bk medical ⋅))

bk3000 & bk5000 Ultrasound Systems

For Professional Users Only

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The main label on the back of a BK Medical system monitor contains information about the year of manufacture.

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Chapter 1
Before You Begin

This is the advanced user guide for the bk3000 and bk5000 ultrasound systems.

The *bk3000 & bk5000 User Guide* includes an overview of all the documentation available for the system, including different user guides.

NOTE: *You must read the Safety chapter in the bk3000 & bk5000 User Guide before working with the system.*

This guide takes you deeper into the functionality and potential of the bk3000 and bk5000 ultrasound systems.

NOTE: *Some of the functionality and options described in this guide may not be available with your version of the system.*

Questions About the System	Where to Find the Answers
What are the various parts of the monitor display?	"The User Interface" on page 17
Is there an alphabetical list of all the controls on the system?	"Controls on the Monitor" on page 25
How do you make measurements and calculations for an image, and what measurement tools are available?	"Making Measurements" on page 47
How do you manage the images, clips, 3D data sets, and reports that are made on the system?	"Documentation" on page 59
What imaging modes are available on the bk3000 and bk5000?	"Imaging Modes" on page 69 and "3D Imaging" on page 203
What is an examination type, and how does it help with imaging?	"Exam Types" on page 95
How does DICOM® work with the bk3000 and bk5000?	"DICOM" on page 217
What do various abbreviations mean?	"Glossary" on page 221
Can the bk3000 and bk5000 be customized and how?	"Setting Up and Customizing Your System" on page 257, and "Redefining Screen Keys – Label, Bodymark, and Measurement" on page 265,
How do you configure the system?	"Configuring the bk3000 and bk5000" on page 269

Chapter 2
The User Interface

Working with the Monitor

This chapter introduces you to each part of the monitor (Fig 2-1).

For a description of the keyboard, see *Getting Started with bk3000 & bk5000*.

The first 3 steps for imaging are:

1   Enter patient information

2   Select a transducer

3   Select exam type and preset.

You can select to work in the upper part of the monitor to perform these steps, as shown in Fig 2-1. Or you can select to follow the procedure in *Getting Started with bk3000 & bk5000*.
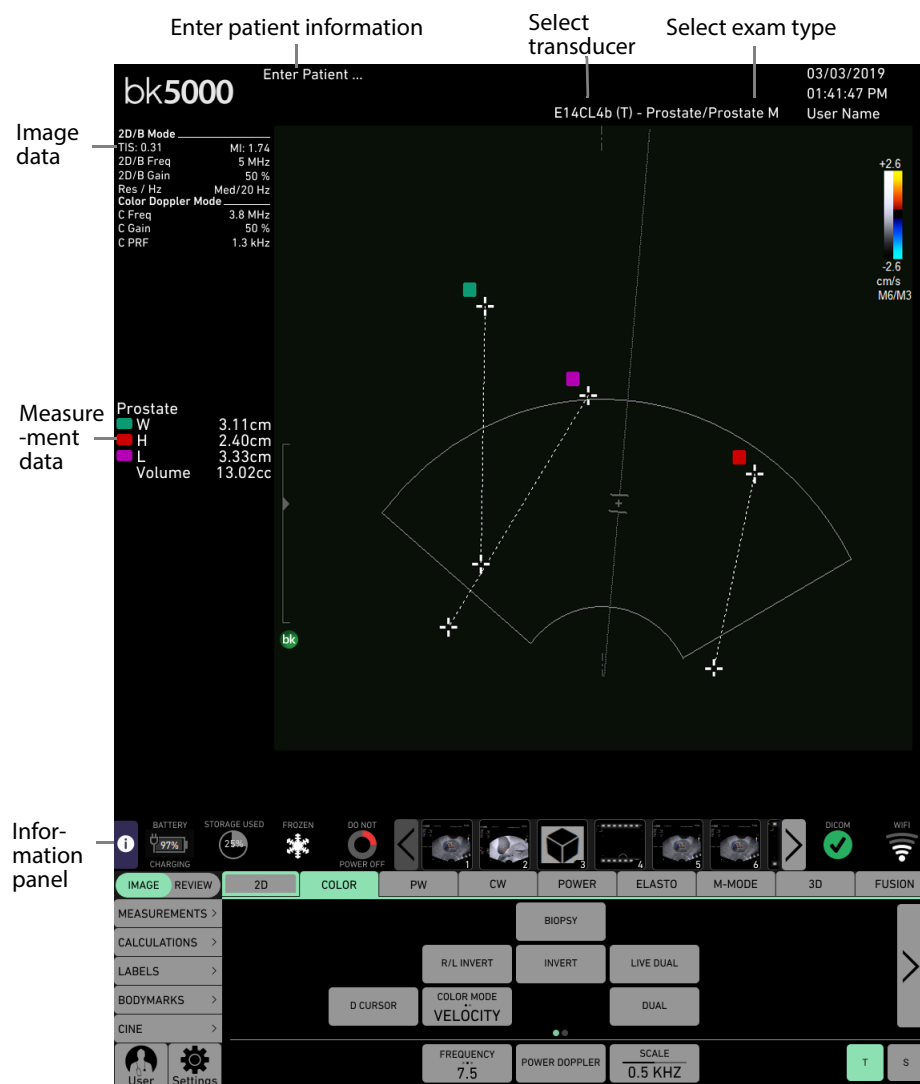
Figure 2-1. The monitor user interface for the bk3000 and bk5000.
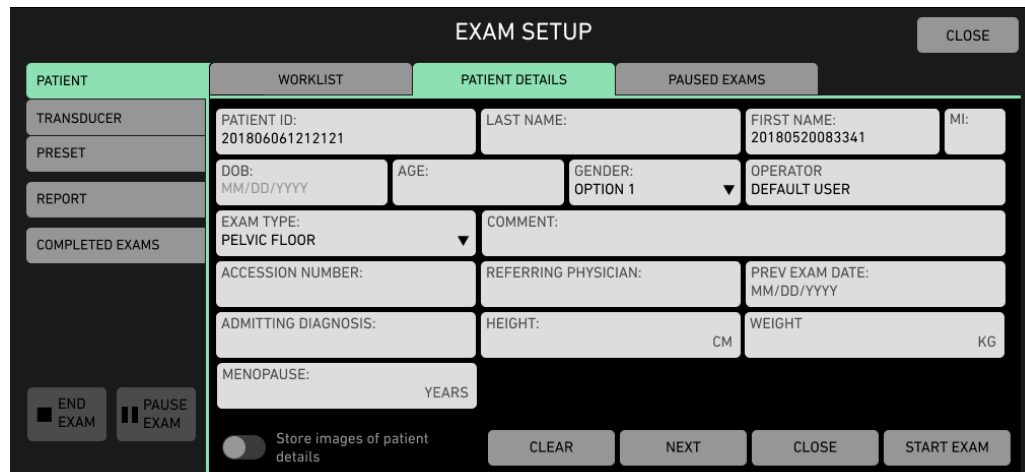
Starting an Exam

The first 3 steps for imaging are:

1 Enter the patient information.

2 Select a transducer.

3 Select an exam type and a preset.

Do as follows:
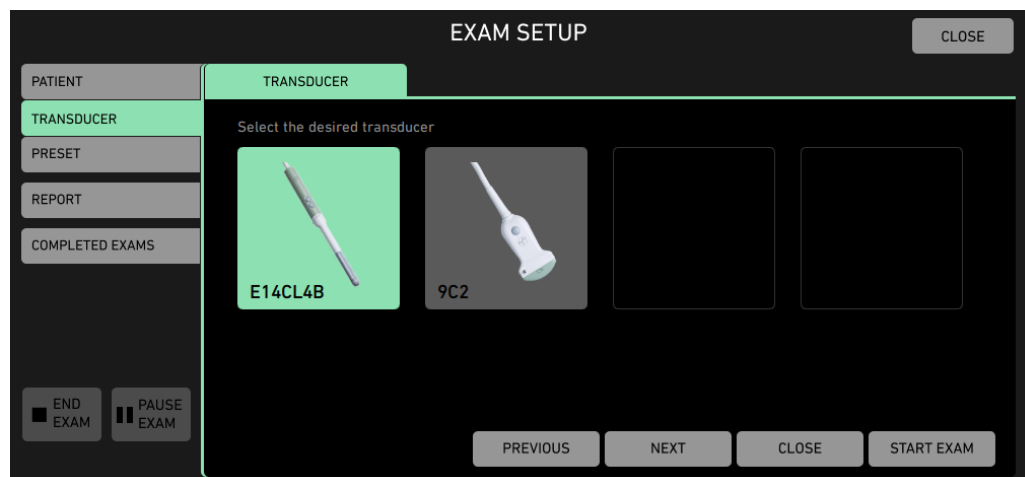
1 Press the **Patient** key [Patient] on the keyboard. The **Exam Setup** window opens. Here you can select a patient from the DICOM **worklist** or enter patient information.

2 If you do not have a DICOM system, enter patient information on the **Patient Details** tab. The **Patient ID** is filled in automatically with a date/timestamp, but you can change this to a relevant ID.

Figure 2-2. Exam Setup - Patient Details

3 If you select **Store Images of Patient Details**, an image of the patient details will be stored in the document browser and the review window.

4 Click **Next** to select transducer. All connected transducers will be displayed on the **Transducer** tab.

Figure 2-3. Exam Setup - Transducer

5 Click **Next** to select **Exam Type** and **Preset** on the **Preset** tab.
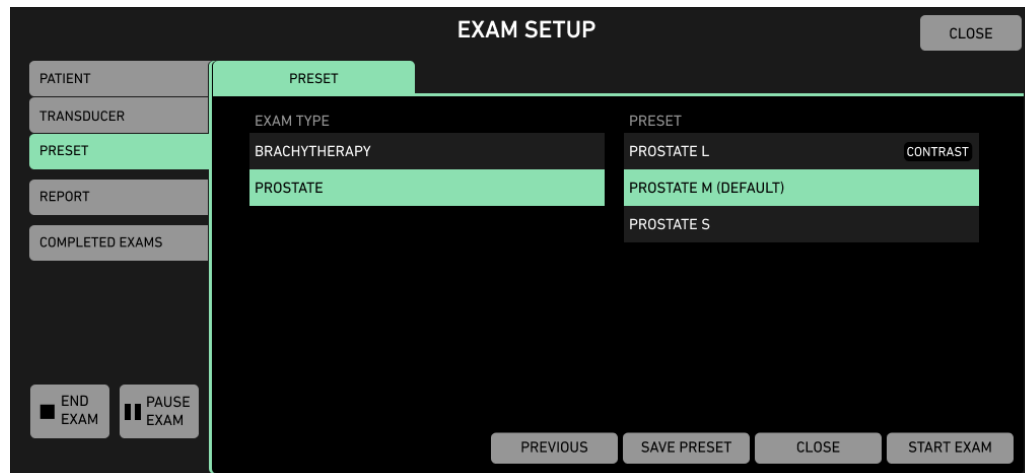
Figure 2-4. Exam Setup - Preset

For information about examination types, see Chapter 9, "Exam Types" on page 95.

6 Click **Start Exam** to start the exam.

You can also start the exam immediately after entering **Patient Details**. Click **Start Exam** and select transducer using the transducer control button. The system will use the default exam type and preset.
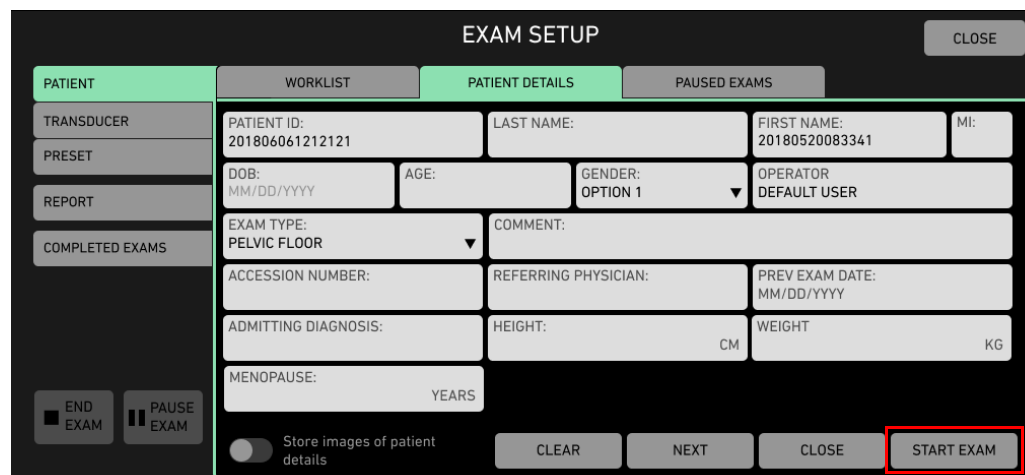
Figure 2-5. Start Exam

Pausing an Exam

To pause the exam, access the **Exam Setup** by pressing [Patient], and click [PAUSE EXAM]. You find the paused exams on the **Paused Exams** tab. From here, you can select an exam and click **Resume Exam**.

Ending the Exam

The exam ends when you press **End Exam** [icon] or access the **Exam Setup** by pressing the **Patient, Exam Type**, or **Probe** key, and then clicking [icon].
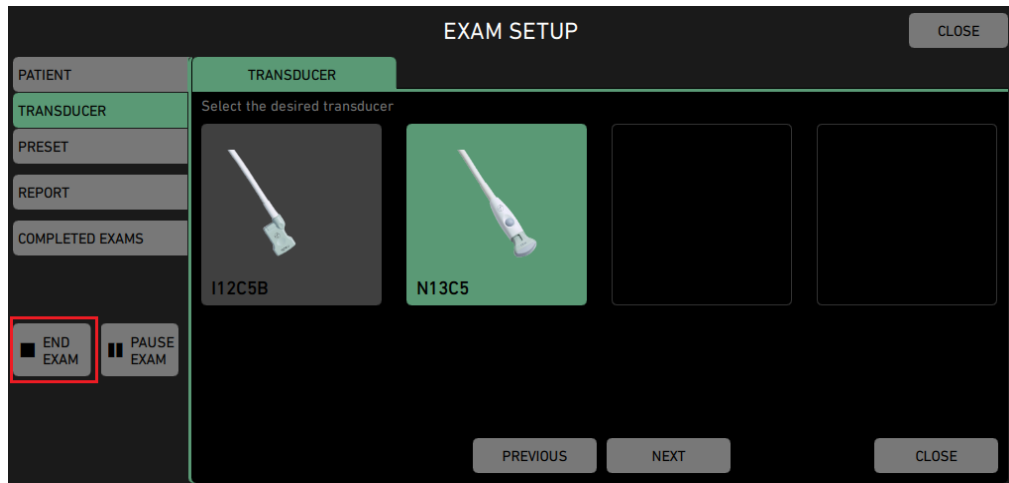
Figure 2-6. End Exam

Document Browser

For information about using the Document Browser, see Chapter 6, "Documentation" on page 59.

View Profile

To view and edit user profile:

1   Select user and click **View Profile**.

2   In the **General** view, add or replace user photo.

3   Click the toggle button to select if **Password required during login** should be activated.

4   If a password is required, type in the password according to the instructions on the screen.

5   Use the radio buttons to select if the user should have a **Regular Profile** or be a **System Administrator**.

6   Click the toggle button to select if the user should be able to modify the profile. This does not allow the user to change a regular profile into a system administrator.

User Preferences

To edit User Preferences:

1   Click the **User** button, next to the **Settings** button in the workspace

2   In the **View Profile** window, click **Preferences**.
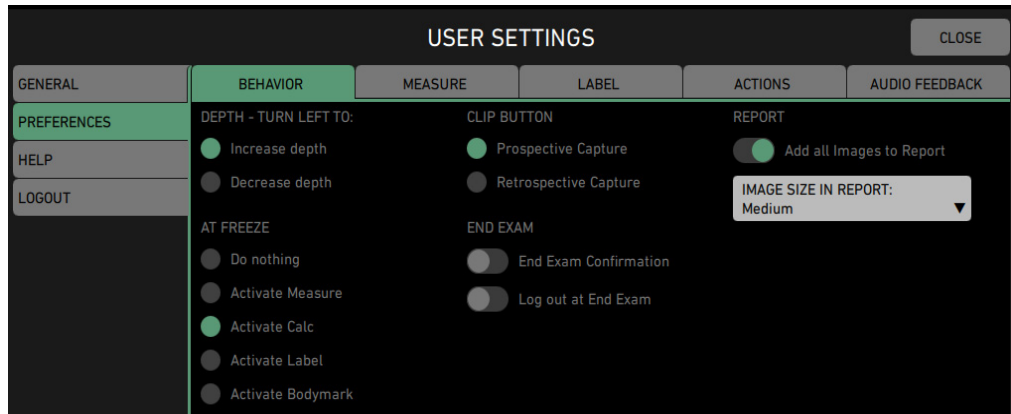
Figure 2-7. User Preferences, Behavior tab

On the **Behavior** tab, you can:

- Select turning direction of **Depth** key.

- Select system reaction **At Freeze**.

- Decide if the **Clip Button** should record a prospective or retrospective video clip.

- Decide if the user should receive a confirmation or be logged out at the end of the exam.

- Select if all images from the current exam should automatically be added to the **Report**, and select default size of these images.
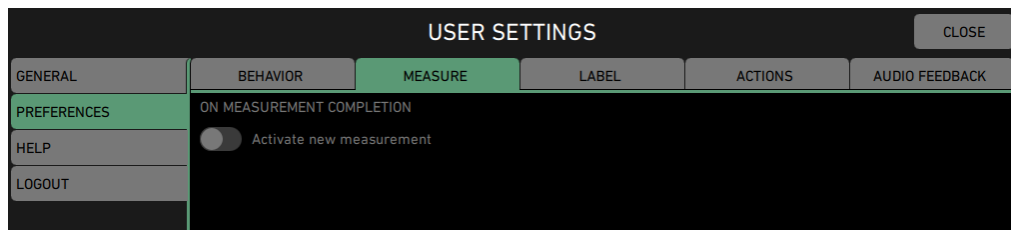
Figure 2-8. User Preferences, Measure tab.

On the **Measure** tab, you can:

- Decide how the system should react on measurement completion.
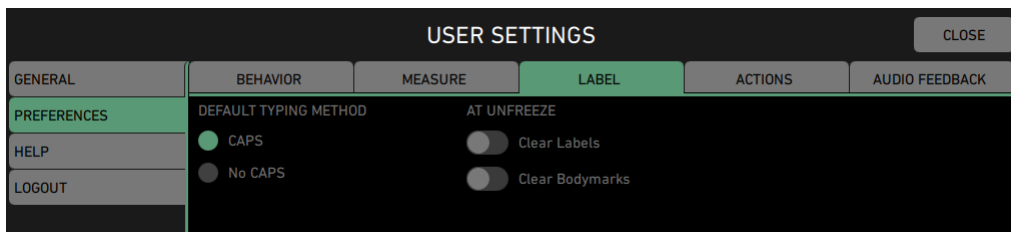
Figure 2-9. User Preferences, Label tab.

On the **Label** tab, you can:

- Decide whether typed-in labels should appear in **Caps** or not.

- Select if labels or bodymarks should be cleared at Unfreeze.
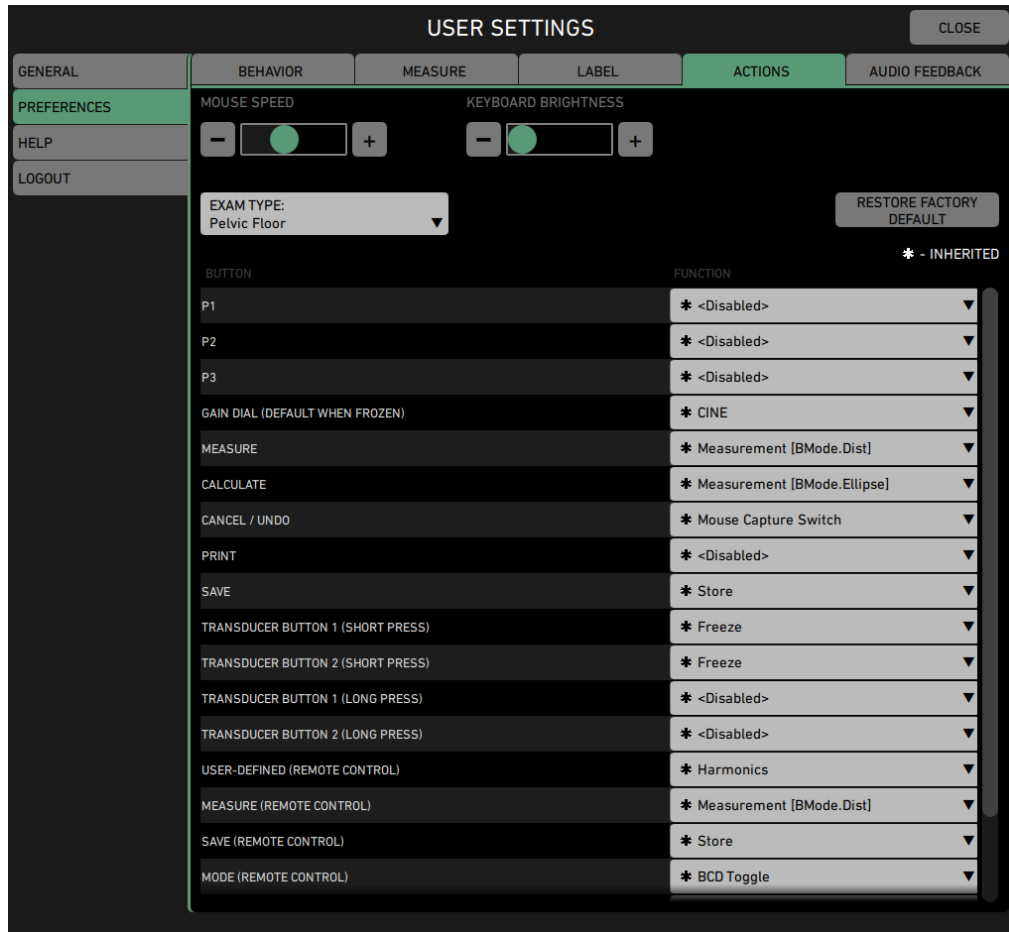
Figure 2-10. User Preferences, Actions tab.

On the **Actions** tab, you can:

- Set the **Keyboard Brightness**.
- Select **Mouse Speed**.
- Select functions for buttons on the dropdown menus.
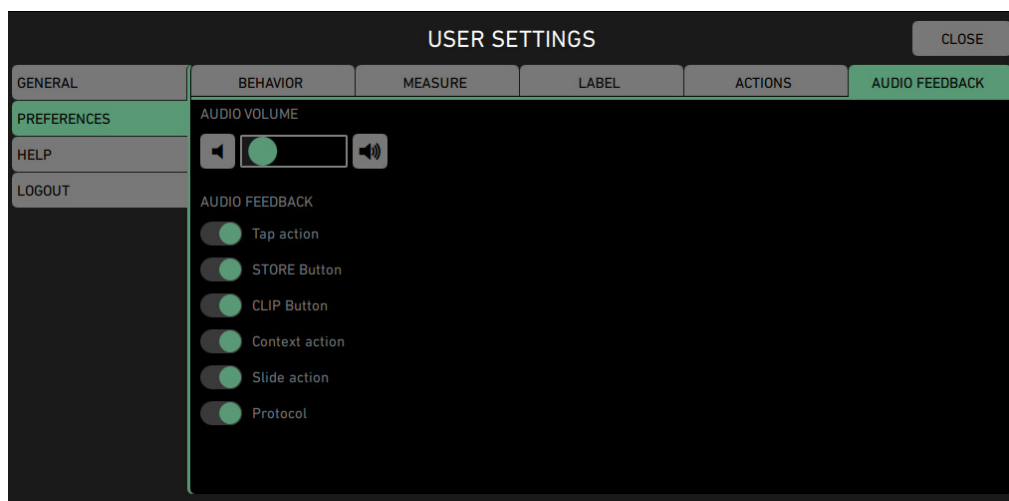
Figure 2-11. User Preferences, Audio Feedback tab

On the Audio Feedback tab, you can:

- Adjust **Audio Volum**e.
- Select or deselect actions, buttons, and protocol for Audio Feedback.

Click **Close** to exit **User Preferences**.

Measurements and Image Data

For information about making and using measurements on the system, see Chapter 5, "Making Measurements" on page 47.

For information about working with the image, see Chapter 4, "Working with the Image" on page 39.

Review

After acquiring the image and making measurements, click **Review** for archiving, copying, reviewing, or deleting the images and reports you made.

Keyboard Control Panel

The keyboard control keys are described in *Getting Started with bk3000 & bk5000*.

Typing Special Letters or Accents

Some special letters are available as keys on the keyboard. In addition, 4 accents are available on the **Accent** key.

Figure 2-12. The Accent key.

To use accents, press the **Accent** key and THEN press the letter that is to be accented.

Examples:

To write this	Press this	Then press this
ö or (Ö)	**Accent**	**o** (or **Shift + o**, for O)
è or (È)	**Shift + Accent**	**e** (or **Shift + e**, for E)
ñ (or Ñ)	**fn+ Accent**	**n** (or **Shift + n**, for N)
ê (or Ê)	**Shift + fn+ Accent**	**e** (or **Shift + e**, for E)

Chapter 3
Controls on the Monitor

This chapter contains a list of the buttons on the monitor in alphabetical order. Some buttons only appear when the system has been set up to display them. See Appendix C, "Setting Up and Customizing Your System".

2D Controls

Monitor Control	Function
0/60 Degree	Angle correction line in Doppler mode, fixed intervals -60, 0, 60.
2D Filter	Speckle reduction algorithm. 2D Filter can be set at 5 different levels ranging from subtle speckle reduction (level 1) to strong reduction (level 5). The default level i 3, level 0 turns 2D Filter off.
Anatomical Pos	Anatomical position for 20R3. Use the scale button to set the actual insertion depth of the transducer.
Angle Correct	Angle correction line in Doppler mode, 1 degree increments from -89 to 89.
Auto Gain	Auto gain makes it possible to have the same brightness across different patients and body parts.
Auto Gn. Level	Displays the level for Auto Gain.
Auto Mode	Defines the way Auto Gain is adjusted.
Biopsy	Displays a puncture line or brachy matrix.
Cine Play	Shows the Cine sequence, that you have selected using the trim buttons.
Cine Start Marker	Marks the starting frame of a cine clip showed on monitor.
Cine Stop Marker	Marks the final frame of a cine clip showed on monitor.
Cine Trim End	Places the end marker on the Cine sequence.
Cine Trim Start	Places the start marker on the Cine sequence.
Compounding	Reduces speckle and optimizes the ultrasound image.
Crystal Pos	Crystal position for 203. The default position is 0 when the crystal is at the tip of the transducer. Use the scale button to change the crystal position.
D Cursor	Doppler cursor.
Depth	Displays tissue depth of the image.
Dual	Activates/deactivates split screen.
Dual Layout	Displays split screen either side by side or top/bottom.
Dynamic Range	Adjust contrast. Lower dynamic range = higher contrast. Higher dynamic range = lower contrast.

Monitor Control	Function
Edge	Edge enhancement. Emphasize contours in image so that edges stand out more clearly.
Frequency	Select imaging frequency. The current imaging frequency is displayed on the button.
Harmonics	Tissue harmonic imaging on and off. When you turn it off, imaging resumes with the frequency, gain, dynamic range, etc. that you were using previously.
Image Size	The size of the image on the monitor.
Linked Dual	Automatically transfers the parameters from screen A to screen B (and vice versa).
Live Dual	Simultaneous imaging.
Map	Grayscale map
MI Limit	Sets the Mechanical Index Limit. The current value is displayed on the button.
Motion Comp	Algorithm to compensate for movement.
Needle Enhance	Activates the Needle Enhancement function for best needle visibility.
Needle Guide	Displays the needle guide(s) available for the selected transducer.
Needle Str	Adjusts the visibility of the needle. This button is only visible if you have selected Needle Enhance.
Noise Reject	Reduces noise in the image by removing the darker gray colors.
Patient Temp	Designates the patient's temperature.
Persistence	Set persistence level of the image.
R/L Invert	Inverts the image orientation right/left. The circle with the bk logo on the monitor corresponds to the logo on the transducer tip.
Res Enhance	Adjusts the balance between resolution and frame rate, e.g. Min gives 1 focus point and a high frame rate.
Sector Width	Allows you to expand and reduce the sector width.
Steer	Change the angle of the Doppler line.
SV Size	Resize the Doppler gate.
TI Limit	Sets the Tissue Index Limit. The current value is displayed on the button.
TI Type	Select Tissue index type. The current value is displayed on the button.
Tint	Sets the tint of the image. The current value is displayed on the button.
U/D Invert	Inverts the image orientation up/down. The circle with the bk logo on the monitor corresponds to the logo on the transducer tip.

Color Controls

Monitor Control	Function
0/60 Degree	Angle correction line in Doppler mode, fixed intervals -60, 0, 60.

Monitor Control	Function
Angle Correct	Angle correction line in Doppler mode, 1 degree increments from -89 to 89.
Auto Scale	Automatic Scale/PRF adjustment.
Baseline	Repositions the baseline (offsets the Doppler Color scale) to help with aliasing problems.
Biopsy	Displays a puncture line or brachy matrix.
Cine Play	Shows the Cine sequence, that you have selected using the trim buttons.
Cine Start Marker	Marks the starting frame of a cine clip showed on monitor.
Cine Stop Marker	Marks the final frame of a cine clip showed on monitor.
Cine Trim End	Places the end marker on the Cine sequence.
Cine Trim Start	Places the start marker on the Cine sequence.
Color Mode	Sets the color mode. The current value is displayed on the button.
D Cursor	Doppler cursor.
Dual	Activates/deactivates split screen.
Dual Layout	Displays split screen either side by side or top/bottom.
Frequency	Select imaging frequency. The current imaging frequency is displayed on the button.
Hide Color	Removes color from the image.
Image Size	The size of the image on the monitor in %.
Invert	Invert color coding of flow information so that flow towards the transducer appears blue and flow away from the transducer appears red.
Live Dual	Simultaneous imaging.
Map	Color map.
MI Limit	Set the Mechanical Index Limit. The current value is displayed on the button.
Motion Comp	Algorithm to compensate for movement.
Needle Guide	Displays the needle guide(s) available for the selected transducer.
Persistence	Sets persistence level of the image.
R/L Invert	Inverts the image orientation right/left. The circle with the bk logo on the monitor corresponds to the logo on the transducer tip.
Res Enhance	Adjusts the balance between resolution and frame rate, e.g. Min gives 1 focus point and a high frame rate.
Scale	Vary the PRF (pulse repetition frequency) to select the range of Doppler velocities (frequencies) that are displayed in the spectrum and/or color-coded.
Smoothing	Softens the colors.
Steer	Change the angle of the Doppler line.
SV Size	Resize the Doppler gate.

Monitor Control	Function
TI Limit	Sets the Tissue Index Limit. The current value is displayed on the button.
TI Type	Select Tissue index type. The current value is displayed on the button.
Tissue Priority	Adjusts the priority given to color (flow information). High tissue priority gives color in more areas; low tissue priority reduces the number of areas that are colored.
U/D Invert	Inverts the image orientation up/down. The circle with the bk logo on the monitor corresponds to the logo on the transducer tip.
VFI Arrow Size	Sets the size of the VFI arrows. The current value is displayed on the button.
VFI Grid Size	Sets the size of the VFI grid. The current value is displayed on the button.
Wall Filter	Adjust the wall filter. The current value is displayed on the button.

PW Doppler Controls

Monitor Control	Function
0/60 Degree	Angle correction line in Doppler mode, fixed intervals -60, 0, 60.
Angle Correct	Angle correction line in Doppler mode, 1 degree increments from -89 to 89.
Assist	Enables assist functionality: vessel outline, assisted steering, assisted angle correction, and assisted caliper placement for volume flow.
Auto Scale	Automatic Scale/PRF adjustment.
Auto Vol Flow	Measures volume flow in ml/min. Opens the Doppler gate to span the entire vessel, setting calipers to measure the diameter of the vessel.
Baseline	Reposition the Doppler mode baseline to help with aliasing problems. The frequency axis is updated to match the spectrum.
Biopsy	Displays a puncture line or brachy matrix.
Cine Play	Shows the Cine sequence, that you have selected using the trim buttons.
Cine Start Marker	Marks the starting frame of a cine clip showed on monitor.
Cine Stop Marker	Marks the final frame of a cine clip showed on monitor.
Cine Trim End	Places the end marker on the Cine sequence.
Cine Trim Start	Places the start marker on the Cine sequence.
D Cursor	Doppler cursor.
Dual	Activates/deactivates split screen.
Dual Layout	Displays split screen either side by side or top/bottom.
Frequency	Select imaging frequency. The current imaging frequency is displayed on the button.
Full Size	Maximize the size of the image.

Monitor Control	Function
Image Size	The size of the image on the monitor in %.
Invert	Inverts the spectrum on the monitor.
Layout	Sets the layout for a Doppler (split) screen: top/bottom or side by side
Layout Size	Select large, medium or small for the ultrasound image.
Live Dual	Simultaneous imaging.
Map	Color/Grayscale Map.
MI Limit	Set the Mechanical Index Limit. The current value is displayed on the button.
Motion Comp	Algorithm to compensate for movement.
Needle Guide	Displays the needle guide(s) available for the selected transducer.
Noise Limit	Reduces noise in the Doppler curve.
R/L Invert	Inverts the image orientation right/left. The circle with the bk logo on the monitor corresponds to the logo on the transducer tip.
Res Enhance	Adjusts the balance between resolution and frame rate, e.g. Min gives 1 focus point and a high frame rate.
Scale	Vary the PRF (pulse repetition frequency) to select the range of Doppler velocities (frequencies) that are displayed in the spectrum and/or color-coded.
Smoothing	Softens the colors.
Steer	Change the angle of the Doppler line.
SV Size	Resize the Doppler gate.
Sweep Speed	Sets the number of cycles of the spectrum displayed on the full time axis. The current value is displayed on the button.
Sync Steer	Synchronizes the steering of box and gate.
TI Limit	Sets the Tissue Index Limit. The current value is displayed on the button.
TI Type	Select Tissue index type. The current value is displayed on the button.
Trace	Activate automatic Doppler curve tracing and specify the type: Peak, Mean+Peak, or Mean.
Triplex	2D/Color image and Doppler spectrum both active.
U/D Invert	Inverts the image orientation up/down. The circle with the bk logo on the monitor corresponds to the logo on the transducer tip.
Vessel Detect	Adjusts vessel outline. The current value is displayed on the button.
VFI Update	Places the Doppler gate at the highest velocity in the vessel.
Volume	Adjust the volume of the audio signal in Doppler mode.
Wall Filter	Turn the wall filter on and set the cut-off frequency.

M-Mode Controls

Monitor Control	Function
0/60 Degree	Angle correction line in Doppler mode, fixed intervals -60, 0, 60.
Angle Correct	Angle correction line in Doppler mode, 1 degree increments from -89 to 89.
Biopsy	Displays a puncture line or brachy matrix.
Cine Play	Shows the Cine sequence, that you have selected using the trim buttons.
Cine Start Marker	Marks the starting frame of a cine clip showed on monitor.
Cine Stop Marker	Marks the final frame of a cine clip showed on monitor.
Cine Trim End	Places the end marker on the Cine sequence.
Cine Trim Start	Places the start marker on the Cine sequence.
Dual	Activates/deactivates split screen.
Dual Layout	Displays split screen either side by side or top/bottom.
Full Size	Maximize the size of the image.
Image Size	The size of the image on the monitor in %.
Layout	Sets the layout for an M-mode (split) screen: top/bottom or side by side
Layout Size	Select large, medium or small for the ultrasound image.
Live Dual	Simultaneous imaging.
M Sync Gain	Synchronizes Gain in relation to 2D image.
MI Limit	Set the Mechanical Index Limit. The current value is displayed on the button.
Motion Comp	Algorithm to compensate for movement.
Needle Guide	Displays the needle guide(s) available for the selected transducer.
R/L Invert	Inverts the image orientation right/left. The circle with the bk logo on the monitor corresponds to the logo on the transducer tip.
Res Enhance	Adjusts the balance between resolution and frame rate, e.g. Min gives 1 focus point and a high frame rate.
Steer	Change the angle of the M-mode line.
Sweep Speed	Sets the number of cycles of the spectrum displayed on the full time axis. The current value is displayed on the button.
TI Limit	Sets the Tissue Index Limit. The current value is displayed on the button.
TI Type	Select Tissue index type. The current value is displayed on the button.
Trace	Activate automatic Doppler curve tracing and specify the type: Peak, Mean+Peak, or Mean.
Triplex	2D/Color image and CW Doppler spectrum both active.

Monitor Control	Function
U/D Invert	Inverts the image orientation up/down. The circle with the bk logo on the monitor corresponds to the logo on the transducer tip.

CW Doppler

Monitor Control	Function
0/60 Degree	Angle correction line in Doppler mode, fixed intervals -60, 0, 60.
Angle Correct	Angle correction line in Doppler mode, 1 degree increments from -89 to 89.
Baseline	Reposition the Doppler mode baseline to help with aliasing problems. The frequency axis is updated to match the spectrum.
Biopsy	Displays a puncture line or brachy matrix.
Cine Play	Shows the Cine sequence, that you have selected using the trim buttons.
Cine Start Marker	Marks the starting frame of a cine clip showed on monitor.
Cine Stop Marker	Marks the final frame of a cine clip showed on monitor.
Cine Trim End	Places the end marker on the Cine sequence.
Cine Trim Start	Places the start marker on the Cine sequence.
D Cursor	Doppler cursor.
Dual	Activates/deactivates split screen.
Dual Layout	Displays split screen either side by side or top/bottom.
Frequency	Select imaging frequency. The current imaging frequency is displayed on the button.
Full Size	Maximize the size of the image.
Image Size	The size of the image on the monitor.
Invert	Inverts the spectrum on the monitor.
Layout	Sets the layout for a Doppler (split) screen: top/bottom or side by side
Layout Size	Select large, medium, or small for the Doppler spectrum.
Live Dual	Simultaneous imaging.
Map	Color map
MI Limit	Sets the Mechanical Index Limit. The current value is displayed on the button.
Motion Comp	Algorithm to compensate for movement.
Needle Guide	Displays the needle guide(s) available for the selected transducer.
Noise Limit	Reduces noise in the Doppler curve.

Monitor Control	Function
R/L Invert	Inverts the image orientation right/left. The circle with the bk logo on the monitor corresponds to the logo on the transducer tip.
Res Enhance	Adjusts the balance between resolution and frame rate, e.g. Min gives 1 focus point and a high frame rate.
Scale	Vary the PRF (pulse repetition frequency) to select the range of Doppler velocities (frequencies) that are displayed in the spectrum and/or color-coded.
Smoothing	Softens the colors.
Steer	Change the angle of the Doppler line.
SV Size	Resize the Doppler gate.
Sweep Speed	Sets the number of cycles of the spectrum displayed on the full time axis. The current value is displayed on the button.
TI Limit	Sets the Tissue Index Limit. The current value is displayed on the button.
TI Type	Select Tissue index type. The current value is displayed on the button.
Trace	Activate automatic Doppler curve tracing and specify the type: Peak, Mean+Peak, or Mean.
Triplex	2D/Color image and Doppler spectrum both active.
U/D Invert	Inverts the image orientation up/down. The circle with the bk logo on the monitor corresponds to the logo on the transducer tip.
Volume	Adjust the volume of the audio signal in Doppler mode.
Wall Filter	Turn the wall filter on and set the cut-off frequency.

Elastography Controls

Monitor Control	Function
0/60 Degree	Angle correction line in Doppler mode, fixed intervals -60, 0, 60.
Angle Correct	Angle correction line in Doppler mode, 1 degree increments from -89 to 89.
Biopsy	Displays a puncture line or brachy matrix.
Cine Play	Shows the Cine sequence, that you have selected using the trim buttons.
Cine Start Marker	Marks the starting frame of a cine clip showed on monitor.
Cine Stop Marker	Marks the final frame of a cine clip showed on monitor.
Cine Trim End	Places the end marker on the Cine sequence.
Cine Trim Start	Places the start marker on the Cine sequence.
Dual	Activates/deactivates split screen.
Dual Layout	Displays split screen either side by side or top/bottom.

Monitor Control	Function
Dynamic Range	Adjust contrast. Lower dynamic range = higher contrast. Higher dynamic range = lower contrast.
E Reject	Increase visibility of cysts.
Enhance	Enhances the mode.
Frequency	Select imaging frequency. The current imaging frequency is displayed on the button.
Gain	Sets the gain.
Image Size	The size of the image on the monitor in %.
Live Dual	Simultaneous imaging.
Map	Color map.
MI Limit	Sets the Mechanical Index Limit. The current value is displayed on the button.
Motion Comp	Algorithm to compensate for movement.
Needle Guide	Displays the needle guide(s) available for the selected transducer.
Opacity	Overlay of 2D and elastography.
Persistence	Set persistence level of the image.
R/L Invert	Inverts the image orientation right/left. The circle with the bk logo on the monitor corresponds to the logo on the transducer tip.
Res Enhance	Adjusts the balance between resolution and frame rate, e.g. Min gives 1 focus point and a high frame rate.
Resolution	Change the elastography resolution.
Steer	Change the angle of the Doppler line.
SV Size	Resize the Doppler gate.
TI Limit	Sets the Tissue Index Limit. The current value is displayed on the button.
TI Type	Select Tissue index type. The current value is displayed on the button.
U/D Invert	Inverts the image orientation up/down. The circle with the bk logo on the monitor corresponds to the logo on the transducer tip.

Power Mode Controls

Monitor Control	Function
0/60 Degree	Angle correction line in Doppler mode, fixed intervals -60, 0, 60.
Angle Correct	Angle correction line in Doppler mode, 1 degree increments from -89 to 89.
Biopsy	Displays a puncture line or brachy matrix.
Cine Play	Shows the Cine sequence, that you have selected using the trim buttons.

Monitor Control	Function
Cine Start Marker	Marks the starting frame of a cine clip showed on monitor.
Cine Stop Marker	Marks the final frame of a cine clip showed on monitor.
Cine Trim End	Places the end marker on the Cine sequence.
Cine Trim Start	Places the start marker on the Cine sequence.
Color Mode	Sets the color mode. The current value is displayed on the button.
D Cursor	Doppler cursor.
Dual	Activates/deactivates split screen.
Dual Layout	Displays split screen either side by side or top/bottom.
Frequency	Select imaging frequency. The current imaging frequency is displayed on the button.
Hide Color	Removes color from the image.
Image Size	The size of the image on the monitor in %.
Invert	Inverts the spectrum on the monitor.
Live Dual	Simultaneous imaging.
Map	Color map.
MI Limit	Sets the Mechanical Index Limit. The current value is displayed on the button.
Motion Comp	Algorithm to compensate for movement.
Needle Guide	Displays the needle guide(s) available for the selected transducer.
Persistence	Sets persistence level of the image.
R/L Invert	Inverts the image orientation right/left. The circle with the bk logo on the monitor corresponds to the logo on the transducer tip.
Res Enhance	Adjusts the balance between resolution and frame rate, e.g. Min gives 1 focus point and a high frame rate.
Scale	Vary the PRF (pulse repetition frequency) to select the range of Doppler velocities (frequencies) that are displayed in the spectrum and/or color-coded.
Smoothing	Softens the colors.
Steer	Change the angle of the Doppler line.
SV Size	Resize the Doppler gate.
TI Limit	Sets the Tissue Index Limit. The current value is displayed on the button.
TI Type	Select Tissue index type. The current value is displayed on the button.
Tissue Priority	Adjusts the priority given to color (flow information). High tissue priority gives color in more areas; low tissue priority reduces the number of areas that are colored.
U/D Invert	Inverts the image orientation up/down. The circle with the bk logo on the monitor corresponds to the logo on the transducer tip.

Monitor Control	Function
VFI Arrow Size	Sets the size of the VFI arrows. The current value is displayed on the button.
VFI Grid Size	Sets the size of the VFI grid. The current value is displayed on the button.
Wall Filter	Turn the wall filter on and set the cut-off frequency.

3D Controls

Monitor Control	Function
0/60 Degree	Angle correction line in Doppler mode, fixed intervals -60, 0, 60.
3D Acquire	Acquires a 3D volume. A progress circle appears during acquisition.
3D Direction	Sets the 3D direction L-R or R-L.
3D Distance	Sets the distance the transducer will travel to acquire the 3D volume in mm. The current value is displayed on the button.
3D Spacing	Sets spacing between frames in mm. The current value is displayed on the button.
3D Sweep Mode	Move the transducer freely to acquire a 3D image - set Untracked Linear or Untracked Fan.
Acquire Time	Set duration of a 3D data acquisition. The current value is displayed on the button. Image quality increases with an increased acquire time.
Angle Correct	Angle correction line in Doppler mode, 1 degree increments from -89 to 89.
Biopsy	Displays a puncture line or brachy matrix.
Cine Play	Shows the Cine sequence, that you have selected using the trim buttons.
Cine Start Marker	Marks the starting frame of a cine clip showed on monitor.
Cine Stop Marker	Marks the final frame of a cine clip showed on monitor.
Cine Trim End	Places the end marker on the Cine sequence.
Cine Trim Start	Places the start marker on the Cine sequence.
Dual	Activates/deactivates split screen.
Dual Layout	Displays split screen either side by side or top/bottom.
Image Size	The size of the image on the monitor in %.
Live Dual	Simultaneous imaging.
MI Limit	Sets the Mechanical Index Limit. The current value is displayed on the button.
Motion Comp	Algorithm to compensate for movement.
Needle Guide	Displays the needle guide(s) available for the selected transducer.
R/L Invert	Inverts the image orientation right/left. The circle with the bk logo on the monitor corresponds to the logo on the transducer tip.

Monitor Control	Function
Res Enhance	Adjusts the balance between resolution and frame rate, e.g. Min gives 1 focus point and a high frame rate.
Steer	Change the angle of the Doppler line.
Stitch	Set the stitch angle of the transducer.
SV Size	Resize the Doppler gate.
TI Limit	Sets the Tissue Index Limit. The current value is displayed on the button.
TI Type	Select Tissue index type. The current value is displayed on the button.
U/D Invert	Inverts the image orientation up/down. The circle with the bk logo on the monitor corresponds to the logo on the transducer tip.

3D Rev. Mode

Monitor Control	Function
3D Animate	Activates/deactivates rotation of the 3D volume.
3D Brightness	Set the brightness of the 3D volume. The current value is displayed on the button.
3D Contrast	Set the dynamic range of the 3D volume. The current value is displayed on the button.
3D Filter	Set threshold so pixels not as bright as threshold are not displayed. Can help eliminate noise in 3D volumes.
3D Hue	Set a color hue for the 3D volume.
3D Label	Type a label for the 3D volume. Use the trackpad to place it and click to set the label.
3D Luminance	Controls the brightness of structures within the volume.
3D Opacity	Sets the opacity of the 3D volume, allowing visualization of structures beneath the surface.
3D Sculpture	Turns sculpting of the 3D cube on and off.
3D Thickness	Sets thickness in photo and non-photo mode in 3D.
3D View	Select how the 3D volume is displayed. The current value is displayed on the button.
3D Zoom	Zoom 3D Volume.
Animation Span	Sets the extent of the rotation of a 3D volume.
Animation Speed	Sets the speed of the rotation of a 3D volume
Arrow	Displays an arrow on the 3D volume.
Clear Labels	Delete any labels that you have typed on the 3D volume.
Clear Measurements	Delete any measurements you have made on the 3D volume.
Clear Sculpture	Clears 3D sculpting.

Monitor Control	Function
Default View	Restores the acquired image, removing any changes.
Gray Level	Adjust the gray level of the 3D volume.
HWL	Measure volume by HWL.
Measure Angle	Measure Angle in 3D.
Measure Area	Measure Area in 3D.
Measure Dist.	Measure distance in 3D.
New Volume	Returns to the Review window.
Next	Steps forward through images in the volume
Orientation	Displays or hides orientation markers in 3D volumes.
Photorealistic	Adjusts the photorealistic characteristics of the 3D volume.
Prev	Steps backward through images in the volume.
Redo Label	Restore the most recent label that has been undone.
Redo Measure	Restore the most recent measurement that has been undone.
Rotation	Sets the 3D volume to rotate horizontally or vertically.
Sculpt. Depth	Sets the penetration of the sculpting tool.
Sculpt. Display	Displays the result of the sculpting.
Sculpt. Method	Select between cutting a hole inside the volume, cutting away the outside of the volume or using the shave tool.
Stitchline	Turns stitchline on and off.
Undo Label	Remove the most recent label from the 3D volume.
Undo Measure	Remove the most recent measurement from the 3D volume.
Undo Sculpture	Remove the most recent sculpture of the 3D volume.
Volume	Draw planimetry on each image to create a volume.
Wireframe	Turns the wireframe around the 3D volume on or off.

Chapter 4
Working with the Image

Depending on which system you have, you can work with an image (measuring, resizing, etc.) using:

- The trackball and its **Select** keys to select or click and drag.
- The keyboard.

Selecting the Imaging Plane

If you are using a transducer with more than one plane, you can select the imaging plane (**T** for transverse, **S** for sagittal, or **E** for endfire). The current imaging plane (**T**, **S,** or **E**) is displayed at the top of the monitor next to the transducer name.

To select the imaging plane:

- Press the appropriate button on the transducer. For details, see the user guide for the transducer

or

- Click **T**, **S,** or **E** in the workspace

or

- Press the **Scanning Plane** ⬚ key

NOTE: *When you change image orientation U/D, you may need to adjust the TGC settings for the 2D image. See "TGC" on page 71.*

Freezing the Image

When you press the **Freeze** key**,** all images on the monitor are frozen and a snowflake appears on the monitor. If you press **Freeze** again, the image returns to its previous state.

