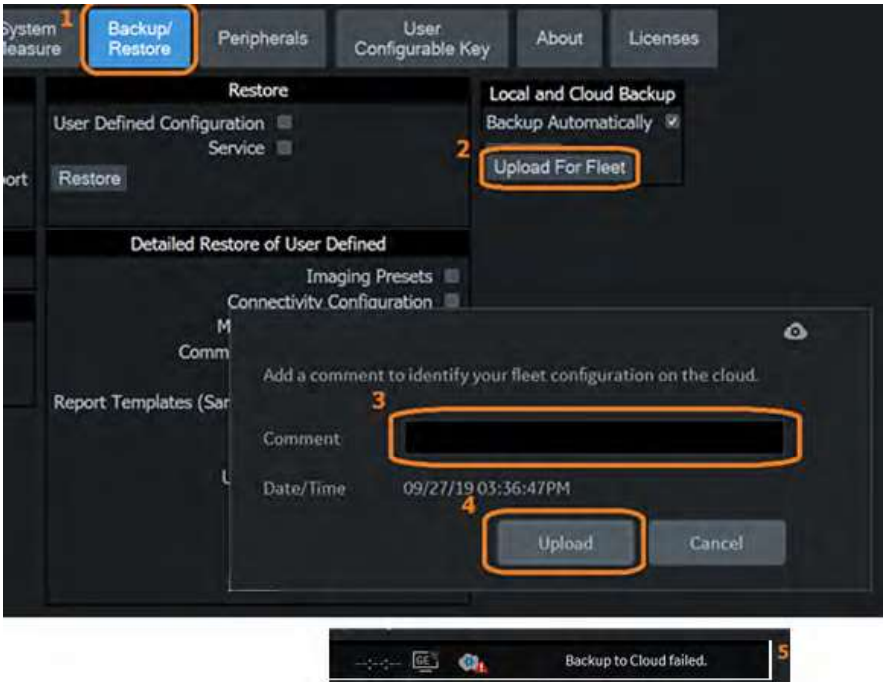


Figure 13-261. Upload For Fleet

NOTE: Upload For Fleet can share the preset configuration across Fleet, while Cloud Backup can restore only to the originating device.

NOTE: Upload For Fleet and Cloud Backup copies all "User Defined Configuration" to the Cloud.

NOTE: The user must have Device Mgmt Administration Group Rights to begin the Upload For Fleet.

Backup Automatically (Local and Cloud Backup)

1. Check ***Backup Automatically*** under Local and Cloud Backup.
2. Press ***Save***.
3. User Defined Configuration files are automatically backed up to Cloud when configuration is changed and then saved.

NOTE: Cloud Backup requires activation. Even if it is not activated, files will automatically copy to Local Backup.

NOTE: If the administrator (ADM) login password is reset and reconfigured, a manual backup should be created to save the ADM password change.

Manual Backup (Cloud Backup)

To backup user defined configuration for Cloud manually:

1. Go to Utility > System > Backup/Restore.
2. Select ***Cloud*** under Backup To/Restore From.
3. Check ***User Defined Configuration*** under Backup
4. Press ***Backup*** under Backup.
5. Set Comment to identify fleet configuration on the Cloud.
6. Press **Backup**.
7. The system displays the result in the status bar and Notification dialog.

Assign Configuration to Fleet or to the Device (on Cloud)

Installation assignment for configuration files uploaded to the Cloud is performed on the Cloud (not on the device).

- Upload For Fleet - Configuration files can be assigned to the Fleet (group of devices).
- Cloud Backup - Configuration files can be assigned only to the device where they were backed up from.

NOTE: Configuration files that have been uploaded to the Cloud with Upload For Fleet and Cloud Backup are displayed in different lists on the Cloud.

Receive Installation Notification

When a configuration file is assigned for installation from the Cloud, the system displays a pop-up dialog notifying that a download is available by selecting the download icon in the status bar. The pop-up appears only at the following operation points, to avoid interrupting an exam:

- New Patient/End Current Patient
- Unlock Lock-screen
- Log off/Log on

The download icon also appears in the status bar.

Figure 13-262. Notification Dialog and Installation Icon

NOTE: The user must have Configuration Group Rights to begin the configuration download and installation. If the user does not have Configuration Group Rights, a Warning message is displayed (see Figure 13-265).

Installation Dialog

Figure 13-263. Installation Icon

Selecting the Installation Icon in the status-bar initiates the Installation Dialog with three options:

- Install
- Delay Install Until Shutdown
- Download Only
- Discard

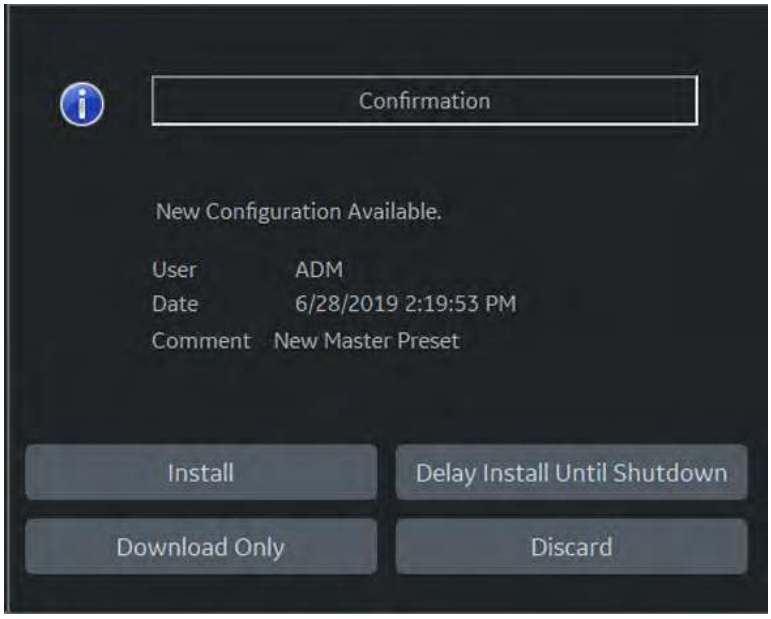


Figure 13-264. Installation Dialog

NOTE: Discard and Download Only are available only when the Installation is marked as optional on the Cloud. Otherwise, no Discard or Download Only buttons appear in the Installation Dialog.

Installation Dialog (continued)

NOTE: Installation requires Advanced Configuration Group Rights. If the user does not have Advanced Configuration Group Rights, selecting the Installation Icon displays a Warning.

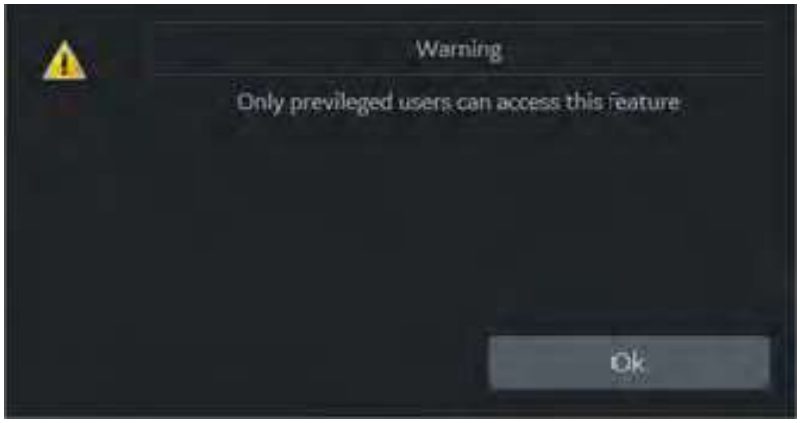


Figure 13-265. Advanced Configuration Group Rights Warning

Install

1. Select the Installation Icon in the status bar.

Figure 13-266. Installation Icon

2. Select **Install**.

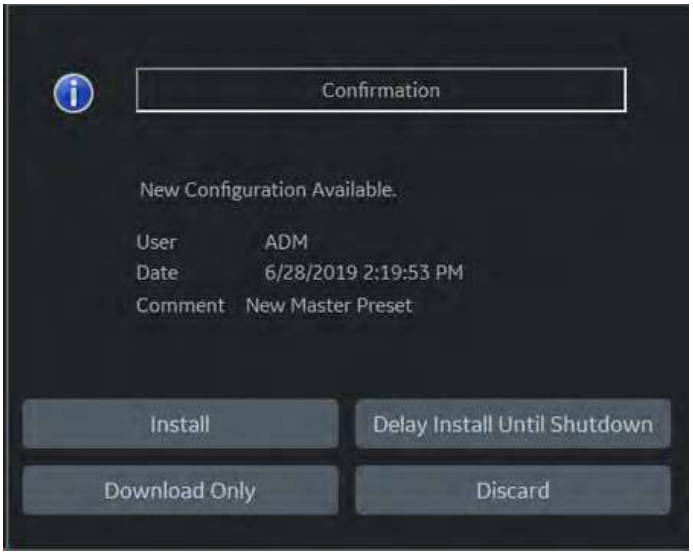


Figure 13-267. Install

3. Select **Continue** to acknowledge. The configuration installation begins and the result is displayed.

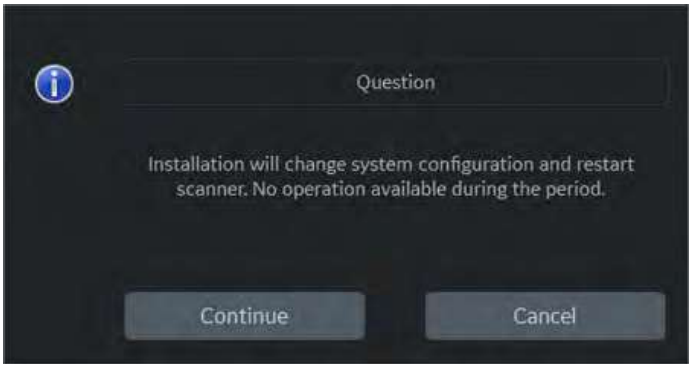


Figure 13-268. Continue Install

Install (continued)

4. Select OK to restart.

Figure 13-269. Select to Restart System

Delay Install Until Shutdown

1. Select the Installation Icon in the status bar.

Figure 13-270. Installation Icon

2. Select **Delay Install Until Shutdown**.

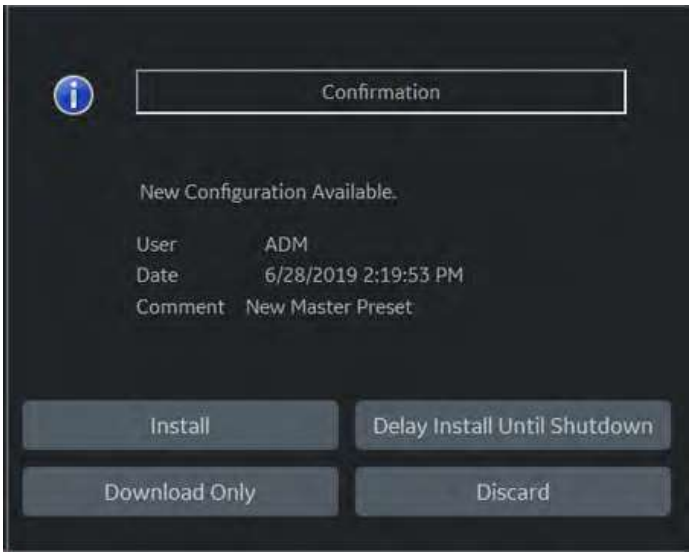


Figure 13-271. Select Delay Install Until Shutdown

3. Select **Continue** to acknowledge. Continue the exam.

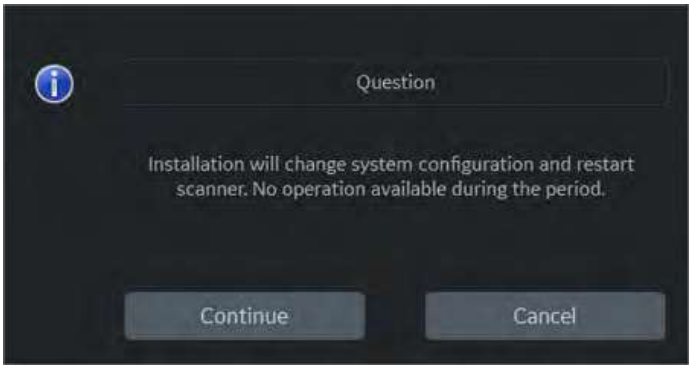


Figure 13-272. Continue Delay Install Until Shutdown

NOTE: Icon changes to "Delay Install Until Shutdown".