NOTE: *Some functions are not available when the image is frozen and some are available **only** when the image is frozen. If a control you want to use is dimmed (indicating that it is unavailable), try freezing or unfreezing the image.*

When you freeze the image, the date and time displayed on the monitor are also frozen, so the time displayed on a printed image is the time the image was frozen, not the time it was printed.

Partial Freeze and the Update Key

You can only do a partial freeze when you are imaging in Doppler mode as well as one or more 2D modes (B-mode, color, and power) – duplex or triplex imaging. In partial freeze, *either* the Doppler image *or* the 2D-mode image is frozen. You can toggle between the two images in a partial freeze.

To start partial freeze:

*   Press the **Update** key.

    The partial freeze state starts with all 2D-modes frozen and Doppler mode imaging.

While the partial freeze is active, press the **Update** key to toggle the display between the 2 states, which are

*   Doppler mode frozen; 2D-modes imaging.
*   2D-modes frozen; Doppler mode imaging.

To unfreeze both views:

*   Long press the **Update** key.

Split Screen

You can split the screen horizontally or vertically to display 2 views side by side or one over the other.

*   If you are using a single-plane transducer, the 2 views contain the same imaging view.
*   If you are using a biplane transducer, each view displays the image from one imaging plane.
*   If simultaneous imaging is turned on, both views can be imaging.

To split the screen:

1   Click **Dual**. Or press the **Split** 🔲 key.
2   Click **Dual Layout** and select **Side By Side or Top/Bottom**.

To select one of the views:

*   Click in the view you want to select (or press the **Split** key).

To remove a split:

*   Click **Dual**. Or long press the **Split** key.

Simultaneous Imaging

The 2 views in a split screen can both be imaging simultaneously; in this case, freezing and unfreezing affect both images.

To turn simultaneous imaging on and off:

*   Click **Live Dual**.

NOTE: *In simultaneous split-screen imaging, only one of the views can contain Color or Power mode. Therefore, if one view has 2D+Color or 2D+Power, the other view contains only a 2D image.*

You can save a simultaneous split setup (which image is in which part of the monitor) as part of a preset.

Linked Dual

Linked Dual is enabled as a default setting on all Exam Types. During split screen imaging, the Linked Dual function automatically transfers the parameters from screen A to screen B (and vice versa). Color and power mode can be in only one screen.

To use Linked Dual:

1 Adjust the image parameters in screen A, then click screen B to transfer the parameters.

2 Use the same method to transfer the parameters from screen B to screen A.

To disable Linked Dual:

• Click **Linked Dual**.

NOTE: *The functionality of the Linked Dual button can be saved as part of a preset. This allows the user to add or remove the button from the GUI as desired.*

NOTE: *In Linked Dual imaging, only one of the views can contain Color or Power mode. Therefore, if one view has 2D+Color or 2D+Power, the other view contains only a 2D image.*

Labels, Bodymarks, and Arrows

In addition to annotating an image during an examination, you can add annotations (labels, bodymarks, and arrows) to archived images and to individual frames of archived clips from the same type of ultrasound system.

NOTE: *Labels and bodymarks change color when being manipulated. When the cursor hovers over them, they are orange. They are green when you are able to move them. When in position and the cursor is not nearby, they are white.*

Labels

Labels provide a practical way to identify or explain an image. You can:

• Place text labels anywhere on the ultrasound image.

• Add more than one label to an image.

• Type labels directly on the image or select a pre-defined label. When you type, labels are auto-completed from the list of pre-defined labels.

• Change the label to have the opposite orientation word (right/left, up/down, upper/lower, anterior/posterior).

• Add an arrow to denote a specific area of interest.
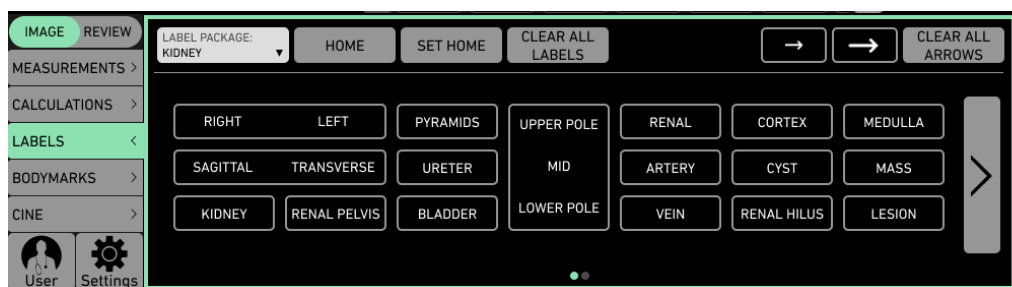
Figure 4-1. Workspace with Labels selector

To select a label:

1   In the workspace, click **Labels**. The Labels selector window opens.

2   From the drop-down menu, select the relevant label package. The displayed labels will reflect the selected package.

3   Click on the arrow button to the right of the label selector to see more labels.

4   Select the label by clicking it. The label appears on the image.

5   Click on the label. The label turns green.

6   Use the trackball to move the label and then click when it is in the correct position.

*You can select where labels show up on the screen per default. Click **Set Home** when you have placed your label. The next label you click will show up in the same place.*

Linked labels:

Opposed labels are linked. This means that if you have selected **Right** and afterwards click **Left**, the label name will change to left. Linked labels are located on the same background. See *Fig 4-1*.

Type and edit your own labels:

1   Type the text you want for the label.

You can move the label while you are typing it.

2   Click on the label to set it on the image.

To move a label that you have already positioned:

•   Click it and drag it to the new position. Click again when the label is where you want it.

To remove a label:

•   Click the label name in the label selector. The label will disappear from the image.

To remove all labels from an image:

•   Click **Clear All Labels** in the workspace.

To edit a label on the image:

•   Click the label on the image and type the changes you want. Note that you can only edit your own labels.

Bodymarks

Bodymarks are small bitmaps depicting parts of the body. You can place a bodymark anywhere on the ultrasound image.

An imaging plane indicator can be placed on the bodymark to show the imaging position.
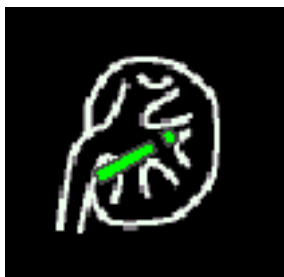
Figure 4-2. Bodymark with imaging plane indicator.

The imaging plane indicator consists of a long bar and small square. The orientation of the bar indicates the orientation of the transducer on the body, and the square indicates the part of the transducer that corresponds to the upper left of the image on the monitor.

Using Bodymarks

Figure 4-3. Bodymarks selector.

To place a bodymark on the image:

1   In the workspace, click **Bodymarks**. The Bodymarks selector window opens.

2   From the drop-down menu, select the relevant bodymark package. The displayed bodymarks will reflect the selected package.

3   Click to select the bodymark you want. (Click on the arrow button to the right of the bodymark selector to see more bodymarks.)

   The bodymark appears on the monitor with a highlighted imaging plane indicator.

4   Drag the imaging plane indicator to position it; and use the + and - keys to rotate it. Click when the imaging place indicator is in the correct position.

5   Use the trackball to select and move the bodymark and then click when it is in the correct position.

To move a bodymark:

1   Click the **Move** button. A green frame appears around the bodymark.

2   Drag it to the position you want, and click again.

To replace a bodymark:

To replace an existing bodymark with a different one, click the new bodymark. The new bodymark will appear in the default position.

To delete a bodymark from the monitor:

• Click the **Delete** button.

Unless you delete it or replace it with a new one, a bodymark will remain on the monitor until you change Preset or begin to image a new patient.

Adjusting the Imaging Plane Indicator

To adjust the imaging plane indicator:

When you place a bodymark on the image, the imaging plane indicator is green and can be adjusted as follows:

1 Drag the imaging plan indicator with the trackball.

2 Rotate left or right by using the + and - keys.

3 Click again when the imaging plane indicator is the way you want it.

The imaging plane indicator turns orange and can be adjusted by pressing ↻ or ↻ buttons.

Arrows

You can place arrows on the image to mark area of special concern or interest.

To place an arrow on the image:

1 Click the **Labels** tab.

2 Click the **Arrows** button and select the arrow you want. The arrow appears highlighted on the monitor.

3 Drag the arrow to the position you want, and click again.

4 You can add another arrow by selecting it.

To delete an arrow, click **Delete**. To delete all arrows from the image, click **Clear All**.

Cine

Cine (image review) lets you review a series of the most recently recorded 2D, 2D+Color mode, 2D+M-mode, or 2D+Doppler mode images.

Freeze the image and *turn* the **B-Mode** key to scroll backward or forward through the series.

Images are constantly being saved and stored for review. When storage capacity is reached, the oldest images are discarded as new ones are stored. The number of images that can be stored for review varies, depending on such factors as image resolution and size.

Images in a clip must be comparable. Therefore, changing certain parameters that affect the image will cause already-stored images to be discarded. If this happens, there will not be a full set of images to be reviewed until the storage has had time to fill again.

You can change some of the settings for the CINE function.

Using Cine

To use the Cine function:

- Freeze the image and turn the **B-Mode** key to scroll backward or forward through the series, or

- Use the **Cine** buttons to navigate through the frames by moving one frame forward or backward.
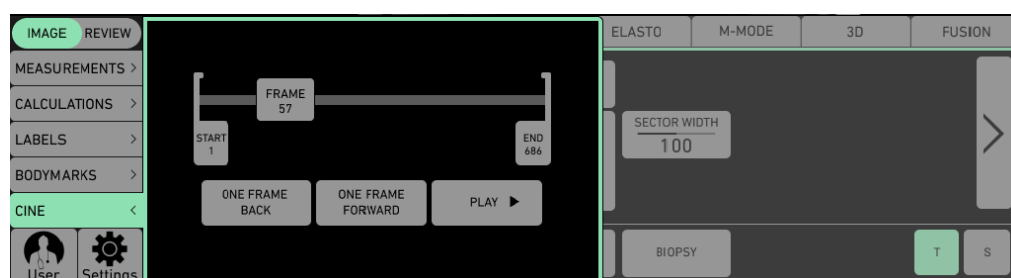
Figure 4-4. Cine indicators.

NOTE: *The most recent image is the highest number. In Fig 4-4, the frame indicator shows that frame #57 of 686 frames is being displayed. The lower the number, the "older" the frame.*

Cine Start and End Markers

You can set the Start and End markers to indicate the range of images to be displayed in **Cine Play**. These markers are shown in Fig 4-4.

- Freeze the image and scroll back through the frames using **Cine** buttons.

- Select the **Start** marker by clicking on it, holding down the select key, and using the trackball to move the marker.

- Release the select key to set the Start marker. The frame number is shown by below the word **Start**.

- Select the **End** marker by clicking on it, holding down the select key, and using the trackball to move the marker.

- Release the select key to set the **End** marker. The frame number is shown by below the word **End**.

During **Cine Play**, the image with the lowest frame number (oldest) is displayed first, followed by images with increasing frame numbers (newer). The current frame is displayed below **Frame**. After the newest image has been displayed, **Cine Play** will begin to play the loop again, starting with the lowest frame number.

Using Cine in M-Mode or Doppler Mode

When cine is activated while imaging in M-mode or Doppler mode, a vertical cine cursor is displayed overlaying the Doppler or M-mode image.

The 2D image displayed is always the one that corresponds to the position of the Doppler or M-mode cursor. The image (frame) number in the **Frame** indicator corresponds to the 2D image.

To make measurements on a cine image or save it:

1   When the desired image is displayed, click the **Pause** button.

2   Make measurements on the image or save it in the usual way.

NOTE: *When you move a cine image after you make a measurement, the measurement result remains, but the markers disappear (because the underlying image is different).*

Chapter 5
Making Measurements

Measurements and Calculations

Each Exam Type contains the measuring tools that you need for the calculations contained in the exam type. You use these tools to measure different aspects of the ultrasound image (and thus the underlying tissue); these measurements are used for various calculations.

You have two options for making measurements, **Measurements** and **Calculations**. Measurements are generic measurements that you can do on any region of interest. Calculations are predefined measurements intended for measuring organs or ROIs within a particular preset.

You can make measurements on stored images from the same type of ultrasound system. The images must be in DICOM format, not .bmp. For information about the format of stored images, see "HIPAA Compliance and Exporting Data" on page 62. You cannot make measurements on video clips.

For calculation formulas and information about the accuracy of different types of measurements, see "Clinical Measurements: Ranges and Accuracies" in the *bk3000 & bk5000 User Guide* and the Technical Data (BZ2100).

To view the list of measurements:

1   Freeze the image.

In the workspace, click **Measurements**. The Measurements selector window opens.

Making a Measurement – General Procedure

The following sections contain detailed descriptions for using the various measuring tools.

To make a measurement:

1   Click on the **Measurements** tab in the left side of the workspace.

2   Click the name of the measurement.

A caliper appears on the image.

3   Drag the caliper to the position you want and click.

If the measurement requires 2 calipers, another one appears.

4   Drag the second caliper to the position you want and click.

5   Repeat this until you have positioned all the calipers for the measurement.

NOTE: *The look of the calipers themselves and of any lines that connect them depend on what you are measuring.*

What the Measurements Indicate

- **Results** – The results of the measurement are displayed (continuously updated) on the monitor.

- **Depth** – While you are positioning the first caliper for a distance measurement in a 2D or Color mode image, the displayed measurement is the depth of the caliper (distance from the caliper to the transducer surface along the scan line). When a second caliper is positioned, the depth is replaced by the appropriate measurement result.

Clearing a Measurement

To clear a measurement

1   Point at the colored square next to the measurement to the left of the image.

A trash can icon appears.

2   Click on the trash can icon.

2D and Color Mode Measuring Tools

This section describes how to make the following types of measurements:

- Distance
- Angle
- Hip Tool
- Circle
- Ellipse
- Freehand drawing of shapes
- Curved Distance

Distance Measuring Tool

Two calipers can be positioned to measure a distance, for example, the length or width of a structure. When the first caliper is positioned, a second one appears for you to position.

NOTE: *Pressing the* **Measure** *key starts a distance measurement.*

Position first caliper.   First caliper positioned;   Second caliper positioned.
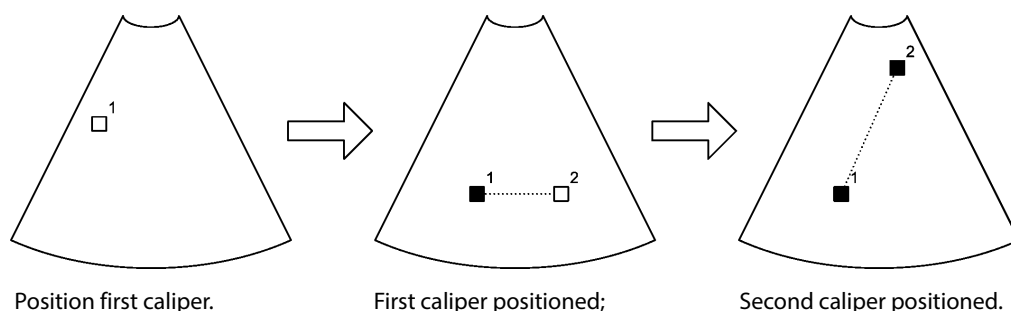
Figure 5-1. Positioning 2 calipers on a 2D or Color mode image.

NOTE: *The small numbers (1 and 2) shown in Fig 5-1 indicate the order in which the calipers appear. The numbers do not appear like this on the monitor.*

To move a caliper after they have all been positioned:
1   Click any caliper and move it to change the length or orientation of the line.
2   Click again to set the measurement.

To move the entire measurement after positioning:
1   Click the line and drag it to the new position.
2   Click again to set the measurement.

Angle Measuring Tool

On a 2D or Color mode image, you can measure angles.

To measure an angle:
1   Click **Angle**.
     A caliper appears.
2   Position the caliper and click.
     A second caliper appears, with a line connecting the two calipers.
3   Position caliper 2 to change the angle of the line. Click.
     A third caliper appears.
4   Position caliper 3 and click.
     A fourth caliper appears, with a line connecting it to caliper 3.
5   Position caliper 4 to change the angle of the line. Click.
     Angle **alpha** between the two lines is indicated on the image, and the size of the angle appears as a measurement to the left of the image.

To change the angle measurement after all the lines are positioned:

1 Click any caliper and move it to change the length or orientation of one of the lines.

2 Click again to set the measurement.

Hip Tool Measuring Tool

The hip tool measuring tool works slightly different from the other measuring tools, but in general as the angle tool described above. There are, however, three lines and thereby two angles to measure.

Position first caliper and click.

First caliper positioned; position second caliper and click.

Second caliper positioned. Position third caliper and click

Position fourth caliper and click.

Fourth caliper positioned; position fifth caliper and click.

Fifth caliper positioned; position sixth caliper and click to set the measurement.
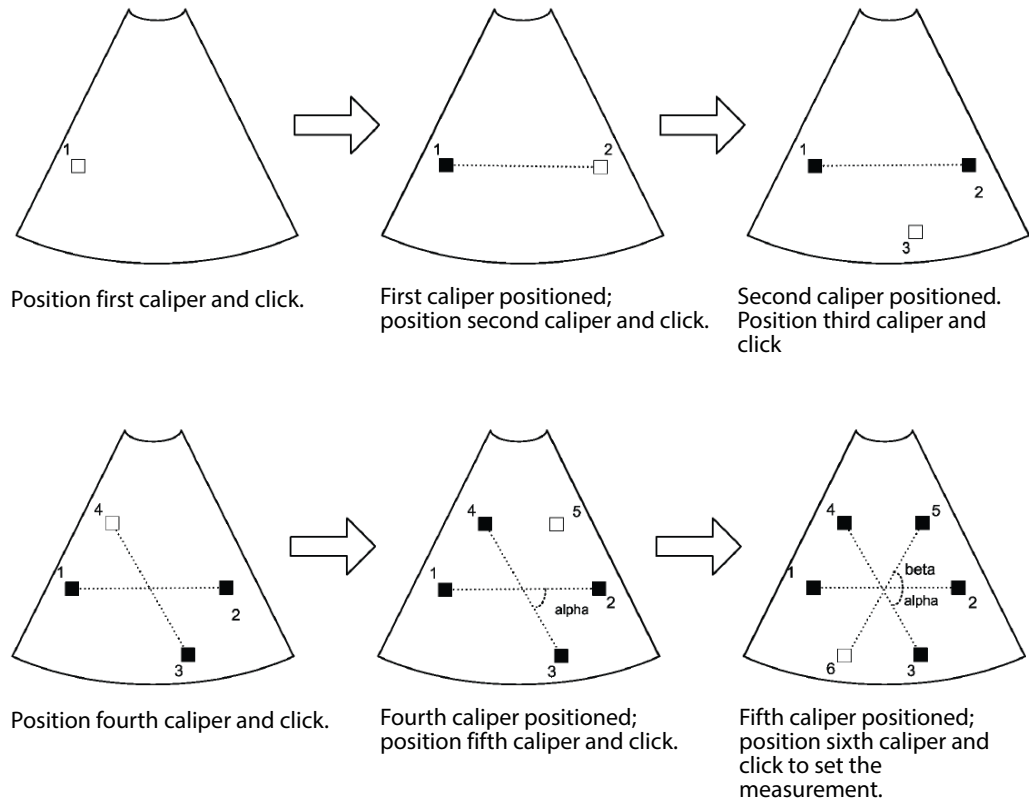
Figure 5-2. Using the Hip Tool to measure two angles.

To use the Hip Tool:

1 Click **Hip Tool**.

A caliper appears.

2 Position the caliper and click.

A second caliper appears, with a line connecting the two calipers.

3 Position caliper 2 to change the angle of the line. Click to place the second caliper.

A third caliper appears.

4 Position caliper 3 and click.

A fourth caliper appears, with a line connecting it to caliper 3.

5 Position caliper 4 to change the angle of the line. Click to place the fourth caliper. Angle **alpha** between the two lines is indicated on the image, and the size of the angle appears as a measurement to the left of the image. Caliper 5 appears.

6 Position caliper 5 and click. Caliper 6 appears, with a line connecting it to caliper 5.

7 Position caliper 6 to change the angle of the line. Click to place the sixth caliper. Angle **beta** between the first and last lines is indicated on the image, and the size of the angle appears as a measurement to the left of the image.

If you just click and do not move any calipers, the default angles are 60º.

To change the hip tool measurement after all the lines are positioned:

1 Click any caliper and move it to change the length or orientation of any of the lines.

2 Click again to set the measurement.

Circle Measuring Tool

On a 2D or Color mode image, you can position 2 calipers to measure an circle. Use the **Ellipse** measure. Position the calipers in the usual way. As you move the second caliper, the ellipse is continuously redrawn on the monitor.

Position first caliper.   First caliper positioned; position second caliper.   Second caliper positioned.
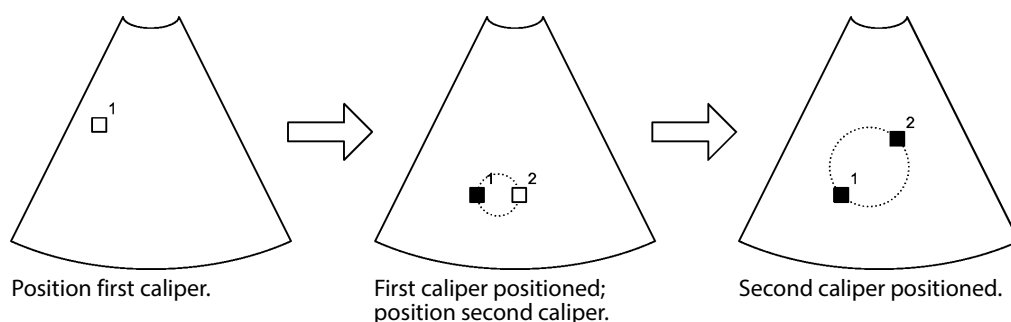
Figure 5-3. Using the ellipse measuring tool.

After the calipers have been positioned, you can move any of them by clicking and dragging to a new location. Click again.

To change the location or size of the circle:

1 Click one of the calipers

2 Reposition the caliper.

3 Repeat with the other caliper, if necessary.

All calipers positioned.   First caliper selected.   First caliper repositioned.
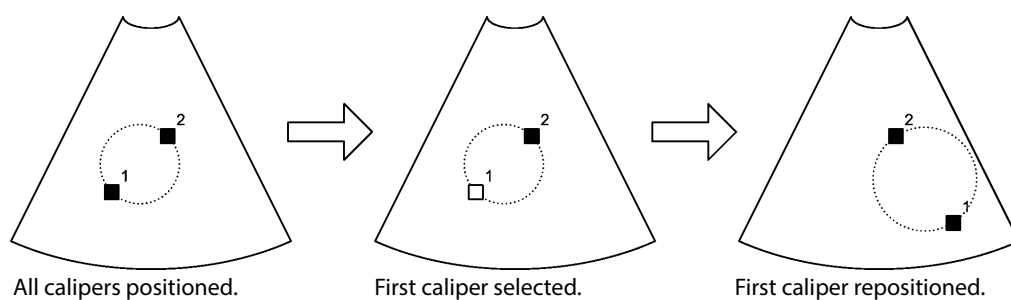
Figure 5-4. Repositioning one of the circle calipers.

To move the entire circle without changing its size:

1   Click inside or on the circle.

A symbol (a plus sign with arrows) appears as shown in the center image of Fig 5-5. This symbol means you can move the circle.

2   Drag it.

3   Click again.

All calipers positioned.   Entire circle selected.   Entire circle repositioned.
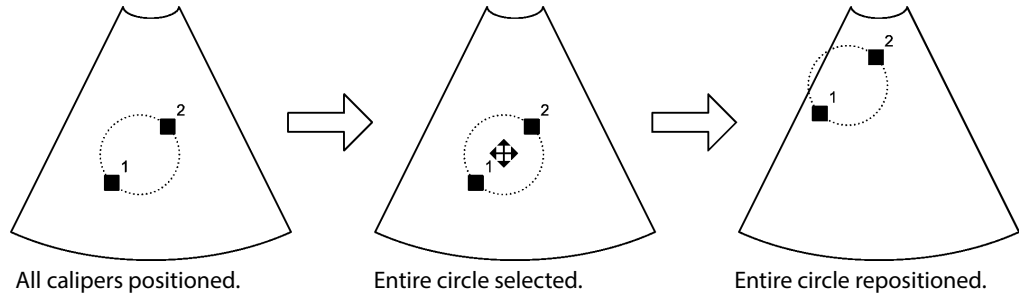
Figure 5-5. Moving an entire circle without changing its size.

Ellipse Measuring Tool

On a 2D or Color mode image, you can use three calipers to measure an ellipse. Position the calipers in the usual way.

Position first caliper.   First caliper positioned; position second caliper.   First and second markers positioned; position third caliper   All calipers positioned.
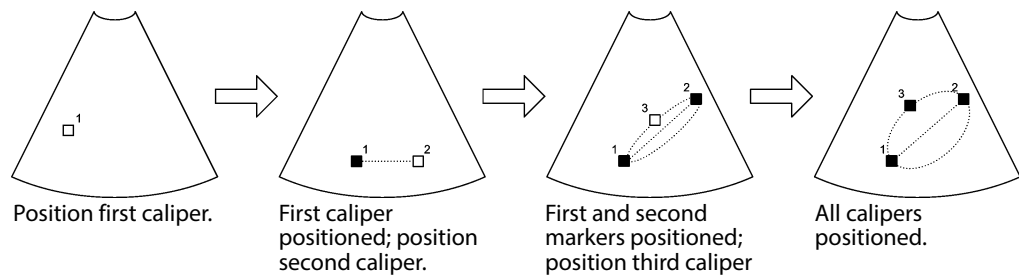
Figure 5-6. Drawing an ellipse.

The first 2 calipers determine a line that is used as the axis of rotation if you use the ellipse to measure volume.

NOTE: *The axis of rotation critically affects the calculated volume. Consider the basic shape of the structure of interest and make sure to place the first 2 calipers so that they define the correct axis of rotation. See Fig 5-7.*
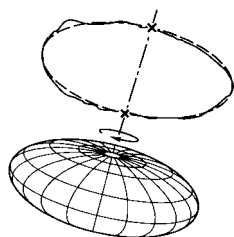
Using the shorter distance as axis of rotation results in an estimated volume of the shape shown here.
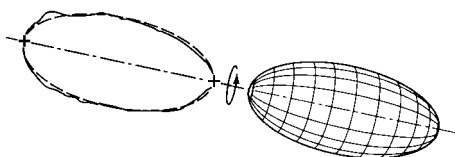
Using the longer distance as axis of rotation results in an estimated volume of the shape shown here.

Figure 5-7. The effect of the rotation axis on volume determination.

The third caliper is always equidistant from the first 2. Moving it makes the ellipse broader or narrower. As you move the third caliper, the ellipse is continuously redrawn on the monitor.

After the calipers have been positioned, you can move any of them by clicking and dragging to a new position.

To move the entire ellipse without changing its size or orientation:

1   Click inside or on the ellipse.

The move symbol – plus sign with arrows – appears as shown in the center image of Fig. 5-8. This symbol means you can move the ellipse.

2   Drag it.

3   Click again to set the ellipse.

Not all of the ellipse has to lie within the ultrasound image.

All calipers positioned.   Entire ellipse selected.   Entire ellipse repositioned.
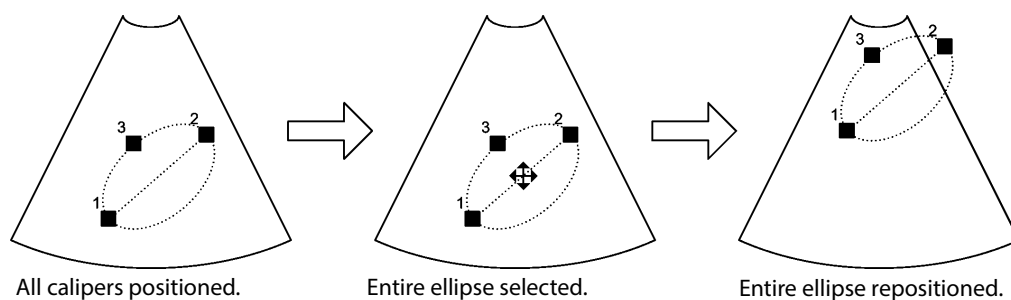
Figure 5-8. Moving an ellipse.

Freehand Drawing on a 2D or Color Mode Image

On a 2D or Color mode image, you can draw a closed shape freehand.

To draw freehand:

1   Click **2D Trace**:

A caliper appears.

2   Drag it to where you want to start drawing. Click.

A drawing cursor appears where you clicked.

3   Drag it to draw the shape you want.

To delete backward from the cursor, press **-** on the **+/-** key. The cursor is automatically moved back. To undo the deletion, press **+**.

4   When you have finished drawing, click the drawing cursor.

The shape is automatically closed by a straight line from the drawing caliper to the first caliper (starting point).

Position starting point.

Starting point positioned; draw trace.

Trace is drawn and shape is automatically closed.
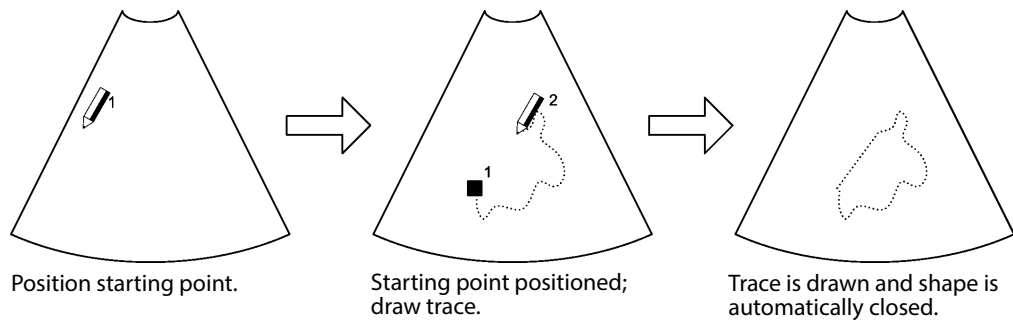
Figure 5-9. Drawing a freehand shape.

You can move the shape to any location in the view:

1   Click inside or on the shape.

The shape turns green and a symbol (plus sign with arrows) appears as shown in the center image of Fig. 5-10. This symbol means you can move the shape.

2   Drag it.

3   Click again to set the shape.

Shape drawn.

Entire shape selected.

Entire shape repositioned.
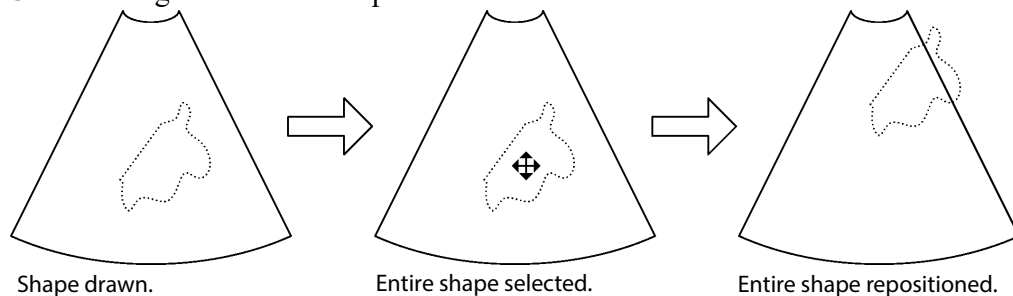
Figure 5-10. Moving a shape you have drawn freehand.

Curved Distance

On a 2D or Color mode image, you can measure a curved distance.

To measure a curved distance:

1   Click **Curveddist**:

A caliper appears.

2   Drag it to where you want to start drawing. Click.

A drawing cursor appears where you clicked.

3   Drag it to draw the curve you want.

To delete backward from the cursor, press **-** on the **+/-** key. The cursor is automatically moved back. To undo the deletion, press **+**.

4   When you have finished drawing, click the drawing cursor to set the measurement.

Doppler Mode Measuring Tools

Making measurements on a Doppler mode image is different from measuring on a 2D or Color mode image because the Doppler mode image has *time* as a dimension. To avoid getting a negative result, successive calipers must be positioned to the right, not the left, of any already-positioned calipers.

Note that the **Angle Correct** button is available when you click **Measurements** or **Calculations** in Doppler mode.

Positioning 2 Point Calipers on a Doppler Mode Image

While you are positioning a caliper, 2 cursor lines are displayed. One is horizontal and one vertical, intersecting at the marker position.

Position first caliper.   First caliper positioned; position   Second caliper positioned.
                                 second caliper.   Measure is set.
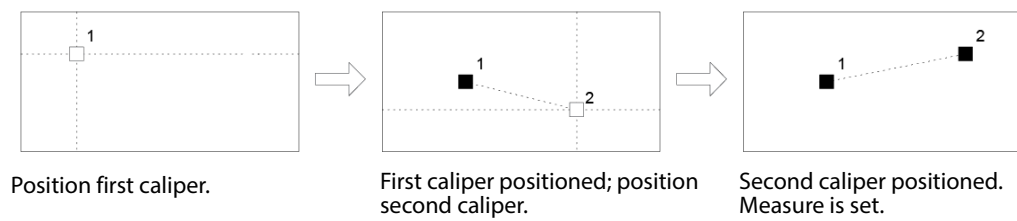
Figure 5-11. Positioning 2 point calipers on a Doppler mode image.

After you position the calipers, you can move one of them by clicking and dragging it. Click again if you want to reposition the second caliper and click when you are done positioning.

Both calipers positioned.   First caliper selected.   First caliper repositioned.
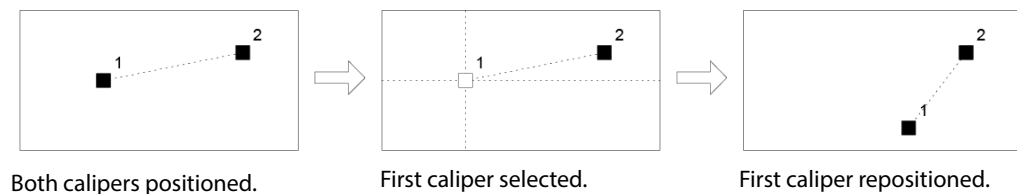
Figure 5-12. Moving a caliper you have placed on a Doppler mode image.

You can position the calipers anywhere in the Doppler mode image.

The appearance of the calipers and whether they are connected by a dotted line depends on what you are measuring.

Positioning 1 Point Caliper on a Doppler Mode Image

If you are measuring something that needs only one caliper, position the caliper in the same way as for 2 calipers.

Positioning 2 Vertical Line Calipers on a Doppler Mode Image

Two vertical line calipers can be positioned on a Doppler mode image to measure intervals.

To position the vertical calipers:

1 Click the **HR** measuring tool.

A line caliper appears on the image.

2 Drag this to the position you want. Click.

Another line caliper appears.

3 Drag it to the correct position. Click.

The measurement is set.

Position first line.

First line positioned;
position second line.

Second line positioned;
measurement terminated.
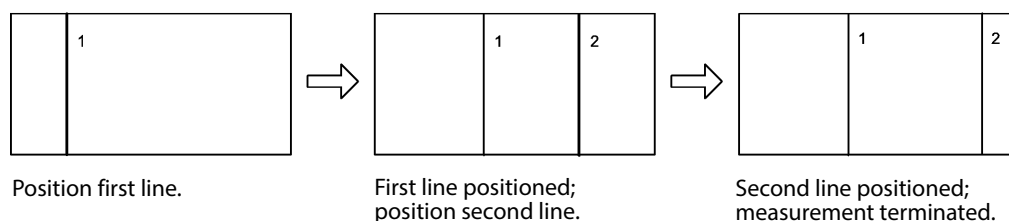
Figure 5-13. Positioning vertical calipers on a Doppler mode image.

After you position the calipers, you can move one of them by clicking it and dragging it. Click again when you have positioned it where you want it.

All lines positioned.

First line selected.

First line repositioned.
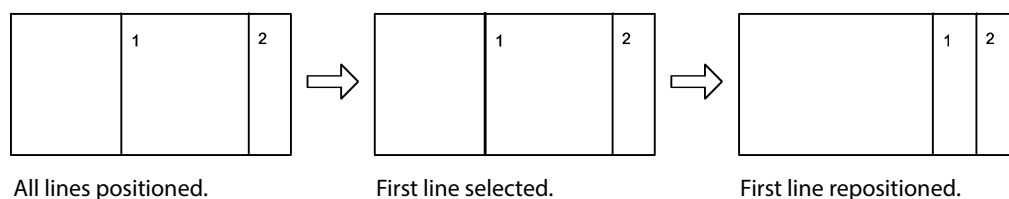
Figure 5-14. Moving a vertical line caliper you have placed on a Doppler mode image.

Drawing an Outline Curve on a Doppler Mode Image

On a Doppler mode image, you can draw an outline curve freehand.

To draw freehand:

1 Click the **D Trace Freehand** measuring tool on the monitor:

A caliper appears.

2 Drag it to where you want to start drawing. Click.

A drawing cursor appears where you clicked.

3 Drag the drawing cursor to draw the shape you want. (You can only drag to the right; you cannot drag to the left.)

To delete backward from the cursor, press **-** on the **+/-** key. The cursor is automatically moved back. To undo the deletion, press **+**.

4 When you have finished drawing, click the drawing cursor.

Position starting point.   Starting point positioned;   Trace is drawn.
                            draw trace.
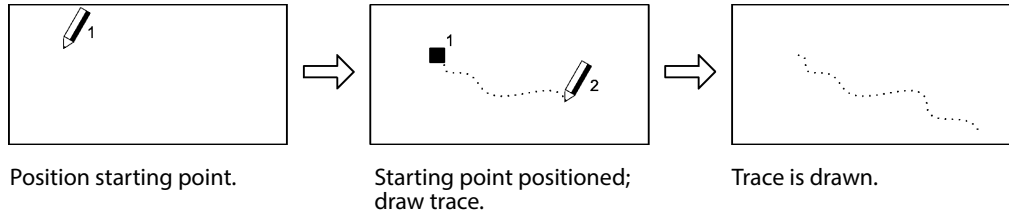
Figure 5-15. Drawing a freehand curve on a Doppler image.

Chapter 6
Documentation

What are Documents?

This chapter describes ways to save, view, and delete documents.

There are four different types of documents:

- Images (2D and 3D)
- Clips
- 3D data sets
- Reports

In this chapter, the term "document" refers to all of these types of documents unless a particular type is specified.

HIPAA Compliance

HIPAA (the American Health Insurance Portability and Accountability Act of 1996) sets standards for handling patient data and medical records in a way that ensures the privacy and security of all health-care related data. Each hospital or office must set up procedures to make sure that all information that identifies an individual remains confidential and safe. Always follow the procedures that have been established for your workplace.

Information relating to HIPAA compliance can be found in the various parts of this chapter:

- "HIPAA Compliance and Exporting Data" on page 62
- "Deleting Documents or Exams from the System." on page 64
- "Password Protection of Patient Data" on page 65

Saving Documents – Capturing Images and Video Clips

You must have a patient ID entered in order to capture images and clips. Normally, the Patient ID field will be populated with a date/timestamp, but you can enter a specific ID before you start the exam if you want to.

Capturing Images

When you have started the exam, press the **Capture** key to capture an image. If the image is frozen, the **Capture** key will capture an image. If the image is not frozen, the **Capture** key will record a clip. While a clip is being captured, a progress wheel is displayed in the document browser. If you press **Capture** and an exam is not running, the system returns you to the **Patient Details** where you can start the exam by clicking **Start Exam**.

Reviewing Documents

The Document Browser

Use the document browser at the bottom of the monitor to review images and clips from the current exam.

The document browser contains numbered thumbnails of the available documents. If the browser contains more images than can be displayed on the monitor, arrows appear at each end of the line of thumbnails.

To view a document:

1 Click the document in the browser.

A green frame with a 'Close' label appears on the selection and the document is displayed on the monitor.

2 Click the document again to close it.
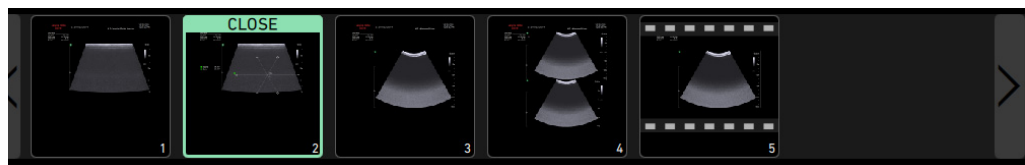
Figure 6-1. The document browser

The Review Window

Use the **Review** window to review and manage images and other documents stored in the patient list. For saved exams, open the documents on the **Patient List** by double-clicking the examination you want to view.

To change the order of the saved images in the active exam:

1 Click **Change Order**.

2 Click and drag the image to where you want it.

The image changes position in the **Review** window and the document browser (when the image is not frozen).

To join video clips:

1 Click **Multiselect**.

2 Click the video clips you want to join.

3 Click **Join Clips**.

The system displays a message to indicate that the clips are being joined, and the new video clip is added at the end.

You can view the documents on the monitor or you can export or delete them. Select a document to view or one or more documents to export or delete.

In the same way, you can also review examinations from a **USB**.

Viewing and Editing Video Clips

Viewing and Editing a Video Clip on the System

When you view a video clip, edit buttons appear in a box in the workspace, so that you can play, pause, go forward one frame, go back one frame, or edit the clip.
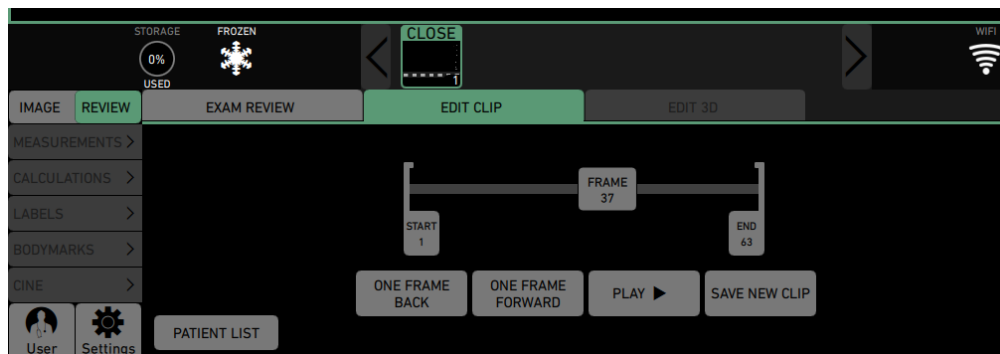
Figure 6-2. Video editing buttons

To edit a video clip:

1 Click **Pause** to pause the video. The button changes text to **Play**.

2 Use the Start marker and End Marker to scroll through the frames to find your preferred start frame and end frame. See "Cine Start and End Markers" on page 45.

3 Click **Save New Clip** to save the clip with new start and end frames.

Viewing Exported Documents on the System

Documents that have been exported to external storage media can be viewed on an ultrasound system.

To view externally stored documents:

1 Use a network drive or insert a USB with a storage device into the USB connector on the left side of the keyboard.

2 In the **Review** window, click the **USB** or **Network Drive** tab.

A list of the folders on the external storage device appears.

3 Click the folder you want to view.

The Review window displays the documents in the selected folder.

Viewing Exported Documents on an External Computer

Formats of Exported Documents

Copied Images Images copied to a network drive or USB storage device are stored in DICOM or PNG format. In PNG format, they are labeled with a code that specifies the date and time the image was captured. For example, 2D_20191022_135426_FV12345.png would be the label on an 2D image of patient FV12345 that was captured on October 22, 2019 at 1:54:26 P.M. (13:54:26). The label on a DICOM file is the same except that the file extension is .dcm.

Copied Video Clips Video clips can be copied in AVI, MPEG, or DICOM format.

Stored Images and Video Clips Stored images and video clips are stored in DICOM format.

Viewing Images on a Computer

NOTE: *DICOM format requires a DICOM viewer on your computer.*

Copied images have been exported in DICOM or PNG format. You select the file you want to view.

Viewing Video Clips on a Computer

If the video clip has been exported in DICOM format, you can view it with a DICOM viewer. Otherwise, you can use a media player on your computer.

Exporting Data

HIPAA Compliance and Exporting Data

To preserve patient confidentiality when you copy patient data, select the option to copy images and other documents to a USB storage device *without the identifying patient information*: **De-identify patient ID.**

Exporting Documents

You can copy documents associated with a patient to a USB storage device, PACS, or a network drive from the review window. When you click **Export**, you can select where to export data to, image format, clip format, and whether or not you want to export the documents without identifying the patient information.

To copy an examination:
1   Click **Review**.
2   Click **Patient List**.
3   Select the patient, whose examination you want to copy.
4   Click **Export.**
5   Select the destination, format, and patient data identification and click **Export** again. **De-identify patient ID** is recommended for patient security.
6   The data is copied to the selected destination.
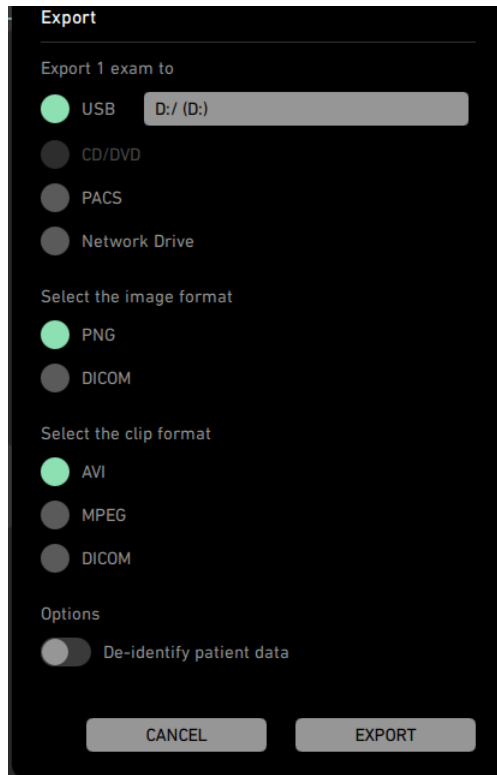
Figure 6-3. Export options

You can make more than one copy of a document.

NOTE: *Do not delete documents from the local patient list system until you have verified that they have been exported successfully to the selected destination.*

Patient List

The **Patient List** contains patient IDs, names, and other information about patients in the patient database, including the date of the last examination.

When you capture an image or save a document during an examination, it is saved directly into the patient list. The document browser is automatically updated to show the saved documents from the current examination.

You can search through the patient list using the search field above the list.

You can sort the listed patients according to the information in one of the columns by clicking the column heading. For example, if you click the **Last Name** column, the listed patients will be sorted alphabetically by last name.

To see documents from a particular examination, double-click the row containing the examination. To continue a previous exam, click the relevant row and select **Append Exam**.

From the **Patient List** you can also export (see "Exporting Documents" above) and delete exams. You can select more than one by clicking the **Select Multiple** or **Select All** buttons.

NOTE: *The patient archiving system can be password-protected. See "Password Protection of Patient Data" on page 65.*

Deleting Documents or Exams from the System.

You can delete documents and patient records from the system.

NOTE: *You cannot delete a document that is in a queue to be sent to a DICOM device.*

To delete one or more documents from the system:

1   Double-click the examination on the **Patient List.**

2   Select one or several documents (Use the **Multiselect** button).

3   Click **Delete** and confirm that you want to delete the document(s).

The selected documents are deleted.

To delete all documents associated with an examination:

1   Double-click the examination on the **Patient List.**

2   Click **Select All.**

3   Click **Delete** and confirm that you want to delete the documents.

The documents associated with the selected examination are deleted.

NOTE: *The examination record itself is never deleted (unless you delete the patient).*

To delete an exam:

1   Click the examination on the **Patient List.**

2   Click **Delete**.

You are asked to confirm that you want to delete the exam.

3   Click **Yes**.

All local documents for the exam are deleted.

To delete the entire Patient List:

See "General Tab" on page 262 in the Setup and Customizing section.

Pausing and Later Resuming an Examination

It is possible to pause an exam (for example, while you examine a different patient) and then resume the exam with the first patient.

To pause an examination:

•   Press the **Patient** key.

•   Click **Pause Exam**.

To resume a paused examination:

1   Press the **Patient** key.

2   Select the **Paused Exams** tab.

3   Select the exam you want to resume and click **Resume Exam**.

Password Protection of Patient Data

To help comply with HIPAA standards, the patient archive database on the system can be password-protected with a user-specific ID (username) and password.

If the database on the system is password-protected, when you turn on the system, a login window appears:
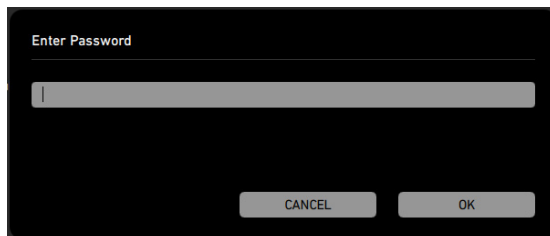
Figure 6-4. Login window.

Select user, enter password, and click **OK**.

Hard Disk Quota

The system hard disk does not have unlimited storage capacity.

The system checks the space on the hard disk each time you enter a new patient ID. If the hard disk is getting full, you will be notified:

- when there is less than 2 GB available space on the hard disk.
- when there is less than 1.5 GB available on the hard disk.
- when there is less than 1 GB available on the hard disk. At this point, you will not be allowed to save any more information to the hard disk.

To clear space on the hard disk, you must delete some documents. You can archive them to a network drive or PACS (if you have DICOM installed) before you delete them from the hard disk. See "Exporting Documents" on page 62.

Reports

Reports are defined for each Preset. A report contains information about the patient and the measurements you have made. You can add assessment, images, patient history, and comments to a report.

You can save a report to the patient database and view, save, or export it in the same way as you view or save other documents. See above for more information.

Creating a Report

To create a report:

1 Click **Exam Review** on the **Review** tab.

2 Click **Report**. The **Report** window is displayed.

The contents of the report will vary, depending on the Preset and the measurements you have made.