Figure 13-273. Delay Install Until Shutdown Icon

Delay Install Until Shutdown (continued)

4. Press Power button to display Exit dialog.
5. Select **Shutdown**. Installation begins automatically and the result is displayed.

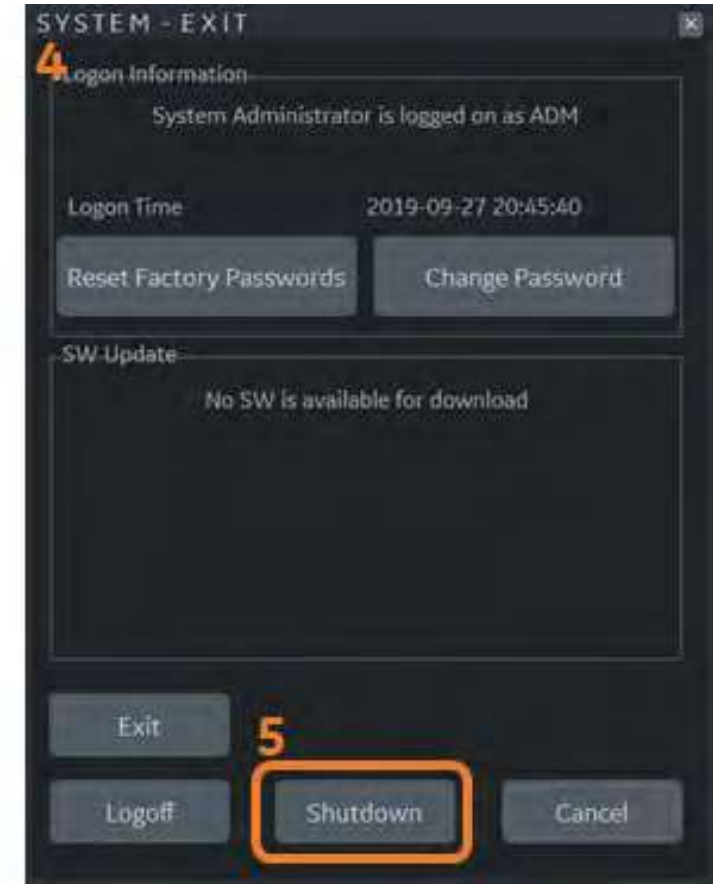


Figure 13-274. Shutdown to Begin Installation

6. When installation is complete the system will shutdown automatically.

NOTE: If the installation fails for any reason, a notification will be displayed after the system restarts.

Discard

1. Select the Installation Icon in the status bar.

Figure 13-275. Installation Icon

2. Select **Discard**.

NOTE: Discard is available only when the Installation is marked as optional on the Cloud. Otherwise, no Discard button appears in the Installation Dialog.

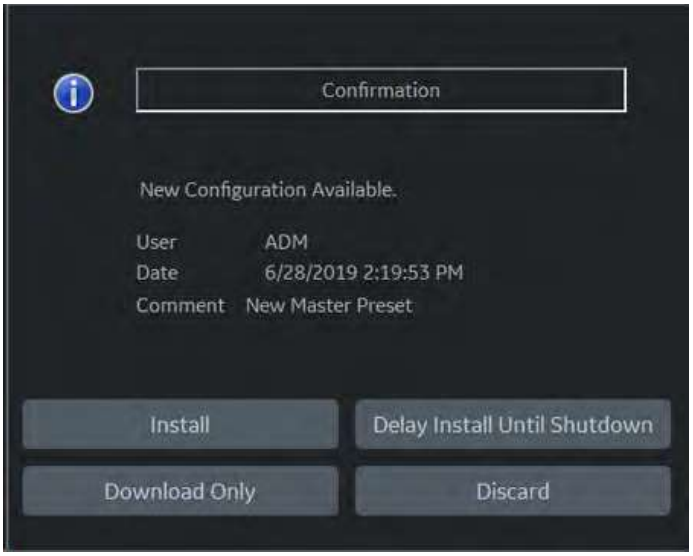


Figure 13-276. Select Discard

3. Select **Continue** to acknowledge.

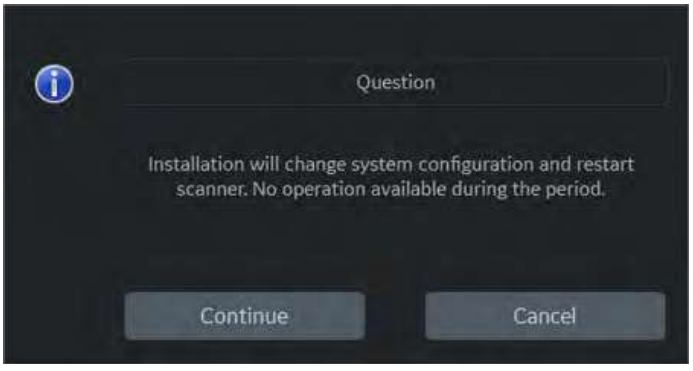


Figure 13-277. Continue Discard

Detailed Restore from Cloud

Download Only from Cloud

NOTE: Because Download from Cloud runs in the background, the download is already completed when selecting Install Icon.

1. Select the Install icon.

Figure 13-278. Install icon

2. Select ***Download Only*** which creates local backup of the preset.

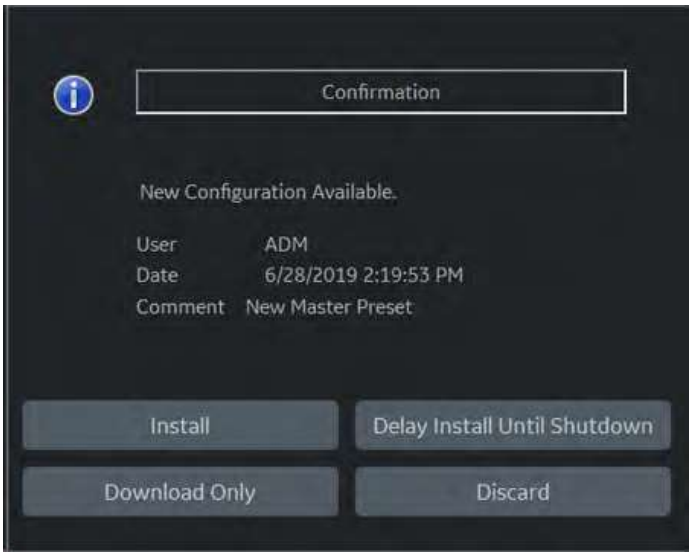


Figure 13-279. Select Dowonload Only

NOTE: If installation of the preset is set as Mandatory, then the dialog enables only the Install or Delay Install until Shutdown.

Download Only from Cloud (continued)

3. Information displays when the download is completed.

   Download completed. To install the downloaded configuration, go to Utility -> System -> Backup/Restore and select Cloud as the Location.

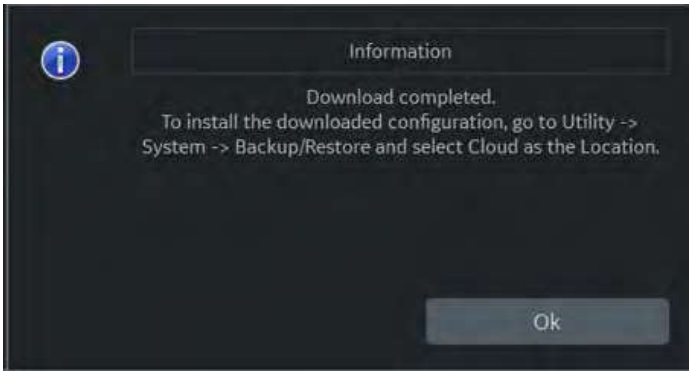


Figure 13-280. Download Completed

Detailed Restore From Cloud

1. Go to Utility > System > Backup/Restore.
2. Select ***Cloud*** as Location of Restore From
3. Select categories and press ***Detailed Restore*** under Detailed Restore of User Defined.

Restore from Cloud

1. Go to Utility > System > Backup/Restore.
2. Select ***Cloud*** as Location of Restore From
3. Select categories and press ***Restore*** under Restore.

Cancel a Failed Job

1. Select Notification Icon.

Figure 13-281. Notification Icon

2. The notification dialog displays on the monitor. Select a failed job and press ***Cancel Selected Job***.

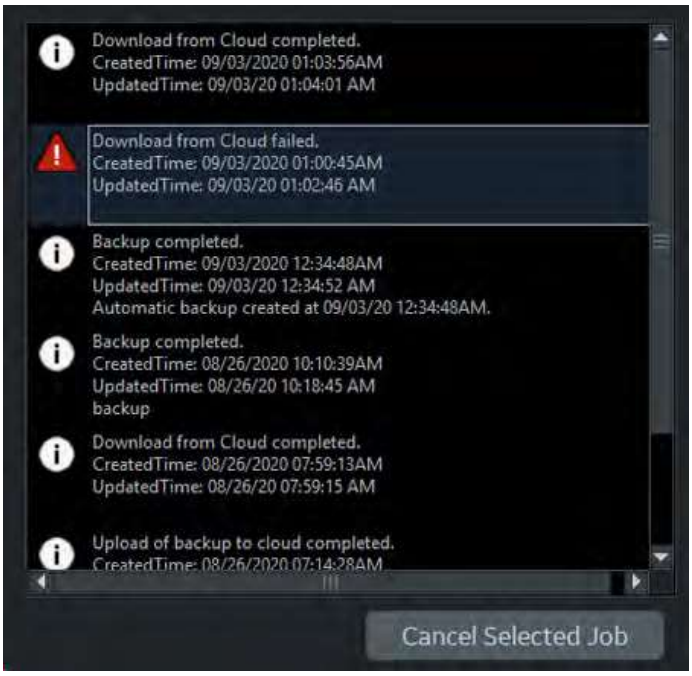


Figure 13-282. Select Failed Job

3. Select ***Continue*** on the dialog.

Figure 13-283. Warning Dialog

NOTE: Successful jobs are removed automatically after a period of time. Failed jobs are deleted automatically after 2 weeks.

Icon and Notification

One of the following icons is displayed in the status bar:

Table 13-87: Device Mgmt Icons

Icon	Description
	Activated/Not Activated
	Unread/Read Error message
	Unread/Read Warning message
	Unread/Read information

When there is a notification, clicking on the icon displays a message (see Icon Message example below).

Figure 13-284. Icon Message

Smart Device Apps

LOGIQ Apps

Smart Device LOGIQ Apps are available for Android devices (both a phone and tablet) via Bluetooth: LOGIQ Remote Control App and LOGIQ Photo/Barcode Reader App.

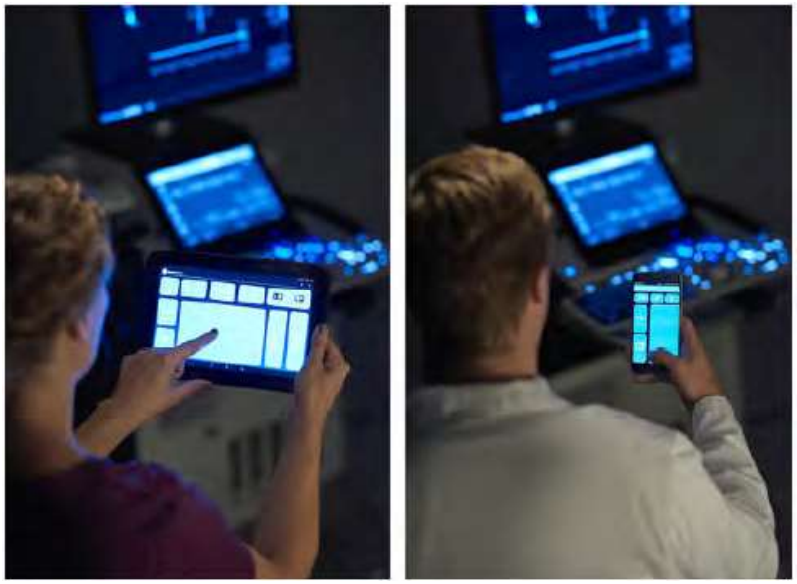


Figure 13-285. Smart LOGIQ Apps Devices

NOTE: The communication between the LOGIQ Apps and the ultrasound system is Bluetooth which is a wireless, secure transmission. At no time is patient data stored on the device hosting the LOGIQ Apps. For the LOGIQ Photo App, photos are never written to a file, but rather directly transferred to the LOGIQ ultrasound system. Once on the ultrasound system they can be included with the diagnostic images sent to the reviewing/reading physician.

LOGIQ Apps (continued)

DANGER DO NOT use the Smart Device Apps if the patient has a life-sustaining device, such as a pacemaker or defibrillator. Failure to follow this instruction could lead to interference with patient electronic device(s).

NOTE: DO NOT use the USB Ports on the LOGIQ Totus to charge LOGIQ Apps devices as these devices are not approved devices to connect to a medical device.

Connecting the Device

To link to the device:

Table 13-88: Linking the Device to the LOGIQ Totus

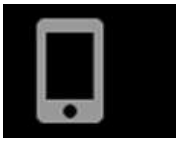
Steps	On LOGIQ Totus	On Device
1. Press the Mobile Icon on the LOGIQ Totus that's located on the display. 		

Table 13-88: Linking the Device to the LOGIQ Totus (Continued)

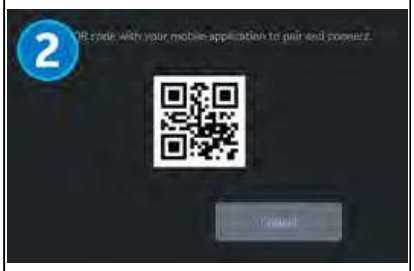
Steps	On LOGIQ Totus	On Device
2. On the LOGIQ Totus, the QR code appears on the display. 3. On the device, press the LOGIQ Remote App.		
4. Follow the instructions on the device. a. Press “Connect.” b. Scan the QR Code with the device.		

Table 13-88: Linking the Device to the LOGIQ Totus (Continued)

Steps	On LOGIQ Totus	On Device
5. Place the device in front of the LOGIQ Totus as directed. “Scan QR code with your mobile application to pair and connect.” The LOGIQ Totus and the device are now ready to pair.		
6. The device displays the Bluetooth pairing request, “Confirm passkey is ##### to pair with the LOGIQ Totus.” Press OK.		

Table 13-88: Linking the Device to the LOGIQ Totus (Continued)

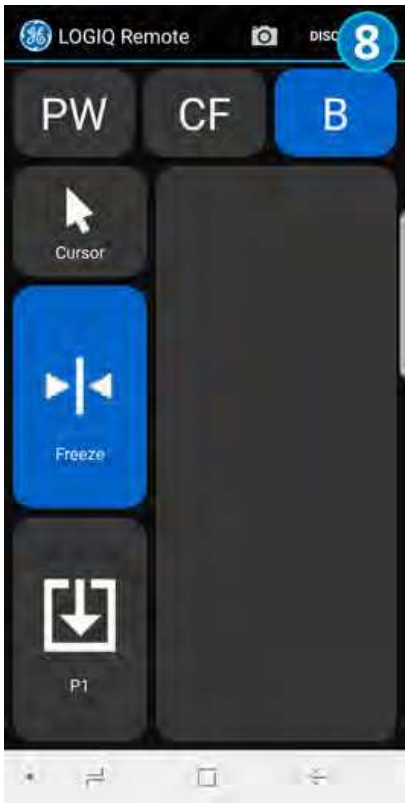
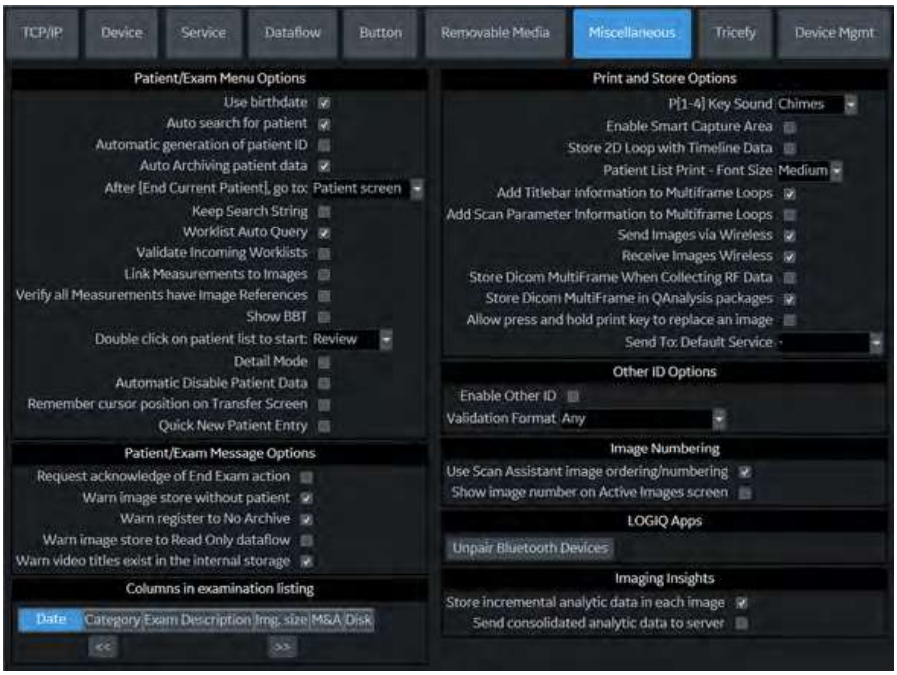
Steps	On LOGIQ Totus	On Device
7. The Bluetooth icon on the LOGIQ Totus is now paired to the device. 8. The LOGIQ Remote application appears on the device. The Phone App and Tablet App displays are shown to the right.		 
To switch to the LOGIQ Photo App, press the Camera icon located on the top of the remote device's display. Note: The Camera Icon only appears if LOGIQ Photo App is already installed.		

Table 13-88: Linking the Device to the LOGIQ Totus (Continued)

Steps	On LOGIQ Totus	On Device
To disconnect the LOGIQ Totus from the device, click on the “Bluetooth Connected to the Device” icon on the bottom of the display and select to disconnect. Or, You can press “Disconnect” on the Device.		
To Unpair a Device from the LOGIQ Totus, press “Unpair Bluetooth Devices” via Utility> Connectivity> Miscellaneous> LOGIQ Apps.		

To completely break the association between the LOGIQ Totus and the device (unpair the device from the LOGIQ Totus):

1. Access the Utility-> Connectivity-> Miscellaneous screen.



2. In the LOGIQApps section, select ***Unpair Bluetooth Devices***.

Assigning LOGIQ Apps to a User Defined Key

To assign LOGIQ Apps to a User Define key, select “LOGIQ Apps” to a User Defined key (restart needed)” via Utility> System> User Configurable Key.

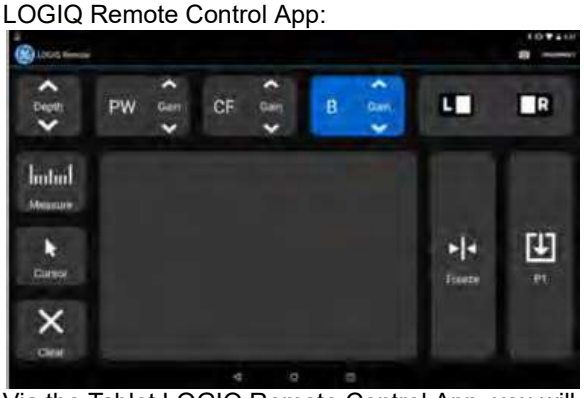
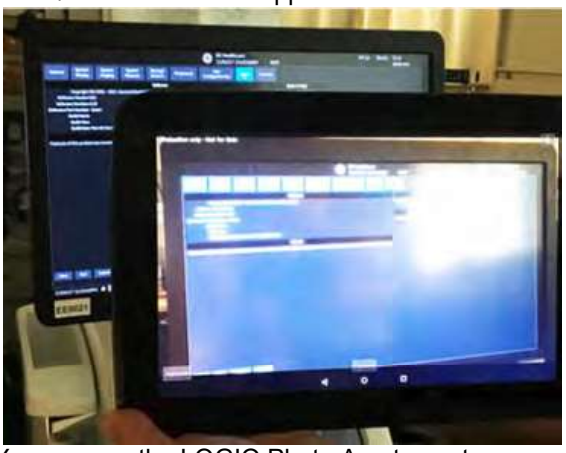
Figure 13-286. Assign LOGIQ Apps to a User Defined Key

Using the Apps

Table 13-89: Using Smart Device LOGIQ Apps

Tablet/Phone Remote Control and Photo/Barcode reader Apps
1. LOGIQ Remote Control App 2. LOGIQ Photo/Barcode Reader App 

Table 13-89: Using Smart Device LOGIQ Apps (Continued)

Tablet/Phone Remote Control and Photo/Barcode reader Apps	
LOGIQ Remote Control App:  Via the Tablet LOGIQ Remote Control App, you will be able to adjust the following controls: Depth, Gain (B-Mode, Color Flow Mode, PW Mode), Left/Right, Measure, Comment, Clear, Trackball, Freeze, Store, Color Flow Scale, and Cursor.  Via the Phone LOGIQ Remote Control App, you will be able to adjust the following controls: Activate PW, CF, or B-Mode, adjust the Cursor, Freeze the image, and sent images to the P1 control.	Photo/Barcode Reader App  You can use the LOGIQ Photo App to capture photos that will go to the patient's exam and to use as a barcode reader to scan in patient exam information. Note: The photo does not go directly into the exam; instead the image must be stored from the LOGIQ Totus. Note: The barcode scanner scans the barcode into the Patient ID field on the Patient menu.

Barcode - Input Mode

Off

Enter the Patient ID using the keyboard.

Patient ID

Scan the barcode for the Patient ID or enter the Patient ID using the keyboard.

Complexation

Patient demographics can be entered by scanning the barcode, or manually, using the keyboard.

To enter patient demographics manually with the keyboard (instead of the barcode), select Cancel.

1. Enter a string in the Input Data field by scanning from a barcode or typing with the keyboard.
2. Scan a sample barcode. The following items can be included in the barcode:
   - Patient ID
   - First Name, Last Name, Middle Name
   - Birth Year, Month, Day

NOTE: The character length for Year is four characters, Month is two characters and Day is two characters. The Year, Month and Day should always be provided together.

   - Gender

Complexation (continued)

3. Configure the Start and End position for each item.

NOTE: If the barcode does not contain information for an item, configure the Start and End position as "0."

For example, if the scanned barcode is "000001LastNameFirstName191990101F," the configuration and results display as seen in Figure 13-287.