If the finished report has more than one page, click the arrows to navigate through the pages.

Patient comments are included in a report. You can also add additional remarks.

Adding Measurements to a Report

• Click the Measurements tab to see the measurements you have saved for this patient.

Measurements are automatically added to the report.

Assessment

• Click the Assessment tab and use the toggle buttons to note your assessments. You are able to Check All, and then un-check the toggle buttons for non-relevant assessments.

Adding Images to a Report

Store images are automatically added to the report but you can select which images you want to include.

3 Click **Images.**

4 Select the images you want to include in the report.

5 Click **Preview**.

Only your selected images are added to the report. In the preview, you can select **Image Size**.

Adding Patient History

6 Click **Patient**.

7 Use the keyboard to type your notes into the fields, and use the dropdown menus for additional information.

NOTE: *You only get individual pages under **Patient** if you have made calculations in these areas. For example, you will not see the page **Kidney Patient History** if you have made no calculations of the kidneys,*

Editing a Report

You can edit a report before you save it.

To delete or edit a measurement from a report:

1 On the **Measurements** tab, scroll down until you reach the measurements taken.

2   Click the measurement you want to edit.

3   Use the keyboard to edit or delete the measurement.

The measurement is updated. In this way, you can edit all information in the report on the individual tabs until you end the exam.

Preview the Report

To preview a report:

1   In the **Report** window, click **Preview**. The first page is displayed on the monitor.

2   Use the arrows below the report to see additional pages.

Click **Close** when you are done.

Printing the Report

To print a report:

•   Press the **Print** key.

or

•   Click **Preview,** and then click **Print**.

The current page of the report is printed. If the report has more than one page, click **Next Page** or **Previous Page** to view other pages of the report and print them.

NOTE: *Reports can be saved as documents or captured as images but cannot be printed directly from the thumbnails. In either case, open the thumbnail to print from the monitor.*

Saving a Report as Images

To save the report as images:

•   Click **Store Report Image** on the report. The report is stored as DICOM images, and you can see and print them by clicking **Review**.

Printing Documents or Images on the Monitor

You can print documents on a local printer or, if DICOM is installed on your system, send them to be printed on a DICOM printer. You can also set up an office printer on a network.

You cannot use an office printer directly with the USB connector on the system. The only printers you can connect directly to the system are ones listed as approved in the Product Data information. See also the Safety chapter in the *bk3000 & bk5000 User Guide*.

Printing Thumbnail Images

To open a thumbnail image and then print it:

1   Click the thumbnail image in the document browser. The image is displayed on the monitor.

2   Press the **Print** key.

Or if you are printing from the Patient List:

1   Click **Review**.

2   Click **Patient List**.

3   Double-click the exam you want to print images from.

4   Select the image you want to print.

5   Press the **Print** key on the keyboard.

See Appendix E, "Configuring the bk3000 and bk5000" for more details.

Printing Images Displayed on the Monitor

To print an image displayed on the monitor:

•   Press the **Print** key on the keyboard.

Chapter 7
Imaging Modes

Imaging Modes

The bk3000 and bk5000 have various imaging modes.

- 2D (B-mode) gives real-time 2D information about the anatomical structure of soft tissues. Includes tissue harmonic imaging.

- Color mode (CFM, color flow mapping, color Doppler) ultrasound displays color-coded, real-time information about direction and velocity of flow in tissue.

- Power mode (power Doppler) ultrasound displays information about the number of particles moving, rather than their velocity.

- Doppler mode (spectral Doppler mode) imaging displays information about the spectrum of flow velocities as a function of time.

- Continuous Wave Doppler (CW Doppler) imaging is used to detect very high velocities in cardiac/echocardiography.

- M-mode (motion mode) ultrasound is produced by slowly sweeping one line of a 2D image across the monitor. The M-mode image illustrates a time series of images along this line.

- Contrast enhanced imaging involves injecting a contrast agent into the patient. The reflected ultrasound waves from the agent generates signals that are analyzed to create the contrast image.

- Elastography uses manual tissue compression or motion to evaluate tissue stiffness.

NOTE: *You cannot change imaging modes when the image is frozen.*

Adjusting the Thermal Index Limit

Before you use the system, check that the TI settings are appropriate. The current TI tissue type and limit are displayed in the top left corner of the monitor.

The absolute TI limit for each tissue type is set by the factory to conform to FDA guidelines and international standards (AIUM/NEMA and IEC) (see the acoustic output section in the *bk3000 & bk5000 User Guide*), but you may want to set a lower TI limit for some purposes. There are 2 types of settings you can vary:

- Tissue type (TIS – soft tissue, TIC – cranial, TIB – bone)
- TI limit (not exceeding the factory-set limits)

To select tissue type:

- Click **TI** type select **TIS**, **TIC**, or **TIB**.

  or

- Press the **+/-** key to toggle through the settings.
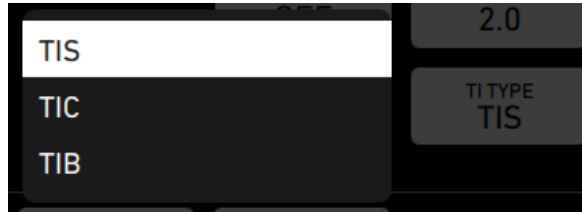
Figure 7-1. TI Type button.

To adjust the TI limit:

• Click **TI limit** and use the trackball to slide the TI scale button to adjust the limit.

2D (B-Mode)

Focus

The ultrasound image is focused sharply within a selected zone. The bk3000 and bk5000 can use either a single focal zone or multiple (up to 3) focal zones (multiple focusing).

When more than one focal zone is active, ultrasound beams are focused at different depths in the tissue. This improves the focus in several zones. However, using more focal zones gives a lower frame rate. Thus using multiple focal zones when there is much tissue movement causes the image to be blurred.

The **Focus** indicator to the left of the image shows the extent (range) of the focal region as well as the point of best focus.
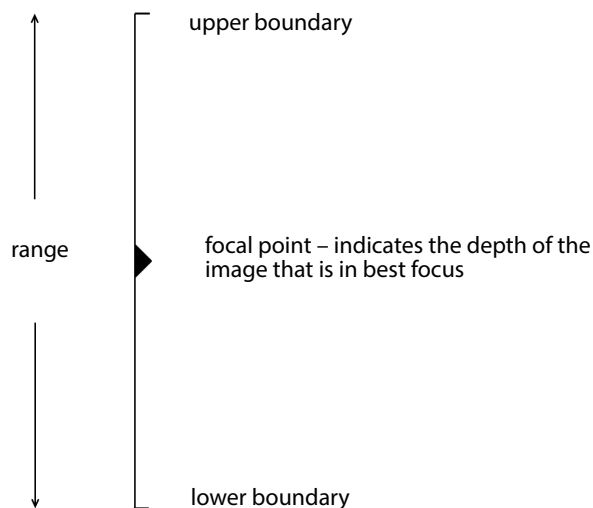
Figure 7-2. The Focus indicator.

The focal point triangle indicates the depth of the image that is in best focus – the focal point. If there is more than one focal point, the range automatically expands to display the improved range of focusing. The actual number of focus zones is not shown.

You can adjust the position and range of the area in best focus.

To adjust focus position:

To move the focus up or down on the image, select the focus indicator and drag it vertically to the desired position on the image.

1   Select the **Focus** indicator by clicking on it or pressing the **Focus** key.

2   Drag the **Focus** indicator to the desired position.

3   Click.

Tru-Focus

Selected transducers are equipped with Tru-Focus[1]. This focus enhancement gives you full focus in the entire depth of the image. With Tru-Focus, it is not possible to further adjust the focus position.

Gain

You can control the overall gain of an imaging mode by turning the **B-mode** key.

TGC

The TGC (Time Gain Compensation) curve determines variable amplification applied to echoes from different depths in the tissue. The TGC function compensates for attenuation and scattering of the ultrasound beam in the tissue.

When you select a transducer, if all TGC sliders are in the center position, imaging starts using a default TGC curve optimized for the transducer. (The default is either the one set at the factory or one you have set up yourself.)

The **TGC** sliders adjust the relative gain of the image at different tissue depths. Each slider adjusts a specific part (1/8th) of the TGC curve; the topmost control adjusts the top 1/8th of the image.

NOTE: *The sliders operate relative to their center position; when they are all centered, the default TGC is used.*
However, resetting the gain to the default setting may change the relationship between the TGC sliders and the TGC curve.

To adjust the TGC curve:

• Move the **TGC** sliders to the right or left to adjust the TGC curve.

   The shape of the TGC curve is temporarily displayed to the right of the image as a curved vertical line. This indicates the modification that is applied to the default TGC curve.

NOTE: *The TGC curve operates on the monitor image, not on the ultrasound echo. Therefore, if you move or resize the image, you may have to readjust the TGC curve.*

NOTE: *With 360° transducers, the top slider adjusts the part of the image that is most central – that is, closest to the transducer.*

1. bk5000 only.

Auto Gain

You can also choose to use Auto gain. With Auto gain, a selected preset defines the brightness for this particular type of scan (also depending on the transducer). Auto gain makes it possible to have the same brightness across different patients and body parts.

To activate/de-activate Auto gain:

• Click the **AutoGain** screen key in the image workspace and use **+/-** to toggle between on and off.
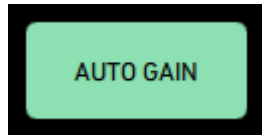
Figure 7-3. The Auto Gain parameter button.

To adjust the brightness/strength of Auto gain, click **A-Gain Level** and use the trackball or use **+/-** on the keyboard to increase or decrease the strength.

Zoom

To zoom in or out on the area you are interested in, adjust the Zoom box and then make the part of the image that is inside the box fill the monitor.

NOTE: *To zoom in on a small part of the image, make the box smaller.*

To use the Zoom box (zoom on different parts of the image):

• Press the **Zoom** key to create a zoom box.
• To move the zoom box, select it by clicking anywhere inside the box and dragging it.
• To resize the box (zoom in or out), turn the Zoom key or press **+/-** when the box is selected.

  You can also resize the box by clicking one of the corners and then dragging the corner or using the **+/-** key.

• Select the zoom box and press the **Zoom** key again to zoom in on the image.

To return to the original image:

• Press the Zoom key.

NOTE: *You can also zoom a frozen image.*

Pressing the Zoom key	Does this	You can
First press	Turns on the Zoom box and selects it. You can move (drag) it or resize it.	Turn Zoom key to change the size of the Zoom box. Use trackball to move it (drag) or resize it (**+/-** key).
Second press	Makes the contents of the (selected) Zoom box fill the entire monitor.	Press Zoom to return to the previous image.
Third press	Returns image to the state it was in before the first press.	

Table 7-1. Overview of the Zoom key.

Depth

With a full 2D image, you adjust the depth to cut out parts below the part you are interested in. The image always includes the transducer surface, so this key changes the magnification of the image, stretching, or compressing it.

Adjusting the depth of a zoomed image changes the magnification even though the transducer surface is not necessarily visible at the top of the image.

To adjust the depth:

- Turn the Zoom key when the Zoom function is turned off.

Grayscale Map

Several gray scales can be used to display a 2D image or an M-mode image. Different gray scales may make various aspects of the image clearer.

To adjust gray scale in 2D mode:

1   Click and slide the **Map** scale button.
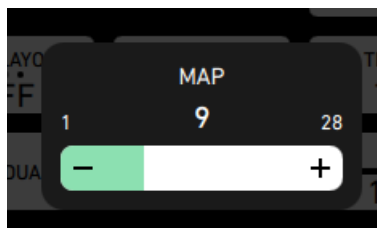
Figure 7-4. Map scale button.

To select the gray scale in M-mode:

- Click the gray scale bar to the right of the M-mode image and select the gray scale you want or click the color bar and press **+/-**.

NOTE: *When you image in Color or Power mode, you cannot use the color bar to change the 2D gray scale because it is used to control the color mapping.*

Combination Modes

2D (B-mode) can be used in combination with other modes. (The terms *duplex* and *triplex* imaging refer to combinations of 2 or 3 modes.)

The available combinations are:

- 2D+Color
- 2D+Color+Doppler
- 2D+Doppler
- 2D+Power+Doppler
- 2D+Power
- 2D+3D
- 2D+M
- 2D+CW
- 2D+Elasto
- 3D+Color

To return to imaging with 2D alone after you have been using it in combination with other modes, *press* the **B-Mode** key.

To add another imaging mode:

- Press the **Color Mode**, **Power Mode**, or **Doppler Mode** key, or click the tab for the imaging mode. (To add M-mode, you must click the **M** tab on the monitor).

To remove an imaging mode from the combination:

- Press the key for the mode you want to remove. You can also click the imaging mode tab when it is on top (This is the only way to turn off M-mode).

To return from a combined mode to 2D only:

- Press the **B-Mode** key.

NOTE: *Pressing the **B-Mode** key several times lets you toggle back and forth between 2D and any combined mode.*

Tissue Harmonic Imaging (True Echo Harmonics – TEH)

Tissue harmonic imaging can reduce noise and improve the clarity of the ultrasound image.

In normal 2D imaging, the transducer uses essentially the same frequency range for both transmitting and receiving. In harmonic imaging, the image is created by receiving higher frequencies (harmonics) that are multiples of the transmitted frequency (f). Tissue harmonic imaging in the bk3000 and bk5000 is based on the 2nd harmonic (2f) spectrum and pulse inversion.

Using TEH

TEH can be used only with transducers that support harmonic imaging.

Each preset that permits TEH has default settings for overall gain, TGC gain, contour level, and contrast level for tissue harmonic imaging.

Restrictions

- TEH is available only for certain transducers.

Advantages

- Better images with difficult-to-image patients.
- Increased contrast resolution.
- Reduced effect of grating lobes.

To turn TEH on or off:

Make sure that you are imaging in 2D (imaging is not frozen).

- Click the **Harmonics** button to toggle between on and off.

When you turn harmonic imaging off, 2D imaging resumes with the frequency, gain, dynamic range etc. that you were using previously.

Displayed Frequencies for Tissue Harmonic Imaging

When TEH is turned on, the letter **H** appears next to the displayed frequency, which is the receiving frequency – double the transmitted frequency.

Contrast Imaging

In contrast imaging, a contrast agent consisting of microbubbles is injected into the patient. When the ultrasound waves are reflected from the contrast agent, non-linear responses are generated. The non-linear signals are received and analyzed to create the contrast image.

Contrast imaging requires a software license from BK Medical and is available with selected transducers only, see the bk3000 or bk5000 Product Data Sheet.

Contrast Agents

Contrast imaging is optimized for SonoVue® and DEFINITY® contrast agents. You must follow the manufacturer's guidelines for using contrast agents and pay attention to any warnings, recommended precautions and contraindications.

Restrictions

Contrast imaging can be used only with:

- 2D imaging. If another imaging mode is active, contrast imaging is disabled.
- Contrast imaging is available only for certain transducers.

Simultaneous Split-Screen Imaging and Contrast Imaging

It can be an advantage to use simultaneous split-screen imaging (see "Simultaneous Imaging" on page 40) with contrast so that you can see a contrast image that contains no tissue information along with a 2D image.
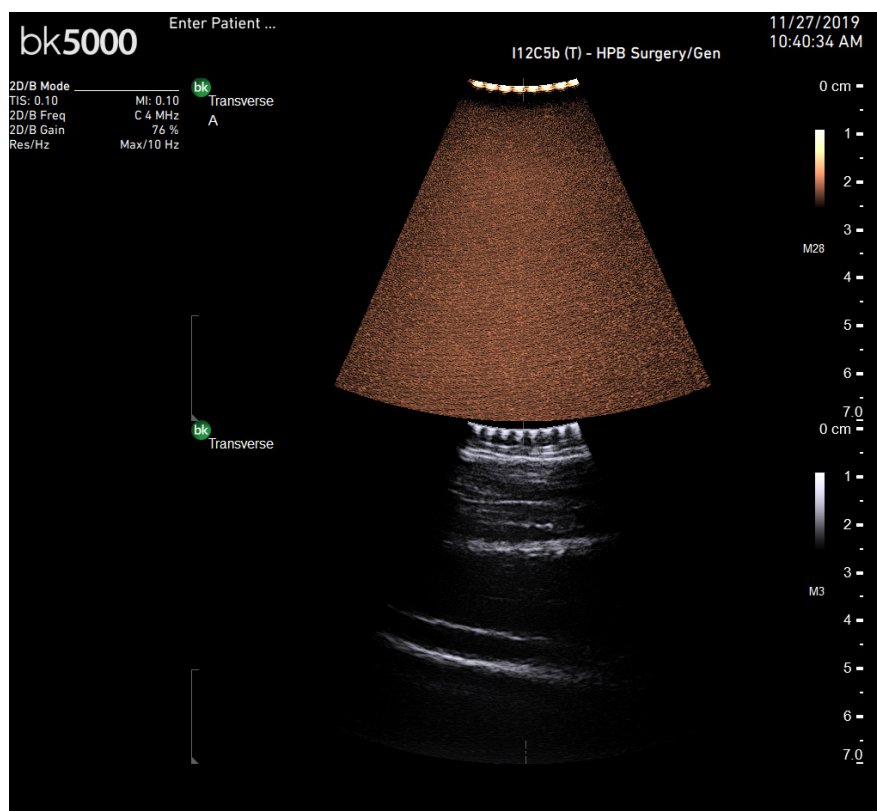
Figure 7-5. Contrast imaging with split screen.

To turn contrast imaging on:

•   Click on the **Contrast** tab in the workspace.

It is also possible to configure a key to enable and disable contrast imaging. See "Setting Up and Customizing Your System" on page 257.

When contrast imaging is turned on, the letter **C** appears next to the frequency at the top of the monitor. Contrast imaging appears in simultaneous split mode, with contrast imaging in screen A and 2D in screen B.

To turn contrast imaging off:

Make sure that you are imaging.

•   Click on the **Contrast** tab.

NOTE: *When you turn contrast imaging off, the MI returns to its previous value.*

To use contrast imaging:

1 Make sure that you have a license for contrast imaging. See "License Tab" on page 286.

2 Click on the **Contrast** tab.

The contrast frequency is displayed at the top of the monitor, preceded by **C**.

3 Inject the contrast agent and start the timer. (See "Timer" below.)

4 Check the MI setting. When you turn on contrast imaging, the MI limit is reduced to avoid bursting the bubbles in the contrast agent. You can turn the **Doppler Mode** button to make small changes to the setting in order to make it suitable for the type of tissue and depth of the region of interest. (See "Adjusting MI" on page 91.)

5 Press **Capture** to save clips or images to the patient archiving system so you can review them later.

6 If you want to inject more contrast agent, you can burst the remaining bubbles first. (See "Bubble Burst" on page 78.)

Timer

You can start the timer to keep track of the elapsed time after you inject a contrast agent. The time will be displayed on a saved or printed image.

To start the timer:

• Click **Contrast Timer** in the workspace.

The timer starts running and is visible in the image area of the monitor. This time is saved when you save or print the image. You can move the time to a new location on the image by clicking and dragging it.

To stop the timer:

• Click **Contrast Timer**.

The time value in the image area disappears.

Bubble Burst

When you use the **Bubble Burst** function, a stronger ultrasound pulse is emitted to burst the remaining bubbles so that you can inject additional contrast agent to repeat the examination.

To use Bubble Burst:

•   Click **Bubble Burst** at the bottom of the monitor or press a user-defined key.

Needle Enhancement

Needle Enhancement uses an adjustment of compounding plus improved focusing to help the user see the needle during interventional procedures. A needle icon indicates where you will get the best visibility.

Before you perform any puncture procedure, including therapy, make sure you have read the warnings in the Puncture and Brachytherapy section of the Safety chapter in the bk3000 & bk5000 User Guide.
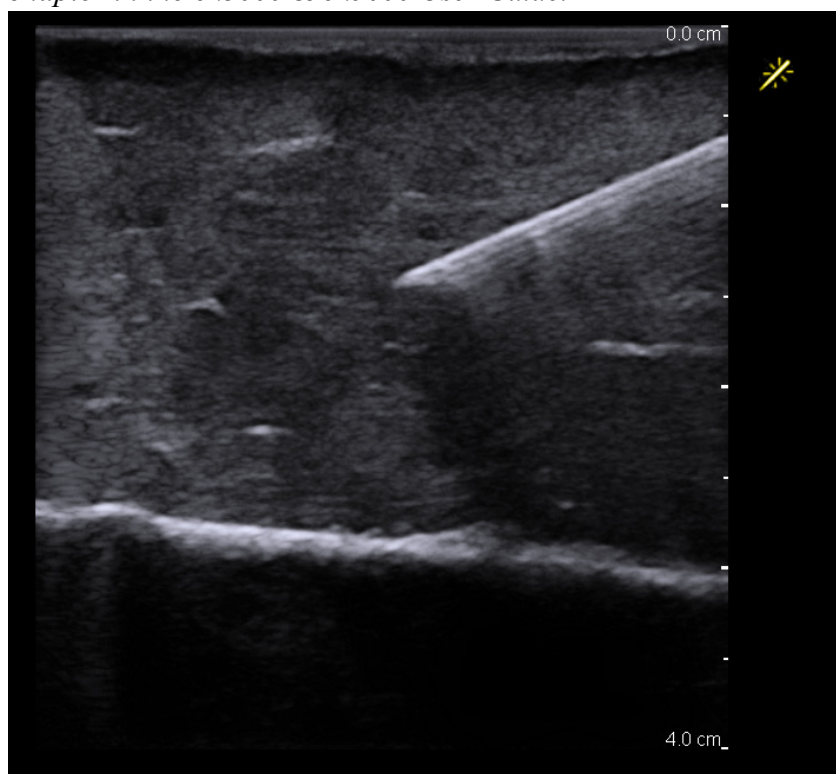
Figure 7-6. Image showing the Needle Enhancement icon and inserted needle

In 2D, you can access Needle Enhancement on the keyboard (using the **Steer** button) or by clicking the **Needle Enhance** button.

A dropdown displays the 3 options:

•   **Left**
•   **Off**
•   **Right**

Left and **Right** switch sides on the image and **Off** returns you to default 2D image quality.

Activate Needle Enhancement

Do as follows:

1 Ensure that **2D** is active.

2 Click **Needle Enhance** to select from which side you enter the needle.
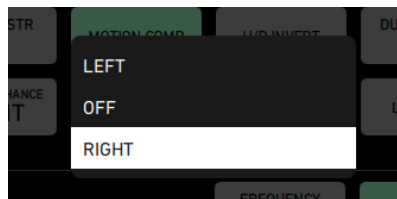
Figure 7-7. Needle Enhance dropdown menu

NOTE: *Make sure that you adjust the icon*   *to match your needle insertion side.*

3 If needed, for example in steep needle angles, you can adjust the balance between the needle strength echo and image quality. For this, click and slide the **Needle Str.** toggle. Increase the number to increase the needle shaft visibility. Decrease the number to improve image quality over needle visualization.

Figure 7-8. Needle strength slider

Note that the **Needle Str.** screen key will only be active when Needle Enhancement is on.

Color Mode and Power Mode

Color mode (CFM) ultrasound displays color-coded real-time information about direction and velocity of flow in the tissues.

Power mode displays color-coded information about the amount of flow but not the direction.

Color Submodes

On the **Color** tab, you can select the submode you want. The view must be imaging when you do this.

Three submodes are available in Color mode imaging:

- **Velocity** (standard color mode)
- **VFI** (See "Vector Flow Imaging (VFI)" on page 105)
- **Tru-Color**. Tru-Color is an alternative to normal color mode without the persist function. It has less averaging and is therefore able to maintain a significantly higher temporal resolution. In this way, you can more easily visualize the hemodynamics, including differences between systole and diastole.

Color Coding of Flow

In a Color mode image, the frequencies of the reflected ultrasound waves are measured to show the velocity and direction of the blood flow. The result is displayed in color on the monitor.

Flow Direction	Default Color
Toward the transducer	Red
Away from the transducer	Blue

Table 7-2. Default color coding in Color mode.

It is possible to invert this color-coding or select a different one.

Independent D-Mode/C-Mode Steering

Independent steering of PW Doppler and CFM is possible using the **Sync Steer** screen key. To enable independent steering, click the **Sync Steer** button to deselect the setting under the **PW** tab.

NOTE: *This feature is only available for certain transducers and exam types.*

Color Box

When Color mode or Power mode imaging is turned on, a color box is superimposed on the 2D image. The color box outlines the area of the tissue in which flow information is available.

You can adjust the size and position of the color box to examine flow in various parts of the 2D image. The view must be imaging when you do this.

To move the color box:

- Click inside the box and drag the box.

To resize the color box:
1 Select the box by clicking inside it.
2 Press **+/-**.

Color Scales

Various color scales can be used to display a Color mode or Power mode image or a Doppler spectrum.

To select the color scale:

- Click the color bar to the right of the image and select the color scale you want.

NOTE: *When you image in Color or Power mode, you cannot use the color bar to change the 2D gray scale because it is used to control the color mapping.*

Elastography

Elastography is a medical imaging mode using manual tissue compression or motion from e.g. patient cardiac movement or respiration, in order to evaluate tissue stiffness. Elastography requires a software license from BK Medical and is available with selected transducers only, see the bk3000 or bk5000 Product Data Sheet.

Before using elastography, you should be adequately trained in ultrasonography.

To activate elastography mode:

- On the **Image** tab, click **Elasto.**
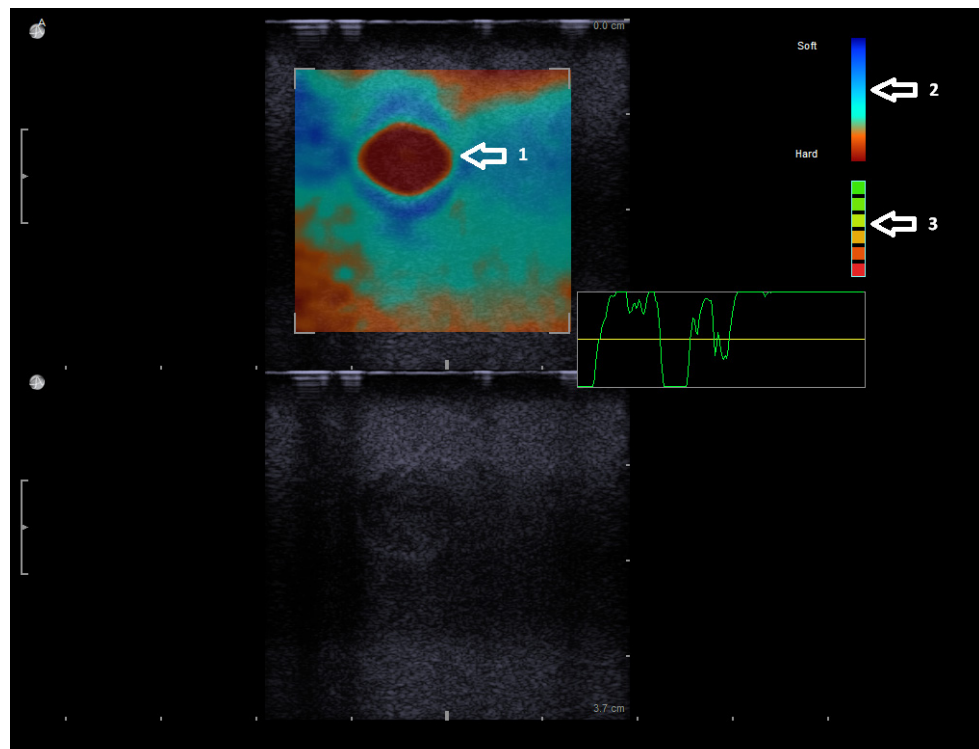
Figure 7-9. Elastography imaging (default horizontal view).

1   Region of interest (ROI)

2   Color Map

3   Quality Indicator

Color Box

When elastography mode imaging is turned on, a color box is superimposed on the 2D image. The color box outlines the area of the tissue in which information is available.

You can adjust the size and position of the color box to examine various parts of the 2D image. The view must be imaging when you do this.

To move the color box:

- Click inside the box and drag the box.

To resize the color box:

1 Select the box by clicking inside it or pressing the **Color Box** key.

2 Press **+/-**.

or

- Click a corner of the box and drag the corner.

Color Map

The color map represents the variants in levels of relative hardness/softness. The default setting depends on the Exam Type/preset. If you click on the color map, you can choose from a set of different color codes.

Quality Indicator

The quality indicator displays the amount of pressure being placed on the transducer. If the green indicator is at the top, transducer compression is at the optimum level, but even if the indicator only shows one square, the image can be useful. A good image is one that can be reproduced.

Strain Ratio Measurement

Strain ratio measurements can be used to quantify the relative stiffness between the region of interest (ROI) and the surrounding tissue. To perform a strain ratio measurement:

3 Click the **Elasto** tab, click **Measurements** and then **Strain Ratio.**

4 Click inside the ROI and then move the trackball to create a measurement circle. When the circle is the required diameter, click again to set the measurement circle on the screen.

5 Repeat the measurement process outside the ROI.

The strain ratio appears in the measurement data to the left of the image.
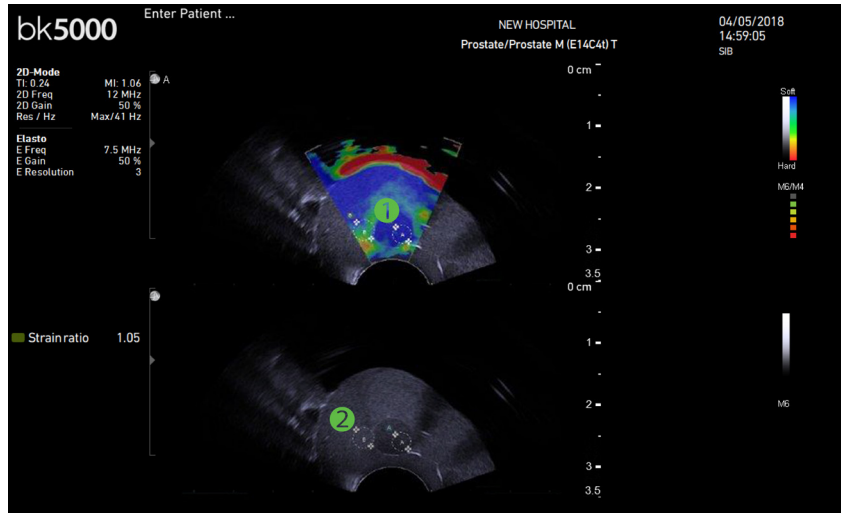
1. A measurement circle inside the ROI (elastography screen)

2. A measurement circle outside the ROI (B-mode screen).

Figure 7-10. A strain ratio measurement.

Diameter Comparison Measurement

The elastography diameter of an ROI can be compared to the 2D diameter.

1 Click **Measurements** and then click **E/B Diameter.**

2 Click on the edge of the ROI in the elastography screen and move the trackball to the opposite side of the ROI. Click again to place an E-diameter line.

3 Repeat the measurement process in the 2D screen to place a B-diameter line.

The E/B ratio appears in the measurement data to the left of the image.
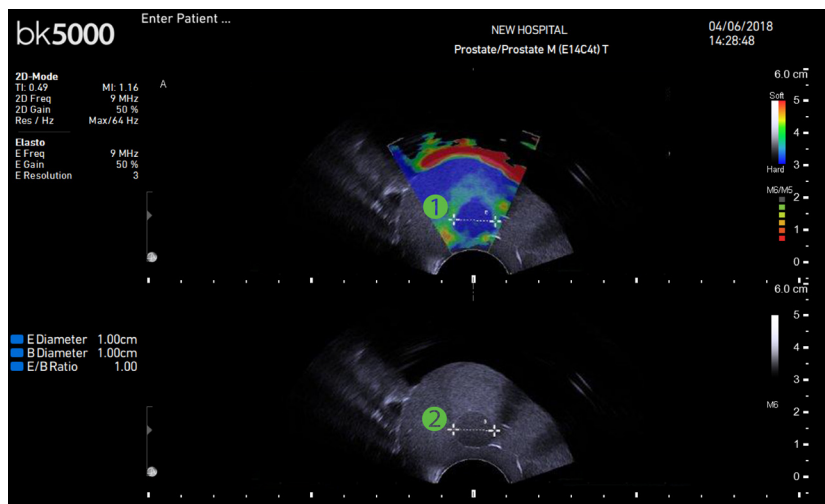
1. A diameter line inside the ROI (elastography screen).

2. A diameter line inside the ROI (B-mode screen).

Figure 7-11. A diameter comparison measurement.

Doppler Mode – Spectral Doppler

Doppler mode (spectral Doppler mode) imaging displays information about the spectrum of flow velocities as a function of time. It is sometimes called FFT (Fast Fourier Transform) because the information is presented as a frequency spectrum indicating velocity components.

Turning Doppler Mode On or Off

When you turn Doppler mode on, 2D must be imaging.

To turn on Doppler mode:

- Press the **Doppler Mode** key.

  The Doppler indicator, including both the Doppler line and the Doppler gate, appears superimposed on the 2D image and the Doppler spectrum appears.

To position the Doppler gate on a 2D image, use the trackball and select keys.
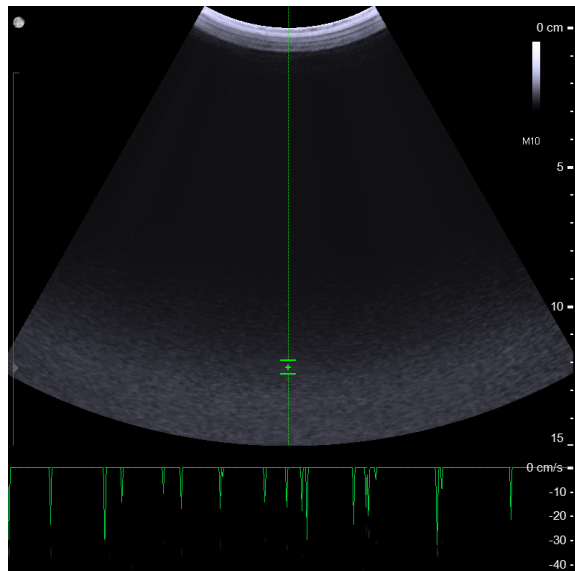
Figure 7-12. The Doppler indicator (line and gate) superimposed on a 2D image.

Fig 7-13 shows information available in Doppler indicators.
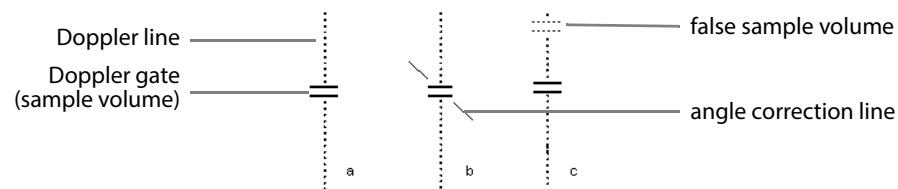
Figure 7-13. Doppler indicators (three examples).

Fig 7-13 (a) The dotted line represents the Doppler line. The horizontal lines show the Doppler gate.

Fig 7-13 (b) A diagonal line (relative to the Doppler line) indicates a sample volume with angle correction.

Fig 7-13 (c) The horizontal dotted lines show the false sample volume in HPRF (see page 86).

To turn off Doppler mode:

• Press the **Doppler Mode** key or the **B-Mode** key.

Adjusting the Doppler Mode Image

Doppler Indicator

When Doppler mode imaging is turned on, the Doppler indicator is superimposed on the 2D image.

You can adjust the position and size of the Doppler gate to get information from sample volumes in various parts of the 2D image. The image must not be frozen when you do this.

To move the Doppler gate:

• Drag the gate with the trackball.

   The sample volume line moves along with the gate.

• Click to set the Doppler gate.

To resize the Doppler gate:

• Click the Doppler indicator and then press **+/-**.

Independent D-Mode/C-Mode Steering

Independent steering of PW Doppler and CFM is possible using the **Sync Steer** screen key. To enable independent steering, click **Sync Steer** in the workspace and switch the setting to **Off**.

NOTE: *This feature is only available for certain transducers and exam types.*

Audio Volume

The Doppler signal can be played as an audio signal as well as appearing on the monitor.

To adjust the volume of the audio signal:

• Click and slide the **Volume** toggle. Press the **Invert** key if you cannot see this button on the PW tab.

Adjusting the Doppler Mode Image

Doppler Trace (Automatic Curve Tracing)

The system can automatically calculate and display a curve that traces the mean or peak values of the Doppler spectrum. See "Doppler Measurements" on page 97 for a description of the curves. You can also choose to have both the peak and mean curves displayed.

To change which curve is displayed or to turn off the display:

• Click **Trace** on the **Doppler** tab and select **Off**, **Peak**, **Mean+Peak**, or **Mean**.

NOTE: *Selecting* **Mean** *will display the mean curve but will not display results or values.*

To measure higher flow speeds (high range setting) in a sample volume placed deep in the tissue, HPRF (high PRF) is automatically used. When HPRF is active, the Doppler line shows the actual sample volume, and false sample volumes (shown dotted). See Fig 7-13 on page 84.

The false sample volumes should always be placed outside a vessel.

Auto

The system can automatically adjust the Baseline and Scale to prevent aliasing and optimize the display of the Doppler spectrum.

To optimize the baseline and scale for the current Doppler spectrum:

• Press the **Auto** button on the keyboard.

Gain

You can adjust the gain of the Doppler mode image. The view must be imaging when you do this.

To adjust Doppler mode gain:

• When spectrum is active, turn the Doppler key.

The current Doppler gain setting (a percentage) is displayed on the monitor at the top left next to **PW Gain**.

Scale

You can vary the scale of the displayed spectrum.

To adjust the velocity scale:

• Click **Scale** at the bottom of the monitor and drag the slider.

The vertical scale is updated to correspond to the new range of velocities.

The current setting is displayed on the monitor next to **PW PRF**.

NOTE: *The wall filter value will be changed automatically when you change the scale.*

Smooth

You can change how smooth the displayed spectrum looks.

To change the smoothness of the spectrum display:

- Click **Smoothing** under the **PW** tab and select the degree of smoothness you want (or click **Smoothing** and press **+/-**).

Wall Filter

In Doppler mode, you can set the cutoff frequency for the wall filter.

To set the cutoff frequency for the wall filter:

- Click **Wall Filter** under the **PW** tab and select the value you want (or Click **Wall Filter** and press **+/-**).

Invert

You can invert the spectrum on the monitor.

To invert the spectrum or to return to the default:

- Press the **Invert** key to toggle between the default and inverted spectrum coding.

  The frequency axis is inverted to match the spectrum.

Baseline

You can reposition the baseline. The baseline separates forward flow from reversed flow, and moving the axis can help overcome aliasing problems.

To adjust the baseline:

- Click on the **Baseline** button and slide to the desired value.

The frequency axis is updated to match the spectrum.

Sweep Speed

You can adjust the sweep speed to change the number of cycles of the spectrum displayed on the full time axis. The available values range from 2 (slowest) to 8 (fastest).

To select the sweep speed:

- Click and slide **Sweep Speed** and select the required value.

  The time axis is updated.

M-Mode

There is no M-mode key on the keyboard.

To turn M-mode on or off:

- Click the **M** tab in the workspace.

NOTE: *M-mode is only available for certain Exam Types. The M-mode tab is visible only when M-mode is available.*

M-mode (motion mode) ultrasound is produced by slowly sweeping one line of a 2D image across the monitor. The M-mode image illustrates a time series of images along this line.

M-mode can only be used in combination with 2D. Selecting any other mode will turn off M-mode.

You can return to imaging with 2D alone by pressing the **B-Mode** key.

M-mode uses the same imaging frequency and focus settings as 2D.

NOTE: *Only a single focal zone is possible in M-mode.*

Zooming and panning do not work directly in the M-mode image. When you make changes in the 2D image, they are applied to the M-mode image.

The M-Mode Image

When M-mode is selected, the monitor is divided into two windows (see Fig 7-14). You can adjust how the two windows are displayed. The window with the vertical M-mode line shows the 2D image.
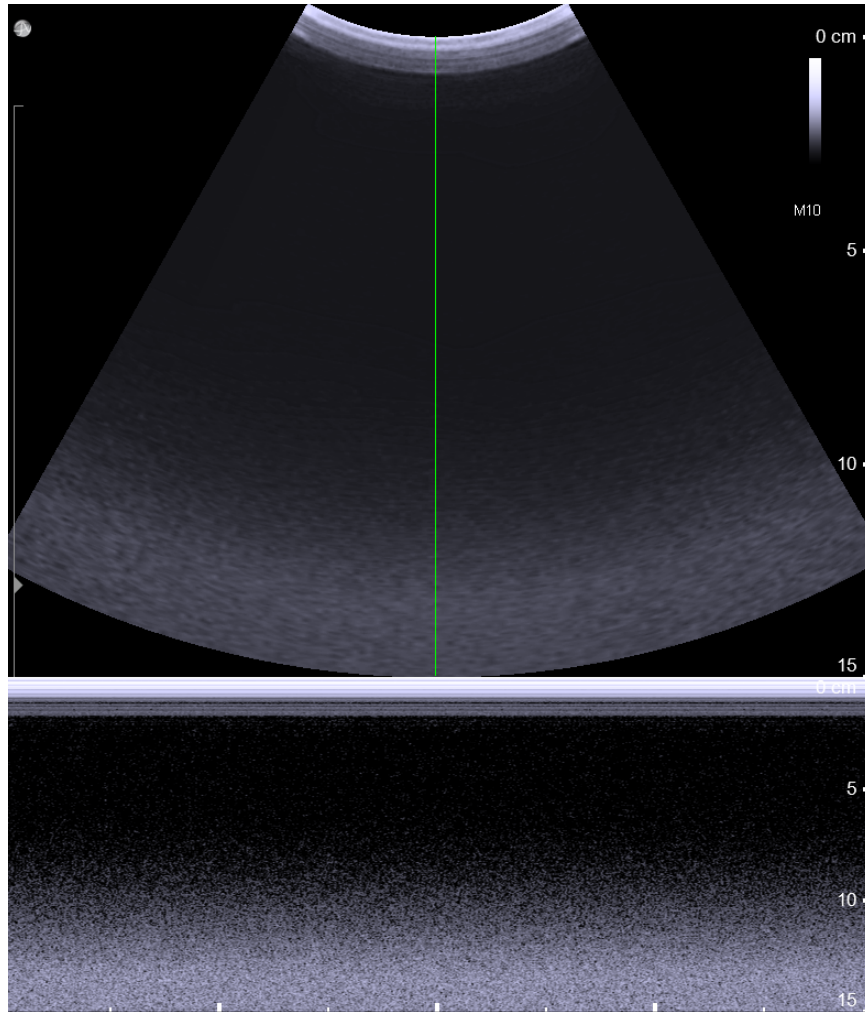
Figure 7-14. M-mode image.

M-Mode Line

The M-mode line (see Fig 7-14) shows the path of the M-mode image in the 2D window. You can adjust the path of the image by moving the M-mode line (click it and drag).

M-Mode Image Ruler

The M-mode image ruler scales the ruler range of the 2D image to the M-mode image. Any given value will represent the same position on both the M-mode and 2D images.

It is not possible to change the ruler.

Saving a Preset

When you have changed the setup, you can save it as a new preset.

To save a preset:

1   Click the **Review** tab and then click either Review or Report.

2   Click on the **Preset** tab and click on Save Preset.

The **Save Preset** window appears.
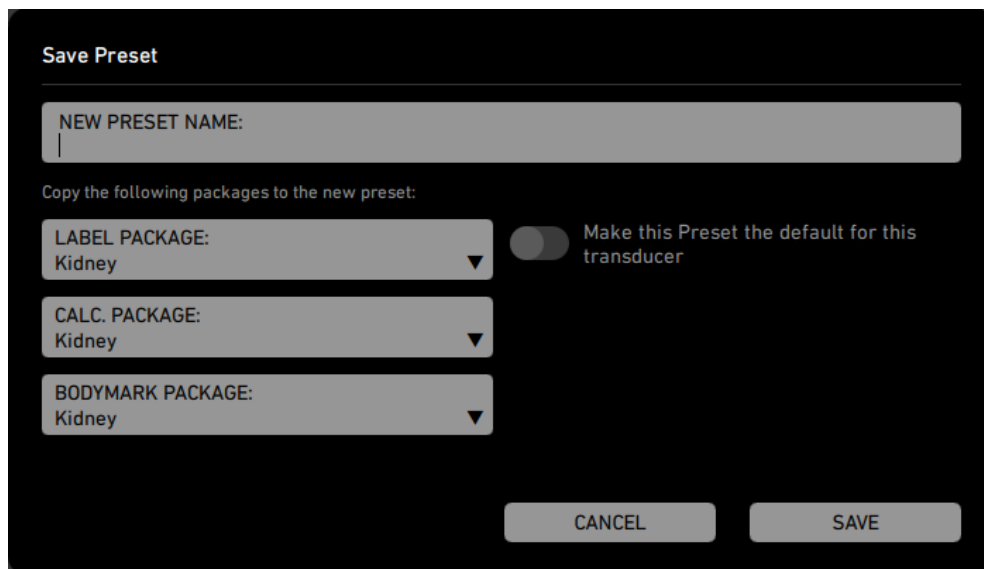
Figure 7-15. The Save Preset window.

3   Enter a name for the preset and select the options you want from the drop-down menus.

4   Click **Save**.

Default Exam Types and Presets

You can change the default Exam Type and preset for a transducer. When creating a new preset as in "Saving a Preset" above, click on the toggle button **Make this Preset the default for this transducer.**

Chapter 8
Continuous Wave Doppler Mode

Overview

In Continuous Wave (CW) Doppler mode, ultrasound is transmitted along a line as a continuous wave and analyzed as it returns. CW Doppler provides greater velocity ranges when measuring high flow regions such as flow through the cardiac valves, especially with stenosis.

Adjusting the Thermal Index Limit

Before you use CW Doppler mode, check that the TI settings are appropriate. The current TI tissue type and limit are displayed just under the BK Medical logo in the upper left corner of the monitor.

Adjusting MI

You can adjust the maximum allowed MI (mechanical index).

To adjust the MI Limit:

• Click **MI Limit** in the workspace and drag the slider.

CW Doppler is a low voltage mode, so the MI will always be low.

Turning CW Doppler Mode On or Off

You must turn CW Doppler on and position the CW Doppler line before you turn on the CW spectrum.

To turn on CW Doppler mode:

Make sure that the **Preset** is **Cardiac**, that you are imaging in 2D, and that the image is not frozen.

• Click the **CW** tab.

   The CW Doppler line appears superimposed on the 2D image.

   Drag the line to the position you want.

To unfreeze the CW Doppler spectrum:

• Press the **Update** key on the keyboard.

NOTE: *The 2D image is frozen while the live CW Doppler spectrum is displayed.*

To switch between live 2D and live CW Doppler mode:

• Press the **Update** key on the keyboard.

To turn off CW Doppler mode:

- Click the **CW** tab twice.

CW Doppler Line

CW Doppler information is acquired along the full length of the CW Doppler line.

region of best focus
(focus region indicator)
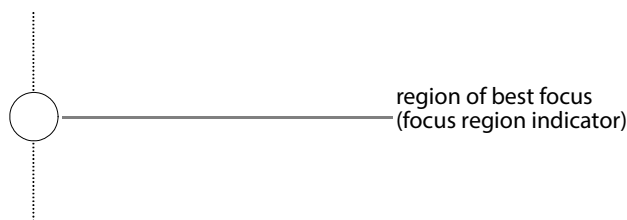
Figure 8-1. CW Doppler line.

The dotted line is the CW Doppler line. The circle indicates the region where the CW Doppler signal is best focused.

When CW Doppler mode imaging is turned on, the CW Doppler line is superimposed on the 2D image.

You can adjust the position of the line to get information from samples in various parts of the 2D image. Place the focus region indicator on the region of interest. The system must be imaging when you do this.

To move the CW Doppler line and focus region indicator:

1   When the CW Doppler line is active, drag with trackball to the desired position. Moving the trackball to the left or right moves the line, and moving the trackball up and down moves the focus region along the line.

Audio Volume

The CW Doppler signal can be played as an audio signal as well as appearing on the monitor.

To adjust the volume of the audio signal:

- Click and slide the **Volume** toggle. Press the **Update** key if you cannot see this button on the CW tab.

Adjusting the Doppler Mode Image

Doppler Trace (Automatic Curve Tracing)

You can have the system automatically calculate and display a curve that traces the mean or peak values of the Doppler spectrum. You can also choose to have both the peak and mean curves displayed.

To change which curve is displayed or to turn off the display:

1   Click **Trace** on the **CW** tab and select **Off**, **Peak**, **Mean+Peak,** or **Mean** on the dropdown.

NOTE: *A CW Doppler signal is much weaker than a PW Doppler signal. Therefore, automatic curve tracing does not always give good results, and measurements based on the curve will not be accurate. If the automatic curve is not a good fit to the signal, you must manually draw the curve to be used for measurements.*

Auto

The system can automatically adjust the Baseline and Scale to prevent aliasing and optimize the display of the Doppler spectrum.

To optimize the baseline and scale for the current Doppler spectrum:

- Press the **Auto** button on the keyboard.

    If this does not work, and the **Auto** button only makes a beep, then press the **Update** key first. Different controls will appear in the workspace and the **Auto** keywill now work.

Gain

You can adjust the gain of the CW Doppler mode image. The view must be imaging when you do this.

To adjust CW Doppler mode gain:

- When spectrum is active, turn the Doppler key.

    The current Doppler gain setting (a percentage) is displayed on the monitor at the top left next to **CW Gain**.

Scale

You can vary the scale of the displayed spectrum.

To adjust the velocity scale:

- Click **Scale** at the bottom of the workspace and drag the slider.

    The vertical scale is updated to correspond to the new range of velocities.

    The current setting is displayed on the monitor next to **CW Scale**.