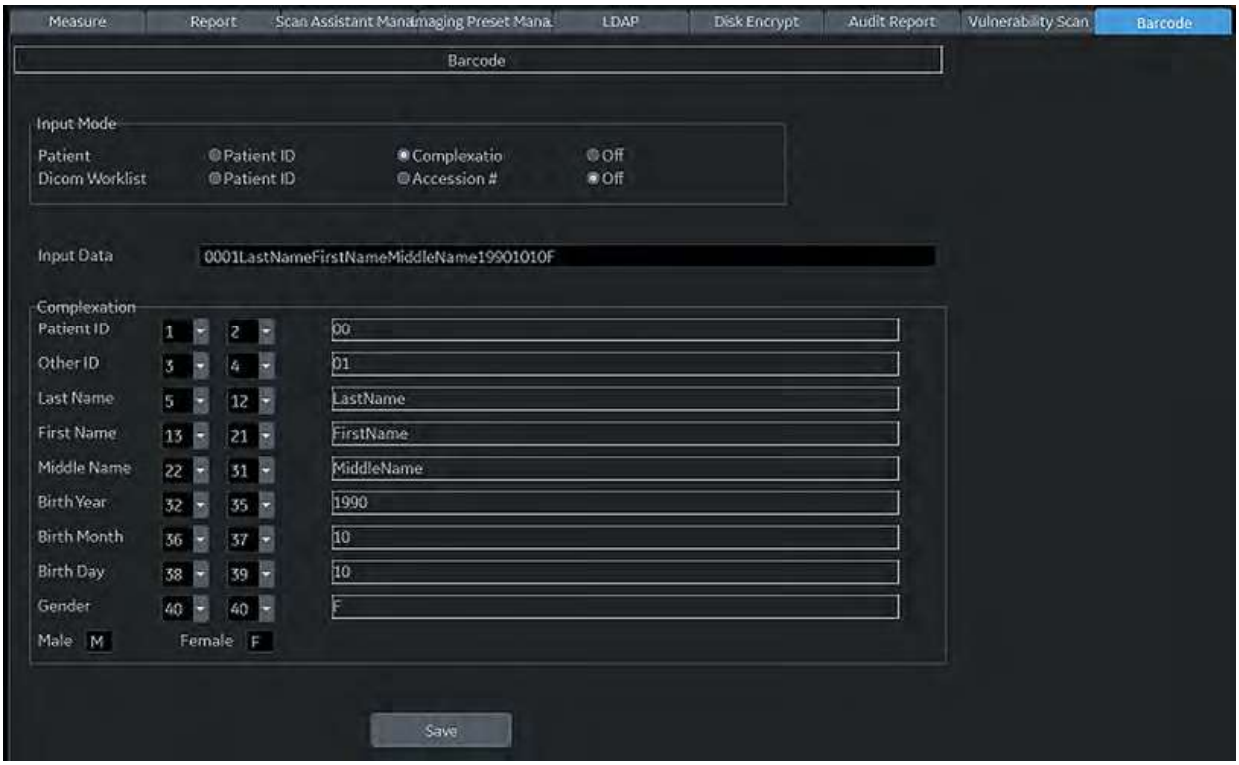


Figure 13-287. Barcode Configuration Page Example

Digital Expert

Digital Expert Remote Training

Digital Expert is a purchasable option which enables remote training between users and the GE HealthCare Clinical Applications team, through scheduled and real-time sessions. Digital Expert is a self-contained, app-based companion solution, designed to pair with GE HealthCare medical devices. Digtal Expert utilizes Intelehealth software for remote connectivity.

NOTE: This tool is not for clinical diagnostics purposes.

Digital expert also enables customer to customer Enterprise Collaboration, where users can connect with each other within their own network. This provides on-demand access for guidance and consultation for clinicians from in-house experts.

Refer to the user manual included with Digital Expert for information on setting up and using Digital Expert.

Service and Applications Support

GE HealthCare Connect Guide

The GE HealthCare Connect Guide helps the user follow the necessary steps to setup the InSite ExC connectivity. To use the GE HealthCare Connect Guide to begin the GE HealthCare Backoffice Connectivity Troubleshooting wizard:

1. Select the Insite icon at the bottom of the display screen to open up the InSite ExC Icon Menu.

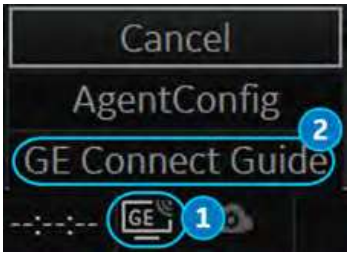


Figure 13-288. InSite ExC Icon Menu with Connection Unconfigured

2. Select GE HealthCare Connect Guide from the menu to open the GE HealthCare Backoffice Connectivity Troubleshooting wizard.

GE HealthCare Backoffice Connectivity Troubleshooting Wizard

Use the following GE HealthCare Backoffice Connectivity Troubleshooting wizard screens to setup the GE HealthCare Backoffice connection.

1. **Agent Configuration** - The Serial ID is displayed (not editable). Verify CRM ID; edit if necessary and save changes. Select Next.

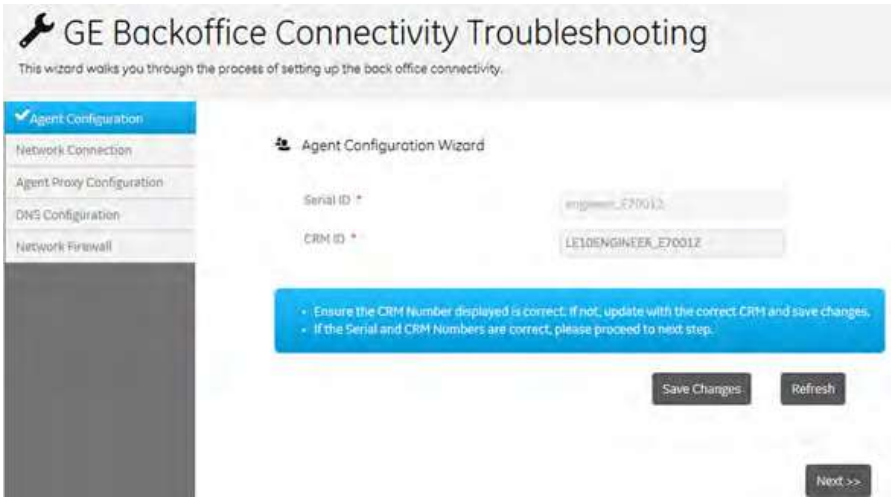


Figure 13-289. Agent Configuration

2. **Network Connection** - Ensure you are connected to the Network with a wired or wireless connection. Select Next.

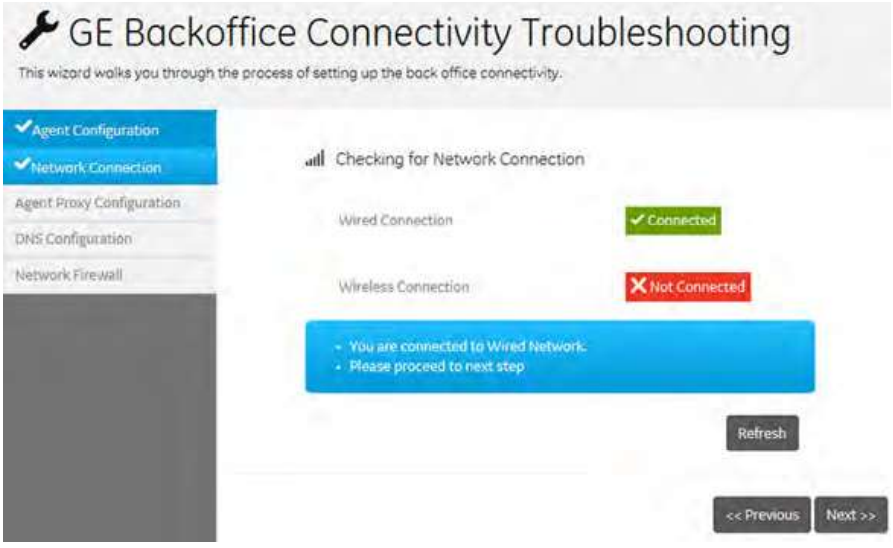


Figure 13-290. Network Connection

GE HealthCare Backoffice Connectivity Troubleshooting Wizard (continued)

3. **Agent Proxy Configuration** - Ensure proxy configuration details and credentials are accurate. Edit if necessary, save changes and select Next.

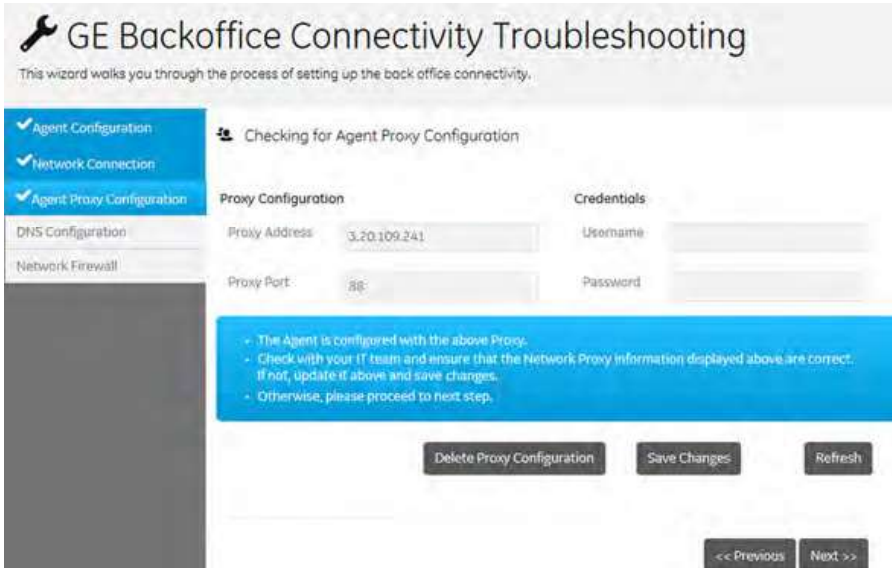


Figure 13-291. Agent Proxy Configuration

4. DNS Configuration - Ensure DNS is configured correctly for the system. Select Next.

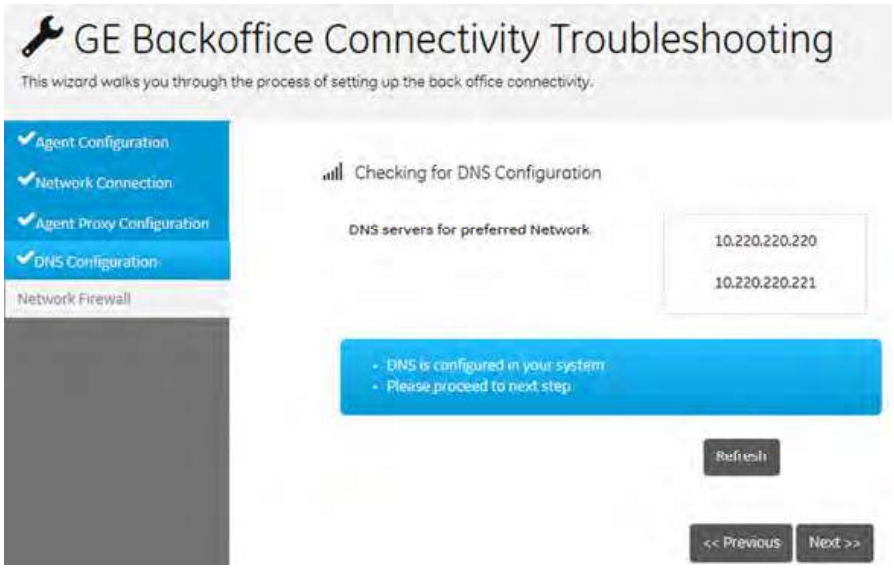


Figure 13-292. DNS Configuration

GE HealthCare Backoffice Connectivity Troubleshooting Wizard (continued)

5. Network Firewall - Ensure the network firewall in the facility is configured correctly to allow GE HealthCare InSite communication. Select Next.

Figure 13-293. Network Firewall

6. Summary Page - The Summary page will check the agent configuration and connection status for all configuration steps. When the process completes (may take up to five minutes) the status for each step is listed as “OK” or “Not OK.” If any step is reported as “Not OK” select the step from the menu on the left and correct the information on that screen, then proceed to the Summary page again for a connection status update.