NOTE: *The wall filter value will be changed automatically when you change the scale.*

Smooth

You can change how smooth the displayed spectrum looks.

To change the smoothness of the spectrum display:

- Click **Smoothing** under the **CW** tab and select the degree of smoothness you want (or click **Smoothing** and press **+/-**).

Wall Filter

In CW Doppler mode, you can set the cutoff frequency for the wall filter.

To set the cutoff frequency for the wall filter:

- Click **Wall Filter** under the **CW** tab and select the value you want (or Click **Wall Filter** and press **+/-**).

Invert

You can invert the spectrum on the monitor.

To invert the spectrum or to return to the default:

- Press the **Invert** key to toggle between the default and inverted spectrum coding.

  The frequency axis is inverted to match the spectrum.

Baseline

You can reposition the baseline. The baseline separates forward flow from reversed flow, and moving the axis can help overcome aliasing problems.

To adjust the baseline:

- Click on the **Baseline** button and slide to the desired value.

  The frequency axis is updated to match the spectrum.

Sweep Speed

You can adjust the sweep speed to change the number of cycles of the spectrum displayed on the full time axis.

To select the sweep speed:

- Click on the **Sweep Speed** button and slide to the desired value.

  The time axis is updated.

Chapter 9
Exam Types

Before You Begin

The information in this user guide may not correspond to the Exam Types on your system as Exam Types can be customized.

Before reading about the Exam Types, you should already be familiar with:

- Working with images on the system (Chapter 4, "Working with the Image").
- Making measurements with the system (Chapter 5, "Making Measurements").
- Documenting the image and its results (Chapter 6, "Documentation").

The tables and formulas that the system uses for calculations are in the *Technical Data (BZ2100)*.

If You Perform a Puncture Procedure

Before you perform any puncture procedure, including therapy, make sure you have read the warnings in the Puncture and Brachytherapy section of the Safety chapter in the bk3000 & bk5000 User Guide.

What Is a Exam Type?

An Exam Type is a pre-defined configuration for the layout and user interface of the monitor. There are different Exam Types for different types of examinations.

Your choice of Exam Type determines:

- Patient information fields needed for the examination
- Specialized presets
- Layout of controls on the monitor (including which controls are available)
- Labels and bodymarks
- Reports
- Measuring tools and pre-defined calculations

Presets

A preset is a pre-defined setup that optimizes the image for a particular type of imaging. It includes suitable settings for gain, frequency, etc.

The Examination Type you can select on the system is a combination of an Exam Type and a preset.

The following Exam Types are available on the system:

- Abdomen
- Brachytherapy
- Neuro (bk5000 only)
- OB

- Colorectal
- Gyn
- HPB Surgery (bk5000 only)
- Lap & Robotic (bk5000 only)
- Micro Neuro (bk5000 only)
- MSK & Nerve

- Pediatric
- Pelvic Floor
- Prostate
- Small Parts
- Vascular
-

The information in the first part of this chapter applies to all Exam Types. Any additional information that applies to individual exam types is described in Chapter 10 through Chapter 17.

Measurements
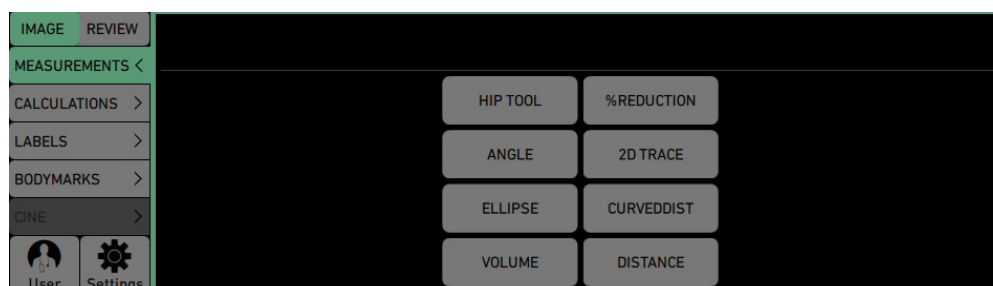
Figure 9-1. Workspace showing Measurements tab open

Each Exam Type contains a set of measurements and calculations that are appropriate for a specific type of examination. Calculations vary according to the specific Exam Type, but the general instructions for making a measurement are the same.

To make a measurement:

1   Click on the **Measurements** tab in the left side of the workspace.
2   Click the name of the measurement.
    A caliper appears on the image.
3   Drag the caliper to the position you want and click.
    If the measurement requires 2 calipers, another one appears.
4   Drag the second caliper to the position you want and click.
5   Repeat this until you have positioned all the calipers for the measurement.

NOTE: *The look of the calipers themselves and of any lines that connect them depend on what you are measuring.*

After you have positioned all the calipers, the result appears at the left side of the monitor:
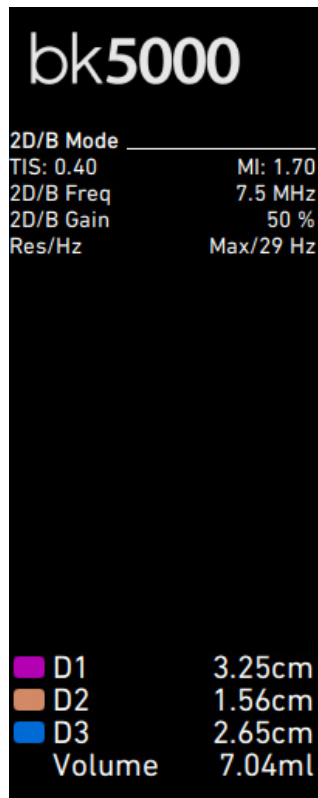
Figure 9-2. Measurements results

Doppler Measurements

Many Exam Types contain Doppler measurements, as most vascular calculations involve making measurements on a Doppler (FFT) spectrum.

You can fit a curve to the spectrum either automatically (see "Doppler Trace (Automatic Curve Tracing)" on page 86) or manually and then make measurements on the curve.

Two curve types are generally used.

This type of curve	Is a trace of...
Peak (Max)	maximum points of the spectrum (those farthest from the baseline).
Mean	mean points of the spectrum.

Table 9-1. Two types of Doppler curves.

Fig 9-3 depicts a Doppler spectrum with two cycles. A cycle starts at the *start systole* (when the heart starts to contract) and ends at the *end diastole* (when the heart is resting and filled with blood). The correct placement of vascular calculation markers is indicated in the figure; their abbreviations are as follows:

SS	Start systole	**MD**	Minimum diastole
PS	Peak systole	**ED**	End diastole
ES	End systole		

Doppler Shift
kHz

Peak (Max)

Mean

time

ES

SS   PS   MD   ED
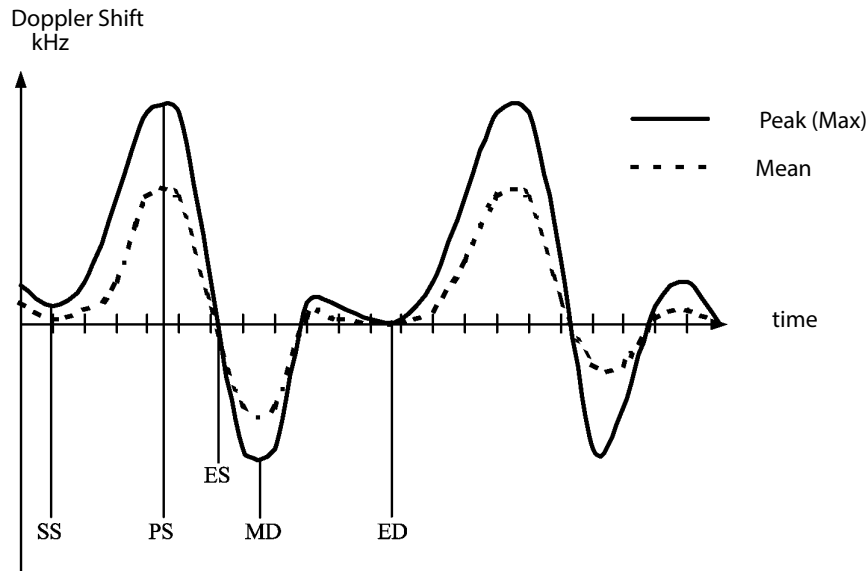
Figure 9-3. Doppler spectrum including vascular calculation markers.

The calculations and the way in which they are presented on the monitor depend on whether the Doppler angle is active or not.

Doppler Angle Active? (Yes/No)	**Velocity or Frequency**
No	Frequency measured at intersection of marker line and Doppler curve.
Yes	Velocity measured, and frequency parameters replaced by corresponding velocity parameters, (dF by dV, FACC by ACC, F1, and F2 by V1 and V2.)

When the Doppler angle is turned off or altered, the results are recalculated.

Reduction

The **%Reduction** measurement uses the area of the vessel before or after the stenosis and the area of the vessel at the stenosis (residual lumen) to calculate the degree (%) of stenosis. You can base the stenosis calculation on the distance across the vessel or the area of the vessel lumen.

To find the reduction measurement, freeze the image, click **Measurements**, and select **%Reduction**. Click on the image to place your measurement points.

Reduction Based on Ellipses

When you use areas to calculate stenosis, make one area measurement to measure each of the following:

- Click **%Reduction** and measure the total lumen of the vessel.
- Click to set the measurement. A new caliper is displayed inside the ellipse or circle.
- Measure the residual lumen of the vessel.
- Click to set the measurement.

The result on the monitor is continuously updated while you position the second ellipse or circle.

VF (Volume Flow)

VF (volume flow) is calculated by multiplying the time average mean velocity (TAM) by a defined cross-section of a vascular structure. The cross-section is measured on a 2D image; the TAM is measured on a Doppler spectrum. These do not have to be measured on the same image.

You can calculate VF based on cross-section measures using a distance (VF Dist), an ellipse (VF Ell), or a circle (VF Circ).

NOTE: *VF can only be measured with the Doppler angle on.*

TAM (Time Average Mean) and TAP (Time Average Peak)

- TAM = average value (over time) of mean frequencies in the Doppler spectrum.
- TAP = average value (over time) of the peak frequencies in the Doppler spectrum.

You can measure TAM and TAP in different ways:

- Automatic – you position markers on the spectrum (using the automatic curve tracing, if that is turned on), and the automatic Doppler curve is used with the markers to calculate TAM or TAP.
- Manual – you draw several cycles of the Doppler curve manually.

TAM and TAP can only be measured with the Doppler angle on.
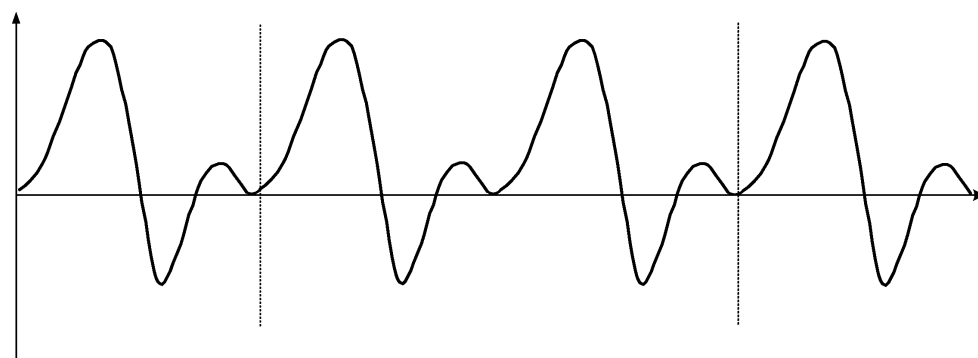
Figure 9-4. Measuring TAM on the Doppler spectrum.

To measure TAM or TAP using the automatic Doppler curve:

1   Click **Auto** and make sure that **TAM** and/or **TAP** is selected in the **Results** tab of the **Measure & Calcs** section under **Settings**.

2   Select **Auto Doppler** in the **Measurements** tab in the workspace.

3   Position 2 line markers to specify the time interval (number of cycles) over which the frequency values are averaged. (See Fig 9-4.)

    The TAM and/or TAP value is displayed.

NOTE: *Turn on the Doppler trace to make sure that the trace appears to be a good fit to the spectrum so that the basis for the automatic calculation is correct.*

You can also draw a Doppler curve manually on the spectrum and use it to measure TAM or TAP.

To measure TAM and TAP manually:

1   Click **Measurements** and select **D Trace Freehand**.

2   Draw a curve that follows the mean frequencies of the spectrum, starting and ending at the same part of the cycle.

    The TAM and or TAP value is displayed to the left of the image.

RI and PI (Resistance Index and Pulsatility Index)

The resistance index (Pourcelot index) is based on the peak systolic velocity (V_{max}) and the end-diastolic minimum velocity ED (V_{ed}) in a supply vessel. RI indicates the level of impedance to blood flow; a high RI suggests increased peripheral vascular resistance.

The pulsatility index represents the hemodynamic conditions in a vessel. It is based on the peak systolic velocity (V_{max}), the maximum velocity at minimum diastole ($V_{min\text{-}diast}$), and the average (V_{mean}) of the peak (max) flow velocity curve. PI describes the elasticity of the vessel combined with the level of peripheral resistance.

The A/B ratio (Stuart index) is calculated as the ratio between PS (V_{ps}) and ED (V_{ed}).

The advantage of using indices rather than absolute velocities is that the indices are independent of the insonation angle.

Index	Formula
A/B ratio	PS/ED
Resistance index	(PS-ED)/PS
Pulsatility index	(PS-MD)/Mean

Table 9-2. Formulas for the main Doppler indices.

The correct placement of markers for measuring RI and PI is indicated in Fig 9-3. "Mean" in the Pulsatility index formula is the averaged max flow velocity.

All main Doppler indices are measured together.

You can measure the Doopler indices in different ways:

- Automatic: The Doppler curve is drawn automatically and you position markers on it.
- Manual: you draw the Doppler curve manually (freehand).
- Real-time: the system calculates and displays the indices automatically in real time.

To measure the Doppler indices automatically:

1 Click on the **Measurements** tab while in Doppler mode and select **Auto Doppler**.

2 Position one marker at the *start systolic* (SS) frequency.

3 Position the second marker at the *end diastolic* (ED) frequency.

   The Ps, Ed, PI, RI, and S/D measurements are displayed to the left of the image.

Minimum two cycles must be included between the time cursors. The calculated index is an average over the cycles.

NOTE: *Make sure that the trace appears to be a good fit to the spectrum so that the basis for the automatic calculation is correct.*

To measure PI manually:

1 Click **D Trace Freehand** on the **Measurements** tab.

2 Position the marker on the *start systolic* (SS) frequency and click.

3 Draw a curve that traces a line along the whole maximum spectrum through the *peak systolic* (PS) frequency, the *minimum diastolic* (MD), and onto the *end diastolic* (ED) frequency.

4 Click.

   Ps, Ed, PI, RI, and S/D measurements are displayed

If the traced curve covers more than one cycle, the PI is calculated as the average of each cycle.

Real-Time Measurements

The following measurements can be made and displayed in real time, so that they are continually updated during imaging:

- PS
- ED
- RI
- PI
- TAM
- TAP

Note that it takes a few cycles before the real-time measurements are displayed.

Calculations

The calculation formulas and accuracies, along with the tables and formulas used by the system, are in the *Technical Data (BZ2100)*.

Chapter 10
Vascular Chapter

This chapter contains information useful for basic vascular imaging including:

- Peripheral arteries
- Peripheral veins

Important:

Read *Getting Started with bk3000 & bk5000* for basic controls.

Read transducer user guides for more information before doing biopsies.

Read *Care and Cleaning* for sterilization instructions.

Read *bk3000 & bk5000 User Guide* before system use.

Contents

- Setting up the Patient – Patient ID
- Presets
- Imaging Controls
- VFI (Vector Flow Imaging)
- Annotations – Labels, Bodymarks, and Arrows
- Measurements and Calculations
- Using Reports
- Capturing and Documenting Images
- Customization Examples
- Links to Additional Information

Setting up the Patient – Patient ID

You must have a patient ID in order to save images.

1 Press **Patient** on keyboard or click **Enter Patient** on the monitor.

2 Enter data in the **Patient Details** window.

3 Click **Next** (below the **Patient Details** window).

Presets

Once you have selected your transducer, select the appropriate **Exam Type** and **Preset**. These will vary with each transducer.

Figure 10-1. Preset window for 8L2

Imaging Controls

2D (B-Mode)

Imaging starts in 2D.

To return to imaging with 2D alone after you have been using it in combination with other modes, press the **B-Mode** key on the keyboard or double-click on the 2D tab.

Overall Gain:

- Adjust gain by *turning* the **B-Mode** key on the keyboard (when the image is not frozen).

Different gain at different image depths: adjusting the TGC curve:

- Move the **TGC** sliders to the right or left to adjust the TGC curve (differential gain).

  The shape of the TGC curve is temporarily displayed to the right of the image as a curved vertical line.

Split Screen

Linked Dual is enabled as a default setting for all Exam Types. During split screen imaging, the Linked Dual function automatically transfers screen-A image parameters to screen-b (and vice versa). Color and power mode can be in only one screen.

To use split screen:
1 Click **Dual**. Or press the **Split** ⬚ key.
2 Click **Dual Layout** and select **Side By Side or Top/Bottom**.

To select one of the views:

- Click in the view you want to select (or press the **Split** key).

To remove a split:

- Click **Dual**. Or long press the **Split** key.

Color Mode (CFM)

To use Color mode:

1 Press **Color Mode** key on keyboard, or click **Color** tab on monitor.

Color box is active (green color) and can be moved with trackball.

2 To resize the color box and keep the default shape, use the **+ /-** key.

3 To decrease the color box width, click to deactivate the size cursor, then click on a corner of the box and drag the corner.

4 Click when you are finished changing the color box.

Color gain:

- Adjust color gain by *turning* the **Color Mode** key.

Scale:

- Change PRF with the **Scale** keyboard key or **Scale** screen button.

Doppler Mode

When you turn Doppler mode on, 2D must be imaging.

To use Doppler mode:

1 Press the **Doppler Mode** or click on the PW tab in the workspace.

The Doppler indicator (green), including both the Doppler line and the Doppler gate, appears superimposed on the 2D image and the Doppler spectrum appears.

2 To position the Doppler gate on a 2D image, use the trackball.

3 To resize the Doppler gate, use the **+/-** key.

4 To adjust the angle, use the **Angle Correct** toggle**.**

In Doppler mode, this control will also be available when measuring.

Volume Flow

To use Volume Flow:

1 In PW Doppler, click on **Volume Flow** measurement.
Calipers appear to measure the diameter of the vessel, then vertical measurement lines appear on the Doppler spectral trace.

2 Place the first one at the beginning of a cardiac cycle and then place the second one farther along the spectral trace to include at least two cardiac cycles.
Volume flow rate appears in ml/min.

Vector Flow Imaging (VFI)

Vector Flow Imaging is available as an option on the bk3000 and bk5000 ultrasound systems.

NOTE: *Before you use VFI, make sure that you have read the warnings in the VFI section of the Safety chapter of the bk3000/bk5000 Short User Guide.*

Normally, color imaging shows only axial flows. Vector Flow Imaging is a technology that uses ultrasound pulses in both axial and lateral directions. The measured signals are therefore sensitive to both axial and transverse motion.

VFI requires a software license from BK Medical and is available with selected transducers only. See the *bk5000* and *bk3000 Product Data sheets*.

NOTE: *The recommended max depth of using VFI is between 15 and 20 mm. Lower frequency equals higher depth.*

VFI can be useful for visualizing the following with high sensitivity:

- Flow when the transducer is perpendicular to the vessel – flow visualization that is independent of imaging angle.
- Carotid and other vessels with high or complex flow.

Vector Flow Imaging can be used in the velocity range of 10 cm/s to 315 cm/s with the corresponding PRF.

Using auto-correlation estimators, both the axial and transverse velocity components are determined and used to make an estimate of 2D blood velocity that does not depend on the image angle.

This method makes it easier to achieve a sufficient image angle and makes it possible to visualize complex flow patterns.

The maximum velocity that can be observed depends on the PRF. Higher velocities can be seen when the PRF is higher.

The direction and velocity of the flow are indicated on the image with color and also by arrows.

Color Flow Indicators for VFI – The Color Map

The **Color Map** is the default color flow indicator for interpreting the color. The **Color Map** outlines the maximum flow velocity by color. If you highlight the **Color Map** you can choose between 3 different VFI color options.

The number at the top of the Color Map is the maximum velocity that can be displayed by the color coding in the VFI image. This can be changed by changing the PRF.

The colors indicate velocity flow. Brighter colors indicate faster flow.

3 VFI color options. First 2 options activate the Color Square.

214.3 cm/s

0.0 cm/s
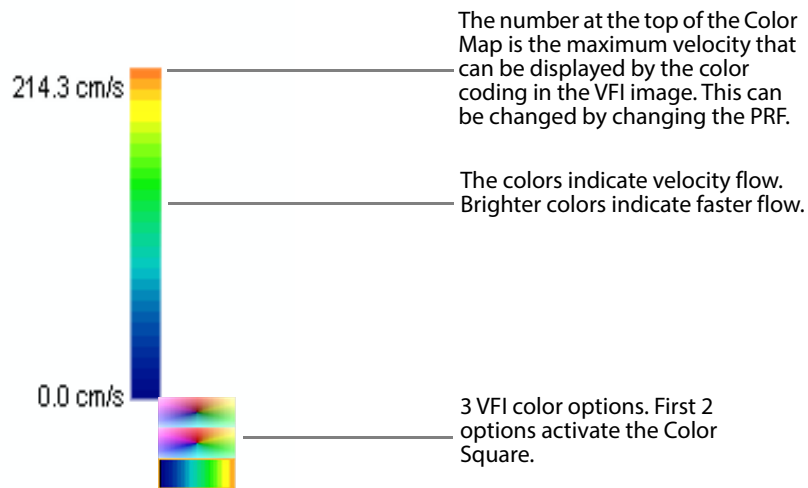
Figure 10-2. Explanation of the Color Map for Vector Flow Imaging.

Saturation/Brightness = Speed

Colors located nearer the top of the **Color Map** (less saturated colors) indicate faster flow.

Color Flow Indicators for VFI – The Color Square

The **Color Square** is an alternative to the **Color Map** for interpreting color. If you choose this color indicator, flow direction and velocity are mapped by color. You can move the **Color Square** around on the monitor (like a bodymark) so that it does not interfere with what you are trying to observe.

This color indicates purely axial flow (24 cm/s).

This color indicates purely transverse flow (24 cm/s).

This color indicates flow down and to the left.
The speed is about 23 cm/s (axial and transverse velocity components both 16 cm/s).
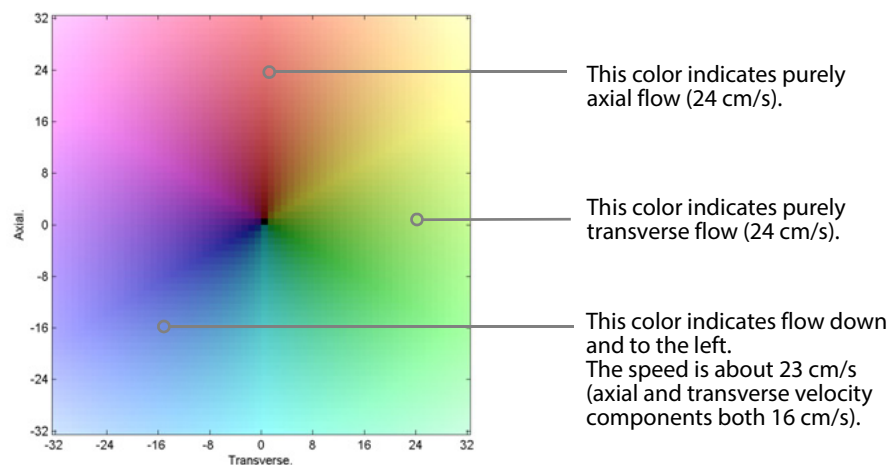
Figure 10-3. Explanation of the Color Square for Vector Flow Imaging. The values are only for illustrative purposes, as the color information is intended to be qualitative rather than quantitative.

Saturation/Brightness = Speed

The center of the square is black. Black indicates zero flow.

Colors located farther from the center (less saturated colors) indicate faster flow.

Color (Hue) = Direction

The color (hue) indicates the flow direction. For example, yellow indicates flow up and to the right.

Using VFI

VFI is activated by selecting the VFI color submode. VFI is available with selected transducers only. See the *bk5000* and *bk3000 Product Data sheets*.

To activate VFI:

1 Click **Color** and select **VFI**.
2 Click **VFI Grid Size** and **VFI Arrow Size** and select size on the dropdown menu.

Steering of the color box is not possible when you use VFI
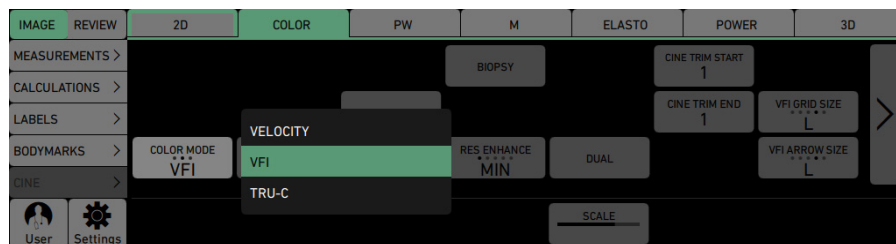
Figure 10-4. Selecting VFI submode.

Arrow Flow Indicators for VFI

Direction and relative velocity are also indicated by arrows superimposed on the flow part of the image. Longer arrows indicate higher velocity.

Arrow Size (VFI)

Use **Arrow Size (VFI)** to adjust the space between the arrows and the size of the arrows in VFI mode. You can choose 4 different size settings (the default setting is Large).

Streamlined VFI Workflow

You can use VFI to ease the workload when determining peak systolic velocity or calculating volume flow rate.

In **2D+VFI+PW** mode, VFI can assist the user with:

- Doppler gate placement
- Vessel outline
- Angle correction
- Doppler steering
- Inverting the Doppler spectrum (when needed)
- Selecting the appropriate Scale/PRF (Pulse Repetition Frequency)
- Adaptively adjusting Doppler sample volume size (PW gate)
- Volume Flow Measurement

Determining Peak Systolic Velocity

To determine the peak systolic velocity:

1 Find the artery and add Color mode by clicking **Color**.

2 On the **Color Mode** tab, select **VFI**. You will see the arrows showing the direction of the flow.

3 Add Doppler mode by clicking **PW**.

4 Click **Assist**. Thin lines along the edges of the vessel show the vessel outline, and steering is adjusted so the angle correction follows the vessel.

5 Click **VFI Update** to place the Doppler gate at the highest velocity in the vessel.

6 **PS** is displayed on the monitor:

PS	113.46cm/s
ED	16.37cm/s
PI	2.44
RI	0.86

Determining Average Volume Flow

To determine average volume flow:

1 With the settings listed above, click **Auto Vol Flow**.
The Doppler gate opens to span the entire vessel, and calipers are set to measure the diameter of the vessel.

2 **VF** is displayed in ml/minute on the monitor, along with the **VF Area** and the **VF Dia** (Diameter):

PS	116.82cm/s
ED	29.52cm/s
PI	1.91
RI	0.75
VF	452.27ml/min
VF Area	0.36cm^2
VF Dia	6.79mm

Note: *If you are measuring volume flow through the portal vein, you must do so in a zoomed image.*
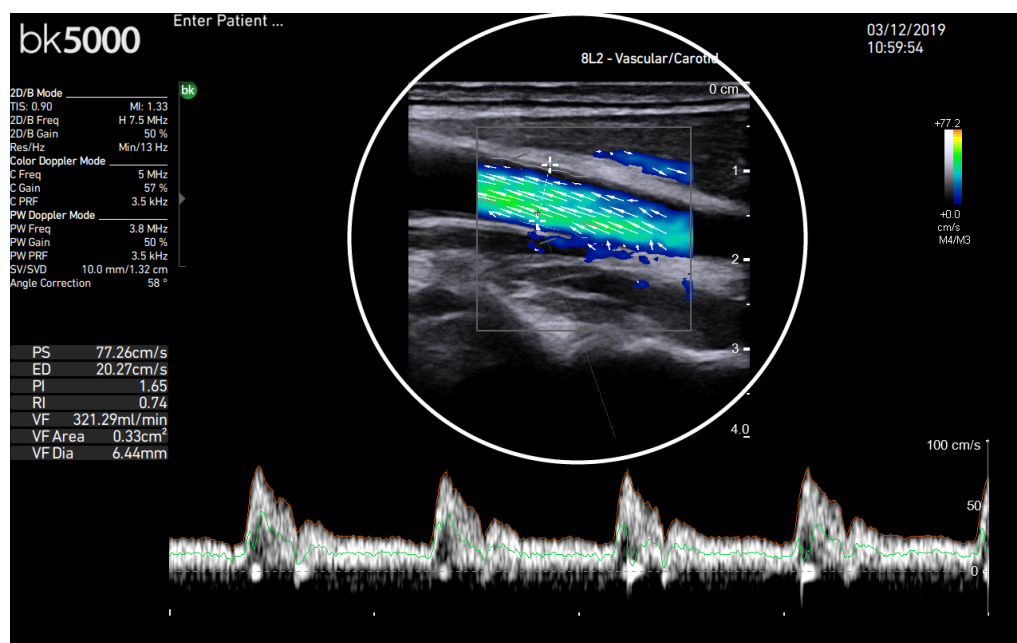
Outline of VFI Workflow

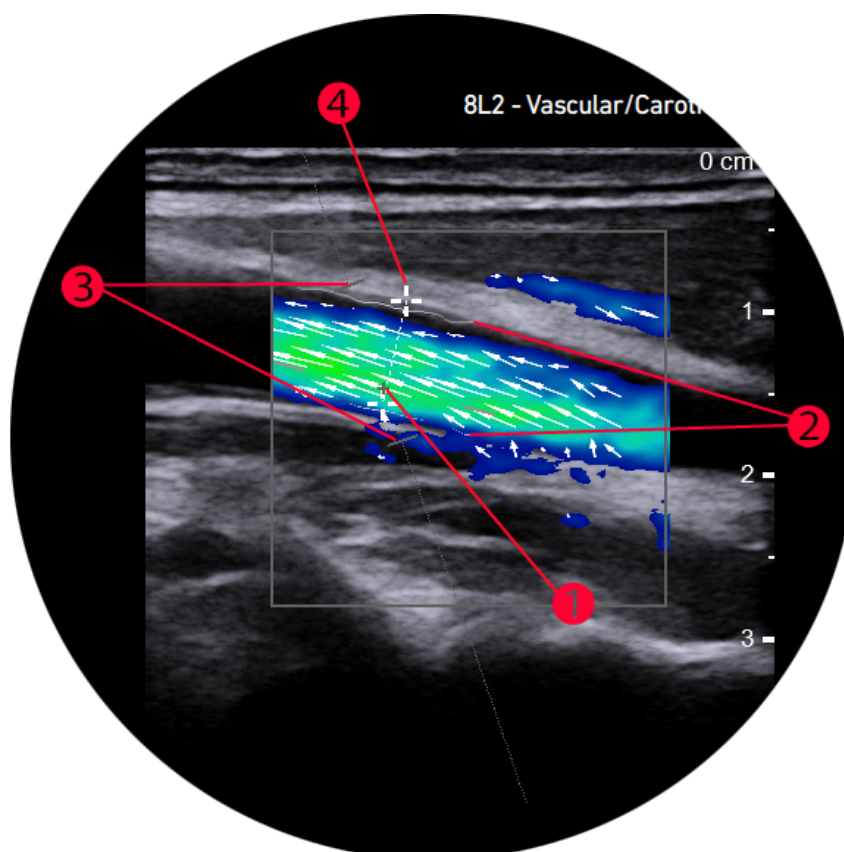

Figure 10-5. Outline of VFI workflow with 8L2 transducer

Figure 10-6. Zoomed VFI workflow

1 POI (highest velocity in vessel)   **3** Doppler gate

2 Vessel outline   **4** Calipers to measure vessel.

Biopsy

NOTE: *Before you perform any puncture procedure, including brachytherapy, make sure you have read the warnings in the Puncture and Brachytherapy section of the Safety chapter in the bk3000 & bk5000 User Guide.*

To display a puncture line on the image for biopsy guidance:

Press the **Biopsy** key on the keyboard: 🔲 or click **Biopsy** on the **Image** tab.

Remember to check that you are using the correct needle guide. The number of the needle guide is displayed on the monitor. Make sure the number corresponds to the guide you are using.

For better needle visualization see "Needle Enhancement" on page 78.

NOTE: *If the image depth is set very low (to see tissue close to the transducer with high magnification), the needle tip echo can be outside the displayed image area. To see the needle tip in this case, zoom out so the full needle path is visible or pan the image to the side (to keep the high magnification).*

Annotations - Labels, Bodymarks, and Arrows

Labels, bodymarks, and arrows are activated from the **Labels** and **Bodymarks** tabs to the left of the workspace.

Labels

Figure 10-7. Label selector

To select a label:

1   In the workspace, click **Labels**. The Labels selector window opens.

2   From the drop-down menu, select the relevant label package. The displayed labels will reflect the selected package.

3   Click on the arrow in the right of the label selector to see all labels.

4   Select the label by clicking it.

5   Use the trackball to move the label and then click when it is in the correct position.

*You can select where labels show up on the screen per default. Click **Set Home** when you have placed your label. The next label you click will show up in the same place*

Opposed labels are linked. This means that if you have selected **Right** and afterwards click **Left**, the label name will change to left. Linked labels are on the same background..

Type and edit your own labels on screen:

1 Type the text you want for the label.

You can move the label while you are typing it.

2 Click to accept the label text and position.

To move or edit a label:

1 To move a label that is on the image, click the label to select it, and use the trackball to move it.

2 To edit a label on the image, click the label. (Label turns green).

You can only edit your own labels.

3 Use backspace to move through the label and edit it.

To remove a label:

• Long click the label you want to remove (point at it and press the **Select** key for more than 1 second).

To remove all labels from an image:

• Click on **Clear All Labels** in the workspace.

Bodymarks

Figure 10-8. Bodymark selector

To place a bodymark on the image:

1 In the workspace, click **Bodymarks**. The Bodymarks selector window opens.

2 From the drop-down menu, select the relevant bodymark package. The displayed bodymarks will reflect the selected package.

3 Click to select the bodymark you want. (If you do not see the one you want, click the arrows to see more pages with bodymarks.This only works if there are more) The bodymark appears on the monitor with a highlighted imaging plane indicator.

4 Drag the imaging plane indicator to position it; and use the + and - keys to rotate it. Click when the imaging plane indicator is in the correct position.

5   Use the trackball to select and move the label and then click when it is in the correct position.

To move a bodymark:

1   Click the **Move** button. A green frame appears around the bodymark.

2   Drag it to the position you want, and click again.

To replace a bodymark:

To replace an existing bodymark with a different one, click the new bodymark. The new bodymark will appear in the default position.

To delete a bodymark from the monitor:

•   Click the **Delete** button.

Unless you delete it or replace it with a new one, a bodymark will remain on the monitor until you change Preset or begin to image a new patient.

Adjusting the Imaging Plane Indicator

To adjust the imaging plane indicator:

When you place a bodymark on the image, the imaging plane indicator is green and can be adjusted as follows:

1   Drag the imaging plane indicator with the trackball.

2   Rotate left or right by using the + and - keys.

3   Click again when the imaging plane indicator is the way you want it.

The imaging plane indicator turns orange and can be adjusted by pressing ⟳ or ⟲ buttons.

Arrows

You can place arrows on the image to mark area of special concern or interest.

To place an arrow on the image:

1   Click the **Labels** tab.

2   Click the **Arrows** button and select the arrow you want. The arrow appears highlighted on the monitor.

3   Drag the arrow to the position you want, and click again.

4   You can add another arrow by selecting it.

To delete an arrow, click **Delete**. To delete all arrows from the image, click **Clear All**.

Measurements and Calculations

Measurements are generic measurements that you can do on any region of interest. Calculations are predefined measurements intended for measuring organs or ROIs within a particular preset.

For detailed instructions about using the measuring tools, see "Making Measurements" on page 47.

Doppler Measurements

Leg Veins (Peripheral Vascular preset)
1. In Doppler mode, freeze the image with the Doppler spectrum.
2. In the **Group** dropdown menu, select **Valve Closure Time**.
3. Select measurement, for example **Lt CFV VCT**.
4. Place first caliper at the beginning of reflux and click.
5. Place second caliper at end of reflux and click.

    Vessel closure time is displayed.

Leg Arteries (Peripheral Vascular preset)
1. In Doppler mode, freeze the image with the Doppler spectrum.
2. In the **Group** dropdown menu, select **LE Arterial Doppler**.
3. Select measurement, for example **Lt Common IA**.
4. Place cursor at peak systole and click.

    Peak systolic velocity (PS) is displayed.

Using Reports

Making a report:

When you have finished making measurements and selecting assessments, add any images you want in the report:
1. On the **Review** tab, click **Report**.
2. Click the Images tab.
3. Select the images you want to include in the report by clicking on them.
4. Comments put in **Patient** and **Comments** appear in the report.

Printing a report:

*   Click Print to print the report on the report printer (See "Printers Tab" on page 278) before saving it.

Saving a report as images:

*   Click **Store Report Image.** The report is stored as DICOM images, and you can see and print them by clicking **Review.**

Capturing and Documenting Images

Cine Review

To use cine review:
1. Freeze image.

2   Turn **B-Mode** key to scroll back through imaging.

or

Click the **Cine tab on th**e left side of the workspace and use the controls shown.

Capturing Images

Capturing Frozen Images

Saving (capturing) images to system hard disk:

1   Freeze the image.

2   Press the **Capture** key.

Thumbnail of saved image appears at bottom of monitor above workspace.

Capturing Clips (Unfrozen Images)

To capture clips:

1   Press **Capture** to start recording.

2   Press **Capture** again to stop recording.

Thumbnail of image appears at bottom of monitor above workspace.

Copying and Archiving

Copying or Archiving Images and Clips

To copy or archive images and clips:

1   In the **Review** window, select thumbnail images. Use the buttons **Multiselect** and **Select All** if required.

2   Click **Export** and select where to export the images.

Printing Images

Printing Images Displayed on the Monitor

- Press the **Print** key on the keyboard.

Printing from Thumbnail Images

You must open the images in order to print them.

To open a thumbnail image and then print it:

1   Click the Review tab.

2   Select the image you want to print.

3   Press the **Print** key.

Customization Examples

Saving a New Preset

When you have changed the setup, you can save it as a new preset.

To save a preset:

1   Click the **Review** tab and then click either Review or Report.

2   Click on the **Preset** tab and click on Save Preset.

The **Save Preset** window appears.

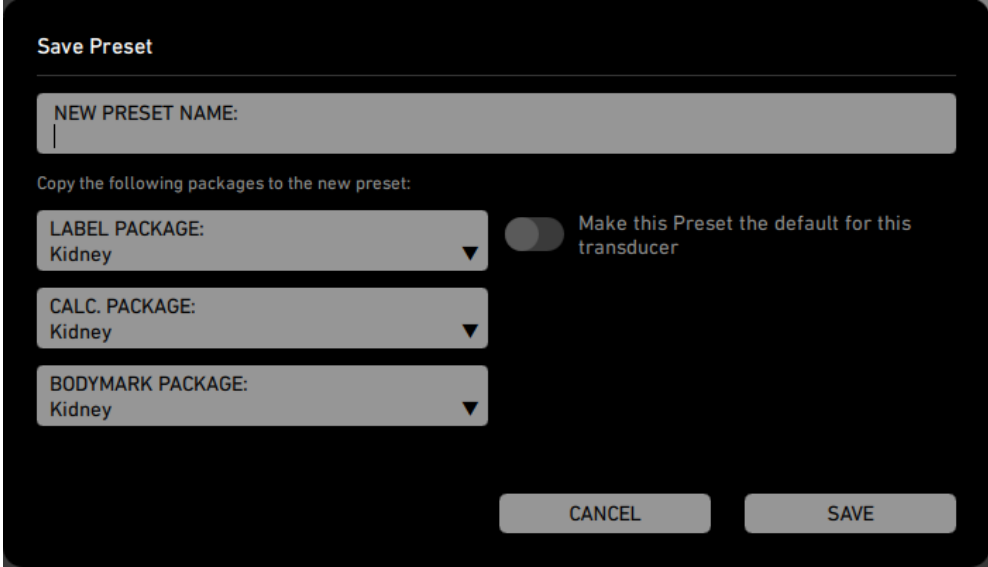*Figure 10-9. The Save Preset window.*

3   Enter a name for the preset and select the options you want from the drop-down menus.

4   Click **Save**.

Default Exam Types and Presets

You can change the default Exam Type and preset for a transducer. When creating a new preset as in "Saving a New Preset" above, click on the toggle button **Make this Preset the default for this transducer.**

Links to Additional Information

For more information about different topics, you may want to refer to the following chapters:

- Layout of controls on the monitor and how to use the workflow tabs (Chapter 2, "The User Interface").

- Names of screen controls and what they do (Chapter 3, "Controls on the Monitor").

- Working with images (Chapter 4, "Working with the Image").

- Making measurements (Chapter 5, "Making Measurements").

- Documenting the image and results (Chapter 6, "Documentation").

- Using different imaging modes (Chapter 7, "Imaging Modes").

- List of all measurement abbreviations with full name (Appendix B, "Measurement Abbreviations").

- Setting up and Customizing the System (including creating custom keys on the keyboard) (Appendix C, "Setting Up and Customizing Your System".)

The tables and formulas that the system uses for calculations are in the *Technical Data (BZ2100)* on the *User Documentation CD*.

Chapter 11
MSK and Nerve Chapter

This chapter contains information useful for basic musculoskeletal and nerve imaging.

Important:

Read *Getting Started with bk3000 & bk5000* for basic controls.

Read transducer user guides for more information before doing biopsies.

Read *Care and Cleaning* for sterilization instructions.

Read *bk3000 & bk5000 User Guide* before using the system.

Contents

- Setting up the Patient – Patient ID
- Presets
- Imaging Controls
- Annotations – Labels, Bodymarks, and Arrows
- Measurements and Calculations
- Using Reports
- Capturing and Documenting Images
- Customization Examples
- Links to Additional Information

Setting up the Patient – Patient ID

You must have a patient ID in order to save images.

1   Press **Patient** on keyboard or click **Enter Patient** on the monitor.

2   Enter data in the **Patient Details** window.

3   Click **Next** (below the **Patient Details** window).

Presets

Once you have selected your transducer, select the appropriate **Exam Type** and **Preset**. These will vary with each transducer.

Figure 11-1. Preset Window for 5P1

Imaging Controls

2D (B-Mode)

Imaging starts in 2D.

To return to imaging with 2D alone after you have been using it in combination with other modes, press the **B-Mode** key on the keyboard or double-click on the 2D tab.

Overall Gain:

• Adjust gain by *turning* the **B-Mode** key on the keyboard (when the image is not frozen).

Different gain at different image depths: adjusting the TGC curve:

• Move the **TGC** sliders to the right or left to adjust the TGC curve (differential gain).

  The shape of the TGC curve is temporarily displayed to the right of the image as a curved vertical line.

Split Screen

Linked Dual is enabled as a default setting for all Exam Types. During split screen imaging, the Linked Dual function automatically transfers screen-A image parameters to screen-b (and vice versa). Color and power mode can be in only one screen.

To use split screen:

1 Click **Dual**. Or press the **Split** 🔲 key.
2 Click **Dual Layout** and select **Side By Side or Top/Bottom**.

To select one of the views:

• Click in the view you want to select (or press the **Split** key).

To remove a split:

• Click **Dual**. Or long press the **Split** key.

M-Mode

There is no M-mode key on the keyboard.

M-mode can only be used in combination with 2D. Selecting any other mode will turn off M-mode.

To turn M-mode on or off:

- Click the **M** tab in the workspace.

- Adjust sweep speed by clicking the **Sweep Speed** button and selecting the required value.

Color Mode (CFM)

To use Color mode:

1 Press **Color Mode** key on keyboard, or click **Color** tab on monitor.

Color box is active (green color) and can be moved with trackball.

2 To resize the color box and keep the default shape, use the **+/-** key.

3 To decrease the color box width, click to deactivate the size cursor, then click on a corner of the box and drag the corner.

4 Click when you are finished changing the color box.

Color gain:

- Adjust color gain by *turning* the **Color Mode** key.

Scale:

- Change PRF with the **Scale** keyboard key or **Scale** screen button.

Doppler Mode

When you turn Doppler mode on, 2D must be imaging.

To use Doppler mode:

1 Press the **Doppler Mode** or click on the PW tab in the workspace.

The Doppler indicator (green), including both the Doppler line and the Doppler gate, appears superimposed on the 2D image and the Doppler spectrum appears.

2 To position the Doppler gate on a 2D image, use the trackball.

3 To resize the Doppler gate, use the **+/-** key.

4 To adjust the angle, use the **Angle Correct** toggle**.**

In Doppler mode, this control will also be available when measuring.

Volume Flow

To use Volume Flow:

1 In PW Doppler, click on **Volume Flow** measurement.

Calipers appear to measure the diameter of the vessel, then vertical measurement lines appear on the Doppler spectral trace.

2 Place the first one at the beginning of a cardiac cycle and then place the second one farther along the spectral trace to include at least two cardiac cycles. Volume flow rate appears in ml/min.

Biopsy

NOTE: *Before you perform any puncture procedure, including brachytherapy, make sure you have read the warnings in the Puncture and Brachytherapy section of the Safety chapter in the bk3000 & bk5000 User Guide.*

To display a puncture line on the image for biopsy guidance:

Press the **Biopsy** key on the keyboard: 🔲 or click **Biopsy** on the **Image** tab.

Remember to check that you are using the correct needle guide. The number of the needle guide is displayed on the monitor. Make sure the number corresponds to the guide you are using.

For better needle visualization see "Needle Enhancement" on page 78.

NOTE: *If the image depth is set very low (to see tissue close to the transducer with high magnification), the needle tip echo can be outside the displayed image area. To see the needle tip in this case, zoom out so the full needle path is visible or pan the image to the side (to keep the high magnification).*

Annotations - Labels, Bodymarks, and Arrows

Labels, bodymarks, and arrows are activated from the **Labels** and **Bodymarks** tabs to the left of the workspace.
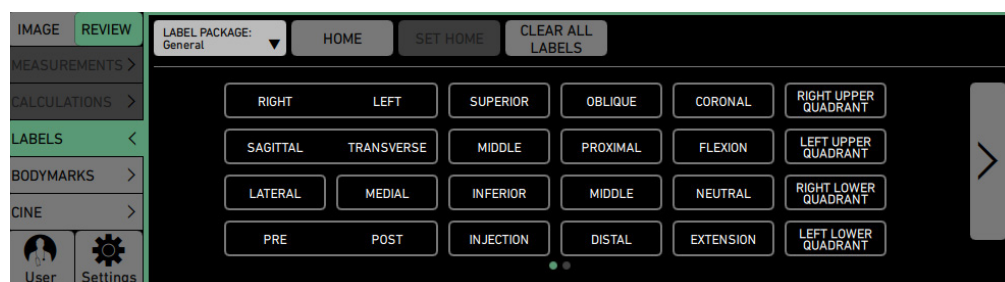
Labels

Figure 11-2. Label selector for MSK

1 To select a label:
2 In the workspace, click **Labels**. The Labels selector window opens.
3 From the drop-down menu, select the relevant label package. The displayed labels will reflect the selected package.
4 Click on the arrow in the right of the label selector to see all labels.
5 Select the label by clicking it.
6 Use the trackball to move the label and then click when it is in the correct position.

*You can select where labels show up on the screen per default. Click **Set Home** when you have placed your label. The next label you click will show up in the same place*

Opposed labels are linked. This means that if you have selected **Right** and afterwards click **Left**, the label name will change to left. Linked labels are on the same background..

Type and edit your own labels on screen:

1   Type the text you want for the label.

      You can move the label while you are typing it.

2   Click to accept the label text and position.

To move or edit a label:

1   To move a label that is on the image, click the label to select it, and use the trackball to move it.

2   To edit a label on the image, click the label. (Label turns green).

      You can only edit your own labels.

3   Use backspace to move through the label and edit it.

To remove a label:

- Long click the label you want to remove (point at it and press the **Select** key for more than 1 second).

To remove all labels from an image:

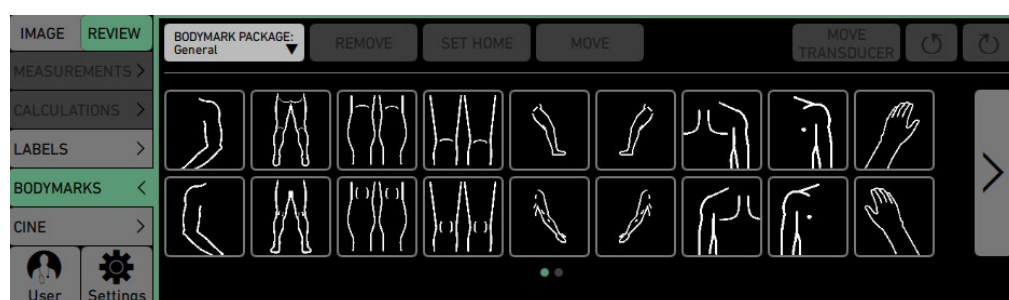- Click on **Clear All Labels** in the workspace.

Bodymarks

Figure 11-3. Bodymark selector for MSK

To place a bodymark on the image:

1   In the workspace, click **Bodymarks**. The Bodymarks selector window opens.

2   From the drop-down menu, select the relevant bodymark package. The displayed bodymarks will reflect the selected package.

3   Click to select the bodymark you want. (If you do not see the one you want, click the arrows to see more pages with bodymarks.This only works if there are more) The bodymark appears on the monitor with a highlighted imaging plane indicator.

4 Drag the imaging plane indicator to position it; and use the + and - keys to rotate it. Click when the imaging plane indicator is in the correct position.