Figure 13-294. Summary Page

Support Requests

InSite ExC

InSite ExC is your direct link with a GE HealthCare Online Service Engineer or Applications Support Engineer by creating a Request for Service via the InSite ExC link at the bottom of the display screen.

NOTE: The Insite connection must already be configured with the GE HealthCare backoffice for the InSite ExC Menu to appear. See 'GE HealthCare Connect Guide' on page 13-516 for more information.

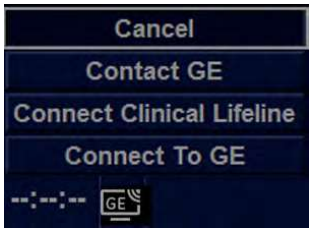


Figure 13-295. InSite ExC Menu

Types of InSite ExC Service

1. **Contact GE HealthCare -** Opens a service dispatch with GE HealthCare Service.
2. **Connect Clinical Lifeline -** Sets the system in a state of readiness for Virtual Console Observation.
3. **Connect To GE HealthCare** - Initiates a connection to the GE HealthCare Backoffice.

Initiating a Request for Service (RFS)

To initiate an RFS:

1. Position the Windows pointer on top of the GE HealthCare InSite ExC icon at the bottom of the display.
2. Press the Right Trackball Set Key. Select Contact GE HealthCare. This opens the RFS screen which sends a service dispatch directly to the Remote Service or Applications Team after you fill in the following information:
   - Last Name, First Name, Phone Number
   - Select correct Problem type
   - Choose Problem area
   - Type in Problem description
3. After you have completed filling in all of this information, press ***Send*** to initiate the Request for Service.

You can confirm if your RFS has been sent as well as RFS's automatically sent by the system. The LOGIQ Totus can automatically submit a Request for Service. These are displayed on the Machine Queue.

In addition, you can use the Users screen to identify your institution's point of contact for service dispatches.

Initiating a Technical or Clinical Support Request

When the Remote Applications or Service person reaches you, they will ask you to you click on the InSite icon and choose either Connect to GE HealthCare or Connect Clinical Lifeline,

1. Position the Windows pointer on top of the GE HealthCare InSite ExC icon at the bottom of the display.
2. Press the Left Trackball Set Key. This opens the following pop-up:
   - Connect to GE HealthCare,
   - Connect Clinical Lifeline, or
   - Cancel
3. Select the option the GE HealthCare representative asks you to select.

NOTE: SIelecting Connect to GE HealthCare changes the polling time from 15 minutes to 15 seconds so that your call can be answered as quickly as possible. Selecting Connect Clinical Lifeline also actives disruptive mode.

Initiating a Technical or Clinical Support Request (continued)

InSite ExC icons appear differently, depending on their state:

Table 13-90: InSite Icons

GE HealthCare InSite - Connected - Disruptive Mode - Enabled	
GE HealthCare InSite - Connected - Disruptive Mode - Disabled	
GE HealthCare InSite - Idle - Disruptive Mode - Enabled	
GE HealthCare InSite - Idle	
GE HealthCare InSIte - Not Configured For more info on the configuring the connection to the GE HealthCare Backoffice, see ‘GE HealthCare Connect Guide’ on *page 13-516*.	

InSite ExC Definitions

Here are definitions for the different InSite ExC states:

Virtual Console Observation (VCO). Allows Technical Support to control LOGIQ Totus functionality remotely.

Disruptive. Allows GE HealthCare's Technical Support person to connect to your system via VCO, to run diagnostics directly on your LOGIQ Totus 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 HealthCare, then the system is in Disruptive, Connected Mode.

Non-Disruptive. Allows GE HealthCare'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, "Service Mode is Activated. Reboot required before patient use" 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. The GE HealthCare Technical Support person will exit Disruptive Mode and VCO, then ask you to reboot your system.
2. Reboot your LOGIQ Totus system before patient use.

For more information on InSite ExC refer to the LOGIQ Totus Basic Service Manual.

Service Desktop

Overview

The Administrator (and others granted the “Access Service Desktop” privilege) can access the Service Desktop to:

- Access the Service Home Page.
- Perform the following Utilities
  - Change Password
  - Data Transfer
  - Delete Files
  - SSA License
  - Gather Logs
  - View Third Party Licenses
  - Disruptive Mode Utility
- View Installed Options
- InSite Agent Configuration

Figure 13-296. Service Desktop

For more information on Service Desktop, refer to the LOGIQ Totus Basic Service Manual.

Accessing the Service Desktop

1. Select ***Utility*** and go to Page 2 of the Utility Menus.
2. Select ***Service***.

Battery Power Mode

Overview

The LOGIQ Totus supports either the 3 pack battery Option or the 6 pack Battery option.

NOTE: Only GE HealthCare Service personnel have access to the batteries. Please contact the technical service department or your local GE HealthCare representative for replacement. Also, replace all battery packs at the same time to avoid confusing used and new battery packs.

Scan on Battery Option (ScoB)

Overview

Scan on Battery Option allows the user to scan using battery power (AC unplugged).

While running on the battery power, the LOGIQ Totus can scan or perform post-processing and switch to Power Saving Mode.

With a fresh battery that is fully charged, the LOGIQ Totus stays powered for approximately 1h in 3 battery pack / 2h in 6 battery pack.

Before starting Scan on Battery

CAUTION

It is recommended to complete the following before unplugging the AC cable.

- Any access to the external media, such as USB HDD via Export, Import, Save As, EZBackup.
- Any access to the Network device, such as DICOM transfer or Network Storage.
- Volume Navigation should be exited by Exit and Clear Control.
- Processing 3D/4D images in live mode.

Before starting Scan on Battery (continued)

Before starting Scan on Battery, go to Utility -> System > General page and select the appropriate value for “Auto Switch to Power Saving Mode” and “Freeze when AC is Unplugged” (Default: Off).

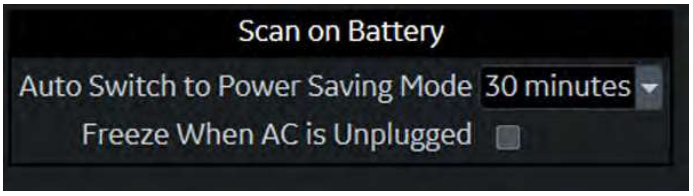


Figure 13-297. Extended Battery for Scanning

Auto Switch to Power Saving Mode

- Select 15, 30 minutes or 1 hour to automatically switch to Power Saving Mode after the time specified on battery operation.
- Select “Never” to never switch to Power Saving Mode.
- Select “Always” to always switch to Power Saving Mode.

Freeze when AC is Unplugged

- On: When selected, the system goes into Freeze mode when the AC cable is unplugged.

Starting Scan on Battery

When the AC cable is unplugged from AC power, the system automatically transitions to Scan on Battery Mode.

NOTE: If the system does not transition to Scan on Battery Mode, contact the technical service department or your local GE HealthCare representative.

WARNING **Do not use Scan on Battery Mode when you need to handle (transfer/ export/ import) patient data.** (Export/ Import/ Backup/ Burn Media, Dicom Transfer, etc.) The system can unexpectedly shutdown when the battery capacity is too low and result in patient data loss. Please note the message in the status bar when Scan on Battery is activated. It is strongly recommend to use AC power when transferring, importing or exporting patient data.

Figure 13-298. Warning message

Recommendation

Plug in AC power if possible, keep using the battery power can impact to the battery life.

When the battery capacity becomes low

The LOGIQ Totus displays a dialog for the user to guide to switch to Power Saving Mode when the battery capacity becomes low. User can either keep scanning until the system shuts down or go to Power Saving Mode to extend time before shutdown.

Switch to Power Saving Mode

WARNING

The system switches to Power Saving Mode automatically when the capacity is low.

You can switch to Power Saving Mode by selecting “Switch to power-saving” in the battery status popup anytime you want.

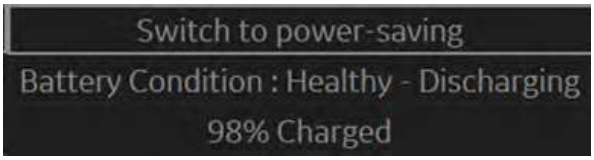


Figure 13-299. Battery status pop-up

The LOGIQ Totus allows going back to Scan on battery mode by pressing the **Power** button or **Freeze** button.

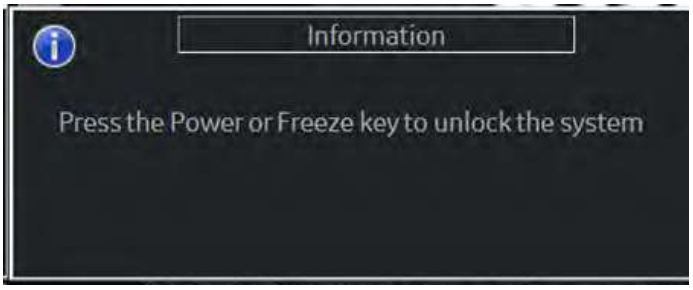


Figure 13-300. Dialog during Power Saving Mode

View current battery status

When the system is running under Power Assistant/Scan on Battery, battery icons appear in the title bar and on the status bar, indicating how much charge is left in the battery.

Battery Status Icon on the status bar

The system displays the battery's current charge and posts a notification message on the display when battery power needs attention.

Detailed battery information is available by clicking on the icon and display the popup, which includes the battery's current capacity displaying.

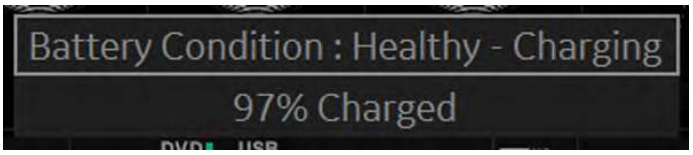


Figure 13-301. Battery status pop-up

NOTE: When the Front Battery LED is blinking, the system is in standby mode and the batteries are charging.

Table 13-91: Battery status icons

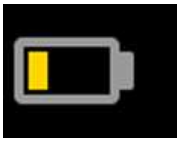
Icon	Description
No icon	AC Plugged; no battery present
	AC Unplugged; battery is fully charged (81 - 100%)
	AC Unplugged; battery is partially charged (61 - 80%)
	AC Unplugged; battery is partially charged (31 - 60%)
	AC Unplugged; battery is partially charged (0 - 30%)

Table 13-91: Battery status icons (Continued)

Icon	Description
	AC Plugged; battery is fully charged (81 - 100%) and charging
	AC Plugged; battery is partially charged (61 - 80%) and charging
	AC Plugged; battery is partially charged (31 - 60%) and charging
	AC Plugged; battery is partially charged (0 - 30%) and charging
	Battery error icon When an abnormal status of the battery is detected, the system displays the following icon: • Battery Temperature error • Communication error or battery charge error NOTE: If this icon displays, do not initiate Power Assistant. Contact the technical service department or your local GE HealthCare representative.

Battery status Icon in the title bar

Fuel Gauge icon appears in the title bar.

Figure 13-302. Fuel Gauge icon

Table 13-92: Battery status icons (AC unplugged)

Icon	Description	Icon	Description
	91 - 100%		41 - 50%
	81 - 90%		31 - 40%
	71 - 80%		16 - 30%
	61 - 70%		0 - 15%
	51 - 60%		

NOTE: To avoid an unintended shutdown of the system, and to avoid risk of losing patient data, it is strongly recommended to connect to AC power when the fuel gauge icon is yellow or red.

Battery charging

NOTE: Whether the LOGIQ Totus is on or off, the battery will charge as long as the system is connected to AC power via the power cable, and the break is on.

While the battery is charging, the front battery LED will blink. When the battery is fully charged, the LED will stop blinking and remain on.