5 Use the trackball to select and move the label and then click when it is in the correct position.

To move a bodymark:

1 Click the **Move** button. A green frame appears around the bodymark.

2 Drag it to the position you want, and click again.

To replace a bodymark:

To replace an existing bodymark with a different one, click the new bodymark. The new bodymark will appear in the default position.

To delete a bodymark from the monitor:

• Click the **Delete** button.

Unless you delete it or replace it with a new one, a bodymark will remain on the monitor until you change Preset or begin to image a new patient.

Adjusting the Imaging Plane Indicator

To adjust the imaging plane indicator:

When you place a bodymark on the image, the imaging plane indicator is green and can be adjusted as follows:

1 Drag the imaging plane indicator with the trackball.

2 Rotate left or right by using the + and - keys.

3 Click again when the imaging plane indicator is the way you want it.

The imaging plane indicator turns orange and can be adjusted by pressing ⟳ or ⟲ buttons.

Arrows

You can place arrows on the image to mark area of special concern or interest.

To place an arrow on the image:

1 Click the **Labels** tab.

2 Click the **Arrows** button and select the arrow you want. The arrow appears highlighted on the monitor.

3 Drag the arrow to the position you want, and click again.

4 You can add another arrow by selecting it.

To delete an arrow, click **Delete**. To delete all arrows from the image, click **Clear All**.

Measurements and Calculations

Measurements are generic measurements that you can do on any region of interest. Calculations are predefined measurements intended for measuring organs or ROIs within a particular preset.

For detailed instructions about using the measuring tools, see "Making Measurements" on page 47.

Using Reports

Making a report:

When you have finished making measurements and selecting assessments, add any images you want in the report:

1 On the **Review** tab, click **Report**.

2 Click the Images tab.

3 Select the images you want to include in the report by clicking on them.

4 Comments put in **Patient** and **Comments** appear in the report.

Printing a report:

• Click Print to print the report on the report printer (See "Printers Tab" on page 278) before saving it.

Saving a report as images:

1 Click **Store Report Image.** The report is stored as DICOM images, and you can see and print them by clicking **Review.**

Capturing and Documenting Images

Cine Review

To use cine review:

1 Freeze image.

2 Turn **B-Mode** key to scroll back through imaging.

or

Click the **Cine tab on th**e left side of the workspace and use the controls shown.

Capturing Images

Capturing Frozen Images

Saving (capturing) images to system hard disk:

1 Freeze the image.

2 Press the **Capture** key.

Thumbnail of saved image appears at bottom of monitor above workspace.

Capturing Clips (Unfrozen Images)

To capture clips:

1 Press **Capture** to start recording.

2 Press **Capture** again to stop recording.

Thumbnail of image appears at bottom of monitor above workspace.

Copying and Archiving

Copying or Archiving Images and Clips

To copy or archive images and clips:

1 In the **Review** window, select thumbnail images. Use the buttons **Multiselect** and **Select All** if required.

2 Click **Export** and select where to export the images.

Printing Images

Printing Images Displayed on the Monitor

• Press the **Print** key on the keyboard.

Printing from Thumbnail Images

You must open the images in order to print them.

To open a thumbnail image and then print it:

1 Click the Review tab.

2 Select the image you want to print.

3 Press **Print** key.

Customization Examples

Saving a New Preset

When you have changed the setup, you can save it as a new preset.

To save a preset:

1 Click the **Review** tab and then click either Review or Report.

2 Click on the **Preset** tab and click on Save Preset.

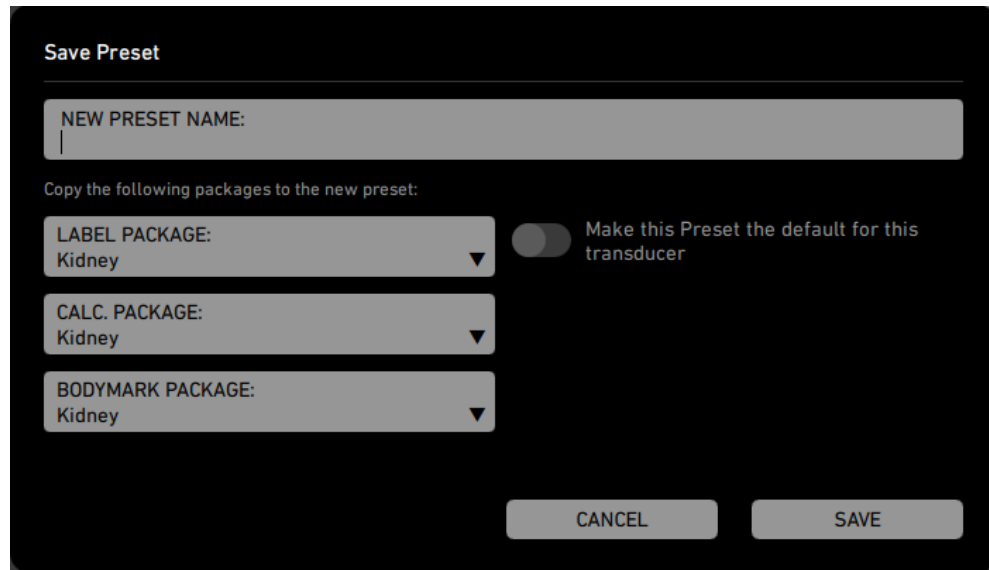The **Save Preset** window appears.

Figure 11-4. The Save Preset window.

3   Enter a name for the preset and select the options you want from the drop-down menus.

4   Click **Save**.

Default Exam Types and Presets

You can change the default Exam Type and preset for a transducer. When creating a new preset as in "Saving a New Preset" above, click on the toggle button **Make this Preset the default for this transducer.**

Links to Additional Information

For more information about different topics, you may want to refer to the following chapters:

- Layout of controls on the monitor and how to use the workflow tabs (Chapter 2, "The User Interface").
- Names of screen controls and what they do (Chapter 3, "Controls on the Monitor").
- Working with images (Chapter 4, "Working with the Image").
- Making measurements (Chapter 5, "Making Measurements").
- Documenting the image and results (Chapter 6, "Documentation").
- Using different imaging modes (Chapter 7, "Imaging Modes").
- List of all measurement abbreviations with full name (Appendix B, "Measurement Abbreviations").
- Setting up and Customizing the System (including creating custom keys on the keyboard) (Appendix C, "Setting Up and Customizing Your System".)

The tables and formulas that the system uses for calculations are in the *Technical Data (BZ2100)* on the *User Documentation CD*.

Chapter 12
Cardiac Chapter

This chapter contains information useful for basic cardiac imaging including:

- Basic Cardiac imaging
- Emergency medicine cardiac imaging (FATE)

Important:

Please see *Getting Started with bk3000 & bk5000* for basic controls.

Read transducer user guides for more information before doing biopsies.

Read *Care and Cleaning* for sterilization instructions.

Read *bk3000 & bk5000 User Guide* before system use.

Contents

- Setting up the Patient – Patient ID
- Presets
- Imaging Controls
- Annotations – Labels, Bodymarks, and Arrows
- Measurements and Calculations
- Using Reports
- Capturing and Documenting Images
- Customization Examples
- FATE – Focus Assessed Transthoracic Echocardiography
- Links to Additional Information

Setting up the Patient – Patient ID

You must have a patient ID in order to save images.

1 Press **Patient** on keyboard or click **Enter Patient** on the monitor.

2 Enter data in the **Patient Details** window.

3 Click **Next** (below the **Patient Details** window).

Presets

Once you have selected your transducer, select the appropriate **Exam Type** and **Preset**. These will vary with each transducer.

Figure 12-1. Preset Window for 5P1

Imaging Controls

2D (B-mode)

Imaging starts in 2D.

To return to imaging with 2D alone after you have been using it in combination with other modes, press the **B-Mode** key on the keyboard or double-click on the 2D tab.

Overall Gain:

• Adjust gain by *turning* the **B-Mode** key on the keyboard (when the image is not frozen).

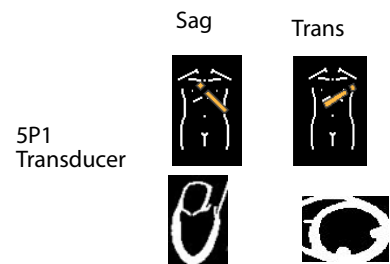**Different gain at different image depths: adjusting the TGC curve:**

• Move the **TGC** sliders to the right or left to adjust the TGC curve (differential gain).

The shape of the TGC curve is temporarily displayed to the right of the image as a curved vertical line.

Transducer Orientation

5P1 Transducer

• Sag – Transducer mark to right shoulder
• Trans – Mark to left shoulder

Split Screen

Linked Dual is enabled as a default setting for all Exam Types. During split screen imaging, the Linked Dual function automatically transfers screen-A image parameters to screen-b (and vice versa). Color and power mode can be in only one screen.

To use split screen:

1   Click **Dual**. Or press the **Split** ⬭ key.

2   Click **Dual Layout** and select **Side By Side or Top/Bottom**.

To select one of the views:

• Click in the view you want to select (or press the **Split** key).

To remove a split:

• Click **Dual**. Or long press the **Split** key.

M-Mode

There is no M-mode key on the keyboard.

M-mode can only be used in combination with 2D. Selecting any other mode will turn off M-mode.

To turn M-mode on or off:

• Click the **M** tab in the workspace.

• Adjust sweep speed by clicking the **Sweep Speed** button and selecting the required value.

Color Mode (CFM)

To use Color mode:

1   Press **Color Mode** key on keyboard, or click **Color** tab on monitor.
Color box is active (green color) and can be moved with trackball.

2   To resize the color box and keep the default shape, use the **+ /-** key.

3   To decrease the color box width, click to deactivate the size cursor, then click on a corner of the box and drag the corner.

4   Click when you are finished changing the color box.

Scale:

• Change PRF with the **Scale** keyboard key or **Scale** screen button.

Doppler Mode

To use Doppler mode:

1   Press **Doppler Mode** key on keyboard, or click **PW** tab on monitor.
Doppler sample gate is active (green). Move with trackball.

2   Adjust size of Doppler gate with the **+/-** key

3   Adjust gain by turning **Doppler Mode** key.

4   Press the **Doppler Angle** key to activate the Doppler angle control, then adjust the angle with the **+/-** key or trackball.

Auto Control of Baseline and Scale

Click **Auto** to have the system adjust baseline and scale (PRF) automatically. The adjustment requires a few vascular cycles before the adjustment is complete.

Continuous Doppler (CW)

To start Continuous Doppler:

1 Click the **CW tab**.

The CW Doppler line appears superimposed on the 2D image.

2 Drag the line to the position you want.

See also Chapter 8, "Continuous Wave Doppler Mode" on page 91.

Volume Flow

To use Volume Flow:

1 In PW/CW Doppler, click on **Volume Flow** measurement.
Calipers appear to measure the diameter of the vessel, then vertical measurement lines appear on the Doppler spectral trace.

2 Place the first one at the beginning of a cardiac cycle and then place the second one farther along the spectral trace to include at least two cardiac cycles. Volume flow rate appears in ml/min.

Annotations - Labels, Bodymarks, and Arrows

Labels, bodymarks, and arrows are activated from the **Labels** and **Bodymarks** tabs to the left of the workspace.
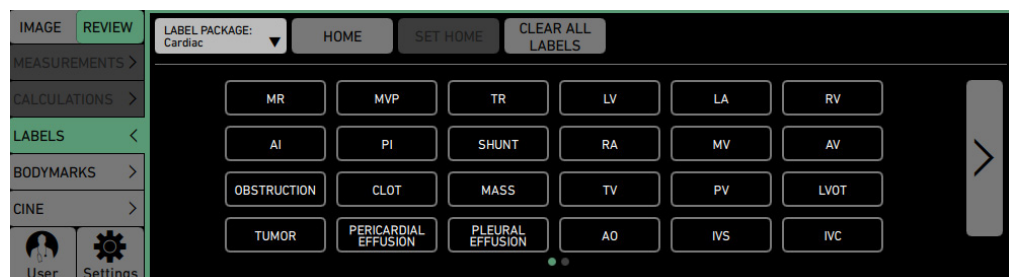
Labels

Figure 12-2. Label selector for Cardiac

To select a label:

1 In the workspace, click **Labels**. The Labels selector window opens.

2 From the drop-down menu, select the relevant label package. The displayed labels will reflect the selected package.

3 Click on the arrow in the right of the label selector to see all labels.

4 Select the label by clicking it.

5 Use the trackball to move the label and then click when it is in the correct position.

*You can select where labels show up on the screen per default. Click **Set Home** when you have placed your label. The next label you click will show up in the same place*

Opposed labels are linked. This means that if you have selected **Right** and afterwards click **Left**, the label name will change to left. Linked labels are on the same background..

Type and edit your own labels on screen:

1 Type the text you want for the label.

You can move the label while you are typing it.

2 Click to accept the label text and position.

To move or edit a label:

1 To move a label that is on the image, click the label to select it, and use the trackball to move it.

2 To edit a label on the image, click the label. (Label turns green).

You can only edit your own labels.

3 Use backspace to move through the label and edit it.

To remove a label:

• Long click the label you want to remove (point at it and press the **Select** key for more than 1 second).

To remove all labels from an image:

• Click on **Clear All Labels** in the workspace.
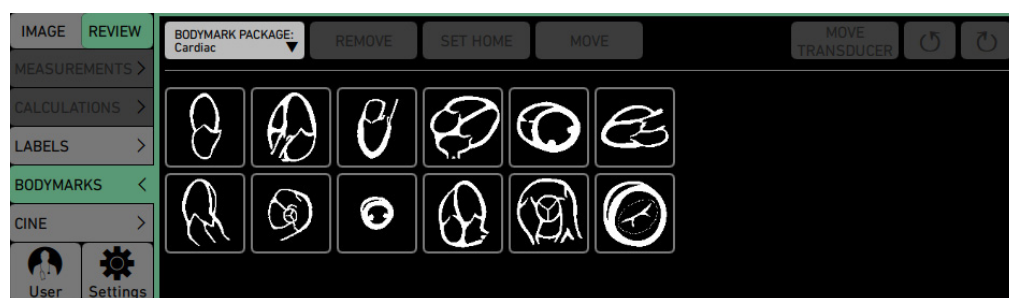
Bodymarks

Figure 12-3. Bodymark selector for Cardiac

To place a bodymark on the image:

1 In the workspace, click **Bodymarks**. The Bodymarks selector window opens.

2 From the drop-down menu, select the relevant bodymark package. The displayed bodymarks will reflect the selected package.

3   Click to select the bodymark you want. (If you do not see the one you want, click the arrows to see more pages with bodymarks. This only works if there are more) The bodymark appears on the monitor with a highlighted imaging plane indicator.

4   Drag the imaging plane indicator to position it; and use the + and - keys to rotate it. Click when the imaging plane indicator is in the correct position.

5   Use the trackball to select and move the label and then click when it is in the correct position.

To move a bodymark:

1   Click the **Move** button. A green frame appears around the bodymark.

2   Drag it to the position you want, and click again.

To replace a bodymark:

To replace an existing bodymark with a different one, click the new bodymark. The new bodymark will appear in the default position.

To delete a bodymark from the monitor:

•   Click the **Delete** button.

Unless you delete it or replace it with a new one, a bodymark will remain on the monitor until you change Preset or begin to image a new patient.

Adjusting the Imaging Plane Indicator

To adjust the imaging plane indicator:

When you place a bodymark on the image, the imaging plane indicator is green and can be adjusted as follows:

1   Drag the imaging plane indicator with the trackball.

2   Rotate left or right by using the + and - keys.

3   Click again when the imaging plane indicator is the way you want it.

The imaging plane indicator turns orange and can be adjusted by pressing ↻ or ↺ buttons.

Arrows

You can place arrows on the image to mark area of special concern or interest.

To place an arrow on the image:

1   Click the **Labels** tab.

2   Click the **Arrows** button and select the arrow you want. The arrow appears highlighted on the monitor.

3   Drag the arrow to the position you want, and click again.

4   You can add another arrow by selecting it.

To delete an arrow, click **Delete**. To delete all arrows from the image, click **Clear All**.

Measurements and Calculations

Measurements are generic measurements that you can do on any region of interest. Calculations are predefined measurements intended for measuring organs or ROIs within a particular preset.

For detailed instructions about using the measuring tools, see "Making Measurements" on page 47.

Cardiac LV Protocol (Left Ventricular Protocol)

2D Mode/M-Mode

1   Freeze the image, and click on the **Calculations** tab.

2   Click LV Protocol

3   Measure the following in diastole:

- IVS d (Interventricular Septum in diastole)

- LVD d (Left Ventricular Diameter in diastole)

- LVPW d (Left Ventricular Posterior Wall in diastole)

4   Then measure the following in systole:

- IVS s (Interventricular Septum in systole)

- LVD s (Left Ventricular Diameter in systole)

- LVPW s (Left Ventricular Posterior Wall in systole)

    These calculations are displayed on the monitor:

- EdV (End Diastolic Volume)

- EsV (End Systolic Volume)

- LVM (Left Ventricular Mass)

- FS (Fractional Shortening)

- EF (Ejection Fraction)

- SV (Stroke Volume)

Figure 12-4. Measurement Data for LV Protocol

HR (Heart Rate)

In M-mode:/Doppler Mode:

1 Freeze the image and click on **Measurements**:

2 Click on **HR.**

A line caliper appears on the image.

3 Drag this to the position you want. Click.

Another line caliper appears.

4 Drag it to the end of the defined number of HR cycles and click.

The heart rate is displayed on the monitor.

Cardiac Output

Doppler Mode:

1 Freeze the image and click on **Calculations**.

2 Click **CO Protocol**.

3 Measure LVOT diameter. The measurement is displayed on the monitor.

4 Trace the VTI. **LVOTVTI** is displayed on the monitor.

5 Measure HR over two cycles.

HR, **CO**, and **SV** are displayed monitor:

Figure 12-5. Measurement Data for Cardiac Output

FATE (Focus Assessed Transthoracic Echocardiography)

FATE calculations are available for **M-mode** only.

FATE Measurements

MSS (Mitral Septal Separation)

MSS is used as an M-mode echocardiographic indicator of normal or abnormal left ventricular ejection fraction.

Parasternal Long Axis View - M-Mode line through RV, IVS, MV end point

To measure:

1 Freeze the image and click **Calculations**.
2 On the Group dropdown, select **FATE**.
3 Click **MSS**.
4 Measure the distance between MV e-point and IVS in systole.
  The MSS calculation appears on the monitor.

MAPSE Mitral Annular Plane Systolic Excursion

MAPSE is assessed with M-mode in apical four-chamber view, placing the M-mode beam on the lateral mitral annulus. Measurement takes place from the end of diastole, until maximal expansion in systole.

To measure MAPSE:

1 Freeze the image and click **Calculations**.
2 On the Group dropdown, select **FATE**.
3 Click **MAPSE**.
4 Place the caliper at the highest systolic excursion and click.
5 Place the next caliper at the lowest diastolic excursion and click.
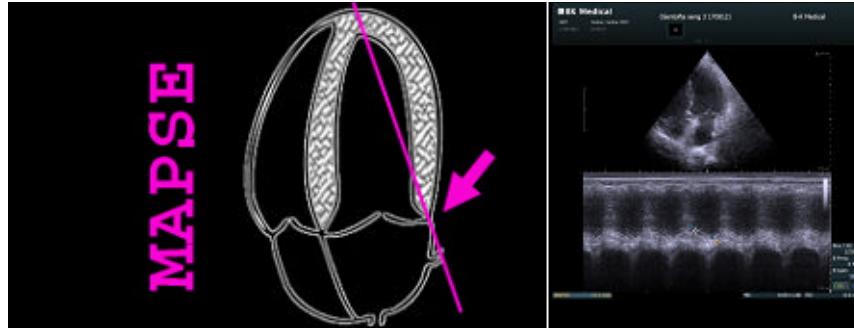 The vertical distance is now measured between the two calipers.

Figure 12-6. Measuring MAPSE in the FATE preset.

TAPSE Tricuspid Annular Plane Systolic Excursion

TAPSE can be assessed with M-mode, in the apical four-chamber view, placing the M-mode beam on the lateral Tricuspid annulus, measuring the distance of tricuspid annular movement between end diastole to end systole.

To measure TAPSE:

1   Freeze the image and click **Calculations**.

2   On the Group dropdown, select **FATE**.

3   Click **TAPSE**.

4   Place the caliper at the highest systolic excursion and click.

5   Place the next caliper at the lowest diastolic excursion and click.

 The vertical distance is now measured between the two calipers.

Using Reports

Making a report:

When you have finished making measurements and selecting assessments, add any images you want in the report:

1   On the **Review** tab, click **Report**.

2   Click the Images tab.

3   Select the images you want to include in the report by clicking on them.

4   Comments put in **Patient** and **Comments** appear in the report.

Printing a report:

•   Click Print to print the report on the report printer (See "Printers Tab" on page 278) before saving it.

Saving a report as images:

1   Click **Store Report Image.** The report is stored as DICOM images, and you can see and print them by clicking **Review.**

Capturing and Documenting Images

Cine Review

To use cine review:

1 Freeze image.

2 Turn **B-Mode** key to scroll back through imaging.

or

Click the **Cine tab on th**e left side of the workspace and use the controls shown.

Capturing Images

Capturing Frozen Images

Saving (capturing) images to system hard disk:

1 Freeze the image.

2 Press the **Capture** key.

Thumbnail of saved image appears at bottom of monitor above workspace.

Capturing Clips (Unfrozen Images)

To capture clips:

1 Press **Capture** to start recording.

2 Press **Capture** again to stop recording.

Thumbnail of image appears at bottom of monitor above workspace.

Copying and Archiving

Copying or Archiving Images and Clips

To copy or archive images and clips:

1 In the **Review** window, select thumbnail images. Use the buttons **Multiselect** and **Select All** if required.

2 Click **Export** and select where to export the images.

Printing Images

Printing Images Displayed on the Monitor

- Press the **Print** key on the keyboard.

Printing from Thumbnail Images

You must open the images in order to print them.

To open a thumbnail image and then print it:

1   Click the Review tab.

2   Select the image you want to print.

3   Press **Print** key.

Customization Example

Saving a New Preset

When you have changed the setup, you can save it as a new preset.

To save a preset:

1   Click the **Review** tab and then click either Review or Report.

2   Click on the **Preset** tab and click on Save Preset.
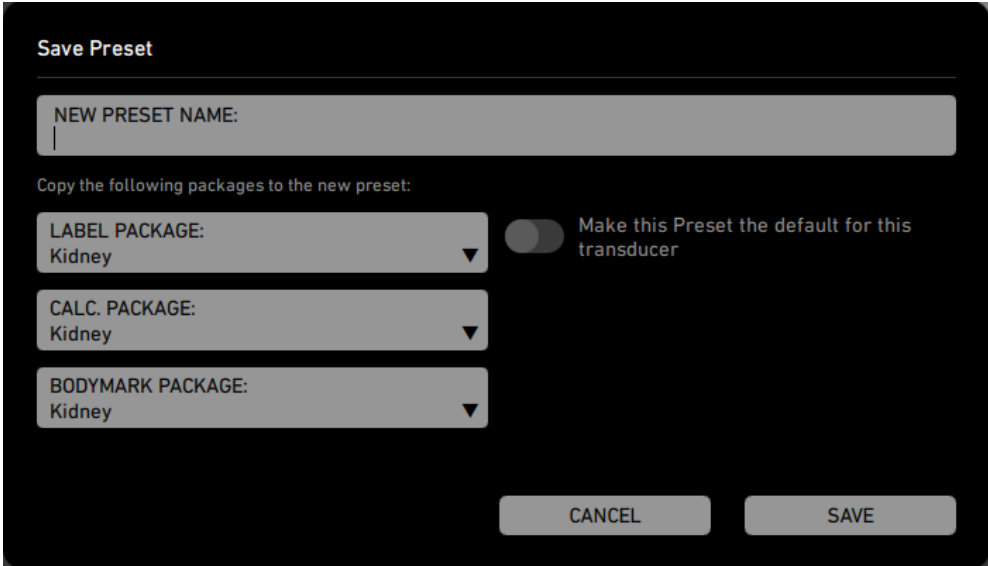
The **Save Preset** window appears.

Figure 12-7. The Save Preset window.

3   Enter a name for the preset and select the options you want from the drop-down menus.

4   Click **Save**.

Default Exam Types and Presets

You can change the default Exam Type and preset for a transducer. When creating a new preset as in "Saving a New Preset" above, click on the toggle button **Make this Preset the default for this transducer.**

Links to Additional Information

For more information about different topics, you may want to refer to the following chapters:

- Layout of controls on the monitor and how to use the workflow tabs (Chapter 2, "The User Interface").

- Names of screen controls and what they do (Chapter 3, "Controls on the Monitor").

- Working with images (Chapter 4, "Working with the Image").

- Making measurements (Chapter 5, "Making Measurements").

- Documenting the image and results (Chapter 6, "Documentation").

- Using different imaging modes (Chapter 7, "Imaging Modes").

- List of all measurement abbreviations with full name (Appendix B, "Measurement Abbreviations").

- Setting up and Customizing the System (including creating custom keys on the keyboard) (Appendix C, "Setting Up and Customizing Your System").

The tables and formulas that the system uses for calculations are in the *Technical Data (BZ2100)* on the *User Documentation CD*.

bk3000 & bk5000 Advanced User Guide (16-01487-EN-03)

Chapter 13
Urology Prostate Chapter

This chapter contains information useful for basic urology imaging, including prostate, abdomen, and small parts imaging. Small parts imaging includes breast, penile, testis, and thyroid imaging.

Important:

Please see *Getting Started with bk3000 & bk5000* for basic controls.

Read transducer user guides for more information before doing biopsies.

Read *Care and Cleaning* for sterilization instructions.

Read *bk3000 & bk5000 User Guide* before system use.

Contents

- Setting up the Patient – Patient ID
- Presets
- Imaging Controls
- Annotations – Labels, Bodymarks, and Arrows
- Measurements and Calculations
- Using Reports
- Capturing and Documenting Images
- Customization Examples
- Links to Additional Information

Setting up the Patient – Patient ID

You must have a patient ID in order to save images.

1 Press **Patient** on keyboard or click **Enter Patient** on the monitor.

2 Enter data in the **Patient Details** window.

3 Click **Next** (below the **Patient Details** window).

NOTE: *It is recommended to enter the PSA (Prostate Specific Antigen) before you image.*

Presets

Once you have selected your transducer, click **Preset** and select the appropriate **Exam Type** and **Preset.** These will vary with each transducer.

Figure 13-1. Preset window for urology/prostate transducer.

- Prostate Small = 12 Mhz.
- Prostate Medium = 9 Mhz.
- Prostate Large = 6 Mhz.

Imaging Controls

2D (B-mode)

Imaging starts in 2D.

To return to imaging with 2D alone after you have been using it in combination with other modes, press the **B-Mode** key on the keyboard or double-click on the 2D tab.

Overall Gain:

- Adjust gain by *turning* the **B-Mode** key on the keyboard (when the image is not frozen).

Different gain at different image depths: adjusting the TGC curve:

- Move the **TGC** sliders to the right or left to adjust the TGC curve (differential gain).

  The shape of the TGC curve is temporarily displayed to the right of the image as a curved vertical line.

Split Screen

Linked Dual is enabled as a default setting for all Exam Types. During split screen imaging, the Linked Dual function automatically transfers screen-A image parameters to screen-b (and vice versa). Color and power mode can be in only one screen.

To use split screen:
1   Click **Dual**. Or press the **Split** 🔲 key.
2   Click **Dual Layout** and select **Side By Side or Top/Bottom**.

To select one of the views:

- Click in the view you want to select (or press the **Split** key).

To remove a split:

Click **Dual**. Or long press the **Split** key.

Color Mode (CFM)

To use Color mode:

1   Press **Color Mode** key on keyboard, or click **Color** tab on monitor.

    Color box is active (green color) and can be moved with trackball.

2   To resize the color box and keep the default shape, use the **+ /-** key.

3   To decrease the color box width, click to deactivate the size cursor, then click on a corner of the box and drag the corner.

4   Click when you are finished changing the color box.

Color gain:

•   Adjust color gain by *turning* the **Color Mode** key.

Scale:

•   Change PRF with the **Scale** keyboard key or **Scale** screen button.

Doppler Mode

When you turn Doppler mode on, 2D must be imaging.

To use Doppler mode:

1   Press the **Doppler Mode** or click on the PW tab in the workspace.

    The Doppler indicator (green), including both the Doppler line and the Doppler gate, appears superimposed on the 2D image and the Doppler spectrum appears.

2   To position the Doppler gate on a 2D image, use the trackball.

3   To resize the Doppler gate, use the **+/-** key.

4   To adjust the angle, use the **Angle Correct** toggle**.**

    In Doppler mode, this control will also be available when measuring.

Volume Flow

To use Volume Flow:

1   In PW Doppler, click on **Volume Flow** measurement.
    Calipers appear to measure the diameter of the vessel, then vertical measurement lines appear on the Doppler spectral trace.

    Place the first one at the beginning of a cardiac cycle and then place the second one farther along the spectral trace to include at least two cardiac cycles. Volume flow rate appears in ml/min.

To Change Imaging Planes

If you are using a transducer with more than one plane, you can select the imaging plane (**T** for transverse, **S** for sagittal, or **E** for endfire). The current imaging plane (**T**, **S,** or **E**) is displayed at the top of the monitor next to the transducer name.

To select the imaging plane:

• Press the appropriate button on the transducer. For details, see the user guide for the transducer.

or

• Press the **Scanning Plane** ⬚ key.

NOTE: *When you change image orientation U/D, you may need to adjust the TGC settings for the 2D image. See "TGC" on page 71.*

Biopsy

NOTE: *Before you perform any puncture procedure, including brachytherapy, make sure you have read the warnings in the Puncture and Brachytherapy section of the Safety chapter in the bk3000 & bk5000 User Guide.*

To display a puncture line on the image for biopsy guidance:

Press the **Biopsy** key on the keyboard: ⬚ or click **Biopsy** on the **Image** tab.

Remember to check that you are using the correct needle guide. The number of the needle guide is displayed on the monitor. Make sure the number corresponds to the guide you are using.

For better needle visualization see "Needle Enhancement" on page 78.

NOTE: *If the image depth is set very low (to see tissue close to the transducer with high magnification), the needle tip echo can be outside the displayed image area. To see the needle tip in this case, zoom out so the full needle path is visible or pan the image to the side (to keep the high magnification).*

Annotations – Labels, Bodymarks, and Arrows

Labels, bodymarks, and arrows are activated from the **Labels** and **Bodymarks** tabs to the left of the workspace.

Labels

Figure 13-2. Label selector

To select a label:

1 In the workspace, click **Labels**. The Labels selector window opens.

2   From the drop-down menu, select the relevant label package. The displayed labels will reflect the selected package.

3   Click on the arrow in the right of the label selector to see all labels.

4   Select the label by clicking it.

5   Use the trackball to move the label and then click when it is in the correct position.

*You can select where labels show up on the screen per default. Click **Set Home** when you have placed your label. The next label you click will show up in the same place*

Opposed labels are linked. This means that if you have selected **Right** and afterwards click **Left**, the label name will change to left. Linked labels are on the same background..

Type and edit your own labels on screen:

1   Type the text you want for the label.

You can move the label while you are typing it.

2   Click to accept the label text and position.

To move or edit a label:

1   To move a label that is on the image, click the label to select it, and use the trackball to move it.

2   To edit a label on the image, click the label. (Label turns green).

You can only edit your own labels.

3   Use backspace to move through the label and edit it.

To remove a label:

•   Long click the label you want to remove (point at it and press the **Select** key for more than 1 second).

To remove all labels from an image:

•   Click on **Clear All Labels** in the workspace.

Bodymarks

Figure 13-3. Bodymark selector

To place a bodymark on the image:

1   In the workspace, click **Bodymarks**. The Bodymarks selector window opens.

2 From the drop-down menu, select the relevant bodymark package. The displayed bodymarks will reflect the selected package.

3 Click to select the bodymark you want. (If you do not see the one you want, click the arrows to see more pages with bodymarks. This only works if there are more) The bodymark appears on the monitor with a highlighted imaging plane indicator.

4 Drag the imaging plane indicator to position it; and use the + and - keys to rotate it. Click when the imaging plane indicator is in the correct position.

5 Use the trackball to select and move the label and then click when it is in the correct position.

To move a bodymark:

1 Click the **Move** button. A green frame appears around the bodymark.

2 Drag it to the position you want, and click again.

To replace a bodymark:

To replace an existing bodymark with a different one, click the new bodymark. The new bodymark will appear in the default position.

To delete a bodymark from the monitor:

• Click the **Delete** button.

Unless you delete it or replace it with a new one, a bodymark will remain on the monitor until you change Preset or begin to image a new patient.

Adjusting the Imaging Plane Indicator

To adjust the imaging plane indicator:

When you place a bodymark on the image, the imaging plane indicator is green and can be adjusted as follows:

1 Drag the imaging plane indicator with the trackball.

2 Rotate left or right by using the + and - keys.

3 Click again when the imaging plane indicator is the way you want it.

The imaging plane indicator turns orange and can be adjusted by pressing ⟳ or ⟲ buttons.

Arrows

You can place arrows on the image to mark area of special concern or interest.

To place an arrow on the image:

1 Click the **Labels** tab.

2 Click the **Arrows** button and select the arrow you want. The arrow appears highlighted on the monitor.

3 Drag the arrow to the position you want, and click again.

4 You can add another arrow by selecting it.

To delete an arrow, click **Delete**. To delete all arrows from the image, click **Clear All**.

Measurements and Calculations

Measurements are generic measurements that you can do on any region of interest. Calculations are predefined measurements intended for measuring organs or ROIs within a particular preset.

For detailed instructions about using the measuring tools, see "Making Measurements" on page 47.

Calculation of Prostate Volume

To measure prostate volume (width, height, and length):

1   Freeze the image and click **Calculations.**

2   Click on **Prostate V W*H*L**.

The width (W) caliper appears automatically.

3   Position the first caliper and click.

4   Position the second caliper and click.

The height (H) caliper appears automatically.

5   Repeat measurement.

Length (L), the last set of measurements, appears automatically.

6   Repeat measurement.

7 When you have finished measuring, the volume calculation appears automatically.
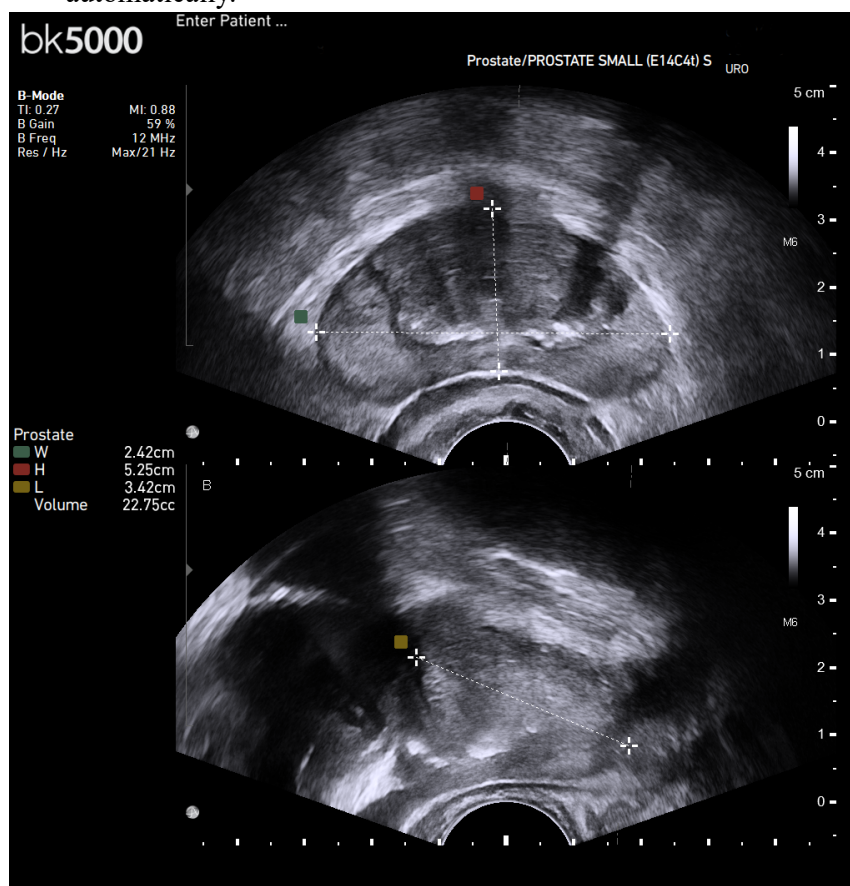
Figure 13-4. Prostate volume in split screen view

PSAD measurements:

The PSAD (Prostate Specific Antigen Density) will be calculated after the PSA has been entered and prostate volume has been measured.

Calculation of Breast Lesion Volume

To measure lesion volume (width, height, and length):

1 Freeze the image and click **Calculations.**

2 On the Group dropdown, select **Right** or **Left** (this procedure uses Left)

3 Click on **Lt Lesion V W*H*L**.

The width (W) caliper appears automatically.

4 Position the first caliper and click.

5 Position the second caliper and click.

The height (H) caliper appears automatically.

6 Repeat measurement.

Length (L), the last set of measurements, appears automatically.

7 Repeat measurement. When you have finished measuring, the volume calculation appears on the monitor.

Calculation of Kidney Volume

To measure kidney volume (width, height, and length):

1 Freeze the image and click **Calculations.**

2 In the **Calc. Package Kidney**, select (e.g.) **Right Kidney** or **Left**

3 Click on **Rt Kidney V W*H*L**.

The width (W) caliper appears automatically.

4 Position the first caliper and click.

5 Position the second caliper and click.

The height (H) caliper appears automatically.

6 Repeat measurement.

Length (L), the last set of measurements, appears automatically.

7 Repeat measurement. When you have finished measuring, the volume calculation appears on the monitor.

To erase measurements:

1 Hover cursor to the left of the measurement name, for example "Prostate".

Trash can icon appears.

2 Click trash can icon to erase measurement.

Using Reports

Making a report:

When you have finished making measurements and selecting assessments, add any images you want in the report:

1 On the **Review** tab, click **Report**.

2 Click the Images tab.

3 Select the images you want to include in the report by clicking on them.

4 Comments put in **Patient** and **Comments** appear in the report.

Printing a report:

• Click Print to print the report on the report printer (See "Printers Tab" on page 278) before saving it.

Saving a report as images:

1 Click **Store Report Image.** The report is stored as DICOM images, and you can see and print them by clicking **Review.**

Capturing and Documenting Images

Cine Review

To use cine review:

1   Freeze image.

2   Turn **B-Mode** key to scroll back through imaging.

    or

    Click the **Cine tab on th**e left side of the workspace and use the controls shown.

Capturing Images

Capturing Frozen Images

Saving (capturing) images to system hard disk:

1   Freeze the image.

2   Press the **Capture** key.

    Thumbnail of saved image appears at bottom of monitor above workspace.

Capturing Clips (Unfrozen Images)

To capture clips:

1   Press **Capture** to start recording.

2   Press **Capture** again to stop recording.

    Thumbnail of image appears at bottom of monitor above workspace.

Copying and Archiving

Copying or Archiving Images and Clips

To copy or archive images and clips:

1   In the **Review** window, select thumbnail images. Use the buttons **Multiselect** and **Select All** if required.

2   Click **Export** and select where to export the images.

Printing Images

Printing Images Displayed on the Monitor

•   Press the **Print** key on the keyboard.

Printing from Thumbnail Images

You must open the images in order to print them.

To open a thumbnail image and then print it:

1   Click the Review tab.

2   Select the image you want to print.

3   Press the **Print** key.

Customization Example

Saving a New Preset

When you have changed the setup, you can save it as a new preset.

To save a preset:

1   Click the **Review** tab and then click either Review or Report.

2   Click on the **Preset** tab and click on Save Preset.

The **Save Preset** window appears.

Figure 13-5. The Save Preset window.

3   Enter a name for the preset and select the options you want from the drop-down menus.

4   Click **Save**.

Default Exam Types and Presets

You can change the default Exam Type and preset for a transducer. When creating a new preset as in"Saving a New Preset" above, click the toggle button **Make this Preset the default for this transducer**.

Links to Additional Information

For more information about different topics, you may want to refer to the following chapters:

- Layout of controls on the monitor and how to use the workflow tabs (Chapter 2, "The User Interface").

- Names of screen controls and what they do (Chapter 3, "Controls on the Monitor")

- Working with images (Chapter 4, "Working with the Image").

- Making measurements (Chapter 5, "Making Measurements").

- Documenting the image and results (Chapter 6, "Documentation").

- Using different imaging modes (Chapter 7, "Imaging Modes").

- List of all measurement abbreviations with full name (Appendix B, "Measurement Abbreviations").

- Setting up and Customizing the System (including creating custom keys on the keyboard) (Appendix C, "Setting Up and Customizing Your System").

The tables and formulas that the system uses for calculations are in the *Technical Data (BZ2100)*.

Chapter 14
Brachytherapy Chapter

This chapter contains information useful for basic brachytherapy imaging.

The Brachytherapy Exam Type is designed for ultrasound-guided brachytherapy and cryotherapy for prostate cancer. This Exam Type helps you measure the volume of the prostate.

NOTE: *If you have the VariSeed or Live Image Transfer licenses activated, the image size is locked by default for the Brachytherapy Exam Type.*

NOTE: *Before you perform any puncture procedure, including brachytherapy, make sure you have read the warnings in the Puncture and Brachytherapy section of the Safety chapter in the bk3000 & bk5000 User Guide.*

For information about calculating PSAD see the Urology Prostate Chapter.

Important:

Please see *Getting Started with bk3000 & bk5000* for basic controls.

Read transducer user guides for more information before doing biopsies.

Read *Care and Cleaning* for sterilization instructions.

Read *bk3000 & bk5000 User Guide* before system use.

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- Setting up the Patient – Patient ID
- Presets
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- Measurements and Calculations
- Using Reports
- Capturing and Documenting Images
- Customization Examples
- Links to Additional Information

Setting up the Patient – Patient ID

You must have a patient ID in order to save images.

1   Press **Patient** on keyboard or click **Enter Patient** on the monitor.
2   Enter data in the **Patient Details** window.
3   Click **Next** (below the **Patient Details** window).

NOTE: *It is recommended to enter the PSA (Prostate Specific Antigen) before you image.*

The **Patient** window for this Exam Type contains a PSA field for PSA Score parameters:

Parameter	Range allowed
PSA	0 – 1000
Gleason	2 – 10

Table 14-1. Brachy parameters in the Patient window.

Presets

Once you have selected your transducer, click **Preset** and select the appropriate **Exam Type** and **Preset.** These will vary with each transducer.
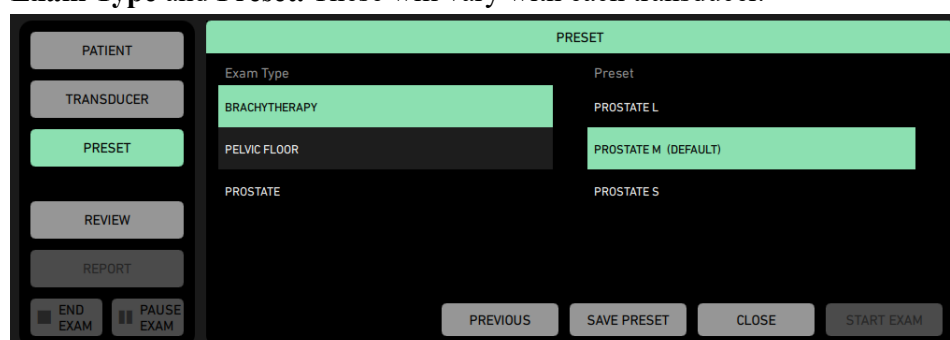
Figure 14-1. Preset window for E14C4t.

- Prostate Small = 12 Mhz.
- Prostate Medium = 9 Mhz.
- Prostate Large = 6 Mhz.

Imaging Controls

2D (B-mode)

Imaging starts in 2D.

To return to imaging with 2D alone after you have been using it in combination with other modes, press the **B-Mode** key on the keyboard or double-click on the 2D tab.

Overall Gain:

- Adjust gain by *turning* the **B-Mode** key on the keyboard (when the image is not frozen).

Different gain at different image depths: adjusting the TGC curve:

- Move the **TGC** sliders to the right or left to adjust the TGC curve (differential gain).

  The shape of the TGC curve is temporarily displayed to the right of the image as a curved vertical line.

Split Screen

Linked Dual is enabled as a default setting for all Exam Types. During split screen imaging, the Linked Dual function automatically transfers screen-A image parameters to screen-b (and vice versa). Color and power mode can be in only one screen.

To use split screen:

1   Click **Dual**. Or press the **Split** ⬡ key.

2   Click **Dual Layout** and select **Side By Side or Top/Bottom**.

To select one of the views:

• Click in the view you want to select (or press the **Split** key).

To remove a split:

Click **Dual**. Or long press the **Split** key.

To Change Imaging Planes

If you are using a transducer with more than one plane, you can select the imaging plane (**T** for transverse or **S** for sagittal). The current imaging plane (**T** or **S**) is displayed at the top of the monitor next to the transducer name.

To select the imaging plane:

• Press the appropriate button on the transducer. For details, see the user guide for the transducer.

or

• Press the **Scanning Plane** ⬡ key.

NOTE: *When you change image orientation U/D, you may need to adjust the TGC settings for the 2D image. See "TGC" on page 71.*

Annotations – Labels, Bodymarks, and Arrows

Labels, bodymarks, and arrows are activated from the **Labels** and **Bodymarks** tabs to the left of the workspace.

Labels

Figure 14-2. Label selector

To select a label:

1 In the workspace, click **Labels**. The Labels selector window opens.

2 From the drop-down menu, select the relevant label package. The displayed labels will reflect the selected package.

3 Click on the arrow in the right of the label selector to see all labels.

4 Select the label by clicking it.

5 Use the trackball to move the label and then click when it is in the correct position.

You can select where labels show up on the screen per default. Click ***Set Home*** *when you have placed your label. The next label you click will show up in the same place*

Opposed labels are linked. This means that if you have selected **Right** and afterwards click **Left**, the label name will change to left. Linked labels are on the same background..

Type and edit your own labels on screen:

1 Type the text you want for the label.

You can move the label while you are typing it.

2 Click to accept the label text and position.

To move or edit a label:

1 To move a label that is on the image, click the label to select it, and use the trackball to move it.

2 To edit a label on the image, click the label. (Label turns green).

You can only edit your own labels.

3 Use backspace to move through the label and edit it.

To remove a label:

• Long click the label you want to remove (point at it and press the **Select** key for more than 1 second).

To remove all labels from an image:

• Click on **Clear All Labels** in the workspace.

Bodymarks

Figure 14-3. Bodymark selector

To place a bodymark on the image:

1   In the workspace, click **Bodymarks**. The Bodymarks selector window opens.

2   From the drop-down menu, select the relevant bodymark package. The displayed bodymarks will reflect the selected package.

3   Click to select the bodymark you want. (If you do not see the one you want, click the arrows to see more pages with bodymarks.This only works if there are more) The bodymark appears on the monitor with a highlighted imaging plane indicator.

4   Drag the imaging plane indicator to position it; and use the + and - keys to rotate it. Click when the imaging plane indicator is in the correct position.

5   Use the trackball to select and move the label and then click when it is in the correct position.

To move a bodymark:

1   Click the **Move** button. A green frame appears around the bodymark.

2   Drag it to the position you want, and click again.

To replace a bodymark:

To replace an existing bodymark with a different one, click the new bodymark. The new bodymark will appear in the default position.

To delete a bodymark from the monitor:

•   Click the **Delete** button.

Unless you delete it or replace it with a new one, a bodymark will remain on the monitor until you change Preset or begin to image a new patient.

Adjusting the Imaging Plane Indicator

To adjust the imaging plane indicator:

When you place a bodymark on the image, the imaging plane indicator is green and can be adjusted as follows:

1   Drag the imaging plane indicator with the trackball.

2   Rotate left or right by using the + and - keys.

3   Click again when the imaging plane indicator is the way you want it.

The imaging plane indicator turns orange and can be adjusted by pressing ↻or ↺ buttons.

Arrows

You can place arrows on the image to mark area of special concern or interest.

To place an arrow on the image:

1   Click the **Labels** tab.

2   Click the **Arrows** button and select the arrow you want. The arrow appears highlighted on the monitor.

3 Drag the arrow to the position you want, and click again.

4 You can add another arrow by selecting it.

To delete an arrow, click **Delete**. To delete all arrows from the image, click **Clear All**.

Measurements and Calculations

Measurements are generic measurements that you can do on any region of interest. Calculations are predefined measurements intended for measuring organs or ROIs within a particular preset.

For detailed instructions about using the measuring tools, see "Making Measurements" on page 47.

Calculating Volumes

Organ volumes can be calculated in several ways. For the formulas used for each of these calculations, and information about their accuracy, see the *Technical Data (BZ2100)*.

NOTE: *A volume calculation based on a measured ellipse is critically dependent on the axis of rotation that you choose. See page 52.*

Planimetry (Contouring)

For this method, you record several parallel B-mode images that cover the organ to be measured. On each image, you draw a curve that traces the outline of the structure, thereby creating a set of parallel section measurements of the structure.

These parallel sections (the outline measurements) are used to estimate the volume of the structure based on several equally spaced slices.