Figure 13-303. LED location of the battery

Approximate charging time (from empty to full)

Wait until the battery is fully charged. It takes at least 1 hour 40 minutes (3 battery pack) / 3 hour 20 minutes (6 battery pack) to fully charge the battery. (depend on the remaining battery capacity).

Refreshing the battery

To maintain battery life and accuracy of the fuel gauge, and to avoid unexpected shutdowns, it is recommended to refresh the battery every 6 months with the following procedure:

1. Plug the AC cable to the wall outlet and turn on the circuit breaker.
2. Wait until the battery is fully charged. It takes about 2.5 hours to fully charge the battery (depend on the remaining battery capacity).
3. Wait at least 1 hour.
4. Remove all probes.
5. Turn on the system.
6. Unplug the AC cable, letting the system run on battery until it automatically shuts down. It may take at least 30 minutes (Power Assistant Battery)/ 50 minutes (Scan on Battery) to complete shutdown.
7. Wait at least 5 hours.
8. Plug the AC cable to the wall outlet and turn on the circuit breaker.
9. Wait until the battery is fully charged. It takes about 2.5 hours to fully charge the battery.

Battery deterioration

When the system detects battery deterioration, the following dialog displays:

Figure 13-304. Battery life message

If this message appears, the LOGIQ Totus disables both of Power Assistant and Scan on Battery.

Contact the technical service department or your local GE HealthCare representative.

Battery Disposal

Lithium Ion

Used batteries must be disposed of properly and as chemical waste. They cannot be treated as regular waste. Contact your building administration for proper disposal.

NOTE: When removing a defective battery, ensure that it is disposed of in accordance with local regulations. Alternatively, provide it to GE HealthCare for proper disposal.

Magstripe Card Reader

Magstripe Magnetic Card Reader

The Magstripe Card Reader can be attached to the LOGIQ Totus by connecting it to any LOGIQ Totus USB port.

Figure 13-305. Magstripe Card Reader

The Magstripe Card Reader can be used in Patient screen, Worklist and Image Display.

- **Patient screen:** Patient ID, First Name, Last Name, Middle Name, Perf. Physician, Ref. Physician
- **Worklist:** Patient ID, Search String
- **Image Display:** Comments (Annotation)

Footswitch

Wired Footswitch

You can attach this Footswitch to the system by connecting it to any USB port on the system.

Figure 13-306. Footswitch and USB Cable

This is a 3-pedal Footswitch. You can configure its functionality via the Utility -> Applications -> Footswitch parameters.

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.

DVR

Setting up the DVR

To set up the Digital Video Recorder (DVR), configure the LOGIQ Totus **PRIOR TO** using the DVR since the system **MUST BE** restarted after updating these configuration parameters.

1. Set up following parameters in ***Utility --> System --> Peripherals***.
   - Media: USB

   NOTE: Pre-format USB device as NTFS

   - Picture Quality: HQ, SP, LP, EP
   - Microphone Level: 1 to 5
   - USB Playback Skip Interval (sec.): 15, 30, 60, 120
2. If needed, assign [DVR Record/Pause] to a Print key in following steps.
   a. Add [Video Capture] and select [DVR Record/Pause] as the Type, in Utility -> Connectivity -> Service.
   b. Assign the [Video Capture] to the Print Button, in Utility -> Connectivity -> Button.
3. Restart the system.

DVR functionality is now set to record the scan.

Using the DVR

WARNING Loss of patient data may occur during an AC failure. Ensure that you are not using Power Assistant and that you do not disconnect AC power while saving an exam to the DVR.

1. Create a patient record or open an existing one.
2. Press the Video-assigned key.
3. Insert USB storage, which is selected as DVR media (Utility -> System -> Peripherals).
4. Press ***Record*** to start recording.

   The status bar updates with the recording information. While recording, you can only pause or stop the recording and cannot perform any other DVR functionalities.

NOTE: Recording automatically pauses when you access the Utility screen.

NOTE: When more than one USB storage is connected, the DVR records to the first drive letter, in alphabetical order.

NOTE: The system does not start the recording while the following operation is in progress: Data Transfer, EZBackup, Utility screen.

5. Press ***Record*** or ***Pause*** to pause/resume recording.
6. Press ***Stop*** on the Touch Panel to stop recording.

   When you stop recording, the DVR writes the title data. During this period of time, the busy state icon is displayed in the status bar (green arrow circling) and you cannot operate any DVR functionalities.

NOTE: The DVR automatically stops recording before the media fills up.

7. Press ***Eject*** on the Touch Panel or the ***F3*** key to eject.
8. Press ***Scan*** tab to return to scanning.

Recording Functionality - USB Storage

Supported media

USB-HDD (NTFS only), USB Flash Device (NTFS only)

NOTE: You cannot record or play FAT (exFAT, FAT32, etc) on a USB Device. Please format the USB device to the NTFS file system on a PC.

Supported format

MPEG video file

Recording to USB storage creates an mpeg video file (*.mpg) (\LOGIQ_Series_DVR\folder) for each title. The file size can be up to 2GB.

NOTE: The mpeg video file does not have a chapter.

Support Picture Quality

- HQ (Record length: approx. 30 minutes)
- SP (Record length: approx. 40 minutes)
- LP (Record length: approx. 60 minutes)
- EP (Record length: approx. 130 minutes)

NOTE: The maximum size of each video file: 4GB.

Video file name

The mpeg video file name is titled as follows: <Date>_<Time>_<Patient Last name>_<Patient First name>..

When the patient's name is not provided, then the video file name is as follows, <Date>_<Time>_<serial number> where the serial number is the number of video files on the media plus one.

Video Touch Panel Menu

DVR Touch Panel menus:

Figure 13-307. Video Touch Panel

Table 13-93: Touch Panel Keys

Touch Panel Key	Explanation
Skip (I<</>>I)	USB storage: Skip specific time to forward/backward.
4x Skip (4x I<</>>I 4x)	USB storage: Quad time interval skip to backward/forward.
Search	Press Search to start the Search dialog. Select Title, adjust offset then press Search Counter to start the Search. The title name is as follows: <Date>_<Time>_<Patient's Last name>_<Patient's First name>
Record (Red circle with Media Inserted)	Start recording.
Pause (II)	Pauses and resume Recording and Playback. NOTE: The Freeze key works the same as the Pause button, when in Playback.
Open Media Drawer	Press to open the Media Drawer.
Eject	Eject the USB storage device. Also you can eject media pressing the F3 key.
Play (> with Media Inserted)	Play a video from USB storage device.
Stop (Box)	Stop playback or recording.

DVR Display Icons

Displays the following icons in the status bar:

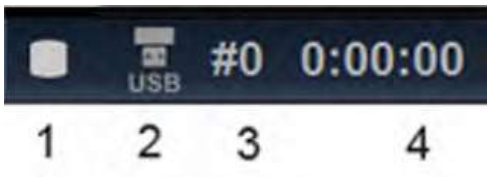


Figure 13-308. DVR Disk Status

Table 13-94: DVR icons

1. DVR status			
	Recording		Stopping
	Pause Recording		Pause Playback
	Playback		Busy
	No media		
2. USB storage status Displays the device availability and the free space size.			
	USB Storage is attached		
3. Current Title Number. Displays while recording			
4. Time counter.			

Auto Preset Assistant

This AI-based framework recognizes some anatomy by analyzing live B-Mode images. The system then automatically adjusts the B-Mode model (user preset) or suggests the user change the preset manually. While live scanning, the system analyzes the B-Mode image at regular time intervals. When the anatomy is recognized for a specific model (user preset), the associated B-Mode model is enabled.

This feature works on 9L-D, M6-15L-D, L3-12L-D and L6-24-D and Supports 10(ten) B-Mode Anatomical areas: Abdomen, Breast, Carotid, Leg, MSK, Scrotal, Thyroid, Thyroid/Carotid Axial, Air and Other.

WARNING

This feature uses AI based computer algorithms to determine the anatomical area. There is an inherent risk that these algorithms may sometimes give suboptimal or incorrect results. Verify that automatically selected presets are appropriate for the scanned anatomy type.

NOTE: *This view recognition algorithm was trained on 14,333 images and validated on 339 images which were independent data sets for the training algorithm.*

Based on the validation test, Minimum Acceptable Algorithmic Performance was confirmed to 80% accuracy.

Auto Preset Assistant Configuration in Imaging Preset Manager

The Imaging Preset Manager can incorporate the Auto Preset selections, or manually added presets.

1. Select Utility > Imaging Preset Manager > Auto Preset in Category.
2. Available Imaging Presets on the left side includes all available presets (including the “Auto Preset” selections).

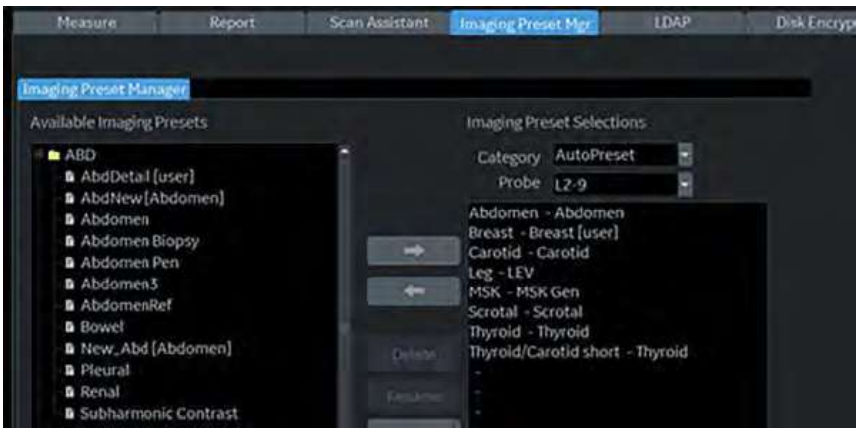


Figure 13-309. Auto Preset Assistant Configuration

For example, in Figure 13-309 "Auto Preset Assistant Configuration" , if the algorithm percentage result meets the MSK preset, the preset that is automatically selected is “MSK Gen.” If no preset was defined, the system does not recommend or automatically change any presets.

Auto Preset Assistant Configuration in System Imaging

1. Select Utility > System > System Imaging on the Touch Panel.
2. “Auto Preset Assistant” configuration column is shown in Utility System Imaging menu.
3. Turn on check box of Enable in Auto preset Assistant in Utility System Imaging menu.
4. See Table 13-95 Auto Preset Assistant for detail parameters.

Table 13-95: Parameters and Description

Parameter	Description
Enable	Select to enable the Auto Preset Assistant feature.
Default Auto Mode in new patient	Off: the system does not automatically change to the recommended preset. Automatic: the system automatically changes to the recommended preset when the algorithm percentage is higher than the defined Auto Threshold. Air detected:The system automatically changes to the recommended preset when the algorithm percentage is higher than the Auto Threshold and is immediately recognized as Preset of Air. By selecting “Air detected” the system automatically changes to the recommended preset, if the confidence result is higher than the automatic threshold and is immediately recognized as Preset of Air.
Turn off Auto after changing preset	If selected, once the preset changes, no automatic preset changes are allowed.
Automatically Retain Field of View	Selecting this ensures that the Imaging Parameters. Retain Field of View stay constant over Probe and Preset changes by Auto Preset Assistant.
Check before automatic change	Requires confirmation before the preset changes.
Recommendation without specifying preset	If there are presets to recommend, the “Check your preset” messgae displays.
Show detected view	A tool displays the detected view result.

Auto Preset Assistant Configuration in User Defined Trackball Set Key Menu

In addition to making this function work automatically, it is possible to confirm the recommended preset using the Trackball Set key. These operations can be assigned to the trackball sub-set key in the User Configurable Key menu. The B-Mode preset can be changed to the recommended preset without moving hands from the operator panel.

1. Select Utility > System > User Configurable Key menu.
2. Select “Auto Preset” check in B/BF/Con category of User Defined Trackball Set Key menu.