The accuracy of this method depends on starting the measurements in the correct place. Start at one end of the organ, where the image shows an area of as close to 0 as possible. After each step, trace the outline of the structure on the image. The system calculates the volume of the structure between the starting point and each new image (see Fig 14-4). This is continued until the whole organ has been covered and a total volume obtained.
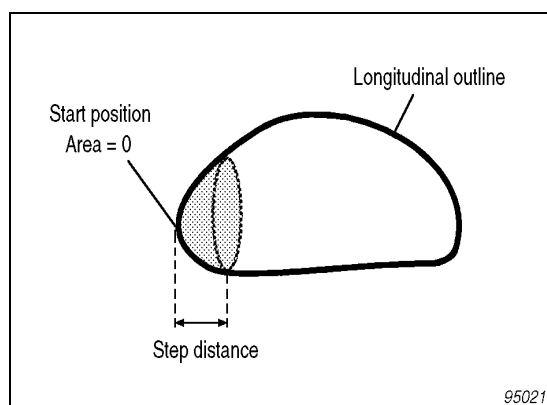
Figure 14-4. Longitudinal outline of organ showing the start position for planimetry.

Different stepping units to control the spacing between the sections are available for use with different transducers.

To use this method to calculate the volume of a particular organ, use the Planimetry (Ellipse) or Planimetry (Freehand) measurements in the submenu for that organ volume. The planimetry method is only available for the prostate and adenoma.

To make a planimetry calculation:

1 Record a 2D image at the far end of the organ.

2 Move the transducer back one step.

3 Freeze the image.

4 In the **Calculations** tab, click **Planimetry (Freehand)**.

5 Draw to outline the prostate.

6 Draw an outline around any other structures of interest, such as the rectal wall or urethra.

7 Unfreeze the image.

8 Repeat steps 2 through 6 until you have covered the entire organ. The step numbers and measurements will be registered on the monitor.

The prostate volume is displayed (updated after each measurement is drawn) to the left of the image.

PSAD measurements:

The PSAD (Prostate Specific Antigen Density) will be calculated after the PSA has been entered and prostate volume has been measured.

To erase measurements:

1 Hover cursor to the left of the measurement name, for example "Prostate".

Trash can icon appears.

2 Click trash can icon to erase measurement.

Performing a Biopsy or Puncture Procedure (including Brachytherapy)

NOTE: *It is important to verify that you are using the correct puncture guide. The number of the guide is displayed at the top of the image. Make sure the number corresponds to the guide you are using. If it does not, click the number on the monitor to select the proper needle guide.*

When you use a transducer (such as the E14CL4b for brachytherapy), a brachytherapy needle guide matrix (brachy matrix) is superimposed on the image.

To superimpose a brachy matrix on an ultrasound image:

• Press the **Puncture Guide** key.

The default brachy matrix appears.

To set a different brachy matrix to be the default:

• After you have selected the brachy matrix you want (and made any other setup changes you want), save your settings as a new preset. Specify that you want the new setup to be your default. See "Saving a New Preset" on page 153.

To select a different needle guide or brachy matrix:

- Click the **Needle Guide** button on the **Image** tab and select the new needle guide number or brachy matrix name.

To highlight the dot on a brachy matrix where you expect to see the needle:

- Click one of the dots on the brachy matrix.

  A green square appears in its place.

- To highlight a different dot, click it. The previously highlighted dot returns to normal and the new one is highlighted.

To remove the brachy matrix from the monitor:

- Click the **Biopsy** button or press the **Puncture Guide** key.

Programmable Needle Guide

If you are using a programmable needle guide, you can change the setup to move it to the left or right or in or out.

Brachy Ruler with Sagittal Plane Imaging

You can set up the system so that a brachy ruler is displayed when you image in the sagittal plane with the E14CL4b transducer, in situations where a brachy matrix appears in the transverse imaging view.
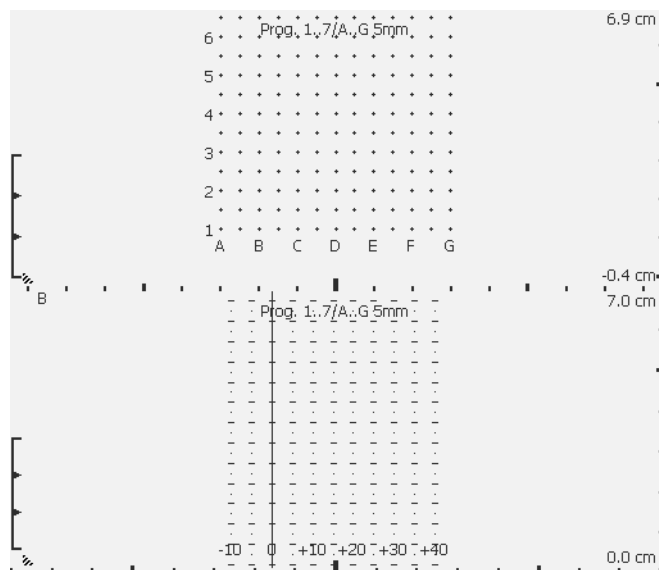
Figure 14-5. A split-screen view with transverse brachy matrix above and sagittal brachy ruler below. Ruler has vertical line to mark 0.

The sagittal brachy ruler is sometimes displayed with a 2-dimensional grid, to make it easier for you to see the horizontal position of the needle no matter where it is in the vertical direction.

To move the ruler to the left or right:

1 Open the Needle Guide setting as described in "Matrix Alignment and Calibration" on page 274.

2   Click on the dropdown menu for **Move left/right** and select the preferred value.

3   Check **Display ruler on sagittal views.**

The vertical line disappears and the ruler markers appear in their new positions.

NOTE: *By checking **Display vertical line with sagittal ruler**, you can set up the system so that a vertical 0 line is always visible, along with the markers as shown in Fig 14-5.*

User-Definable Brachy Matrix and Ruler

You can also define your own brachy matrix and ruler. See "User-Defined Matrices (including Brachy and Transperineal)" on page 270.

Using Reports

Making a report:

When you have finished making measurements and selecting assessments, add any images you want in the report:

1   On the **Review** tab, click **Report**.

2   Click the Images tab.

3   Select the images you want to include in the report by clicking on them.

4   Comments put in **Patient** and **Comments** appear in the report.

Printing a report:

- Click Print to print the report on the report printer (See "Printers Tab" on page 278) before saving it.

Saving a report as images:

1   Click **Store Report Image.** The report is stored as DICOM images, and you can see and print them by clicking **Review.**

Capturing and Documenting Images

Cine Review

To use cine review:

1   Freeze image.

2   Turn **B-Mode** key to scroll back through imaging.

or

Click the **Cine tab on th**e left side of the workspace and use the controls shown.

Capturing Images

Capturing Frozen Images

Saving (capturing) images to system hard disk:
1   Freeze the image.
2   Press the **Capture** key.
    Thumbnail of saved image appears at bottom of monitor above workspace.

Capturing Clips (Unfrozen Images)

To capture clips:
1   Press **Capture** to start recording.
2   Press **Capture** again to stop recording.
    Thumbnail of image appears at bottom of monitor above workspace.

Copying and Archiving

Copying or Archiving Images and Clips

To copy or archive images and clips:
1   In the **Review** window, select thumbnail images. Use the buttons **Multiselect** and **Select All** if required.
2   Click **Export** and select where to export the images.

Printing Images

Printing Images Displayed on the Monitor

•   Press the **Print** key on the keyboard.

Printing from Thumbnail Images

You must open the images in order to print them.

To open a thumbnail image and then print it:
1   Click the Review tab.
2   Select the image you want to print.
3   Press the **Print** key.

Customization Example

Saving a New Preset

When you have changed the setup, you can save it as a new preset.

To save a preset:

1 Click the **Review** tab and then click either Review or Report.

2 Click on the **Preset** tab and click on Save Preset.

The **Save Preset** window appears.

Figure 14-6. The Save Preset window.

3 Enter a name for the preset and select the options you want from the drop-down menus.

4 Click **Save**.

Default Exam Types and Presets

You can change the default Exam Type and preset for a transducer. When creating a new preset as in"Saving a New Preset" above, click the toggle button **Make this Preset the default for this transducer**.

Links to Additional Information

For more information about different topics, you may want to refer to the following chapters:

- Layout of controls on the monitor and how to use the workflow tabs (Chapter 2, "The User Interface").

- Names of screen controls and what they do (Chapter 3, "Controls on the Monitor")

- Working with images (Chapter 4, "Working with the Image").

- Making measurements (Chapter 5, "Making Measurements").

- Documenting the image and results (Chapter 6, "Documentation").

- Using different imaging modes (Chapter 7, "Imaging Modes").

- List of all measurement abbreviations with full name (Appendix B, "Measurement Abbreviations").

- Setting up and Customizing the System (including creating custom keys on the keyboard) (Appendix C, "Setting Up and Customizing Your System").

The tables and formulas that the system uses for calculations are in the *Technical Data (BZ2100)*.

Chapter 15
OB and GYN Chapter

This chapter contains information useful for basic obstetrical, gynecological, and pelvic floor imaging.

Important:

Please see *Getting Started with bk3000 & bk5000* for basic controls.

See Chapter 18, "3D Imaging" for using 3D.

Read transducer user guides for more information before doing biopsies.

Read *Care and Cleaning* for sterilization instructions.

Read *bk3000 & bk5000 User Guide* before system use.

Contents

- Setting up the Patient – Patient ID
- Presets
- Imaging Controls
- Annotations – Labels, Bodymarks, and Arrows
- Measurements and Calculations
- Using Reports
- Capturing and Documenting Images
- Customization Examples
- Links to Additional Information

Setting up the Patient – Patient ID

You must have a patient ID in order to save images.

1 Press **Patient** on keyboard or click **Enter Patient** on the monitor.

2 Enter data in the **Patient Details** window. Typing in the LMP (last menstrual period) for the exam type **OB** will calculate the expected date of confinement.

Figure 15-1. Exam Setup window with LMP

3   If it is already known that there is more than one fetus, select the number of fetuses.

Figure 15-2. Exam Setup window with number of fetuses

4   Click **Next** (below the **Patient Details** window).

Presets

Once you have selected your transducer, click **Preset** and select the appropriate **Exam Type** and **Preset.** These will vary with each transducer.

Figure 15-3. Preset window for GYN or OB Transducer

Gestational Age and Expected Date of Confinement

You can calculate the gestational age (GA) and expected date of confinement (EDC) from measurements on the ultrasound image, or from clinical parameters such as date of last menstrual period. You can also use the results of an earlier examination.

Imaging Controls

2D (B-mode)

Imaging starts in 2D.

To return to imaging with 2D alone after you have been using it in combination with other modes, press the **B-Mode** key on the keyboard or double-click on the 2D tab.

Overall Gain:

- Adjust gain by *turning* the **B-Mode** key on the keyboard (when the image is not frozen).

Different gain at different image depths: adjusting the TGC curve:

- Move the **TGC** sliders to the right or left to adjust the TGC curve (differential gain).

    The shape of the TGC curve is temporarily displayed to the right of the image as a curved vertical line.

Split Screen

Linked Dual is enabled as a default setting for all Exam Types. During split screen imaging, the Linked Dual function automatically transfers screen-A image parameters to screen-b (and vice versa). Color and power mode can be in only one screen.

To use split screen:
1. Click **Dual**. Or press the **Split** key.
2. Click **Dual Layout** and select **Side By Side or Top/Bottom**.

To select one of the views:

- Click in the view you want to select (or press the **Split** key).

To remove a split:
    Click **Dual**. Or long press the **Split** key.

Color Mode (CFM)

To use Color mode:
1. Press **Color Mode** key on keyboard, or click **Color** tab on monitor.
    Color box is active (green color) and can be moved with trackball.
2. To resize the color box and keep the default shape, use the **+ /-** key.

3   To decrease the color box width, click to deactivate the size cursor, then click on a corner of the box and drag the corner.

4   Click when you are finished changing the color box.

Scale:

•   Change PRF with the **Scale** keyboard key or **Scale** screen button.

Doppler Mode

To use Doppler mode:

1   Press **Doppler Mode** key on keyboard, or click **PW** tab on monitor.

Doppler sample gate is active (green). Move with trackball.

2   Adjust size of Doppler gate with the **+/-** key

3   Adjust gain by turning **Doppler Mode** key.

4   Press the **Doppler Angle** key to activate the Doppler angle control, then adjust the angle with the **+/-** key or trackball.

5   To adjust volume, PRF, baseline, sweep speed, use keys on keyboard or click **Advanced** on the **Doppler** tab to use screen controls.

Auto Control of Baseline and Scale

Click **Auto** to have the system adjust baseline and scale (PRF) automatically. The adjustment requires a few vascular cycles before the adjustment is complete.

Biopsy

NOTE: *Before you perform any puncture procedure, including brachytherapy, make sure you have read the warnings in the Puncture and Brachytherapy section of the Safety chapter in the bk3000 & bk5000 User Guide.*

To display a puncture line on the image for biopsy guidance:

Press the **Biopsy** key on the keyboard: or click **Biopsy** on the **Image** tab.

Remember to check that you are using the correct needle guide. The number of the needle guide is displayed on the monitor. Make sure the number corresponds to the guide you are using.

For better needle visualization see "Needle Enhancement" on page 78.

NOTE: *If the image depth is set very low (to see tissue close to the transducer with high magnification), the needle tip echo can be outside the displayed image area. To see the needle tip in this case, zoom out so the full needle path is visible or pan the image to the side (to keep the high magnification).*

Annotations – Labels, Bodymarks, and Arrows

Labels, bodymarks, and arrows are activated from the **Labels** and **Bodymarks** tabs to the left of the workspace.

Labels

Figure 15-4. Label selector

To select a label:

1 In the workspace, click **Labels**. The Labels selector window opens.

2 From the drop-down menu, select the relevant label package. The displayed labels will reflect the selected package.

3 Click on the arrow in the right of the label selector to see all labels.

4 Select the label by clicking it.

5 Use the trackball to move the label and then click when it is in the correct position.

*You can select where labels show up on the screen per default. Click **Set Home** when you have placed your label. The next label you click will show up in the same place*

Opposed labels are linked. This means that if you have selected **Right** and afterwards click **Left**, the label name will change to left. Linked labels are on the same background..

Type and edit your own labels on screen:

1 Type the text you want for the label.

You can move the label while you are typing it.

2 Click to accept the label text and position.

To move or edit a label:

1 To move a label that is on the image, click the label to select it, and use the trackball to move it.

2 To edit a label on the image, click the label. (Label turns green).

You can only edit your own labels.

3 Use backspace to move through the label and edit it.

To remove a label:

• Long click the label you want to remove (point at it and press the **Select** key for more than 1 second).

To remove all labels from an image:

• Click on **Clear All Labels** in the workspace.

Bodymarks

Figure 15-5. Bodymark selector

To place a bodymark on the image:

1   In the workspace, click **Bodymarks**. The Bodymarks selector window opens.

2   From the drop-down menu, select the relevant bodymark package. The displayed bodymarks will reflect the selected package.

3   Click to select the bodymark you want. (If you do not see the one you want, click the arrows to see more pages with bodymarks.This only works if there are more) The bodymark appears on the monitor with a highlighted imaging plane indicator.

4   Drag the imaging plane indicator to position it; and use the + and - keys to rotate it. Click when the imaging plane indicator is in the correct position.

5   Use the trackball to select and move the label and then click when it is in the correct position.

To move a bodymark:

1   Click the **Move** button. A green frame appears around the bodymark.

2   Drag it to the position you want, and click again.

To replace a bodymark:

To replace an existing bodymark with a different one, click the new bodymark. The new bodymark will appear in the default position.

To delete a bodymark from the monitor:

•   Click the **Delete** button.

Unless you delete it or replace it with a new one, a bodymark will remain on the monitor until you change Preset or begin to image a new patient.

Adjusting the Imaging Plane Indicator

To adjust the imaging plane indicator:

When you place a bodymark on the image, the imaging plane indicator is green and can be adjusted as follows:

1   Drag the imaging plane indicator with the trackball.

2   Rotate left or right by using the + and - keys.

3   Click again when the imaging plane indicator is the way you want it.

The imaging plane indicator turns orange and can be adjusted by pressing ⟳ or ⟳ buttons.

Arrows

You can place arrows on the image to mark area of special concern or interest.

To place an arrow on the image:

1 Click the **Labels** tab.

2 Click the **Arrows** button and select the arrow you want. The arrow appears highlighted on the monitor.

3 Drag the arrow to the position you want, and click again.

4 You can add another arrow by selecting it.

To delete an arrow, click **Delete**. To delete all arrows from the image, click **Clear All**.

Measurements and Calculations

Measurements are generic measurements that you can do on any region of interest. Calculations are predefined measurements intended for measuring organs or ROIs within a particular preset.

For detailed instructions about using the 3D measuring tools, see Chapter 18, "3D Imaging" on page 203.

For detailed instructions about using the 2D measuring tools, see "Making Measurements" on page 47.

Nuchal Translucency

Nuchal translucency measurements require special training. See the caution in the measurements section of the Safety chapter in the *bk3000 & bk5000 User Guide*.

Calculation Methods - GYN

Follicle Diameter Measurements

By default, you can calculate the average diameter of a follicle using two diameters.
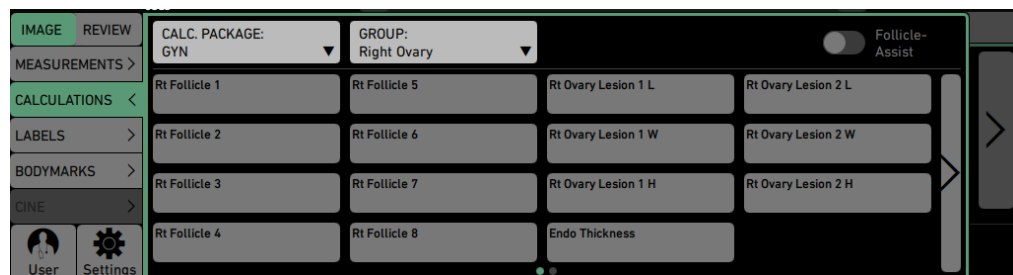
Figure 15-6. Ovary calculations.

To make a follicle calculation:

1   Click **Calculations**.

2   In the **GYN** calculation package, select **Right** (or **Left**) **Ovary** on the **Group** dropdown menu.

3   Click **Rt Follicle 1** (2,3..)
    A caliper appears on the image.

4   Drag the caliper to the widest distance of the follicle and click. Another caliper appears.

5   Drag the second caliper to the narrowest distance of the follicle and click.

The system calculates the average diameter and displays it in the measurement data on the monitor.

When you make a manual follicle calculation, the average diameter is displayed after Dist a and b.

Follicle-Assist

The Follicle-Assist calculation automatically sets two diameter measurements and calculates the average diameter of the follicle. You can adjust the calipers of these distance measurements as needed.

Figure 15-7. Follicle-Assist calculations.

To make a Follicle-Assist calculation:

1   Click **Calculations**.

2   In the **GYN** calculation package, select **Right** (or **Left**) **Ovary** on the **Group** dropdown menu.

3   Click **Follicle-Assist** and select a measurement.

4   Place the cursor in the center of a follicle and click.

The system measures the widest diameter, then measures the diameter in a 90 degree angle to the first, and calculates the average diameter.
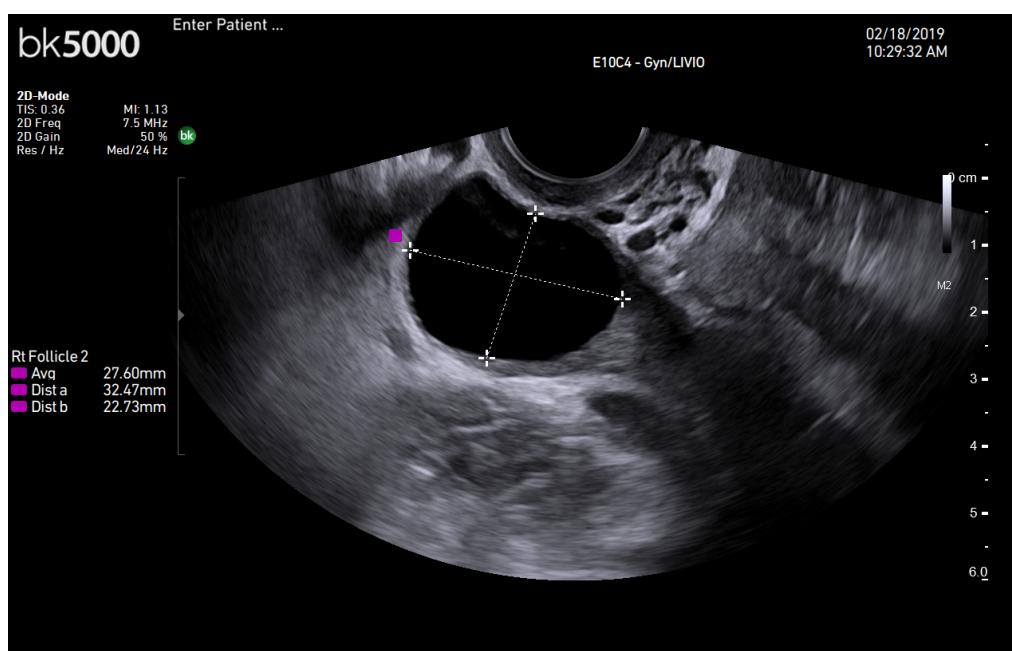
Figure 15-8. Follicle-Assist calculation. When you use the Follicle-Assist option, the average diameter is displayed before Dist a and b.

Calculation Methods - OB

General Information

This Exam Type contains measuring tools that can be used to calculate gestational age (GA), fetal weight (FW), and expected date of confinement (EDC). The calculations are based on measurements of the ultrasound image such as biparietal diameter (BPD) or abdominal circumference (AC).

Unless otherwise noted, in this chapter GA is expressed in days, FW in grams (g) and distances are in millimeters (mm).

Obstetrics Reports

Obstetrics reports contains the results of clinical calculations of GA and EDC, as well as calculations based on measurements of the ultrasound image. For more information about editing, printing and saving reports, see "Using Reports" on page 178.

Curves in Reports

The report will include reference curves for the current calculations. The ultrasound measured and calculated GA is displayed as an 'x' placed within the three curves according to its relation to the clinical calculation. In the report below, there is only a discrepancy of 1 day between the clinical and the ultrasound calculation, so the 'x' is placed on the center curve. With a higher discrepancy between the calculations, the 'x' will be placed further away from the center curve.

NEW HOSPITAL

Patient Details

Name:	Patient ID:	Study Date:
DOE, JANE	20190306144612	03/06/2019

DOB:
03/22/1989

Age:
29 years

Exam Details

# Fetuses:	LMP:
1	11/10/2018

OB Summary

Clinical Age	16w4d	EDC	08/17/2019	LMP	11/10/2018
US Age	16w5d	US EDC	08/16/2019		

OB Measurements

Label	Value	GA		Growth
BPD:	3.48 cm	16w5d	+/- 1w1d	
		Hadlock		Hadlock

OB Graphs
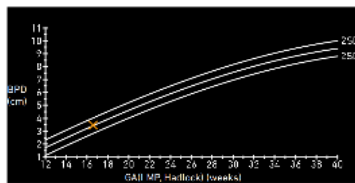
Figure 15-9. OB report with curve showing the calculated GA.

Measuring Several Fetuses

If there is more than one fetus, and this has not been entered in the **Patient Details**, you can select the number of fetuses on the **Fetuses** dropdown menu. When measuring, select which fetus you are measuring (A, B...) on the **Fetus** dropdown menu.

NOTE: *When you have selected e.g. Fetus A, make certain that you are measuring on the correct fetus.*

Figure 15-10. Measuring several fetuses.

Using Reports

Making a report:

When you have finished making measurements and selecting assessments, add any images you want in the report:

1 On the **Review** tab, click **Report**.

2 Click the Images tab.

3 Select the images you want to include in the report by clicking on them.

4 Comments put in **Patient** and **Comments** appear in the report.

Printing a report:

- Click Print to print the report on the report printer (See "Printers Tab" on page 278) before saving it.

Saving a report as images:

1 Click **Store Report Image.** The report is stored as DICOM images, and you can see and print them by clicking **Review.**

Capturing and Documenting Images

Cine Review

To use cine review:

1 Freeze image.

2 Turn **B-Mode** key to scroll back through imaging.

or

Click the **Cine tab on th**e left side of the workspace and use the controls shown.

Capturing Images

Capturing Frozen Images

Saving (capturing) images to system hard disk:

1 Freeze the image.

2 Press the **Capture** key.

Thumbnail of saved image appears at bottom of monitor above workspace.

Capturing Clips (Unfrozen Images)

To capture clips:

1 Press **Capture** to start recording.

2 Press **Capture** again to stop recording.

Thumbnail of image appears at bottom of monitor above workspace.

Copying and Archiving

Copying or Archiving Images and Clips

To copy or archive images and clips:
1   In the **Review** window, select thumbnail images. Use the buttons **Multiselect** and **Select All** if required.
2   Click **Export** and select where to export the images.

Printing Images

Printing Images Displayed on the Monitor

*   Press the **Print** key on the keyboard.

Printing from Thumbnail Images

You must open the images in order to print them.

To open a thumbnail image and then print it:
1   Click the Review tab.
2   Select the image you want to print.
3   Press the **Print** key.

Customization Example

Saving a New Preset

When you have changed the setup, you can save it as a new preset.

To save a preset:
1   Click the **Review** tab and then click either Review or Report.
2   Click on the **Preset** tab and click on Save Preset.
     The **Save Preset** window appears.

Figure 15-11. The Save Preset window.

3   Enter a name for the preset and select the options you want from the drop-down menus.

4   Click **Save**.

Default Exam Types and Presets

You can change the default Exam Type and preset for a transducer. When creating a new preset as in "Saving a New Preset" above, click the toggle button **Make this Preset the default for this transducer**.

Links to Additional Information

For more information about different topics, you may want to refer to the following chapters:

*   Layout of controls on the monitor and how to use the workflow tabs (Chapter 2, "The User Interface").
*   Names of screen controls and what they do (Chapter 3, "Controls on the Monitor")
*   Working with images (Chapter 4, "Working with the Image").
*   Making measurements (Chapter 5, "Making Measurements").
*   Documenting the image and results (Chapter 6, "Documentation").
*   Using different imaging modes (Chapter 7, "Imaging Modes").
*   List of all measurement abbreviations with full name (Appendix B, "Measurement Abbreviations").
*   Setting up and Customizing the System (including creating custom keys on the keyboard) (Appendix C, "Setting Up and Customizing Your System").

The tables and formulas that the system uses for calculations are in the *Technical Data (BZ2100)*.

Chapter 16
Surgery Chapter

This chapter is valid for bk5000 only.

This chapter contains information useful for basic surgery imaging, including colorectal, HPB, laparoscopic, and robotic imaging.

Important:

Read *Getting Started with bk3000 & bk5000* for basic controls.

Read transducer user guides for more information before doing biopsies.

Read *Care and Cleaning* for sterilization instructions.

Read *bk3000 & bk5000 User Guide* before system use.

Contents

- Setting up the Patient - Patient ID
- Presets
- Imaging Controls
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- Measurements and Calculations
- Using Reports
- Capturing and Documenting Images
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Setting up the Patient – Patient ID

You must have a patient ID in order to save images.

1   Press **Patient** on keyboard or click **Enter Patient** on the monitor.
2   Enter data in the **Patient Details** window.
3   Click **Next** (below the **Patient Details** window).

Presets

Once you have selected your transducer, click **Preset** and select the appropriate **Exam Type** and **Preset.** These will vary with each transducer.

Figure 16-1. Presets window for surgical transducer

Imaging Controls

2D (B-mode)

Imaging starts in 2D.

To return to imaging with 2D alone after you have been using it in combination with other modes, press the **B-Mode** key on the keyboard or double-click on the 2D tab.

Overall Gain:

• Adjust gain by *turning* the **B-Mode** key on the keyboard (when the image is not frozen).

Different gain at different image depths: adjusting the TGC curve:

• Move the **TGC** sliders to the right or left to adjust the TGC curve (differential gain).

The shape of the TGC curve is temporarily displayed to the right of the image as a curved vertical line.

Split Screen

Linked Dual is enabled as a default setting for all Exam Types. During split screen imaging, the Linked Dual function automatically transfers screen-A image parameters to screen-b (and vice versa). Color and power mode can be in only one screen.

To use split screen:

1   Click **Dual**. Or press the **Split** ⬚ key.

2   Click **Dual Layout** and select **Side By Side or Top/Bottom**.

To select one of the views:

- Click in the view you want to select (or press the **Split** key).

To remove a split:
   Click **Dual**. Or long press the **Split** key.

Biopsy

NOTE: *Before you perform any puncture procedure, including brachytherapy, make sure you have read the warnings in the Puncture and Brachytherapy section of the Safety chapter in the bk3000 & bk5000 User Guide.*

To display a puncture line on the image for biopsy guidance:

Press the **Biopsy** key on the keyboard: or click **Biopsy** on the **Image** tab.

Remember to check that you are using the correct needle guide. The number of the needle guide is displayed on the monitor. Make sure the number corresponds to the guide you are using.
For better needle visualization see "Needle Enhancement" on page 78.

NOTE: *If the image depth is set very low (to see tissue close to the transducer with high magnification), the needle tip echo can be outside the displayed image area. To see the needle tip in this case, zoom out so the full needle path is visible or pan the image to the side (to keep the high magnification).*

Color Mode (CFM)

To use Color mode:
1   Press **Color Mode** key on keyboard, or click **Color** tab on monitor.
   Color box is active (green color) and can be moved with trackball.
2   To resize the color box and keep the default shape, use the **+ /-** key.
3   To decrease the color box width, click to deactivate the size cursor, then click on a corner of the box and drag the corner.
4   Click when you are finished changing the color box.

Scale:

- Change PRF with the **Scale** keyboard key or **Scale** screen button.

Doppler Mode

To use Doppler mode:
1   Press **Doppler Mode** key on keyboard, or click **PW** tab on monitor.
   Doppler sample gate is active (green). Move with trackball.
2   Adjust size of Doppler gate with the **+/-** key
3   Adjust gain by turning **Doppler Mode** key.
4   Press the **Doppler Angle** key to activate the Doppler angle control, then adjust the angle with the **+/-** key or trackball.

5 To adjust volume, PRF, baseline, sweep speed, use keys on keyboard or click **Advanced** on the **Doppler** tab to use screen controls.

Auto Control of Baseline and Scale

Click **Auto** to have the system adjust baseline and scale (PRF) automatically. The adjustment requires a few vascular cycles before the adjustment is complete.

Elastography

See the section on Elastography in Chapter 7, "Imaging Modes" on page 81.

Annotations – Labels, Bodymarks, and Arrows

Labels, bodymarks, and arrows are activated from the **Labels** and **Bodymarks** tabs to the left of the workspace.
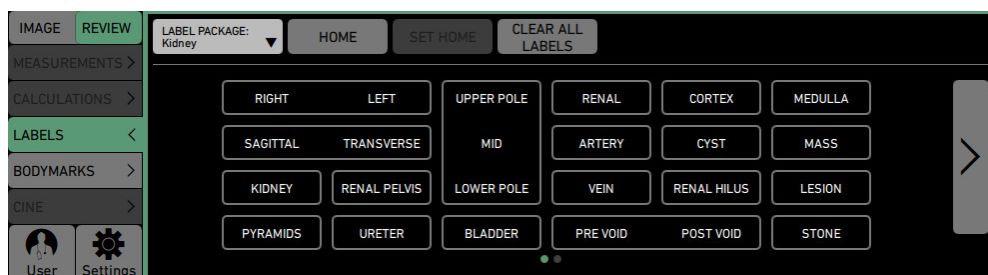
Labels

Figure 16-2. Label selector

To select a label:

1 In the workspace, click **Labels**. The Labels selector window opens.

2 From the drop-down menu, select the relevant label package. The displayed labels will reflect the selected package.

3 Click on the arrow in the right of the label selector to see all labels.

4 Select the label by clicking it.

5 Use the trackball to move the label and then click when it is in the correct position.

*You can select where labels show up on the screen per default. Click **Set Home** when you have placed your label. The next label you click will show up in the same place*

Opposed labels are linked. This means that if you have selected **Right** and afterwards click **Left**, the label name will change to left. Linked labels are on the same background..

Type and edit your own labels on screen:

1 Type the text you want for the label.

You can move the label while you are typing it.

2   Click to accept the label text and position.

To move or edit a label:

1   To move a label that is on the image, click the label to select it, and use the trackball to move it.

2   To edit a label on the image, click the label. (Label turns green).

You can only edit your own labels.

3   Use backspace to move through the label and edit it.

To remove a label:

•   Long click the label you want to remove (point at it and press the **Select** key for more than 1 second).

To remove all labels from an image:

•   Click on **Clear All Labels** in the workspace.

Bodymarks

Figure 16-3. Bodymark selector

To place a bodymark on the image:

1   In the workspace, click **Bodymarks**. The Bodymarks selector window opens.

2   From the drop-down menu, select the relevant bodymark package. The displayed bodymarks will reflect the selected package.

3   Click to select the bodymark you want. (If you do not see the one you want, click the arrows to see more pages with bodymarks.This only works if there are more) The bodymark appears on the monitor with a highlighted imaging plane indicator.

4   Drag the imaging plane indicator to position it; and use the + and - keys to rotate it. Click when the imaging plane indicator is in the correct position.

5   Use the trackball to select and move the label and then click when it is in the correct position.

To move a bodymark:

1   Click the **Move** button. A green frame appears around the bodymark.

2   Drag it to the position you want, and click again.

To replace a bodymark:

To replace an existing bodymark with a different one, click the new bodymark. The new bodymark will appear in the default position.

To delete a bodymark from the monitor:

• Click the **Delete** button.

Unless you delete it or replace it with a new one, a bodymark will remain on the monitor until you change Preset or begin to image a new patient.

Adjusting the Imaging Plane Indicator

To adjust the imaging plane indicator:

When you place a bodymark on the image, the imaging plane indicator is green and can be adjusted as follows:

1 Drag the imaging plane indicator with the trackball.

2 Rotate left or right by using the + and - keys.

3 Click again when the imaging plane indicator is the way you want it.

The imaging plane indicator turns orange and can be adjusted by pressing ↺ or ↻ buttons.

Arrows

You can place arrows on the image to mark area of special concern or interest.

To place an arrow on the image:

1 Click the **Labels** tab.

2 Click the **Arrows** button and select the arrow you want. The arrow appears highlighted on the monitor.

3 Drag the arrow to the position you want, and click again.

4 You can add another arrow by selecting it.

To delete an arrow, click **Delete**. To delete all arrows from the image, click **Clear All**.

Measurements and Calculations

Distance

To measure a distance:

1 Press the Measure key on the keyboard

or

Click on the **Measurements** tab, click distance.

A caliper appears on the image.

2 Drag the caliper to the position you want and click.

Another caliper appears.

3   Drag the second caliper to the position you want and click.

Measurement is displayed on the monitor to the left of the image.

4   For multiple measurements, repeat the steps.

Freehand Measurements – Area and Circumference

To measure the area and circumference:

1   Press the Measure key on the key board

or

Click on the Measurements tab, click **2D Trace**:

A caliper appears on the image.

2   Drag the caliper to where you want to start drawing. Click.

A drawing cursor appears where you clicked.

3   Drag it to draw the shape you want.

To delete backward from the cursor, press **-** on the **+/-** key. The cursor is automatically moved back. To undo the deletion, press **+**.

4   When you have finished drawing, click the drawing cursor.

The shape is automatically closed by a straight line from the drawing caliper to the first caliper (starting point).

Area and circumference are automatically calculated and displayed to the left of the image.

Volume

When you calculate volume using this method, the height, width, and length measurements must all be made at right angles to each other. Therefore, you must use 2 images to measure volume.

To calculate a volume:

1   Press the Measure key on the key board

or

Click on the Measurements tab, click **Volume**:

A caliper appears on the image.

2   Position the first caliper and click. Another caliper appears.

3   Position the second caliper and click. Another caliper appears.

4   Position the third caliper and click.

5   When you have finished measuring, the volume calculation appears automatically to the left of the image.

Using Reports

Making a report:

When you have finished making measurements and selecting assessments, add any images you want in the report:

1 On the **Review** tab, click **Report**.

2 Click the Images tab.

3 Select the images you want to include in the report by clicking on them.

4 Comments put in **Patient** and **Comments** appear in the report.

Printing a report:

- Click Print to print the report on the report printer (See "Printers Tab" on page 278) before saving it.

Saving a report as images:

1 Click **Store Report Image.** The report is stored as DICOM images, and you can see and print them by clicking **Review.**

Capturing and Documenting Images

Cine Review

To use cine review:

1 Freeze image.

2 Turn **B-Mode** key to scroll back through imaging.

or

Click the **Cine tab on th**e left side of the workspace and use the controls shown.

Capturing Images

Capturing Frozen Images

Saving (capturing) images to system hard disk:

1 Freeze the image.

2 Press the **Capture** key.

Thumbnail of saved image appears at bottom of monitor above workspace.

Capturing Clips (Unfrozen Images)

To capture clips:

1 Press **Capture** to start recording.

2 Press **Capture** again to stop recording.

Thumbnail of image appears at bottom of monitor above workspace.

Copying and Archiving

Copying or Archiving Images and Clips

To copy or archive images and clips:

1   In the **Review** window, select thumbnail images. Use the buttons **Multiselect** and **Select All** if required.

2   Click **Export** and select where to export the images.

Printing Images

Printing Images Displayed on the Monitor

- Press the **Print** key on the keyboard.

Printing from Thumbnail Images

You must open the images in order to print them.

To open a thumbnail image and then print it:

1   Click the Review tab.

2   Select the image you want to print.

3   Press the **Print** key.

Customization Example

Saving a New Preset

When you have changed the setup, you can save it as a new preset.

To save a preset:

1   Click the **Review** tab and then click either Review or Report.

2   Click on the **Preset** tab and click on Save Preset.
     The **Save Preset** window appears.

Figure 16-4. The Save Preset window.

3　Enter a name for the preset and select the options you want from the drop-down menus.

4　Click **Save**.

Default Exam Types and Presets

You can change the default Exam Type and preset for a transducer. When creating a new preset as in"Saving a New Preset" above, click the toggle button **Make this Preset the default for this transducer**.

Links to Additional Information

Before reading about the Pro Packages, you should already be familiar with the system, but for more information about different topics, you may want to refer to the following chapters:

- Layout of controls on the monitor and how to use the workflow tabs (Chapter 2, "The User Interface")

- Names of screen controls and what they do (Chapter 3, "Controls on the Monitor")

- Working with images (Chapter 4, "Working with the Image")

- Making measurements (Chapter 5, "Making Measurements")

- Documenting the image and results (Chapter 6, "Documentation")

- Using different imaging modes (Chapter 7, "Imaging Modes")

- List of all measurement abbreviations with full name (Appendix B, "Measurement Abbreviations")

The tables and formulas that the system uses for calculations are in the *Technical Data (BZ2100)*

Chapter 17
Neurosurgery Chapter

This chapter is valid for bk5000 only.

This Exam Type contains information useful for basic brain imaging including:

- Burr-hole imaging (N11C5s transducer)
- Craniotomy imaging (N13C5 transducer)
- Spinal Cord imaging (X18L5s transducer[1]) - see "Spinal Cord Exam Type" on page 200.
- Imaging with Brainlab Cranial Navigation systems.

Important:

Please see *Getting Started with bk3000 & bk5000* for basic controls.

Read transducer user guides for more information before doing biopsies.

Read *Care and Cleaning* for sterilization instructions.

Read *bk3000 & bk5000 User Guide* before system use.

Contents

- Setting up the Patient – Patient ID
- Presets
- Imaging Controls
- Annotations – Labels, Bodymarks, and Arrows
- Measurements and Calculations
- Using Reports
- Capturing and Documenting Images
- Customization Examples
- Links to Additional Information

Setting up the Patient – Patient ID

You must have a patient ID in order to save images.

1 Press **Patient** on keyboard or click **Enter Patient** on the monitor.
2 Enter data in the **Patient Details** window.
3 Click **Next** (below the **Patient Details** window).

Presets

Once you have selected your transducer, click the **Neuro Exam Type** and select the appropriate preset. This will vary with each transducer.

1. USA only.
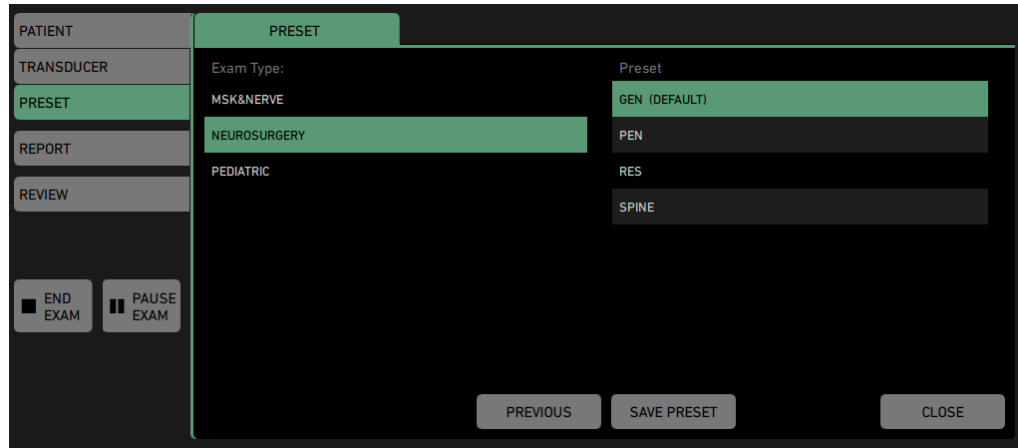
Figure 17-1. Preset window for Neuro transducer

Imaging Controls

2D (B-mode)

Imaging starts in 2D.

To return to imaging with 2D alone after you have been using it in combination with other modes, press the **B-Mode** key on the keyboard or double-click on the 2D tab.

Overall Gain:

• Adjust gain by *turning* the **B-Mode** key on the keyboard (when the image is not frozen).

Different gain at different image depths: adjusting the TGC curve:

• Move the **TGC** sliders to the right or left to adjust the TGC curve (differential gain).

The shape of the TGC curve is temporarily displayed to the right of the image as a curved vertical line.

Split Screen

Linked Dual is enabled as a default setting for all Exam Types. During split screen imaging, the Linked Dual function automatically transfers screen-A image parameters to screen-b (and vice versa). Color and power mode can be in only one screen.

To use split screen:

1 Click **Dual**. Or press the **Split** key.

2 Click **Dual Layout** and select **Side By Side or Top/Bottom**.

To select one of the views:

• Click in the view you want to select (or press the **Split** key).

To remove a split:

Click **Dual**. Or long press the **Split** key.

Biopsy

NOTE: *Before you perform any puncture procedure, including brachytherapy, make sure you have read the warnings in the Puncture and Brachytherapy section of the Safety chapter in the bk3000 & bk5000 User Guide.*

To display a puncture line on the image for biopsy guidance:

Press the **Biopsy** key on the keyboard: or click **Biopsy** on the **Image** tab.

Remember to check that you are using the correct needle guide. The number of the needle guide is displayed on the monitor. Make sure the number corresponds to the guide you are using.
For better needle visualization see "Needle Enhancement" on page 78.

NOTE: *If the image depth is set very low (to see tissue close to the transducer with high magnification), the needle tip echo can be outside the displayed image area. To see the needle tip in this case, zoom out so the full needle path is visible or pan the image to the side (to keep the high magnification).*

Color Mode (CFM)

To use Color mode:

1   Press **Color Mode** key on keyboard, or click **Color** tab on monitor.
    Color box is active (green color) and can be moved with trackball.

2   To resize the color box and keep the default shape, use the **+ /-** key.

3   To decrease the color box width, click to deactivate the size cursor, then click on a corner of the box and drag the corner.

4   Click when you are finished changing the color box.

Scale:

•   Change PRF with the **Scale** keyboard key or **Scale** screen button.

Doppler Mode

To use Doppler mode:

1   Press **Doppler Mode** key on keyboard, or click **PW** tab on monitor.
    Doppler sample gate is active (green). Move with trackball.

2   Adjust size of Doppler gate with the **+/-** key

3   Adjust gain by turning **Doppler Mode** key.

4   Press the **Doppler Angle** key to activate the Doppler angle control, then adjust the angle with the **+/-** key or trackball.

5   To adjust volume, PRF, baseline, sweep speed, use keys on keyboard or click **Advanced** on the **Doppler** tab to use screen controls.

Auto Control of Baseline and Scale

Click **Auto** to have the system adjust baseline and scale (PRF) automatically. The adjustment requires a few vascular cycles before the adjustment is complete.

Elastography

See the section on Elastography in Chapter 7, "Imaging Modes" on page 81.

Measurements and Calculations

Distance

To measure a distance:

1   Press the Measure key on the keyboard

     or

     Click on the **Measurements** tab, click distance.

     A caliper appears on the image.

2   Drag the caliper to the position you want and click.

     Another caliper appears.

3   Drag the second caliper to the position you want and click.

     Measurement is displayed on the monitor to the left of the image.

4   For multiple measurements, repeat the steps.

Freehand Measurements – Area and Circumference

To measure the area and circumference:

1   Press the Measure key on the key board

     or

     Click on the Measurements tab, click **2D Trace**:

     A caliper appears on the image.

2   Drag the caliper to where you want to start drawing. Click.

     A drawing cursor appears where you clicked.

3   Drag it to draw the shape you want.

     To delete backward from the cursor, press **-** on the **+/-** key. The cursor is automatically moved back. To undo the deletion, press **+**.

4   When you have finished drawing, click the drawing cursor.

     The shape is automatically closed by a straight line from the drawing caliper to the first caliper (starting point).

     Area and circumference are automatically calculated and displayed to the left of the image.

Volume

When you calculate volume using this method, the height, width, and length measurements must all be made at right angles to each other. Therefore, you must use 2 images to measure volume.

To calculate a volume:

1 Press the Measure key on the key board

or

Click on the Measurements tab, click **Volume**:

A caliper appears on the image.

2 Position the first caliper and click. Another caliper appears.

3 Position the second caliper and click. Another caliper appears.

4 Position the third caliper and click.

5 When you have finished measuring, the volume calculation appears automatically to the left of the image.

Using Reports

Making a report:

When you have finished making measurements and selecting assessments, add any images you want in the report:

1 On the **Review** tab, click **Report**.

2 Click the Images tab.

3 Select the images you want to include in the report by clicking on them.

4 Comments put in **Patient** and **Comments** appear in the report.

Printing a report:

- Click Print to print the report on the report printer (See "Printers Tab" on page 278) before saving it.

Saving a report as images:

1 Click **Store Report Image.** The report is stored as DICOM images, and you can see and print them by clicking **Review.**

Capturing and Documenting Images

Cine Review

To use cine review:

1 Freeze image.

2 Turn **B-Mode** key to scroll back through imaging.

or

Click the **Cine tab on th**e left side of the workspace and use the controls shown.

Capturing Images

Capturing Frozen Images

Saving (capturing) images to system hard disk:

1 Freeze the image.

2 Press the **Capture** key.

Thumbnail of saved image appears at bottom of monitor above workspace.

Capturing Clips (Unfrozen Images)

To capture clips:

1 Press **Capture** to start recording.

2 Press **Capture** again to stop recording.

Thumbnail of image appears at bottom of monitor above workspace.

Copying and Archiving

Copying or Archiving Images and Clips

To copy or archive images and clips:

1 In the **Review** window, select thumbnail images. Use the buttons **Multiselect** and **Select All** if required.

2 Click **Export** and select where to export the images.

Printing Images

Printing Images Displayed on the Monitor

- Press the **Print** key on the keyboard.

Printing from Thumbnail Images

You must open the images in order to print them.

To open a thumbnail image and then print it:

1 Click the Review tab.

2 Select the image you want to print.

3 Press the **Print** key.

Customization Example

Saving a New Preset

When you have changed the setup, you can save it as a new preset.

To save a preset:

1   Click the **Review** tab and then click either Review or Report.

2   Click on the **Preset** tab and click on Save Preset.

     The **Save Preset** window appears.

Figure 17-2. The Save Preset window.

3   Enter a name for the preset and select the options you want from the drop-down menus.

4   Click **Save**.

Default Exam Types and Presets

You can change the default Exam Type and preset for a transducer. When creating a new preset as in"Saving a New Preset" above, click the toggle button **Make this Preset the default for this transducer**.

Imaging with Brainlab

Brainlab combined with intraoperative ultrasound is an enhanced navigation system for brain surgery.

Three Brainlab navigation systems can be used with the bk5000: Curve, Kick, and Buzz.

Contact with the Company

Contact your Brainlab representative, who can help you with the setup.

Installation and Setup

For installation and connection, see the Setup Guide *IG36483* on web.bkmed.dk.

During surgery, the transducer is in a special support bracket (the transducer adapter).

Figure 17-3. The Brainlab N11C5s/N13C5 transducer adapter.

Test the Established Connections

Make sure that the connection works, by confirming that the Brainlab system can see the input from the bk5000.

Spinal Cord Exam Type[1]

This Exam Type is used with the X18L5s transducer. License dependent.

Links to Additional Information

Before reading about the Exam Types, you should already be familiar with the system, but for more information about different topics, you may want to refer to the following chapters:

- Layout of controls on the monitor and how to use the workflow tabs (Chapter 2, "The User Interface")
- Names of screen controls and what they do (Chapter 3, "Controls on the Monitor")
- Working with images (Chapter 4, "Working with the Image")
- Making measurements (Chapter 5, "Making Measurements")
- Documenting the image and results (Chapter 6, "Documentation")
- Using different imaging modes (Chapter 7, "Imaging Modes")
- List of all measurement abbreviations with full name (Appendix B, "Measurement Abbreviations")
- Setting up and Customizing the System (including creating custom keys on the keyboard) (Appendix C, "Setting Up and Customizing Your System")

The tables and formulas that the system uses for calculations are in the *Technical Data (BZ2100)*.

1. USA only.

Chapter 18
3D Imaging

Introduction to 3D Ultrasound

The basic concept of 3D ultrasound is to collect a data set of 2D ultrasound images (black & white or color) while tracking and storing the location of each individual 2D image. The data set is then reconstructed into a single 3D volume that can be displayed on the monitor and manipulated. The reconstructed 3D volume can be rotated, sliced, rendered, or displayed in multiplane cross-sections.

Before you perform any 3D imaging, make sure you have read the warnings in the 3D section of the Safety chapter in the bk3000 & bk5000 User Guide.

Imaging Modes

On bk3000 and bk5000, you can use 3D with 2D, Color mode, or Power mode imaging. However, you cannot use 3D with the following modes and functions:

- Doppler mode (spectral PW Doppler)
- 2D Tint

NOTE: *Turning on one of these modes or functions while you are using 3D will turn off 3D. If you are already using one of these modes, turning on 3D will turn the mode or function off, and turning off 3D will not turn it on again.*

NOTE: *Acquiring a 3D volume with some color maps may result in faulty colors for some pixels. To avoid this, the system selects a default pure grayscale instead.*

Making measurements on a 3D cube is not the same as making measurements on a 2D image, as described in Chapter 5, "Making Measurements".

3D License

The 3D function of the bk3000 and bk5000 can be purchased as an option. For more information, see the bk3000 and bk5000 Product Data sheets that accompany this user guide.

To run the 3D software, you must have a license from BK Medical. For information about activating the 3D option, see "License Tab" on page 286.

Controlling Transducer Movement

The 2D images in the data set are imaged with the transducer in different positions. The transducer can be moved in the following way:

- With 360° degree built-in 3D imaging.
- Untracked freehand (see warnings in the *bk3000 & bk5000 User Guide*).

360° built-in 3D-imaging

Transducers 20R3 (9052) and X14L4 (9038) have built-in movers for 3D acquisition. For information about setting up and attaching these transducers, see their respective User Guides.

Untracked Freehand Acquisition

Untracked linear and fan acquisitions (freely moving the transducer while you acquire a 3D data set) are allowed with any transducer. However, certain combinations of motion and transducer will not produce a sensible 3D volume.

Imaging Direction

You must select the imaging direction corresponding to the direction in which you plan to move the transducer.

• Select imaging direction with **3D Direction** button in the **3D** tab.

The direction you choose gives the system information about how to reconstruct the 3D volume. If there is a mismatch, the resulting volume can be mirrored.

After you acquire the image, you must check the reconstructed volume to make sure that it is a correct representation of the data.

Measurements Not Accurate

If you start to make a measurement on a 3D data set acquired using the untracked freehand method, a warning appears in red on the monitor to remind you that the measurement will not be accurate.

3D Imaging Overview

The 3D imaging process has the following steps:
• Preparations – see page 204
• Adjust settings – see page 205
• Acquisition – see page 206
• Viewing – see page 207
• Working with the 3D image – see page 208

Preparations

Before you start the 3D image acquisition:

1   Check all the connections.
2   Choose the preset you want.
3   Optimize the 2D image.

NOTE: *You cannot turn on 3D if the image is frozen.*

NOTE: *You cannot acquire 3D data sets unless you have entered a patient ID. If you have not entered a valid patient ID, you will be prompted to do so. The default patient ID is the current time and date.*

Adjusting the Image Capture Settings

ROI (3D Region of Interest)
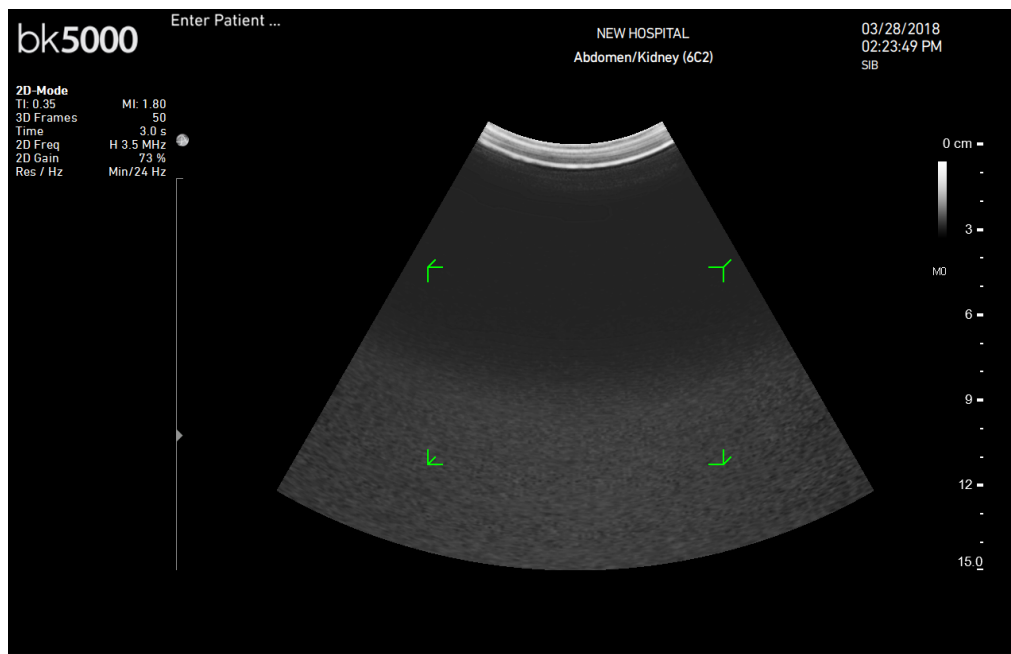
Figure 18-1. The 3D Region of Interest

When you turn 3D on, 3D ROI markers (see Fig 18-1) appear in the image area to indicate the area that will be captured in the 3D data set.

NOTE: *You cannot press the* **Zoom** *key to activate the 3D ROI box. The* **Zoom** *key continues to work in the normal way for the 2D image.*

To move the 3D ROI box to a different part of the image, click inside the box to select it and drag it with the trackball. Click to release the cursor when the box is where you want it.

To resize the box (increase or decrease the area covered by the 3D acquisition), press **+/-** when the box is selected.

You can also resize the box by clicking one of the corners (selecting it) and then dragging the corner.

3D Capture Settings

You can set various 3D capture settings using the 3D buttons in the **3D** tab.

- **3D Spacing** sets the spacing between frames in mm.
- **3D Distance** sets the distance the transducer will travel to acquire the 3D volume.
- **3D Direction** sets the direction to **L-R** (left to right) or **R-L** (right to left)
- **3D Sweep Mode** sets the freehand sweep mode to **Untracked Linear** or **Untracked Fan**.
- **Acquire Time** sets the duration of the recording.

Note: *These buttons function differently when used with built-in 3D movers. Spacing and distance are shown in degrees. Direction is shown in clockwise or counter-clockwise, and 3D Sweep Mode cannot be selected.*

Imaging Direction

Untracked freehand

Before you acquire an untracked freehand data set, it is essential to select the appropriate imaging direction so that the 3D volume will be reconstructed correctly. Be especially careful if you have changed the orientation (right/left or left/right) of the 2D image (changed its orientation). In this case, the system will not make any automatic adjustments of orientation before 3D acquisition. The effect of a flipped 2D image on the resulting 3D volume can be confusing, so we recommend that you do *not* change the default orientation of the 2D image before acquiring a 3D data set.

You must select the imaging direction to match the direction that the transducer will move during acquisition.

NOTE: *If the patient is not lying on his or her back, be very careful when you choose the imaging direction because the directions are defined relative to a patient lying face-up.*

Acquisition

To start a 3D acquisition:

1   Select **Acquire Time**. Note that image quality is dependent on the time spent on the acquisition.

2   Press the **3D** key.

or

- Click **3D Acquire.**

A progress bar appears during acquisition along with a **Stop** button that allows you to stop the progressing acquisition.

3D review buttons appear when you have acquired the 3D volume.

After you have acquired a 3D data set, it is displayed as a volume on the monitor. You can select various ways of viewing the volume, and you can use various tools and settings to enhance the image.

Viewing a 3D Data Set

When viewing a 3D data set, there are different buttons for enhancing the 3D view. These are described in detail later in this chapter.

Enhancing a 3D View

When a 3D view is displayed, you can use different buttons on the **3D** tab to enhance the appearance of the 3D volume and make it easier to see the structures you are interested in:

- **3D Brightness**
- **3D Contrast**
- **3D Zoom**
- **3D Opacity**
- **3D Luminance**
- **3D Hue**
- **Photorealistic**

Presets

After you have set **Brightness**, **Contrast**, and **Zoom**, and any other **3D** settings, you can save your settings as a **Preset**. Do as follows:

1 Press the **Patient** key.
2 Click the **Preset** tab.
3 Select **Save Preset**.
4 Type in a name for your preset.
5 Keep or change the **Label**, **Calculation**, and **Bodymark** packages.
6 Decide if the preset should be the default for this transducer.
7 Click **Save.**

3D Layout Options

When you view the acquired volume, you can change the layout of the monitor using the following options on the **3D** tab.

- **Orientation** – Turns the orientation marker on and off. The orientation marker is positioned on the first frame in the volume.
- **Wire Frame** – Shows or hides the wire frame on the volume.

Working with the 3D Image

Manipulating the Volume

You can use the trackball and the **Select** key to manipulate the volume in various ways. The form of the cursor is different, depending on what you are doing.

Rotating

To rotate a volume in any direction:

1   Point outside the volume.

    The cursor looks like this: 🔄

2   Click and use the trackball to drag the cursor and rotate the volume.

3   Click to end rotating.

You can also rotate the intersecting planes view in the 4-Up and 6-Up views.

Moving a Plane In and Out of the Volume

You can move a selected plane in and out of the volume to "slice" the volume so that a plane inside the original volume is displayed as a face of the transformed volume. This new face is called a "cut plane". The cut plane can be parallel to a one of the original faces of the volume or at an angle (tilted) relative to the axes of the volume.

To slice the volume:

1   Move the cursor onto one of the volume faces.

    The cursor looks like this: ▦

2   Click and use the trackball to drag the cursor to move the plane through the volume until the cut face you want is visible.

3   To restore parts of the volume that you have sliced away, drag the cut plane back through the volume.

4   Click to end slicing.

Tilting a Plane

You can tilt a plane to see views that are not parallel to one of the original faces of the volume. (This often creates additional planes.)

To tilt a plane:

1   Click the edge of a plane to select it.

    The cursor looks like this ✍ , and the wire frame around the plane becomes red.

2   Click and use the trackball to drag the cursor to tilt the cut plane.

    You can then move the tilted cut plane in and out (slice) as described before.

3   Click to end tilting.

Moving the Volume

To move the volume:

1   Move the cursor so that it is inside the volume.

2   Hold down the **Shift** key and the **Select** key.

   The cursor looks like a hand.

3   Drag the volume to the position you want, while holding the **Shift** key and the **Select** key down.

4   Click when the volume is where you want it.

Animating the Volume

To make the volume rotate automatically:

•   Click **3D Animate**.

   The volume rotates.

To stop the rotation, click **3D Animate** again.

You can select how to rotate the volume using the following buttons:

•   **Animation Speed**

•   **Animation Span** – the extent of the rotation

•   **Rotation** – horizontal or vertical

Aligning or Deleting a Face

You can turn the volume so that a particular plane is facing you. You can also delete a cut plane to create a tilted cut plane.

If you point at a plane of the volume and press the **+** side of the **+/-** key, a popup menu appears.

Click	Result
Align Face	The volume moves so that the plane is facing you.
Delete Face	The plane disappears.

Annotating a 3D View

As with 2D images, you can annotate a 3D view with a label or arrow. You cannot use a bodymark.

You can add as many labels or arrows to a 3D view as you want. When you have finished, you can save the annotated image as a view that you name. You can save the image both as a 2D snapshot and as a 3D cube.

To add a label to a 3D view:

1   Click **3D Label**.

   A writing cursor appears.

2   Move the cursor to where you want the label.

3   Type the label.

4   Click. (You can drag the label to reposition it before you click; however, after you click, you cannot edit the label, only delete it.)

You can add additional labels.

5   When you have added all the labels you want, click **3D Label** again.

To add an arrow to a 3D view:

1   Click **Arrow**.

The cursor appears on the 3D volume with an arrow.

2   Drag the arrow to where you want it.

The orientation of the arrow changes with the direction in which you drag it.

3   Click to set the arrow.

An arrow is placed on the image.

4   You can add another arrow.

5   When you have added all the arrows you want, click **Arrow** again.

NOTE: *After you have positioned an annotation on the image and clicked, you cannot edit the annotation or move it. You can only delete it. To delete an annotation, click* **Undo Label***. The most recent annotation is deleted. You can click* **Undo** *several times to remove more than one annotation. You can also click* **Clear Labels** *to remove them all.*

The 6 3D Views

There are 6 different ways you can view the 3D data set:

•   Cube

•   Render

•   4-up

•   MIP

•   6-up

•   Transp.

Cube View

This is a texture-mapped representation of the volume. It is the default view.

Making Measurements in a Cube View

In a Cube view, you can measure the height, length, width, and volume of a pathology if you have used a system-controlled positioning device to acquire the data set. You cannot make accurate measurements on data sets acquired using untracked freehand.

NOTE: *Making measurements on a 3D cube is not the same as making measurements on a 2D image, as described in Chapter 5, "Making Measurements". After you have clicked to position a point to make a 3D measurement, you cannot move the point. You can only complete the measurement (if it requires more points) and then delete the measurement and make a new one.*

To make a 3D distance measurement:

1   Click **Measure Dist.**

2   Click to position the points of the measurement.

The measurement is displayed underneath the 3D volume.

Measuring Volumes

To make a **HWL measurement**:

3   Click **HWL.**

4   Make a measurement of the height of the pathology.

The measurement is displayed underneath the 3D volume with the number of the measurement and **H** (e.g. 1-H).

5   Click **HWL** again and measure the width of the pathology.

The measurement is displayed underneath the 3D volume with the number of the measurement and **W** (e.g. 1-W).

6   Click **HWL** again and measure the length of the pathology.

The measurement is displayed underneath the 3D volume with the number of the measurement and **L** (e.g. 1-L), along with the volume of the pathology displayed with **HWL**.

To make a Planimetry measurement

You can also measure a volume by drawing polygons around the area of interest on slices taken throughout the Cube.

1   Click **Volume**.

2   Draw a polygon around the area of interest by clicking points on the perimeter.

When you have come to the last point, double-click to set the area.

3   Click **Next** to move through the volume by the chosen step size or **Prev** to go to the previous step.

4   Outline the area of interest in the new slice.

5   Repeat steps 2, 3, and 4 for each slice until the area of interest is no longer visible (the volume measurement is completed.)

The system updates the accumulated volume (in square cm) as each polygon is completed.

6   Click Volume again to finish the volume measurement.

Deleting measurements

To delete all measurements:

- Click **Clear Measurements**.

NOTE: *For information about accuracy of measurements on acquired and reconstructed places, see the bk3000 & bk5000 User Guide.*

Render View

Rendering dramatically improves 3D visualization. It is useful for looking in detail at soft tissues such as fistulas and abscess cavities. In this view, for gray scale volumes only, you can use sculpting tools to remove obstructing portions of the volume so you can better see the areas of interest.

Render Settings

You can change the way a Render view looks by using the buttons available after selecting **Render** in the **3D Display Mode** dropdown.:

- **Photorealistic** – Adjusts the photorealistic parameter used in the rendering. This can only be used on gray scale volumes.

- **3D Opacity** – Specifies the transparency (opacity) of a structure.

Sculpting Tool

The Sculpting tool lets you remove unwanted data from a Render view. The Sculpting tool can only be used on gray scale volumes – when there is no color in the volume.

There are two sculpting tools:

- The cutting tool (which you can use to cut away the outside of the volume or to cut a hole inside the volume)

- The shaving tool

To use the sculpting tools:

1 Click **3D Sculpture**.

2 Click **Sculpt. Method** to select **Inside**, **Outside** or **Shave**.

3 If you select **Inside**, you can adjust how deep you want to cut. Click **Sculpt Depth** and move the slider to adjust the percentage that is removed when you move the cutting tool.

4 Use the different tools as described below.

5 To turn off the sculpting tools, click **3D Sculpture**.

To use the cutting tool (inside):

1 Click on one plane of the volume.

2 Press the **Select**, then drag the ✎ to draw a closed curve on the volume plane.

3 Press the **Select** key again when you are finished.

If you have selected 100% **Depth**, a hole appears extending through the volume.

To use the cutting tool (outside):

1   Click on one plane of the volume.

2   Press the **Select**, then drag the ✎ to draw a closed curve on the volume plane.

3   Press the **Select** key again when you are finished.

   The area outside the curve disappears.

To use the shaving tool:

1   Click on one plane of the volume.

2   Press **Select**, then move the ▣ cursor over the area to be shaved.

   The more you move the cursor over the surface, the more surface is removed.

3   Press the **Select** key again when you are finished.

Displaying Sculpture Results

Click **Sculpt Display** to toggle between a view showing the result of sculpting and the unsculpted view.

MIP View

Maximum Intensity Projection (MIP) emphasizes the pixels with the highest intensity in the volume. If the highest intensities are mapped to the highest blood flow velocities, this mode accentuates and reveals the peak velocity regions of a volume. It is useful for:

• Looking at maximum flow jets

• Visualizing skeletal structures beneath tissue

• Looking at vascularization

4-Up View

This view has three orthogonal plane views and a view showing the positions of these intersecting planes within the volume. The planes can be moved by adjusting them in the intersecting view.
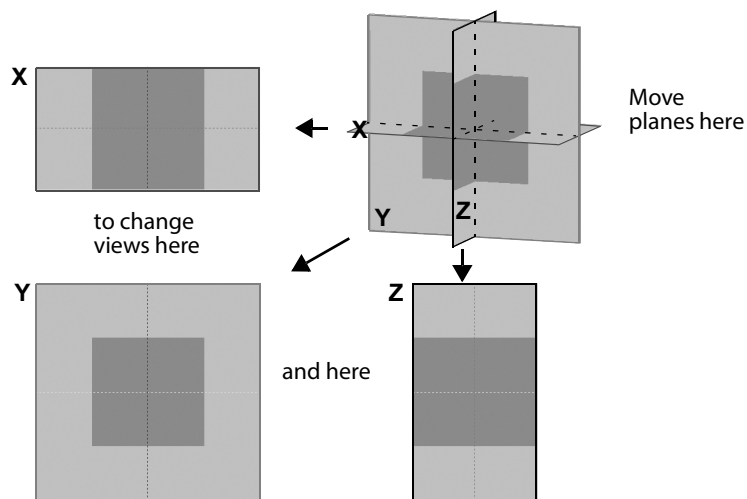
Figure 18-2. The 3D 4-Up View window.

Move the **XYZ** planes in the intersecting view to see the different planes **X**, **Y**, and **Z**, respectively.

6-Up View

In addition to the views in the 4-Up view, this view contains a Cube view and a sixth view, which is the view most recently displayed (MIP, Render, Transparency, or Cube).

Transparency View

Transparency rendering (which is only possible when you have acquired the 3D volume using Color or Power mode) lets you adjust the relative transparencies of the color and the gray scale parts of the volume. This can allow hidden features to become visible.

Render Settings

You can change the way a Transparency view looks using the **3D** buttons. See "Render Settings" on page 212.

Chapter 19
DICOM

DICOM on the System

DICOM is not installed as a default on the system. When it is installed, it is set up specially to match your DICOM system and procedures.

NOTE: *Changing the DICOM setup can cause your system to not work properly. For example, you may be unable to print to a DICOM printer. All changes to the DICOM setup should be made by qualified service personnel only. Do not try to change the DICOM setup yourself.*

New Patient Information from a DICOM Worklist

The system may be set up so that you can retrieve a worklist of patients and then select a patient from the worklist.

Depending on how your DICOM system is set up, the worklist may appear as soon as you open the **Patient** window. If the worklist is blank, you can retrieve the information.

To retrieve a worklist:

1   Use the drop-down window in the upper right corner to select the dates you want the list to include.

2   Click **Update**.

The worklist appears in the window. If there are more patients than can fit in the window, you can scroll down to see the rest of the list.

To select a patient from the worklist:

1   Click the row that contains the patient.

Now that patient is shown in the fields next to the worklist.

2   If required, enter additional information in the fields in the window.

NOTE: *You cannot delete a document from the system that is in a queue to be sent to a DICOM device.*

Saving or Printing to a DICOM Network

Filenames of Documents Exported in DICOM Format

The filename of an exported document specifies the date and time the image was captured.

For example, 2D_20181022_135426_FV12345.dcm would be the label on an 2D image of patient FV12345 that was captured on October 22, 2018 at 1:54:26 P.M. (13:54:26).

Exporting to a PACS

If you have DICOM installed on your system, you can export images and clips to a PACS.

To archive all documents for a patient or examination or individual documents:

1 Click to select the patient, the examination, or the individual documents you want to archive.

2 Click **Export**, and select the **PACS system you want to archive to**.

Reports

It is possible to export DICOM Structured Reports.

Queue

When you export to a (PACS), the information is copied and put into a queue to be transferred to the PACS. When the PACS is available, the information is transmitted.

NOTE: *If you have an accidental power failure while information is being transferred to the PACS, transfer may fail. Documents and information may not be stored in the PACS even though they appear to have been transferred successfully from the system.*

DICOM Status

A DICOM status indicator appears by the display values to the right of the image. It has a colored light next to it.

Status Indicator Color	Meaning
Green	No unsent documents. The LED disappears after 5 seconds.
Yellow	A document is being sent or waiting to be sent.
Red	A document was not sent successfully.

Table 19-1. DICOM status indicators.

If you click the DICOM status indicator, the **DICOM Status** window appears.
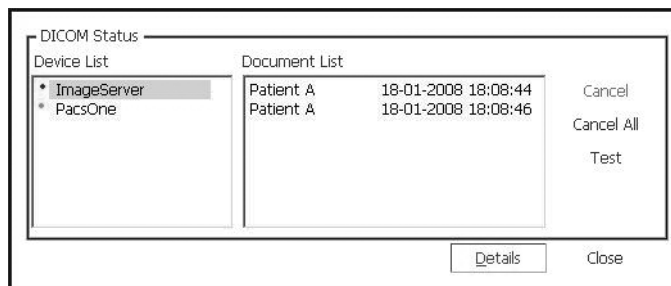
Figure 19-1. The DICOM status window.

The colors of the status indicator next to a device in the **Device List** are the same as described in Table 19-1. If a device has a red or yellow indicator, you can click the device name to see a list of unsent documents displayed in the **Document List**.

You have the following options:

- **Cancel** – cancels the selected document.
- **Clear All** – clear all pending documents or jobs for the selected device.
- **Test** – tests the connection to the selected device (PING + C-ECHO).
- **Details** – see log of DICOM transactions - this is useful for a service technician.
- **Close** – closes the window and does nothing else.

To update the transaction log, click **Update**.

NOTE: *You can also open the **DICOM Status** window from the **DICOM Setup** window. See "DICOM/PACS Tab" on page 279.*

Deleting a Document

NOTE: *You cannot delete a document from the system that is in a queue to be sent to a DICOM device.*

Appendix A
Glossary

This glossary contains explanations of terms and abbreviations that appear in the user guide or on the monitor. Measurements are listed in Appendix B, "Measurement Abbreviations".

Term	Explanation
2D Filter	With 2D Filter, an automatic speckle suppression algorithm continuously analyzes the ultrasound image for irregularities and adjusts the smoothness to be applied. This reduces speckle and optimizes the ultrasound image. 2D Filter supports all array transducers (mechanical transducers are not supported).
A/B	Stuart index. PS/ED.
AIUM	American Institute of Ultrasound in Medicine.
ALARA	As Low As Reasonably Achievable. Refers to the principle of keeping ultrasound exposure as low as possible.
aliasing	Detection of a false flow in the opposite direction from the real flow. This can occur when the PRF used for the Doppler signal detection is not high enough compared to the flow speed. The problem only exists with pulsed wave Doppler detection.
array transducer	A transducer that consists of a set of transducer elements, each capable of transmitting and receiving ultrasound.
Auto (Cardiac measurement)	PS, ED, RI, PS/ED
B/A	ED/PS
baseline	The baseline separates forward flow from reversed flow in Doppler imaging. Moving the axis can help overcome aliasing problems.
bodymark	A small drawing positioned on the image to help identify it in documentation.
catalog	A list of available items, as in a bodymark catalog or label catalog.
CFM	Color flow mapping. See Color mode.
cine	A function that lets you review a series of previously acquired images.
color box	When Color mode or Power mode imaging is turned on, the color box is superimposed on the 2D image. The color box outlines the area of the tissue in which flow information is available.
color Doppler	See Color mode.

Term	Explanation
Color mode (CFM)	Color-Flow Mapping (CFM). Real-time signal that represents the speed of flowing material in each sample volume within the Color mode image area. The Color mode signal is in principle independent of the amount of flowing material. The Color mode is normally superimposed on a 2D image that shows the anatomical surroundings. Flow directions towards and away from the transducer are represented as different colors in Color mode (e.g. towards = red, away = blue). The Color mode signal (flow speed) is represented by different values in the color mapping (relative measure) for each sample volume in Color mode. No color means either: • No flow in the sample volume (very low flow speed) or • Amount of reflection from flowing material (which might have a high flow speed) is below threshold set by the Color mode gain. The Color mode signal (flow speed) is dependent on the angle of the ultrasound beam relative to the flow direction.
color priority	When color information is superimposed on a 2D image, color can appear outside vessels, making it appear that the flow is not restricted to the vessel. To minimize this effect, you can adjust the color priority. Make the color priority lower to have less color outside the vessels. **NOTE:** High color priority gives color in more areas; low color priority reduces the number of areas that are colored.
combination mode	Simultaneous imaging in more than one mode, for example, 2D+Color or 2D+Color+Doppler.
Compounding	Compounding is a result of combining images made at up to 5 different angles into one compound image. This reduces speckle and optimizes the ultrasound image. **NOTE:** In certain cases compounding can remove or suppress some image artifacts such as shadowing (from e.g. kidney stones or cyst edges), which may be used to identify certain characteristics of the imaged anatomy.
CW Doppler	Continuous Wave Doppler. In Continuous Wave (CW) Doppler mode, ultrasound is transmitted along a line as a continuous wave and analyzed as it returns.
DecT	Flow Deceleration Time.

Term	Explanation
depth	With a full 2D image, you adjust the depth to cut out parts below the part you are interested in. The image always includes the transducer surface, so changing depth changes the magnification of the image, stretching, or compressing it. **NOTE**: To adjust the depth of the image without changing the magnification, use Panning. When the image is panned, the top of the image does not necessarily still correspond to the transducer surface. Adjusting the depth of a zoomed image changes the magnification even though the transducer surface is not necessarily visible at the top of the image.
Doppler mode	(Spectral) Doppler mode. This mode displays information about the spectrum of flow velocities as a function of time. It is sometimes called FFT (Fast Fourier Transform) because the information is presented as a frequency spectrum indicating velocity components.
duplex	Simultaneous imaging in 2 modes. See combination mode.
dynamic range	The number of steps (gray scale change) between black and white.
EDC	Expected date of confinement.
EMC	Electromagnetic compatibility.
ESD	Electrostatic discharge.
Exam Type	An application package containing presets, measuring tools and calculation formulas.
F1, F2	Frequency at position of marker 1 or 2 (when you make a measurement).
FOI	Field of interest. The area within the 2D image where resolution and focus are maximal.
freeze	Stop updating the image so an unchanging image is displayed.
gain	The overall amplification that is applied to ultrasound echoes from all depths.
HIPAA	Health Insurance Portability and Accountability Act of 1996. American law that sets rules for how patient accounts, billing and medical records must be handled.
IEC	International Electrotechnical Commission.
image review	See cine.
label	Text positioned on the image to label it.
LC	Length of cycle.

Term	Explanation
line density	Line density is a measure of how closely spaced the image lines are in the ultrasound image. Increasing the line density decreases the frame rate so that you get finer resolution but a slower refresh rate (frame rate).
MIP	Maximum Intensity Projection (3D imaging).
NEMA	Association of Electrical and Medical Imaging Equipment Manufacturers (National Electrical Manufacturer's Association)
PACS	Picture Archiving and Communications System (DICOM).
PE	Previous examination.
persistence	Persistence is the amount of time over which 2D image frames are averaged on the monitor. High persistence increases the contrast in the image, but tissue movement will blur a high-persistence image.
PG	Pressure Gradient
phased array	A technique to control the image area by using time delays on an array transducer.
PI	Pulsatility index.
planimetry	Measuring the surface area and perimeter of an object by tracing its boundaries.
POI	Point of interest.
Power Doppler	See Power mode.
Power mode	Power mode (power Doppler) ultrasound displays information about the number of particles moving, rather than their velocity. The signal strength (related to the square of the velocity) increases as the number of flowing particles increases. Thus the amplitude of the signal indicates the amount of blood present and flowing within a sample volume.
power supply cord	The cord that connects the system to the wall outlet or power supply.
PRF	Pulse repetition frequency.
PSA	Prostate-specific antigen.
PSAD	PSA density: PSA divided by prostate volume.
pulse repetition frequency	The rate at which pulses of ultrasound waves are transmitted and received in PW (pulsed-wave) Doppler imaging.

Term	Explanation
PW Doppler	Pulsed wave Doppler. PW Doppler is the primary Doppler mode. In PW Doppler, short bursts (pulses) of ultrasound waves are transmitted at regular intervals and analyzed as they return. The received signals are detected and sent to amplifiers for audio output as well as displayed on the monitor for a visual presentation of the frequency components (spectrum).
Range (of velocities)	You can vary the PRF (pulse repetition frequency) to select the range of Doppler velocities (frequencies) that are color-coded and displayed. Restricting the range allows you to see velocity differences (within the range) in more detail.
Shots per estimate	One way to improve the accuracy of the color-coded velocity information is to increase the number of pulses transmitted in each waveform packet (shots per estimate) at the expense of decreasing the frame rate.
spectral Doppler	See Doppler mode.
SS	Start systole.
steering	You can steer the Doppler beam of a linear transducer to vary the beam angle. This can be useful for examining flow in blood vessels parallel to the transducer surface.
ON/standby button	The switch on the back of the system used for turning the system on and off each day.
TAM	Time Average Mean.
TAMX	Time Average Max.
T-area	Transverse Area.
TEH	True echo harmonics. BK Medical's trademarked term for its pulse inversion tissue harmonic imaging system.
TGC	Time gain control. The TGC curve determines variable amplification applied to echoes from different depths in the tissue. The TGC function compensates for attenuation and scattering of the ultrasound beam in the tissue.
TI	Thermal index. The estimated rise in tissue temperature (in °C) caused by the power emitted by the transducer.
TIB	Thermal index in bone at focal point.
TIC	Thermal index, cranial – bone at surface.
TIS	Thermal index in soft tissue.
triplex	Simultaneous imaging in 3 modes. See combination mode.
voxel	A three-dimensional pixel. A **vo**lume pi**xel**.

Term	Explanation
wall filter	A wall filter is used to eliminate low-frequency artifacts (such as Doppler shifts arising from respiratory and cardiac motion or movement of blood vessel walls) in Color, Power and Doppler modes. The wall filter cuts off all frequencies below its cutoff frequency. You can adjust the cut-off frequency.
width	For some transducers, you can increase the width of the image area beyond normal full width. With linear transducer arrays, this is sometimes referred to as Trapezoidal View. You can also narrow the image width to increase frame rate.

Appendix B
Measurement Abbreviations

Measurement	Explanation
%Reduction	General % reduction tool (using distance tool)
%Reduction	General % reduction tool (using 2 ellipses) to measure stenosis.
2-Caliper Doppler	General 2 Caliper Velocity Tool
2D Trace	General Freehand Tool
A:B Ratio	General A:B Ratio Velocity Tool
AC	Abdominal Circumference
AD Persson	Abdominal Diameter Persson
Angle	General 1 Angle tool
Ao Dist	Aorta Distal
Ao Dist AP	Aorta Distal AP
Ao Dist Ed	Aorta Distal End Diastole
Ao Dist Ps	Aorta Distal Peak Systole
Ao Dist W	Aorta Distal W
Ao Mid	Aorta Mid
Ao Mid AP	Aorta Mid AP
Ao Prox	Aorta Proximal
Ao Prox AP	Aorta Proximal AP
Ao Prox Ed	Aorta Proximal End Diastole
Ao Prox Ps	Aorta Proximal Peak Systole
Ao Prox W	Aorta Proximal W
AODd	Aortic Root Diameter Diastole
APD	Anteroposterior Diameter
ATD	Abdominal Transverse Diameter
Auto	Auto Doppler Calculations (PS, ED, RI, PS/ED)
Average Ultrasound Age	Average Ultrasound Age
Binoc D	Binocular Distance

Measurement	Explanation
Bladder	Bladder Outline
BPD	Biparietal Diameter
CBD	Common Duct
Celiac A	Celiac Artery
Celiac A Ed	Celiac Artery End Diastole
Celiac A Ps	Celiac Artery Peak Systole
Cerebellum	Cerebellum
Cervix L	Cervical Length
Cist Mag	Cisterna Magna
Clav	Clavicle
CO Protocol	Cardiac Output Protocol
CO SI	Cardiac Output Stroke Volume Index
CRL	Crown Rump Length
Curved Distance	General Open Freehand Tool
CX Length	Cervical Length
D1	Diameter 1
D2	Diameter 2
Dist LRA	Left Kidney Distance LRA
Dist LRA Ed	Left Kidney Distance LRA End Diastole
Dist LRA Ps	Left Kidney Distance LRA Peak Systole
Dist RRA	Right Kidney Distance RRA
Dist RRA Ed	Right Kidney Distance RRA End Diastole
Dist RRA Ps	Right Kidney Distance RRA Peak Systole
Distal IVC	Distal IVC
Distal IVC Ed	Distal IVC End Diastole
Distal IVC Ps	Distal IVC Peak Systole
Distance	General Distance Tool
Doppler Trace	General Doppler Trace Tool
Dorsal Vn Dia	Dorsal Vein Diameter Flaccid/Post Injection
D Trace Freehand	Doppler Freehand Trace Tool

Measurement	Explanation
E/B Ratio	E/B Ratio
Ed	End Diastole
Ellipse	Ellipse (various organs)
Endo Thickness	Endo Thickness
Fibroid 1..5 H	Fibroid 1,2,3,4,5 Height
Fibroid 1..5 L	Fibroid 1,2,3,4,5 Length
Fibroid1..5 W	Fibroid 1,2,3,4,5 Width
Fibula	Fibula
FL	Femur Length
Foot	Foot
GB Wall	Gall Bladder Wall
GS	Gestational Sac
GS Dist	Gestational Sac Distance
HC	Head Circumference
HC - BPD + OFD	Head Circumference - Biparietal Diameter + Occipito-frontal Diameter
Heart Rate	Heart Rate
Height	Height
Hepatic A	Main Hepatic Artery
Hepatic A Ed	Main Hepatic Artery End Diastole
Hepatic A Ps	Main Hepatic Artery Peak Systole
Hip Tool	General 2 Angle Tool
HR	Heart Rate (Doppler/M-mode)
Humerus	Humerus
Innom A	Innominate Artery
Innom A (Dia)	Innominate Artery Diameter
Innom A (Dpt)	Innominate Artery Depth
Innom A Ed	Innominate Artery End Diastole
Innom A Ps	Innominate Artery Peak Systole
Isthmus	Isthmus
IVC	Inferior Vena Cava

Measurement	Explanation
LADs	Left Atrium Diameter Systole
LADs/AODd	Left Atrium Diameter Systole/Aortic Root Diameter Diastole
Lat Vent	Lateral Ventrical
Length	Length
LHV	Left Hepatic Vein
LHV Ed	Left Hepatic Vein End Diastole
LHV Ps	Left Hepatic Vein Peak Systole
Liver L	Liver Length
LLQ - AFI	Left Lower Quadrant Amniotic Fluid Index
LPV	Left Portal Vein
LPV Ed	Left Portal Vein End Diastole
LPV Ps	Left Portal Vein Peak Systole
Lt AC Bas V (Dia)	Left Antecubital Basilic Vein Diameter
Lt AC Bas V (Dpt)	Left Antecubital Basilic Vein Depth
Lt AC Ceph V (Dia)	Left Antecubital Cephalic Vein Diameter
Lt AC Ceph V (Dpt)	Left Antecubital Cephalic Vein Depth
Lt Accessory RA	Left Accessory Renal Artery
Lt Ant Bas V (Dia)	Left Anterior Basilic Vein Diameter
Lt Ant Bas V (Dpt)	Left Anterior Basilic Vein Depth
Lt Ant Ceph V (Dia)	Left Anterior Cephalic Vein Diameter
Lt Ant Ceph V (Dpt)	Left Anterior Cephalic Vein Depth
Lt Arcuate RA	Left Arcuate Renal Artery
Lt ATV VCT	Left Anterior Tibial Vein Valve Closure Time
Lt Axill A	Left Axillary Artery
Lt Axill A (Dia)	Left Axillary Artery Diameter
Lt Axill A (Dpt)	Left Axillary Artery Depth
Lt Axill A Ed	Left Axillary Artery End Diastole
Lt Axill A Ps	Left Axillary Artery Peak Systole
Lt Axill V (Dia)	Left Axillary Vein Diameter
Lt Axill V (Dpt)	Left Axillary Vein Depth

Measurement	Explanation
Lt Bulb	Left Bulb
Lt Bulb Ed	Left Bulb End Diastole
Lt Bulb Ps	Left Bulb Peak Systole
Lt CAV Auto	Left Cavernosal Artery Flaccid/Post Injection Auto
Lt CAV Ed	Left Cavernosal Artery Flaccid/Post Injection End Diastole
Lt CAV Manual	Left Cavernosal Artery Flaccid/Post Injection Manual
Lt CAV Ps	Left Cavernosal Artery Flaccid/Post Injection Peak Systole
Lt CFA	Left Common Femoral Artery
Lt CFA (Dia)	Left Common Femoral Artery Diameter
Lt CFA (Dpt)	Left Common Femoral Artery Depth
Lt CFA Ed	Left Common Femoral Artery End Diastole
Lt CFA Ps	Left Common Femoral Artery Peak Systole
Lt CFV (Dia)	Left Common Femoral Vein Diameter
Lt CFV (Dpt)	Left Common Femoral Vein Depth
Lt CFV VCT	Left Common Femoral Vein Valve Closure Time
Lt CFV/GSV Jct (Dia)	Left Common Femoral Vein/Greater Saphenous Vein Junction Diameter
Lt CFV/GSV Jct (Dpt)	Left Common Femoral Vein/Greater Saphenous Vein Junction Depth
Lt Common IA	Left Common Iliac Artery
Lt Common IA (Dia)	Left Common Iliac Artery Diameter
Lt Common IA (Dpt)	Left Common Iliac Artery Depth
Lt Common IA Ed	Left Common Iliac Artery End Diastole
Lt Common IA Ps	Left Common Iliac Artery Peak Systole
Lt Common IV VCT	Left Common Iliac Vein Valve Closure Time
Lt Corp Lut	Left Corpus Luteum
Lt Dist ATA	Left Distal Anterior Tibial Artery
Lt Dist ATA (Dia)	Left Distal Anterior Tibial Artery Diameter
Lt Dist ATA (Dpt)	Left Distal Anterior Tibial Artery Depth
Lt Dist ATA Ed	Left Distal Anterior Tibial Artery End Diastole
Lt Dist ATA Ps	Left Distal Anterior Tibial Artery Peak Systole

Measurement	Explanation
Lt Dist Bas V (Dia)	Left Distal Basilic Vein Diameter
Lt Dist Bas V (Dpt)	Left Distal Basilic Vein Depth
Lt Dist Brach A	Left Distal Brachial Artery
Lt Dist Brach A (Dia)	Left Distal Brachial Artery Diameter
Lt Dist Brach A (Dpt)	Left Distal Brachial Artery Depth
Lt Dist Brach A Ed	Left Distal Brachial Artery End Diastole
Lt Dist Brach A Ps	Left Distal Brachial Artery Peak Systole
Lt Dist CCA	Left Distal Common Carotid Artery
Lt Dist CCA Ed	Left Distal Common Carotid Artery End Diastole
Lt Dist CCA Ps	Left Distal Common Carotid Artery Peak Systole
Lt Dist Ceph V LA (Dia)	Left Distal Cephalic Vein Lower Arm Diameter
Lt Dist Ceph V LA (Dpt)	Left Distal Cephalic Vein Lower Arm Depth
Lt Dist FV VCT	Left Distal Femoral Vein Valve Closure Time
Lt Dist ICA	Left Distal Internal Carotid Artery
Lt Dist ICA Ed	Left Distal Internal Carotid Artery End Diastole
Lt Dist ICA Ps	Left Distal Internal Carotid Artery Peak Systole
Lt Dist Pero A	Left Distal Peroneal Artery
Lt Dist Pero A (Dia)	Left Distal Peroneal Artery Diameter
Lt Dist Pero A (Dpt)	Left Distal Peroneal Artery Depth
Lt Dist Pero A (Ed)	Left Distal Peroneal Artery End Diastole
Lt Dist Pero A (Ps)	Left Distal Peroneal Artery Peak Systole
Lt Dist Pero V VCT	Left Distal Peroneal Vein Valve Closure Time
Lt Dist Pop A	Left Distal Popliteal Artery
Lt Dist Pop A (Dia)	Left Distal Popliteal Artery Diameter
Lt Dist Pop A (Dpt)	Left Distal Popliteal Artery Depth
Lt Dist Pop A Ed	Left Distal Popliteal Artery End Diastole
Lt Dist Pop A Ps	Left Distal Popliteal Artery Peak Systole
Lt Dist PTA	Left Distal Posterior Tibial Artery
Lt Dist PTA (Dia)	Left Distal Posterior Tibial Artery Diameter
Lt Dist PTA (Dpt)	Left Distal Posterior Tibial Artery Depth

Measurement	Explanation
Lt Dist PTA Ed	Left Distal Posterior Tibial Artery End Diastole
Lt Dist PTA Ps	Left Distal Posterior Tibial Artery Peak Systole
Lt Dist PTV VCT	Left Distal Posterior Tibial Vein Valve Closure Time
Lt Dist Rad A	Left Distal Radial Artery
Lt Dist Rad A (Dia)	Left Distal Radial Artery Diameter
Lt Dist Rad A (Dpt)	Left Distal Radial Artery Depth
Lt Dist Rad A Ed	Left Distal Radial Artery End Diastole
Lt Dist Rad A Ps	Left Distal Radial Artery Peak Systole
Lt Dist SFA	Left Distal Superficial Femoral Artery
Lt Dist SFA (Dia)	Left Distal Superficial Femoral Artery Diameter
Lt Dist SFA (Dpt)	Left Distal Superficial Femoral Artery Depth
Lt Dist SFA Ed	Left Distal Superficial Femoral Artery End Diastole
Lt Dist SFA Ps	Left Distal Superficial Femoral Artery Peak Systole
Lt Dist SSA (Dia)	Left Distal Small Saphenous Vein Diameter
Lt Dist SSA (Dpt)	Left Distal Small Saphenous Vein Depth
Lt Dist Subcl A	Left Dist Subclavian Artery
Lt Dist Subcl A Ed	Left Dist Subclavian Artery End Diastole
Lt Dist Subcl A Ps	Left Dist Subclavian Artery Peak Systole
Lt Dist Subclav A (Dia)	Left Dist Subclavian Artery Diameter
Lt Dist Subclav A (Dpt)	Left Dist Subclavian Artery Depth
Lt Dist Uln A	Left Distal Ulnar Artery
Lt Dist Uln A (Dia)	Left Distal Ulnar Artery Diameter
Lt Dist Uln A (Dpt)	Left Distal Ulnar Artery Depth
Lt Dist Uln A Ed	Left Distal Ulnar Artery End Diastole
Lt Dist Uln A Ps	Left Distal Ulnar Artery Peak Systole
Lt Dor Pedis A	Left Dorsalis Pedis Artery
Lt Dor Pedis A (Dia)	Left Dorsalis Pedis Artery Diameter
Lt Dor Pedis A (Dpt)	Left Dorsalis Pedis Artery Depth
Lt Dor Pedis A Ed	Left Dorsalis Pedis Artery End Diastole
Lt Dor Pedis A Ps	Left Dorsalis Pedis Artery Peak Systole

Measurement	Explanation
Lt ECA	Left External Carotid Artery
Lt ECA Ed	Left External Carotid Artery End Diastole
Lt ECA Ps	Left External Carotid Artery Peak Systole
Lt Epid H	Left Epid Height
Lt Epid L	Left Epid Length
Lt Epid V	Left Epid Volume
Lt Epid W	Left Epid Width
Lt External IV VCT	Left External Iliac Vein Valve Closure Time
Lt Fem V (Dia)	Left Femoral Vein Diameter
Lt Fem V (Dpt)	Left Femoral Vein Depth
Lt Follicle 1..15	Left Follicle 1, 2, 3,..15. Auto, 1-3 distances or Volume (W*H*L), depending on your preferences in the setup.
Lt GNV VCT	Left Gastrocnemius Vein Valve Closure Time
Lt GSV Dist Calf (Dia)	Left Greater Saphenous Vein Distal Calf Diameter
Lt GSV Dist Calf (Dpt)	Left Greater Saphenous Vein Distal Calf Depth
Lt GSV Dist Thigh (Dia)	Left Greater Saphenous Vein Distal Thigh Diameter
Lt GSV Dist Thigh (Dpt)	Left Greater Saphenous Vein Distal Thigh Depth
Lt GSV Knee (Dia)	Left Greater Saphenous Vein at Knee Diameter
Lt GSV Knee (Dpt)	Left Greater Saphenous Vein at Knee Depth
Lt GSV Mid Calf (Dia)	Left Greater Saphenous Vein Mid Calf Diameter
Lt GSV Mid Calf (Dpt)	Left Greater Saphenous Vein Mid Calf Depth
Lt GSV Mid Thigh (Dia)	Left Greater Saphenous Vein Mid Thigh Diameter
Lt GSV Mid Thigh (Dpt)	Left Greater Saphenous Vein Mid Thigh Depth
Lt GSV Prox Calf (Dia)	Left Greater Saphenous Vein Proximal Calf Diameter
Lt GSV Prox Calf (Dpt)	Left Greater Saphenous Vein Proximal Calf Depth
Lt GSV Prox Thigh (Dia)	Left Greater Saphenous Vein Proximal Thigh Diameter
Lt GSV Prox Thigh (Dpt)	Left Greater Saphenous Vein Proximal Thigh Depth
Lt GSV VCT	Left Great Saphenous Vein Valve Closure Time
Lt GSV-Calf VCT	Left Great Saphenous Vein of Calf Valve Closure Time
Lt GSV-Thigh VCT	Left Great Saphenous Vein of Thigh Valve Closure Time
Lt Iliac A	Left Iliac Artery

Measurement	Explanation
Lt Iliac A AP	Left Iliac Artery AP
Lt Iliac A Ed	Left Iliac Artery End Diastole
Lt Iliac A Ps	Left Iliac Artery Peak Systole
Lt Iliac A W	Left Iliac Artery W
Lt INF Segmental RA	Left Inferior Segmental Renal Artery
Lt Interlobar RA	Left Interlobar Renal Artery
Lt Interlobular RA	Left Interlobular Renal Artery
Lt Kidney H	Left Kidney Height
Lt Kidney L	Left Kidney Length
Lt Kidney V	Left Kidney Volume
Lt Kidney W	Left Kidney Width
Lt Kidney V L*H*W	Left Kidney Volume Length * Height * Width
Lt Lesion 1..8 H	Left Lesion 1,2,3..8 Height
Lt Lesion 1..8 L	Left Lesion 1,2,3..8 Length
Lt Lesion 1..8 V W*H*L	Left Lesion 1,2,3..8 Volume Width * Height * Length
Lt Lesion 1..8 W	Left Lesion 1,2,3..8 Width
Lt Lobe H	Left Lobe Height
Lt Lobe L	Left Lobe Length
Lt Lobe V W*H*L	Left Lobe Volume Width * Height * Length
Lt Lobe W	Left Lobe Width
Lt LSV VCT	Left Lesser Saphenous Vein Valve Closure Time
Lt Mid ATA	Left Mid Anterior Tibial Artery
Lt Mid ATA (Dia)	Left Mid Anterior Tibial Artery Diameter
Lt Mid ATA (Dpt)	Left Mid Anterior Tibial Artery Depth
Lt Mid ATA Ed	Left Mid Anterior Tibial Artery End Diastole
Lt Mid ATA Ps	Left Mid Anterior Tibial Artery Peak Systole
Lt Mid Bas V (Dia)	Left Mid Basilic Vein Diameter
Lt Mid Bas V (Dpt)	Left Mid Basilic Vein Depth
Lt Mid Brach A	Left Mid Brachial Artery
Lt Mid Brach A (Dia)	Left Mid Brachial Artery Diameter