Figure 13-310. User Defined Trackball Set key

Table 13-96: Parameters and Description

Parameter	Description
AUTO	On: Automatically changes to the recommended preset as defined in the Auto Preset Assistant parameters.  Off: Does not automatically change to the recommended preset. 
Change	Displayed if there is a suggested preset change. If preset should change to the recommended preset, press Change.

Using Auto Preset Assistant

1. Perform the required setup in the configuration menu.
2. Select Linear probe and start B-Mode scan.
3. Scan the same plane continuously for more than one second.
4. During live scan, Auto Preset Assistant uses computer algorithms to estimate which of the B-Mode presets is closest to the current scan plane.
5. If the algorithm percentage result exceeds the Assist Threshold and the confidence level is different from the current preset, a message displays to press the Change key to change to the appropriate preset. The Change key is then assigned to the right side of the Sub-set key.

6. If the “Change” key is pressed while the above message is displayed, the system changes from the current to the proposed preset.

Using Auto Preset Assistant (continued)

7. If the returned confidence result exceeds the Auto threshold and inferencing is different from the current preset, a system message similar to “Changing to Thyroid Preset” appears. The preset change algorithm is automatically executed.

This feature only starts if certain conditions are met:

- Simplex B-Mode live images
- When there is a link between the preset and the confidence preset
- Depth > 2 cm
- Does not work with a contrast application
- Does not work in write zoom.
- Does not work with Scan Assistant

This algorithm may display suboptimal or incorrect results, especially in the following cases.

- When the target or probe is moving significantly.
- In case of poor visualization due to probe contact, deep attenuation, artifacts, etc..
- When it is not a typical scan cross section. For example, including tumors, cysts, or diffuse changes.
- Affected by B-Mode display settings such as Compress and Gain, or user adjustments for post-processing.
- When multiple different organs coexist. Algorithms tend to make more important decisions based on image information close to the center.
- MSK anatomical area is limited to only scan views that contain bone structures of knee and elbow.

Using Auto Preset Assistant (continued)

- LEG(Arm) anatomical Area is limited to only scan views that contain vessel structures of Leg and Arm.
- The “Thyroid/Carotid Axial” anatomical area is specific to the short axis view of the carotid artery that also captures the thyroid lobe. When the user is scanning in the “Thyroid” preset and the “Thyroid/Carotid Axial” anatomical area is detected, no change is made to the preset. And when the user is scanning in the “Carotid” preset and the “Thyroid/Carotid Axial” anatomical area is detected, no change is made to the preset. This allows the user to stay in the existing preset.
- The system does not actively change presets if a preset within same categories is already selected. For example, if MSK sup and UEA are selected, do not automatic change to MSK gen or LEA, respectively.

Auto Abdominal Color Assistant

This AI-based framework recognizes some anatomy by analyzing live B-Mode images. When the user enters Color Doppler, the system automatically adjusts to a flow shortcut based on a confidence level. While live scanning, the system analyzes the B-Mode image at regular time intervals. When the anatomy is recognized for a specific model (user preset) in B-Mode and Color mode is entered, the associated flow shortcut is activated.

This feature works on C1-6-D, C1-6(VN)-D, C2-7-D, C2-7(VN)-D, C3-10D, RAB6-D, 9L-D, L3-12-D, M5Sc-D probes while scanning in an Abdomen application (Abdomen, Abdomen Detail, Abdomen Penetration, Abdomen Biopsy and Renal). The algorithm supports five abdominal areas: “Aorta”, “Liver/IVC/ Spleen”, “Gallbladder/Urinary Bladder”, “Kidney” and “Pancreas.”

This feature is trained to classify views among five anatomical areas, and two labels called "Unknown/Other" and “Probe in Air.”

WARNING

This feature uses AI based computer algorithms to determine the abdominal model presets. There is an inherent risk that these algorithms may sometimes give suboptimal or incorrect results. Verify that automatically selected Flow models are appropriate for the scanned anatomy type.

NOTE: This view recognition algorithm was trained on 11,478 images and validated on 285 images which were independent data sets for the training algorithm.

Based on the validation test, Minimum Acceptable Algorithmic Performance was confirmed to 80% accuracy.

Auto Abdominal Color Assistant Configuration for System Imaging

1. Select Utility > System > System Imaging on the Touch Panel.
2. “Auto Abodminal Color Assistant” configuration column is shown.
3. Turn on check box of Enable in Auto Abdominal Color Assistant.
4. See Figure 13-311 for detail parameters.

Figure 13-311. Configuration for Auto Abdominal Color Assistant

Table 13-97: Parameters and Description

Parameter	Description
Enable	To use this feature, turn on check box of Enable Auto Abdominal Color Assistant.
Auto Flow Model selection	Turn on check box, selecting recommended Flow model automatically at the timing of entering color mode.
Turn off Auto after manual Flow Model selection	If the Flow Model is selected by manual operation from the Touch Panel, automatic change function will be turned off tentatively. After selecting a new patient or probe, it becomes valid again.
Show detected view	A tool displays the detected view result.

Auto Abdominal Color Assistant Configuration in User Defined Trackball Set Key Menu

In addition to making this function work automatically, it is also possible to accept user confirmation operations based on the confidence results. These operations can be assigned to the trackball sub-set key in the Configuration Menu below. The Flow model can be changed while still touching the operator panel.

1. Select Utility > System > User Configurable Key menu.
2. Select “Auto Preset” check in CF/TVI/PDI category of User Defined Trackball Set Key menu.

Figure 13-312. User Configurable Key for Auto Flow Model

Table 13-98: Parameters and Description

Parameter	Description
Reset CF	System turns off any Flow model. This can be easily reverted if the Flow model proposed by the algorithm and automatically modified does not meet expectations.
Change	Displayed it if there is a proposed Flow model. Press to change to the proposed

Auto Flow Model Selection Configuration in Imaging Menu

Each confidence preset can be freely associated with any of the four pre-prepared flow models. Each flow model name and parameters can be customized.

1. Select Utility > Imaging > CF-tab.
2. The left side of “Auto Preset - Flow Model” shows bundled view confidence preset as Aorta, Liver/Spleen/IVC, Renal, Gall/Urinary Bladder and Pancreas. Select the corresponding Flow Model from the column of right side.

Figure 13-313. Configuration for Auto Abdominal Color Assistant

Using the above sample settings as an example, when the confidence algorithm estimates the Aorta Preset, the “Flow Model 1” is automatically or semi-automatically selected by entering color mode. For the Pancreas Preset (“-” is selected), the system does not recommend or automatically change any Flow model. For the Liver/Spleen Preset (“None” is selected), the system turns off any Flow model and changes to the default setting. The settings of these four pre-prepared flow models (Flow Model 1...4) can be confirmed and adjusted on the setting screen.

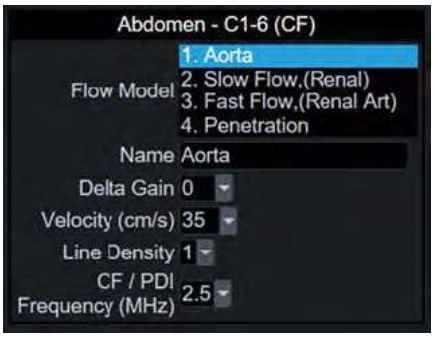


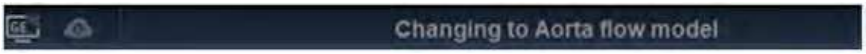
Figure 13-314. Setting screen example - Auto Abdominal Color Assistant

Using Auto Abdominal Color Assistant

1. Perform the required setup in the configuration menu.
2. Select a probe that supports abdominal applications and start the B-Mode scan.
3. Scan the same plane continuously for more than three seconds.
4. By entering color mode, the Auto Abdominal Color Assistant uses computer algorithms to estimate which of the 11 abdominal presets is closest to the current scan plane.
5. If the returned confidence result exceeds the Assist threshold and inferencing is different from the current Flow model, a system message similar to "Recommend changing to Aorta flow model" appears on the bottom of the display (information area). The "Change" key is then assigned to the right side of the Sub-set key.
6. If the "Change" key is pressed while the above message is displayed, the system changes from the current to the proposed Flow model.

Auto Abdominal Color Assistant (continued)

7. If the returned confidence result exceeds Auto threshold and inferencing is different from the current Flow model, a system message similar to "Changing to Aorta flow model" displays. The preset change algorithm is automatically executed.



This feature only starts if certain conditions are met:

- Using Abdomen, Abdomen2, AbdBiopsy and AbdDetail or an application created based on one of them.
- When color or PDI mode is activated from the B-Mode Live scan.
- When there is a link between the Flow model and the confidence preset.
- When there is live information of B-Mode for more than 3 seconds. This feature does not work if Color Flow is activated immediately after starting Auto Flow mode Model, or if the color mode is turned on/off in a shorter time frame.
- Does not work with a contrast application or other flow modes (only with Color and PDI).
- Does not work with Scan Assistant.

This algorithm may display suboptimal or incorrect results, especially in the following cases:

- When the target or probe is moving significantly.
- In case of poor visualization due to probe contact, deep attenuation, artifacts, etc.
- When it is not a typical scan cross section. For example, including tumors, cysts, or diffuse changes.
- Affected by B-mode display settings such as Compress and Gain, or user adjustments for post-processing.
- When multiple different organs coexist. Algorithms tend to make more important decisions based on image information close to the center.
- The algorithm uses only information for the entire B mode, not the position of the color ROI or blood flow information. Therefore, depending on the location or size of CF ROI, algorithm may sometimes give suboptimal or incorrect results.

Voice Control

Voice Control lets you activate certain functions by speaking recognized commands.

NOTE: Voice Control is not available in all languages. To choose the language you want to use for Voice Control, Utility --> System --> General --> Language.

CAUTION

Voice recognition accuracy may be affected by background noise, speech clarity/accent, or microphone configuration.

Set up Voice Control

1. Go to Utility --> System --> General.
2. Check the box for "Enable Voice Control".

Start Voice Control

1. You can start by performing one of the following :
   - If “Wake with ‘Hey LOGIQ’” is checked, you can say "Hey LOGIQ"
   - On the scan screen, click the Voice Control icon on the status bar.
   - Press the User Defined key assigned to Voice Control. (You can set up the User Defined key via Utility --> System --> User Configurable Key.)
   - Push the footswitch pedal mapped to Voice Control. (You can set up the footswitch via Utility --> Application --> Footswitch.)
2. Say a command, such as "Freeze."

Table 13-99: Icon description

Icon	Description
	**Mute:** Not listening for a wake word.
	**Standby:** Listening for a wake word.
	**Listening:** Listening for a command.
	**Busy:** Responding and not listening.

NOTE: Voice Control might activate when you didn't say "Hey LOGIQ." This can happen when it detects something that sounds similar. If this happens often, you can make it less sensitive. Also, Voice Control might not activate when you say "Hey LOGIQ," particularly in a noisy environment. If this happens often, you can make it more sensitive. You can adjust ‘Hey LOGIQ’ Sensitivity via Utility --> System --> General --> Voice Control.

NOTE: To protect your privacy, Voice Control does not log any audio data or transcripts.

Command Set

The following list of commands shall be supported. There are many varied expressions for the same intent. The list has only the simplest forms composed of essential keywords.

HINTS

In the list, [n] is an index and X is a value, such as:

- [n] is a relative index if the command is a type of incremental or decremental. e.g., "Gain up 10"
- [n] is an absolute index if the command is a type of direct setting. e.g., "SRI 2"
- X is always an absolute value. e.g., "Gain 50"

Table 13-100: Essential keywords and command

Category	Command
Freeze/Unfreeze	• Freeze • Unfreeze
Print	• Print [1/2/3/4/Screen]
Imaging	• Gain up/down [n] • Gain X • Depth up/down [n] • Depth X • Frequency up/down [n] • Frequency X
B/BFlow	• B Mode • CHI [on/off] • CrossXBeam [on/off] • Advanced SRI [on/off] • SRI n • Virtual Convex [on/off] • Near/Far/Overall TGC up/down [n] • Dual/Split [left/right/simultaneous]
CF/PDI/MVI/TVI	• Color Flow [on/off] • PDI [on/off] • MVI [on/off] • TVI [on/off] • Scale up/down [n] • Scale X • Steer [left/right] • Virtual Convex [on/off] • Dual/Split [left/right/simultaneous]
Biopsy Kit	• Biopsy [on/off] • Biopsy n
BSteer+	• BSteer+ [on/off] • Needle left/right • Needle Angle X

Table 13-100: Essential keywords and command

Category	Command
Comment	• Type <text>
Clear	• Clear • Clear all
Probe and Preset	• Probe n • Preset <preset>
Other Controls	• M mode [on/off] • PW [on/off] • CW [on/off] • LOGIQView [on/off] • Contrast [on/off] • Elasto [on/off] • UGAP [on/off] • Quick Patient Change • Reverse

NOTE: Keep the Doppler volume at its lowest acceptable level.

NOTE: Do not speak too loudly.

Stop Voice Control

To stop Voice Control, you can do any of the followings:

- Say "Stop listening."
- If you select a timeout period for "Time Out After No Speech" in Voice Control settings, wait the specified time.
- Click the Voice Control icon on the scan screen.
- Press the User Defined key assigned to Voice Control.
- Push the footswitch pedal mapped to Voice Control.

NOTE: Clicking the icon, pressing the User Defined key, or pushing the footswitch pedal is to either start or stop Voice Control.

NOTE: To turn off Voice Control entirely, go to Utility --> System --> General, and then uncheck "Enable Voice Control".

Change Voice Control settings

To view or change your Voice Control settings:

1. Select Utility --> System --> General.
2. Select Voice Control settings.

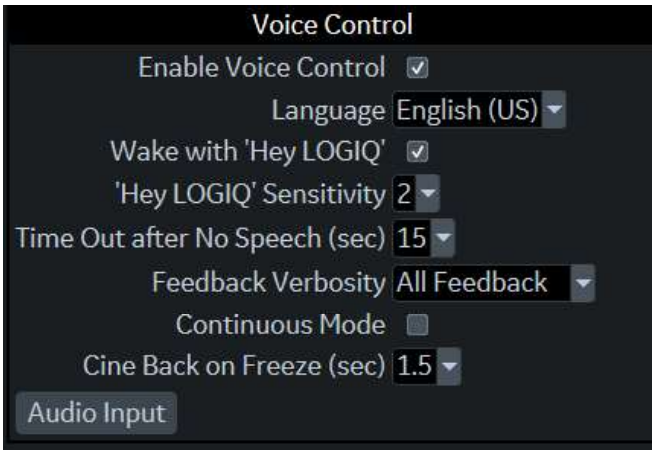


Figure 13-315. Voice Control Setting

Refer to the followings for the detail.

- Enable Voice Control: Select to enable Voice Control.
- Language: Select the language you want to use for Voice Control. Voice Control is currently available only for US English.
- Wake with ‘Hey LOGIQ’: Select to activate Voice Control with your voice.
- ‘Hey LOGIQ’ Sensitivity: Choose how sensitive Voice Control to be when it responds to "Hey LOGIQ" (0, 1, 2, 3, 4).
- Time Out after No Speech: Stop Voice Control after a specified period of no speech. (5, 15, 30, 120, Always).
- Show Live Captions: Display live captions in real-time.
- Continuous Mode: Keep listening for a next command continuously.
- Cine Back on Freeze (sec) : Select time by which cine back after recognition of the Freeze command (0.0, 1.0, 1.5, 2.0).

- Audio Input: Adjust the audio input volume.

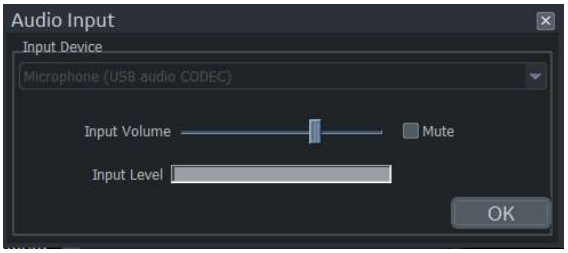


Figure 13-316. Audio Input

NOTE: The input level monitor bar should not rise above approximately 3/4 of its maximum width. It goes greater than that, the volume is too loud, and the recording will probably experience clipping. This may cause the quality of the speech recognition to be poor. If there is no sound coming from the audio source, the bar will not move.

Data Streaming (Option)

NOTE: The Data Streaming option key should be installed to enable streaming live/recall/CINE ultrasound data.

The system has the capability to stream live/recall/CINE ultrasound image data over the network connection to enabled devices. The data stream will contain grayscale, color map, geometry, view settings (flip/rotate/reverse), probe and system information, VNav position information and ultrasound data. No patient information is transferred with the streamed data.

The following table represents the types of data streamed in different modes on the ultrasound system.

Table 13-101: Icon description

Data Type	Modes
2D Image	B Mode, B-Flow Mode, Contrast Mode

NOTE: It is recommended to use a 1 Gbps network connection for Data Streaming. The required bandwidth often lies in the 100-300 Mbps range. Usage of a 100 Mbps network leads to dropped frames and the risk of latency buildup.

User Setup for Data Streaming

Only a member of the group "ReceiveStreaming" will have permission to receive streamed data. See example of users who can receive streaming data below.

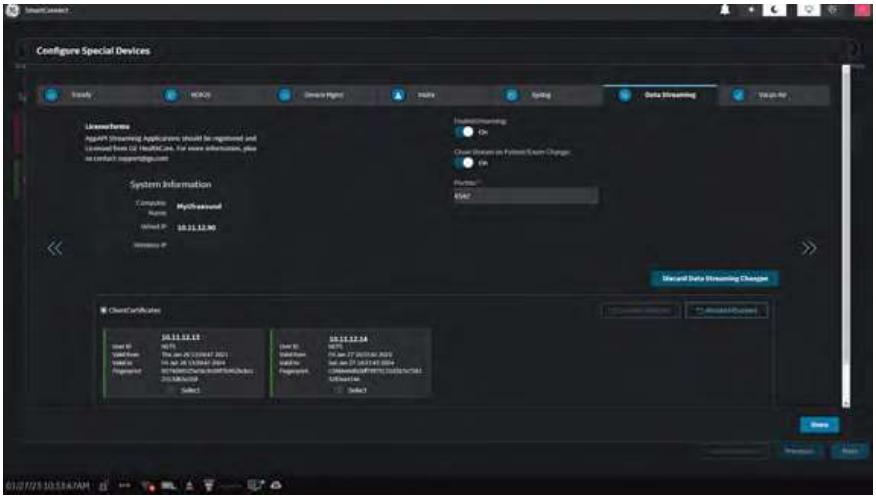


Figure 13-317. User Setup for Data Streaming

If LDAP authentication is enabled, at least one of the LDAP groups that the user belongs to must be mapped to the group "ReceiveStreaming" to allow the device to receive streaming data.

Enable Data Streaming

1. Press UTILITY+ on the Touch Panel.
2. Press Utility on the Touch Panel.
3. Press Connectivity on the Touch Panel.
4. Select Data Streaming on SmartConnect.
5. Turn on Enable Streaming.
6. Enter the Port No (or use the default port).

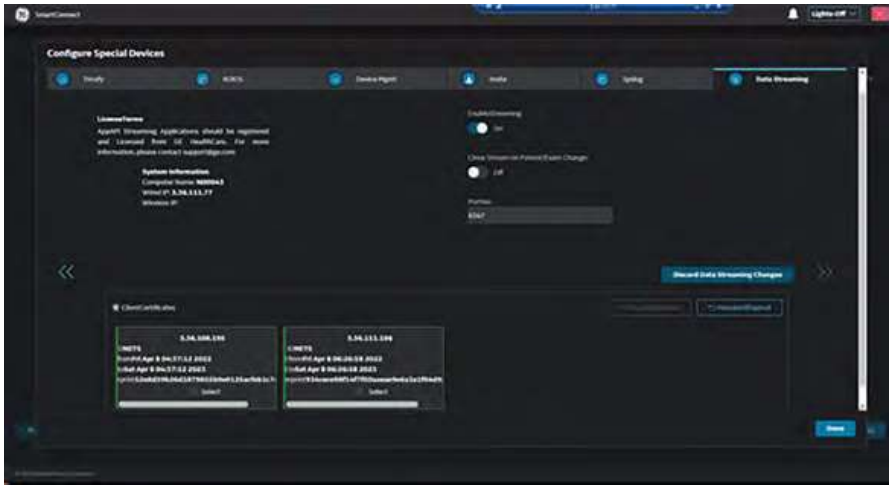


Figure 13-318. Data Streaming settings

Enable Data Streaming

1. On the device, connect to the ultrasound system with the IP address, Port Number, user account and password currently used to log on to the ultrasound system.
2. The ultrasound sytem displays a PIN code. Enter the PIN code on the device.
3. The device and the ultrasound system establish the Data Streaming connection.

NOTE: Once the device establishes the connection, the ultrasound system stores the connection as a certificate. The PIN code is NOT necessary in the next connection.

Figure 13-319. Certificates

NOTE: The certificate is valid for one year. After the certificate expires, a new PIN code displays on the ultrasound system at the next connection attempt.

NOTE: When the certificate for the device is no longer needed, the certificate can be revoked.

1. Press APPS+ on the Touch Panel.
2. Press Utility on the Touch Panel.
3. Press Connectivity on the Touch Panel.
4. Select Data Streaming on SmartConnect.
5. Select the certificate.
6. Click Revoke Selected.

Data Streaming in Process

Data Streaming is initiated and terminated from an enabled device (e.g. a smart phone/tablet or PC connected to the same network and capable of receiving the streamed data over a custom protocol). An enabled device can only receive data when streaming has been enabled on the system.

Streaming status is indicated on the screen as follows:

Table 13-102: Streaming status

Indication (Icon)	Status
	• The streaming device is connected. • The system is in freeze mode, or PW/CW when 2D is not live. • Data is NOT streaming.
	• The streaming device is connected. • Data is streaming.
	• The streaming device is connected. • The system is in a mode not supported in Data Streaming. • Data is NOT streaming.

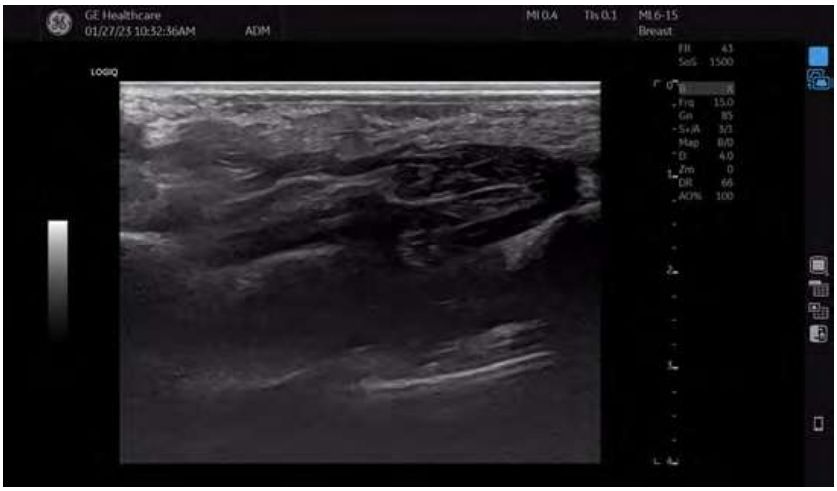


Figure 13-320. Data Streaming is in active (example)

Data Streaming can be stopped by the following operations:

- Changing a patient or ending an exam when Close Stream on Patient/Exam Change is turned on.
- Pressing the Pointer Key to display the pointer on the monitor. Hover the pointer over the Streaming status icon and select the icon.

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