Measurement	Explanation
Lt Mid Brach A (Dpt)	Left Mid Brachial Artery (Depth)
Lt Mid Brach A Ed	Left Mid Brachial Artery End Diastole
Lt Mid Brach A Ps	Left Mid Brachial Artery Peak Systole
Lt Mid CCA	Left Mid Common Carotid Artery
Lt Mid CCA Ed	Left Mid Common Carotid Artery End Diastole
Lt Mid CCA Ps	Left Mid Common Carotid Artery Peak Systole
Lt Mid Pero A	Left Mid Peroneal Artery
Lt Mid Pero A (Dia)	Left Mid Peroneal Artery Diameter
Lt Mid Pero A (Dpt)	Left Mid Peroneal Artery Depth
Lt Mid Pero A Ed	Left Mid Peroneal Artery End Diastole
Lt Mid Pero A Ps	Left Mid Peroneal Artery Peak Systole
Lt Mid Pero V VCT	Left Mid Peroneal Vein Valve Closure Time
Lt Mid PTA	Left Mid Posterior Tibial Artery
Lt Mid PTA (Dia)	Left Mid Posterior Tibial Artery Diameter
Lt Mid PTA (Dpt)	Left Mid Posterior Tibial Artery Depth
Lt Mid PTA Ed	Left Mid Posterior Tibial Artery End Diastole
Lt Mid PTA Ps	Left Mid Posterior Tibial Artery Peak Systole
Lt Mid PTV VCT	Left Mid Posterior Tibial Vein Valve Closure Time
Lt Mid Rad A	Left Mid Radial Artery
Lt Mid Rad A (Dia)	Left Mid Radial Artery Diameter
Lt Mid Rad A (Dpt)	Left Mid Radial Artery Depth
Lt Mid Rad A Ed	Left Mid Radial Artery End Diastole
Lt Mid Rad A Ps	Left Mid Radial Artery Peak Systole
Lt MID Segmental RA	Left MID Segmental Renal Artery
Lt Mid SFA	Left Mid Superficial Femoral Artery
Lt Mid SFA (Dia)	Left Mid Superficial Femoral Artery Diameter
Lt Mid SFA (Dpt)	Left Mid Superficial Femoral Artery Depth
Lt Mid SFA Ed	Left Mid Superficial Femoral Artery End Diastole
Lt Mid SFA Ps	Left Mid Superficial Femoral Artery Peak Systole
Lt Mid SSV (Dia)	Left Mid Small Saphenous Vein Diameter

Measurement	Explanation
Lt Mid SSV (Dpt)	Left Mid Small Saphenous Vein Depth
Lt Mid Subcl A	Left Mid Subclavian Artery
Lt Mid Subcl A Ed	Left Mid Subclavian Artery End Diastole
Lt Mid Subcl A Ps	Left Mid Subclavian Artery Peak Systole
Lt Mid Subclav A (Dia)	Left Mid Subclavian Artery Diameter
Lt Mid Subclav A (Dpt)	Left Mid Subclavian Artery Depth
Lt Mid Uln A	Left Mid Ulnar Artery
Lt Mid Uln A (Dia)	Left Mid Ulnar Artery Diameter
Lt Mid Uln A (Dpt)	Left Mid Ulnar Artery Depth
Lt Mid Uln A Ed	Left Mid Ulnar Artery End Diastole
Lt Mid Uln A Ps	Left Mid Ulnar Artery Peak Systole
Lt Nodule 1..5 H	Left Nodule 1,2,3,4,5 Height
Lt Nodule 1..5 L	Left Nodule 1,2,3,4,5 Length
Lt Nodule 1..5 V W*H*L	Left Nodule 1,2,3,4,5 Volume Width * Height * Length
Lt Nodule 1..5 W	Left Nodule 1,2,3,4,5 Width
Lt Ovarian A	Left Maternal Ovarian Artery
Lt Ovarian A Ed	Left Maternal Ovarian Artery End Diastole
Lt Ovarian A Ps	Left Maternal Ovarian Artery Peak Systole
Lt Ovary H	Left Ovary Height
Lt Ovary L	Left Ovary Length
Lt Ovary V L*H*W	Left Ovary Volume Width * Height * Length
Lt Ovary W	Left Ovary Width
Lt Ovary Lesion 1..5 H	Left Ovary Lesion 1,2,3,4,5 Height
Lt Ovary Lesion 1..5 L	Left Ovary Lesion 1,2,3,4,5 Length
Lt Ovary Lesion 1..5 W	Left Ovary Lesion 1,2,3,4,5 Width
Lt Perf-Boyd VCT	Left Boyd's Perforating Vein Valve Closure Time
Lt Perf-Cockett VCT	Left Cockett's Perforating Vein Valve Closure Time
Lt Perf-Hunterian VCT	Left Hunterian Perforating Vein Valve Closure Time
Lt PFA	Left Profunda Artery
Lt PFA (Dia)	Left Profunda Artery Diameter

Measurement	Explanation
Lt PFA (Dpt)	Left Profunda Artery Depth
Lt PFA Ed	Left Profunda Artery End Diastole
Lt PFA Ps	Left Profunda Artery Peak Systole
Lt PFV VCT	Left Profunda Femoral Vein Valve Closure Time
Lt Pop V VCT	Left Popliteal Vein Valve Closure Time
Lt Prox ATA	Left Proximal Anterior Tibial Artery
Lt Prox ATA (Dia)	Left Proximal Anterior Tibial Artery Diameter
Lt Prox ATA (Dpt)	Left Proximal Anterior Tibial Artery Depth
Lt Prox ATA Ed	Left Proximal Anterior Tibial Artery End Diastole
Lt Prox ATA Ps	Left Proximal Anterior Tibial Artery Peak Systole
Lt Prox Bas V (Dia)	Left Proximal Basilic Vein Diameter
Lt Prox Bas V (Dpt)	Left Proximal Basilic Vein Depth
Lt Prox Brach A	Left Proximal Brachial Artery
Lt Prox Brach A (Dia)	Left Proximal Brachial Artery Diameter
Lt Prox Brach A (Dpt)	Left Proximal Brachial Artery Depth
Lt Prox Brach A Ed	Left Proximal Brachial Artery End Diastole
Lt Prox Brach A Ps	Left Proximal Brachial Artery Peak Systole
Lt Prox CCA	Left Proximal Common Carotid Artery
Lt Prox CCA Ed	Left Proximal Common Carotid Artery End Diastole
Lt Prox CCA Ps	Left Proximal Common Carotid Artery Peak Systole
Lt Prox Ceph V LA (Dia)	Left Proximal Cephalic Vein Lower Arm Diameter
Lt Prox Ceph V LA (Dpt)	Left Proximal Cephalic Vein Lower Arm Depth
Lt Prox Ceph V UA (Dia)	Left Proximal Cephalic Vein Upper Arm Diameter
Lt Prox Ceph V UA (Dpt)	Left Proximal Cephalic Vein Upper Arm Depth
Lt Prox FV VCT	Left Proximal Femoral Vein Valve Closure Time
Lt Prox ICA	Left Proximal Internal Carotid Artery
Lt Prox ICA Ed	Left Proximal Internal Carotid Artery End Diastole
Lt Prox ICA Ps	Left Proximal Internal Carotid Artery Peak Systole
Lt Prox Pero A	Left Proximal Peroneal Artery
Lt Prox Pero A (Dia)	Left Proximal Peroneal Artery Diameter

Measurement	Explanation
Lt Prox Pero A (Dpt)	Left Proximal Peroneal Artery Depth
Lt Prox Pero A Ed	Left Proximal Peroneal Artery End Diastole
Lt Prox Pero A Ps	Left Proximal Peroneal Artery Peak Systole
Lt Prox Pero V VCT	Left Proximal Peroneal Vein Valve Closure Time
Lt Prox Pop A	Left Proximal Popliteal Artery
Lt Prox Pop A (Dia)	Left Proximal Popliteal Artery Diameter
Lt Prox Pop A (Dpt)	Left Proximal Popliteal Artery Depth
Lt Prox Pop A Ed	Left Proximal Popliteal Artery End Diastole
Lt Prox Pop A Ps	Left Proximal Popliteal Artery Peak Systole
Lt Prox PTA	Left Proximal Posterior Tibial Artery
Lt Prox PTA (Dia)	Left Proximal Posterior Tibial Artery Diameter
Lt Prox PTA (Dpt)	Left Proximal Posterior Tibial Artery Depth
Lt Prox PTA Ed	Left Proximal Posterior Tibial Artery End Diastole
Lt Prox PTA Ps	Left Proximal Posterior Tibial Artery Peak Systole
Lt Prox PTV VCT	Left Proximal Posterior Tibial Vein Valve Closure Time
Lt Prox Rad A	Left Proximal Radial Artery
Lt Prox Rad A (Dia)	Left Proximal Radial Artery Diameter
Lt Prox Rad A (Dpt)	Left Proximal Radial Artery Depth
Lt Prox Rad A Ed	Left Proximal Radial Artery End Diastole
Lt Prox Rad A Ps	Left Proximal Radial Artery Peak Systole
Lt Prox SFA	Left Proximal Superficial Femoral Artery
Lt Prox SFA (Dia)	Left Proximal Superficial Femoral Artery Diameter
Lt Prox SFA (Dpt)	Left Proximal Superficial Femoral Artery Depth
Lt Prox SFA Ed	Left Proximal Superficial Femoral Artery End Diastole
Lt Prox SFA Ps	Left Proximal Superficial Femoral Artery Peak Systole
Lt Prox SSV (Dia)	Left Proximal Small Saphenous Vein Diameter
Lt Prox SSV (Dpt)	Left Proximal Small Saphenous Vein Depth
Lt Prox Subcl A	Left Prox Subclavian Artery
Lt Prox Subcl A Ed	Left Prox Subclavian Artery End Diastole
Lt Prox Subcl A Ps	Left Prox Subclavian Artery Peak Systolic

Measurement	Explanation
Lt Prox Subclav A (Dia)	Left Prox Subclavian Artery Diameter
Lt Prox Subclav A (Dpt)	Left Prox Subclavian Artery Depth
Lt Prox Uln A	Left Proximal Ulnar Artery
Lt Prox Uln A (Dia)	Left Proximal Ulnar Artery Diameter
Lt Prox Uln A (Dpt)	Left Proximal Ulnar Artery Depth
Lt Prox Uln A Ed	Left Proximal Ulnar Artery End Diastole
Lt Prox Uln A Ps	Left Proximal Ulnar Artery Peak Systole
Lt Rad A	Left Radial Artery
Lt Rad A (Dia)	Left Radial Artery Diameter
Lt Rad A (Dpt)	Left Radial Artery Depth
Lt Rad A Ed	Left Radial Artery End Diastole
Lt Rad A Ps	Left Radial Artery Peak Systole
Lt Renal Hilum	Left Renal Hilum
Lt SFJ VCT	Left Saphenofemoral Junction Valve Closure Time
Lt Skin Thickness	Left Testicle Skin Thickness
Lt SLV VCT	Left Soleal Vein Valve Closure Time
Lt SSV/Pop Jct (Dia)	Left Small Saphenous Vein/Popliteal Junction Diameter
Lt SSV/Pop Jct (Dpt)	Left Small Saphenous Vein/Popliteal Junction Depth
Lt Subclav A	Left Subclavian Artery
Lt Subclav A (Dia)	Left Subclavian Artery Diameter
Lt Subclav A (Dpt)	Left Subclavian Artery Depth
Lt Subclav A Ed	Left Subclavian Artery End Diastole
Lt Subclav A Ps	Left Subclavian Artery Peak Systole
Lt SUP Segmental RA	Left Superior Segmental Renal Artery
Lt Testicle H	Left Testicle Height
Lt Testicle L	Left Testicle Length
Lt Testicle V	Left Testicle Volume
Lt Testicle W	Left Testicle Width
Lt Uln A	Left Ulnar Artery
Lt Uln A (Dia)	Left Ulnar Artery Diameter

Measurement	Explanation
Lt Uln A (Dpt)	Left Ulnar Artery Depth
Lt Uln A Ed	Left Ulnar Artery End Diastole
Lt Uln A Ps	Left Ulnar Artery Peak Systole
Lt Uterine A	Left Maternal Uterine Artery
Lt Vertebral A	Left Vertebral Artery
Lt Vertebral A Ed	Left Vertebral Artery End Diastole
Lt Vertebral A Ps	Left Vertebral Artery Peak Systole
LUQ - AFI	Left Upper Quadrant Amniotic Fluid Index
LV Protocol	Left Ventricle Protocol
LV Single Plane	Left Ventricle Single Plane
LVd	Left Ventricle Diastole
LVd Single Plane	Left Ventricle Diastole Single Plane
LVOT VTI	Velocity Time Integral Left Ventricle Outflow Tract
LVOTDs	Left Ventricular Outflow Tract Diameter, systole
LVs	Left Ventricle Systole
LVs Single Plane	Left Ventricle Systole Single Plane
M Distance	General M-mode Distance Tool
MAPSE	Mitral Annular Plane Systolic Excursion
MHV	Middle Hepatic Vein
MHV Ed	Middle Hepatic Vein End Diastole
MVH Ps	Middle Hepatic Vein Peak Systole
Mid LRA	Left Kidney Mid LRA
Mid LRA Ed	Left Kidney Mid LRA
Mid LRA Ps	Left Kidney Mid LRA
Mid RRA	Right Kidney Mid RRA
Mid RRA Ed	Right Kidney Mid RRA End Diastole
Mid RRA Ps	Right Kidney Mid RRA Peak Systole
MPV	Main Portal Vein
MPV Ed	Main Portal Vein End Diastole
MPV Ps	Main Portal Vein Peak Systole

Measurement	Explanation
MSS	Mitral Septal Separation
Nuc Translucency	Nuchal Translucency
Nuchal Thick	Nuchal Fold Thickness
OFD	Occipito-frontal Diameter
Planimetry (Freehand)	Prostate Volume
Post Void Bl Ellipse	Post Void Bladder Ellipse
Post Void Bl H	Post Void Bladder Height
Post Void Bl L	Post Void Bladder Length
Post Void Bl V Ellipse	Post Void Bladder Volume Ellipse
Post Void Bl V W*H*L	Post Void Bladder Volume Width*Height*Length
Post Void Bl W	Post Void Bladder Width
Pre Void Bl Ellipse	Pre Void Bladder Ellipse
Pre Void Bl H	Pre Void Bladder Height
Pre Void Bl L	Pre Void Bladder Length
Pre Void Bl V Ellipse	Pre Void Bladder Volume Ellipse
Pre Void Bl V W*H*L	Pre Void Bladder Width*Height*Length
Pre Void Bl W	Pre Void Bladder Width
Prostate Ellipse	Prostate Ellipse
Prostate H	Prostate Height
Prostate L	Prostate Length
Prostate V Ellipse	Prostate Volume Ellipse
Prostate V W*H*L	Prostate Volume Width*Height*Length
Prostate W	Prostate Width
Prox IVC Ed	Proximal IVC End Diastole
Prox IVC Ps	Proximal IVC Peak Systole
Prox IVC	Proximal IVC
Prox LRA	Left Kidney Proximal LRA
Prox LRA Ed	Left Kidney Proximal LRA End Diastole
Prox LRA Ps	Left Kidney Proximal LRA Peak Systole
Prox RRA	Right Kidney Proximal RRA

Measurement	Explanation
Prox RRA Ed	Right Kidney Proximal RRA End Diastole
Prox RRA Ps	Right Kidney Proximal RRA Peak Systole
Ps	Peak Systole
PSAD	PSAD
Real-Time	Real-Time
Rectum	Rectum Outline
RHV	Right Hepatic Vein
RHV Ed	Right Hepatic Vein End Diastole
RHV Ps	Right Hepatic Vein Peak Systole
RLQ - AFI	Right Lower Quadrant Amniotic Fluid Index
RPV	Right Portal Vein
RPV Ed	Right Portal Vein End Diastole
RPV Ps	Right Portal Vein Peak Systole
Rt AC Bas V (Dia)	Right Antecubital Basilic Vein Diameter
Rt AC Bas V (Dpt)	Right Antecubital Basilic Vein Depth
Rt AC Ceph V (Dia)	Right Antecubital Cephalic Vein Diameter
Rt AC Ceph V (Dpt)	Right Antecubital Cephalic Vein Depth
Rt Accessory RA	Right Accessory Renal Artery
Rt Ant Bas V (Dia)	Right Anterior Basilic Vein Diameter
Rt Ant Bas V (Dpt)	Right Anterior Basilic Vein Depth
Rt Ant Ceph V (Dia)	Right Anterior Cephalic Vein Diameter
Rt Ant Ceph V (Dpt)	Right Anterior Cephalic Vein Depth
Rt Arcuate RA	Right Arcuate Renal Artery
Rt ATV VCT	Right Anterior Tibial Vein Valve Closure Time
Rt Axill A	Right Axillary Artery
Rt Axill A (Dia)	Right Axillary Artery Diameter
Rt Axill A (Dpt)	Right Axillary Artery Depth
Rt Axill A Ed	Right Axillary Artery End Diastole
Rt Axill A Ps	Right Axillary Artery Peak Systole
Rt Axill V (Dia)	Right Axillary Vein Diameter

Measurement	Explanation
Rt Axill V (Dpt)	Right Axillary Vein Depth
Rt Bulb	Right Bulb
Rt Bulb Ed	Right Bulb End Diastole
Rt Bulb Ps	Right Bulb Peak Systole
Rt CAV Auto	Right Cavernosal Artery Flaccid/Post Injection Auto
Rt CAV Ed	Right Cavernosal Artery Flaccid/Post Injection End Diastole
Rt CAV Manual	Right Cavernosal Artery Flaccid/Post Injection Manual
Rt CAV Ps	Right Cavernosal Artery Flaccid/Post Injection Peak Systole
Rt CFA	Right Common Femoral Artery
Rt CFA (Dia)	Right Common Femoral Artery Diameter
Rt CFA (Dpt)	Right Common Femoral Artery Depth
Rt CFA Ed	Right Common Femoral Artery End Diastole
Rt CFA Ps	Right Common Femoral Artery Peak Systole
Rt CFV (Dia)	Right Common Femoral Vein Diameter
Rt CFV (Dpt)	Right Common Femoral Vein Depth
Rt CFV VCT	Right Common Femoral Vein Valve Closure Time
Rt CFV/GSV Jct (Dia)	Right Common Femoral Vein/Greater Saphenous Vein Junction Diameter
Rt CFV/GSV Jct (Dpt)	Right Common Femoral Vein/Greater Saphenous Vein Junction Depth
Rt Common IA	Right Common Iliac Artery
Rt Common IA (Dia)	Right Common Iliac Artery Diameter
Rt Common IA (Dpt)	Right Common Iliac Artery Depth
Rt Common IA	Right Common Iliac Artery
Rt Common IA	Right Common Iliac Artery
Rt Common IV VCT	Right Common Iliac Vein Valve Closure Time
Rt Corp Lut	Right Corpus Luteum
Rt Dist ATA	Right Distal Anterior Tibial Artery
Rt Dist ATA (Dia)	Right Distal Anterior Tibial Artery Diameter
Rt Dist ATA (Dpt)	Right Distal Anterior Tibial Artery Depth
Rt Dist ATA Ed	Right Distal Anterior Tibial Artery End Diastole

Measurement	Explanation
Rt Dist ATA Ps	Right Distal Anterior Tibial Artery Peak Systole
Rt Dist Bas V (Dia)	Right Distal Basilic Vein Diameter
Rt Dist Bas V (Dpt)	Right Distal Basilic Vein Depth
Rt Dist Brach A	Right Distal Brachial Artery
Rt Dist Brach A (Dia)	Right Distal Brachial Artery Diameter
Rt Dist Brach A (Dpt)	Right Distal Brachial Artery Depth
Rt Dist Brach A Ed	Right Distal Brachial Artery End Diastole
Rt Dist Brach A Ps	Right Distal Brachial Artery Peak Systole
Rt Dist CCA	Right Distal Common Carotid Artery
Rt Dist CCA Ed	Right Distal Common Carotid Artery End Diastole
Rt Dist CCA Ps	Right Distal Common Carotid Artery Peak Systole
Rt Dist Ceph V LA (Dia)	Right Distal Cephalic Vein Lower Arm Diameter
Rt Dist Ceph V LA (Dpt)	Right Distal Cephalic Vein Lower Arm Depth
Rt Dist FV VCT	Right Distal Femoral Vein Valve Closure Time
Rt Dist ICA	Right Distal Internal Carotid Artery
Rt Dist ICA Ed	Right Distal Internal Carotid Artery End Diastole
Rt Dist ICA Ps	Right Distal Internal Carotid Artery Peak Systole
Rt Dist Pero A	Right Distal Peroneal Artery
Rt Dist Pero A (Dia)	Right Distal Peroneal Artery Diameter
Rt Dist Pero A (Dpt)	Right Distal Peroneal Artery Depth
Rt Dist Pero A (Ed)	Right Distal Peroneal Artery End Diastole
Rt Dist Pero A (Ps)	Right Distal Peroneal Artery Peak Systole
Rt Dist Pero V VCT	Right Distal Peroneal Vein Valve Closure Time
Rt Dist Pop A	Right Distal Popliteal Artery
Rt Dist Pop A (Dia)	Right Distal Popliteal Artery Diameter
Rt Dist Pop A (Dpt)	Right Distal Popliteal Artery Depth
Rt Dist Pop A Ed	Right Distal Popliteal Artery End Diastole
Rt Dist Pop A Ps	Right Distal Popliteal Artery Peak Systole
Rt Dist PTA	Right Distal Posterior Tibial Artery
Rt Dist PTA (Dia)	Right Distal Posterior Tibial Artery Diameter

Measurement	Explanation
Rt Dist PTA (Dpt)	Right Distal Posterior Tibial Artery Depth
Rt Dist PTA Ed	Right Distal Posterior Tibial Artery End Diastole
Rt Dist PTA Ps	Right Distal Posterior Tibial Artery Peak Systole
Rt Dist PTV VCT	Right Distal Posterior Tibial Vein Valve Closure Time
Rt Dist Rad A	Right Distal Radial Artery
Rt Dist Rad A (Dia)	Right Distal Radial Artery Diameter
Rt Dist Rad A (Dpt)	Right Distal Radial Artery Depth
Rt Dist Rad A Ed	Right Distal Radial Artery End Diastole
Rt Dist Rad A Ps	Right Distal Radial Artery Peak Systole
Rt Dist SFA	Right Distal Superficial Femoral Artery
Rt Dist SFA (Dia)	Right Distal Superficial Femoral Artery Diameter
Rt Dist SFA (Dpt)	Right Distal Superficial Femoral Artery Depth
Rt Dist SFA Ed	Right Distal Superficial Femoral Artery End Diastole
Rt Dist SFA Ps	Right Distal Superficial Femoral Artery Peak Systole
Rt Dist SSA (Dia)	Right Distal Small Saphenous Vein Diameter
Rt Dist SSA (Dpt)	Right Distal Small Saphenous Vein Depth
Rt Dist Subcl A	Right Dist Subclavian Artery
Rt Dist Subcl A Ed	Right Dist Subclavian Artery End Diastole
Rt Dist Subcl A Ps	Right Dist Subclavian Artery Peak Systole
Rt Dist Subclav A (Dia)	Right Dist Subclavian Artery Diameter
Rt Dist Subclav A (Dpt)	Right Dist Subclavian Artery Depth
Rt Dist Uln A	Right Distal Ulnar Artery
Rt Dist Uln A (Dia)	Right Distal Ulnar Artery Diameter
Rt Dist Uln A (Dpt)	Right Distal Ulnar Artery Depth
Rt Dist Uln A Ed	Right Distal Ulnar Artery End Diastole
Rt Dist Uln A Ps	Right Distal Ulnar Artery Peak Systole
Rt Dor Pedis A	Right Dorsalis Pedis Artery
Rt Dor Pedis A (Dia)	Right Dorsalis Pedis Artery Diameter
Rt Dor Pedis A (Dpt)	Right Dorsalis Pedis Artery Depth
Rt Dor Pedis A Ed	Right Dorsalis Pedis Artery End Diastole

Measurement	Explanation
Rt Dor Pedis A Ps	Right Dorsalis Pedis Artery Peak Systole
Rt ECA	Right External Carotid Artery
Rt ECA Ed	Right External Carotid Artery End Diastole
Rt ECA Ps	Right External Carotid Artery Peak Systole
Rt Epid H	Right Epid Height
Rt Epid L	Right Epid Length
Rt Epid V	Right Epid Volume
Rt Epid W	Right Epid Width
Rt External IV VCT	Right External Iliac Vein Valve Closure Time
Rt Fem V (Dia)	Right Femoral Vein Diameter
Rt Fem V (Dpt)	Right Femoral Vein Depth
Rt Follicle 1..15	Right Follicle 1, 2, 3,..15. Auto, 1-3 distances or Volume (W*H*L), depending on your preferences in the setup.
Rt GNV VCT	Right Gastrocnemius Vein Valve Closure Time
Rt GSV Dist Calf (Dia)	Right Greater Saphenous Vein Distal Calf Diameter
Rt GSV Dist Calf (Dpt)	Right Greater Saphenous Vein Distal Calf Depth
Rt GSV Dist Thigh (Dia)	Right Greater Saphenous Vein Distal Thigh Diameter
Rt GSV Dist Thigh (Dpt)	Right Greater Saphenous Vein Distal Thigh Depth
Rt GSV Knee (Dia)	Right Greater Saphenous Vein at Knee Diameter
Rt GSV Knee (Dpt)	Right Greater Saphenous Vein at Knee Depth
Rt GSV Mid Calf (Dia)	Right Greater Saphenous Vein Mid Calf Diameter
Rt GSV Mid Calf (Dpt)	Right Greater Saphenous Vein Mid Calf Depth
Rt GSV Mid Thigh (Dia)	Right Greater Saphenous Vein Mid Thigh Diameter
Rt GSV Mid Thigh (Dpt)	Right Greater Saphenous Vein Mid Thigh Depth
Rt GSV Prox Calf (Dia)	Right Greater Saphenous Vein Proximal Calf Diameter
Rt GSV Prox Calf (Dpt)	Right Greater Saphenous Vein Proximal Calf Depth
Rt GSV Prox Thigh (Dia)	Right Greater Saphenous Vein Proximal Thigh Diameter
Rt GSV Prox Thigh (Dpt)	Right Greater Saphenous Vein Proximal Thigh Depth
Rt GSV VCT	Right Great Saphenous Vein Valve Closure Time
Rt GSV-Calf VCT	Right Great Saphenous Vein of Calf Valve Closure Time
Rt GSV-Thigh VCT	Right Great Saphenous Vein of Thigh Valve Closure Time

Measurement	Explanation
Rt Iliac A	Right Iliac Artery
Rt Iliac A AP	Right Iliac Artery AP
Rt Iliac A Ed	Right Iliac Artery End Diastole
Rt Iliac A Ps	Right Iliac Artery Peak Systole
Rt Iliac A W	Right Iliac Artery W
Rt INF Segmental RA	Right Inferior Segmental Renal Artery
Rt Interlobar RA	Right Interlobar Renal Artery
Rt Interlobular RA	Right Interlobular Renal Artery
Rt Kidney H	Right Kidney Height
Rt Kidney L	Right Kidney Length
Rt Kidney V	Right Kidney Volume
Rt Kidney W	Right Kidney Width
Rt Kidney V L*H*W	Right Kidney Volume Length * Height * Width
Rt Lesion 1..8 H	Right Lesion 1,2,3..8 Height
Rt Lesion 1..8 L	Right Lesion 1,2,3..8 Length
Rt Lesion 1..8 V W*H*L	Right Lesion 1,2,3..8 Volume Width * Height * Length
Rt Lesion 1..8 W	Right Lesion 1,2,3..8 Width
Rt Lobe H	Right Lobe Height
Rt Lobe L	Right Lobe Length
Rt Lobe V W*H*L	Right Lobe Volume Width * Height * Length
Rt Lobe W	Right Lobe Width
Rt LSV VCT	Right Lesser Saphenous Vein Valve Closure Time
Rt Mid ATA	Right Mid Anterior Tibial Artery
Rt Mid ATA (Dia)	Right Mid Anterior Tibial Artery Diameter
Rt Mid ATA (Dpt)	Right Mid Anterior Tibial Artery Depth
Rt Mid ATA Ed	Right Mid Anterior Tibial Artery End Diastole
Rt Mid ATA Ps	Right Mid Anterior Tibial Artery Peak Systole
Rt Mid Bas V (Dia)	Right Mid Basilic Vein Diameter
Rt Mid Bas V (Dpt)	Right Mid Basilic Vein Depth
Rt Mid Brach A	Right Mid Brachial Artery

Measurement	Explanation
Rt Mid Brach A (Dia)	Right Mid Brachial Artery Diameter
Rt Mid Brach A (Dpt)	Right Mid Brachial Artery (Depth)
Rt Mid Brach A Ed	Right Mid Brachial Artery End Diastole
Rt Mid Brach A Ps	Right Mid Brachial Artery Peak Systole
Rt Mid CCA	Right Mid Common Carotid Artery
Rt Mid CCA Ed	Right Mid Common Carotid Artery End Diastole
Rt Mid CCA Ps	Right Mid Common Carotid Artery Peak Systole
Rt Mid Pero A	Right Mid Peroneal Artery
Rt Mid Pero A (Dia)	Right Mid Peroneal Artery Diameter
Rt Mid Pero A (Dpt)	Right Mid Peroneal Artery Depth
Rt Mid Pero A Ed	Right Mid Peroneal Artery End Diastole
Rt Mid Pero A Ps	Right Mid Peroneal Artery Peak Systole
Rt Mid Pero V VCT	Right Mid Peroneal Vein Valve Closure Time
Rt Mid PTA	Right Mid Posterior Tibial Artery
Rt Mid PTA (Dia)	Right Mid Posterior Tibial Artery Diameter
Rt Mid PTA (Dpt)	Right Mid Posterior Tibial Artery Depth
Rt Mid PTA Ed	Right Mid Posterior Tibial Artery End Diastole
Rt Mid PTA Ps	Right Mid Posterior Tibial Artery Peak Systole
Rt Mid PTV VCT	Right Mid Posterior Tibial Vein Valve Closure Time
Rt Mid Rad A	Right Mid Radial Artery
Rt Mid Rad A (Dia)	Right Mid Radial Artery Diameter
Rt Mid Rad A (Dpt)	Right Mid Radial Artery Depth
Rt Mid Rad A Ed	Right Mid Radial Artery End Diastole
Rt Mid Rad A Ps	Right Mid Radial Artery Peak Systole
Rt MID Segmental RA	Right MID Segmental Renal Artery
Rt Mid SFA	Right Mid Superficial Femoral Artery
Rt Mid SFA (Dia)	Right Mid Superficial Femoral Artery Diameter
Rt Mid SFA (Dpt)	Right Mid Superficial Femoral Artery Depth
Rt Mid SFA Ed	Right Mid Superficial Femoral Artery End Diastole
Rt Mid SFA Ps	Right Mid Superficial Femoral Artery Peak Systole

Measurement	Explanation
Rt Mid SSV (Dia)	Right Mid Small Saphenous Vein Diameter
Rt Mid SSV (Dpt)	Right Mid Small Saphenous Vein Depth
Rt Mid Subcl A	Right Mid Subclavian Artery
Rt Mid Subcl A Ed	Right Mid Subclavian Artery End Diastole
Rt Mid Subcl A Ps	Right Mid Subclavian Artery Peak Systole
Rt Mid Subclav A (Dia)	Right Mid Subclavian Artery Diameter
Rt Mid Subclav A (Dpt)	Right Mid Subclavian Artery Depth
Rt Mid Uln A	Right Mid Ulnar Artery
Rt Mid Uln A (Dia)	Right Mid Ulnar Artery Diameter
Rt Mid Uln A (Dpt)	Right Mid Ulnar Artery Depth
Rt Mid Uln A Ed	Right Mid Ulnar Artery End Diastole
Rt Mid Uln A Ps	Right Mid Ulnar Artery Peak Systole
Rt Nodule 1..5 H	Right Nodule 1,2,3,4,5 Height
Rt Nodule 1..5 L	Right Nodule 1,2,3,4,5 Length
Rt Nodule 1..5 V W*H*L	Right Nodule 1,2,3,4,5 Volume Width * Height * Length
Rt Nodule 1..5 W	Right Nodule 1,2,3,4,5 Width
Rt Ovarian A	Right Maternal Ovarian Artery
Rt Ovarian A Ed	Right Maternal Ovarian Artery End Diastole
Rt Ovarian A Ps	Right Maternal Ovarian Artery Peak Systole
Rt Ovary H	Right Ovary Height
Rt Ovary L	Right Ovary Length
Rt Ovary V L*H*W	Right Ovary Volume Width * Height * Length
Rt Ovary W	Right Ovary Width
Rt Ovary Lesion 1..5 H	Right Ovary Lesion 1,2,3,4,5 Height
Rt Ovary Lesion 1..5 L	Right Ovary Lesion 1,2,3,4,5 Length
Rt Ovary Lesion 1..5 W	Right Ovary Lesion 1,2,3,4,5 Width
Rt Perf-Boyd VCT	Right Boyd's Perforating Vein Valve Closure Time
Rt Perf-Cockett VCT	Right Cockett's Perforating Vein Valve Closure Time
Rt Perf-Hunterian VCT	Right Hunterian Perforating Vein Valve Closure Time
Rt PFA	Right Profunda Artery

Measurement	Explanation
Rt PFA (Dia)	Right Profunda Artery Diameter
Rt PFA (Dpt)	Right Profunda Artery Depth
Rt PFA Ed	Right Profunda Artery End Diastole
Rt PFA Ps	Right Profunda Artery Peak Systole
Rt PFV VCT	Right Profunda Femoral Vein Valve Closure Time
Rt Pop V VCT	Right Popliteal Vein Valve Closure Time
Rt Prox ATA	Right Proximal Anterior Tibial Artery
Rt Prox ATA (Dia)	Right Proximal Anterior Tibial Artery Diameter
Rt Prox ATA (Dpt)	Right Proximal Anterior Tibial Artery Depth
Rt Prox ATA Ed	Right Proximal Anterior Tibial Artery End Diastole
Rt Prox ATA Ps	Right Proximal Anterior Tibial Artery Peak Systole
Rt Prox Bas V (Dia)	Right Proximal Basilic Vein Diameter
Rt Prox Bas V (Dpt)	Right Proximal Basilic Vein Depth
Rt Prox Brach A	Right Proximal Brachial Artery
Rt Prox Brach A (Dia)	Right Proximal Brachial Artery Diameter
Rt Prox Brach A (Dpt)	Right Proximal Brachial Artery Depth
Rt Prox Brach A Ed	Right Proximal Brachial Artery End Diastole
Rt Prox Brach A Ps	Right Proximal Brachial Artery Peak Systole
Rt Prox CCA	Right Proximal Common Carotid Artery
Rt Prox CCA Ed	Right Proximal Common Carotid Artery End Diastole
Rt Prox CCA Ps	Right Proximal Common Carotid Artery Peak Systole
Rt Prox Ceph V LA (Dia)	Right Proximal Cephalic Vein Lower Arm Diameter
Rt Prox Ceph V LA (Dpt)	Right Proximal Cephalic Vein Lower Arm Depth
Rt Prox Ceph V UA (Dia)	Right Proximal Cephalic Vein Upper Arm Diameter
Rt Prox Ceph V UA (Dpt)	Right Proximal Cephalic Vein Upper Arm Depth
Rt Prox FV VCT	Right Proximal Femoral Vein Valve Closure Time
Rt Prox ICA	Right Proximal Internal Carotid Artery
Rt Prox ICA Ed	Right Proximal Internal Carotid Artery End Diastole
Rt Prox ICA Ps	Right Proximal Internal Carotid Artery Peak Systole
Rt Prox Pero A	Right Proximal Peroneal Artery

Measurement	Explanation
Rt Prox Pero A (Dia)	Right Proximal Peroneal Artery Diameter
Rt Prox Pero A (Dpt)	Right Proximal Peroneal Artery Depth
Rt Prox Pero A Ed	Right Proximal Peroneal Artery End Diastole
Rt Prox Pero A Ps	Right Proximal Peroneal Artery Peak Systole
Rt Prox Pero V VCT	Right Proximal Peroneal Vein Valve Closure Time
Rt Prox Pop A	Right Proximal Popliteal Artery
Rt Prox Pop A (Dia)	Right Proximal Popliteal Artery Diameter
Rt Prox Pop A (Dpt)	Right Proximal Popliteal Artery Depth
Rt Prox Pop A Ed	Right Proximal Popliteal Artery End Diastole
Rt Prox Pop A Ps	Right Proximal Popliteal Artery Peak Systole
Rt Prox PTA	Right Proximal Posterior Tibial Artery
Rt Prox PTA (Dia)	Right Proximal Posterior Tibial Artery Diameter
Rt Prox PTA (Dpt)	Right Proximal Posterior Tibial Artery Depth
Rt Prox PTA Ed	Right Proximal Posterior Tibial Artery End Diastole
Rt Prox PTA Ps	Right Proximal Posterior Tibial Artery Peak Systole
Rt Prox PTV VCT	Right Proximal Posterior Tibial Vein Valve Closure Time
Rt Prox Rad A	Right Proximal Radial Artery
Rt Prox Rad A (Dia)	Right Proximal Radial Artery Diameter
Rt Prox Rad A (Dpt)	Right Proximal Radial Artery Depth
Rt Prox Rad A Ed	Right Proximal Radial Artery End Diastole
Rt Prox Rad A Ps	Right Proximal Radial Artery Peak Systole
Rt Prox SFA	Right Proximal Superficial Femoral Artery
Rt Prox SFA (Dia)	Right Proximal Superficial Femoral Artery Diameter
Rt Prox SFA (Dpt)	Right Proximal Superficial Femoral Artery Depth
Rt Prox SFA Ed	Right Proximal Superficial Femoral Artery End Diastole
Rt Prox SFA Ps	Right Proximal Superficial Femoral Artery Peak Systole
Rt Prox SSV (Dia)	Right Proximal Small Saphenous Vein Diameter
Rt Prox SSV (Dpt)	Right Proximal Small Saphenous Vein Depth
Rt Prox Subcl A	Right Prox Subclavian Artery
Rt Prox Subcl A Ed	Right Prox Subclavian Artery End Diastole

Measurement	Explanation
Rt Prox Subcl A Ps	Right Prox Subclavian Artery Peak Systolic
Rt Prox Subclav A (Dia)	Right Prox Subclavian Artery Diameter
Rt Prox Subclav A (Dpt)	Right Prox Subclavian Artery Depth
Rt Prox Uln A	Right Proximal Ulnar Artery
Rt Prox Uln A (Dia)	Right Proximal Ulnar Artery Diameter
Rt Prox Uln A (Dpt)	Right Proximal Ulnar Artery Depth
Rt Prox Uln A Ed	Right Proximal Ulnar Artery End Diastole
Rt Prox Uln A Ps	Right Proximal Ulnar Artery Peak Systole
Rt Rad A	Right Radial Artery
Rt Rad A (Dia)	Right Radial Artery Diameter
Rt Rad A (Dpt)	Right Radial Artery Depth
Rt Rad A Ed	Right Radial Artery End Diastole
Rt Rad A Ps	Right Radial Artery Peak Systole
Rt Renal Hilum	Right Renal Hilum
Rt SFJ VCT	Right Saphenofemoral Junction Valve Closure Time
Rt Skin Thickness	Right Testicle Skin Thickness
Rt SLV VCT	Right Soleal Vein Valve Closure Time
Rt SSV/Pop Jct (Dia)	Right Small Saphenous Vein/Popliteal Junction Diameter
Rt SSV/Pop Jct (Dpt)	Right Small Saphenous Vein/Popliteal Junction Depth
Rt Subclav A	Right Subclavian Artery
Rt Subclav A (Dia)	Right Subclavian Artery Diameter
Rt Subclav A (Dpt)	Right Subclavian Artery Depth
Rt Subclav A Ed	Right Subclavian Artery End Diastole
Rt Subclav A Ps	Right Subclavian Artery Peak Systole
Rt SUP Segmental RA	Right Superior Segmental Renal Artery
Rt Testicle H	Right Testicle Height
Rt Testicle L	Right Testicle Length
Rt Testicle V	Right Testicle Volume
Rt Testicle W	Right Testicle Width
Rt Uln A	Right Ulnar Artery

Measurement	Explanation
Rt Uln A (Dia)	Right Ulnar Artery Diameter
Rt Uln A (Dpt)	Right Ulnar Artery Depth
Rt Uln A Ed	Right Ulnar Artery End Diastole
Rt Uln A Ps	Right Ulnar Artery Peak Systole
Rt Uterine A	Right Maternal Uterine Artery
Rt Vertebral A	Right Vertebral Artery
Rt Vertebral A Ed	Right Vertebral Artery End Diastole
Rt Vertebral A Ps	Right Vertebral Artery Peak Systole
RUQ - AFI	Right Upper Quadrant Amniotic Fluid Index
RVDd	Right Ventricle Diameter Diastole
RVSP	Right Ventricle Systolic Pressure
Seminal Vesicles	Seminal Vesicles Outline
SI	Stroke Volume Index
SI Single Plane	Stroke Volume Index Single Plane
SMA	Superior Mesenteric A
SMA Ed	Superior Mesenteric A End Diastole
SMA Ps	Superior Mesenteric A Peak Systole
SMV	Sup Mesenteric Vein
SMV Ed	Sup Mesenteric Vein End Systole
SMV Ps	Sup Mesenteric Vein Peak Systole
Spleen H	Spleen Height
Spleen L	Spleen Length
Spleen V L*H*W	Spleen Volume Length * Height * Width
Spleen W	Spleen Width
Splenic A	Splenic Artery
Splenic A Ed	Splenic Artery End Diastole
Splenic A Ps	Splenic Artery Peak Systole
Splenic V	Splenic Vein
Splenic V Ed	Splenic Vein End Diastole
Splenic V Ps	Splenic Vein Peak Systole

Measurement	Explanation
Strain Ratio	General Strain Ratio Tool
TAPSE	Tricuspid Annular Plane Systolic Excursion
Tibia	Tibia
Ulna	Ulna
Umb A	Umbilical Artery
Urethra	Urethra Outline
Uterus H	Uterus Height
Uterus L	Uterus Length
Uterus V L*H*W	Uterus Volume Length * Height * Width
Uterus W	Uterus Width
Velocity	Velocity
VF Auto	Volume Flow Auto Doppler
VF Dist	Volume Flow Distance
Volume	General Volume Tool using Ellipse/3 distances
Volume Flow	General Volume Flow Tool
Width	Width
Yolk Sac	Yolk Sac

Appendix C
Setting Up and Customizing Your System

The bk3000 and bk5000 include default setups that were created to optimize the ultrasound images and make it easy for you to use the different transducers, Exam Types, and Presets. You can customize the system so that it is easy to enter and select exactly the information you need.
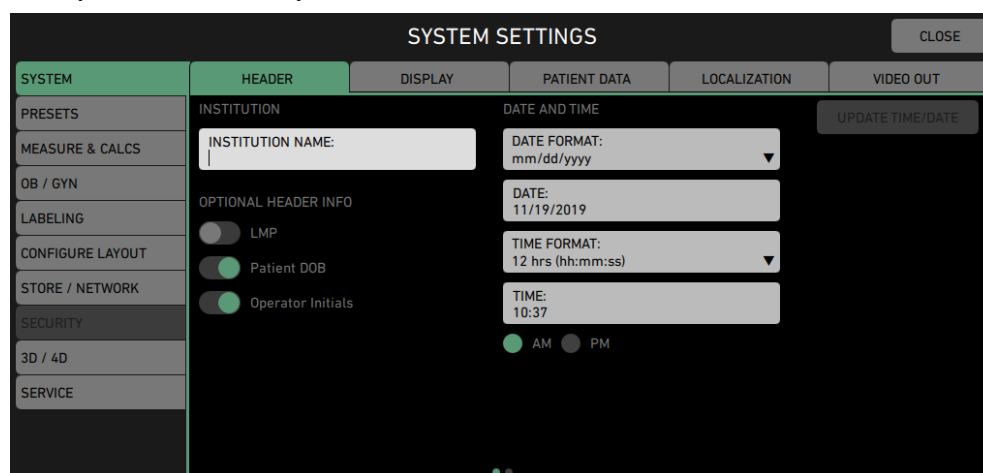
Figure C-1. The Settings screen

In the settings screen, you can select to customize the following:

- **System** for Header, Display, Patient Data, Localization, and Video Out.

- **Presets** with a list of available presets, default presets, and the possibility to manage them.

- **Measure & Calcs** for general measurement settings, assignment of calculation packages to presets, results, and preferences.

- **OB / Gyn** for preferred settings in these exam types.

- **Labeling** to assign new labels and bodymarks to presets, and to adjust the position of needle guides.

- **Configure Layout** to configure the button layout for exam type and imaging mode.

- **Store/Network** for storing and clip capture preferences, printer connections, DICOM/PACS connections, Wi-Fi, and network connection.

- **Security** for system administrators only. Select password protection and login/logout preferences. User manager window.

- **3D-4D**

- **Service** for import/export and restoring settings, system and transducer licenses, system information, and third party licenses.

You can navigate the windows by dragging the window with the trackball while holding down a selector key or by clicking on the dots at the bottom of the window.

System Window

Header Tab
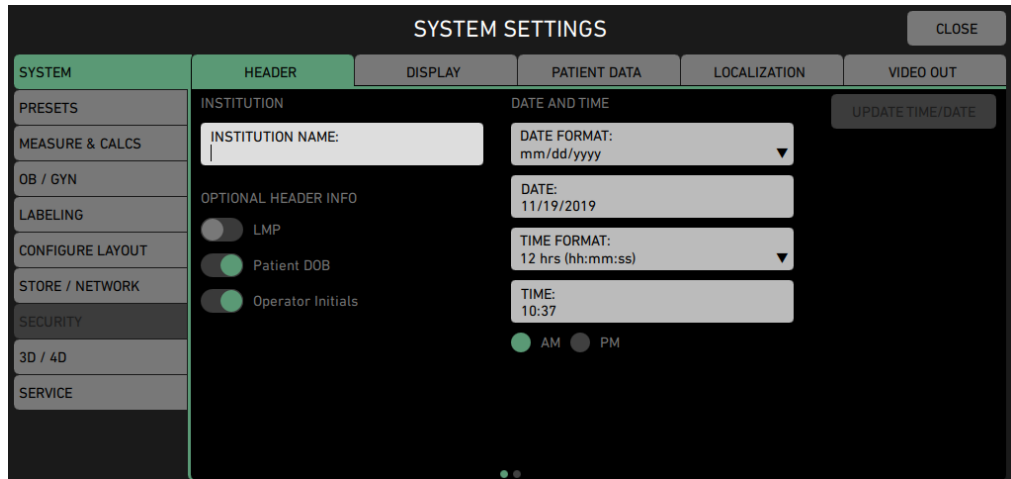
Figure C-2. System Header tab

Institution information is displayed above the transducer name at the top of the monitor and included in documents archived to a DICOM system. On the Header tab, you can:

- Type in your institution name.

- Select date format, date, and time format.

- Decide if you want to add **Optional Header Info**.

- Navigate to next window to add a logo for your institution.

Display Tab
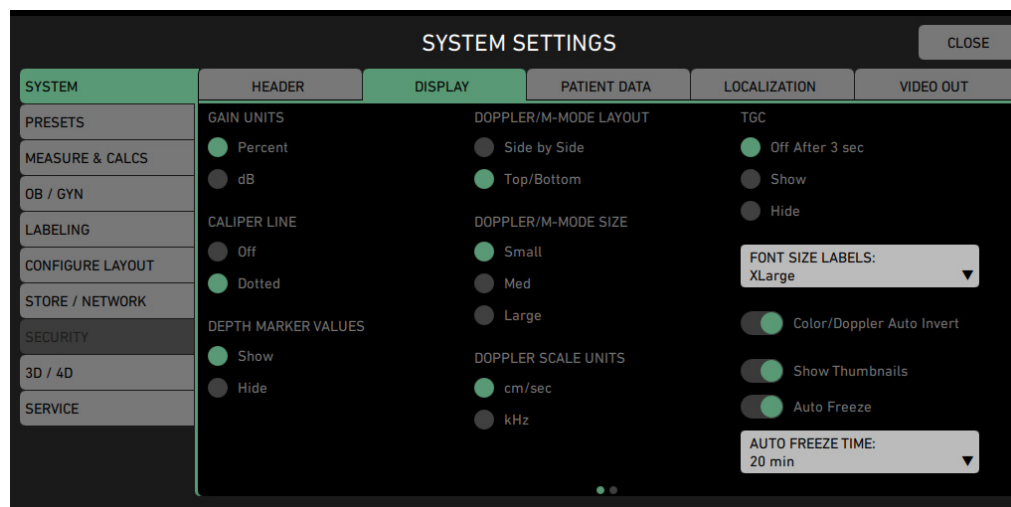
Figure C-3. System Display tab - first view
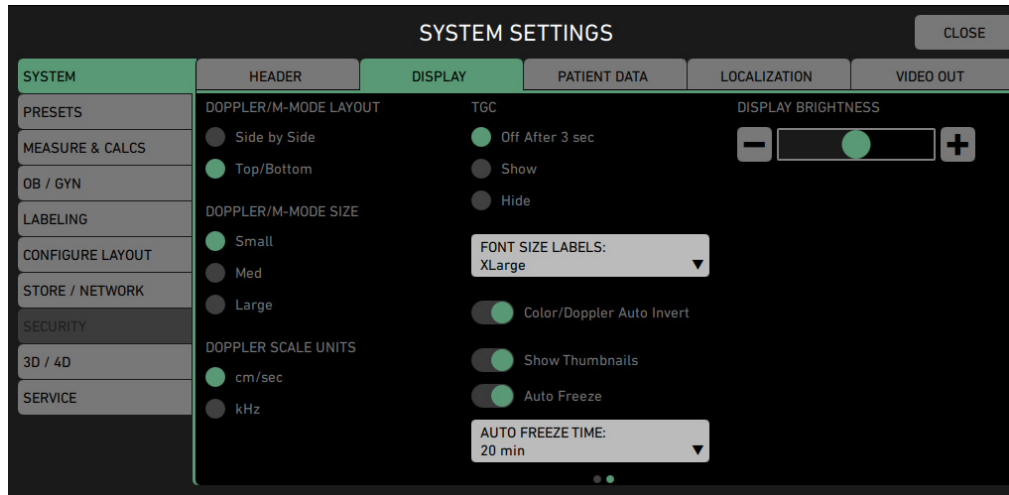
Figure C-4. System Display tab - next view

On the **Display** tab, there are several options for customizing your monitor. Use the radio buttons, slide buttons, and dropdown menus to adjust the system to your preferences. **Auto Freeze** activates or deactivates the screensaver. You can set the time before the screensaver is activated in **Auto Freeze Time**.

Patient Data Tab
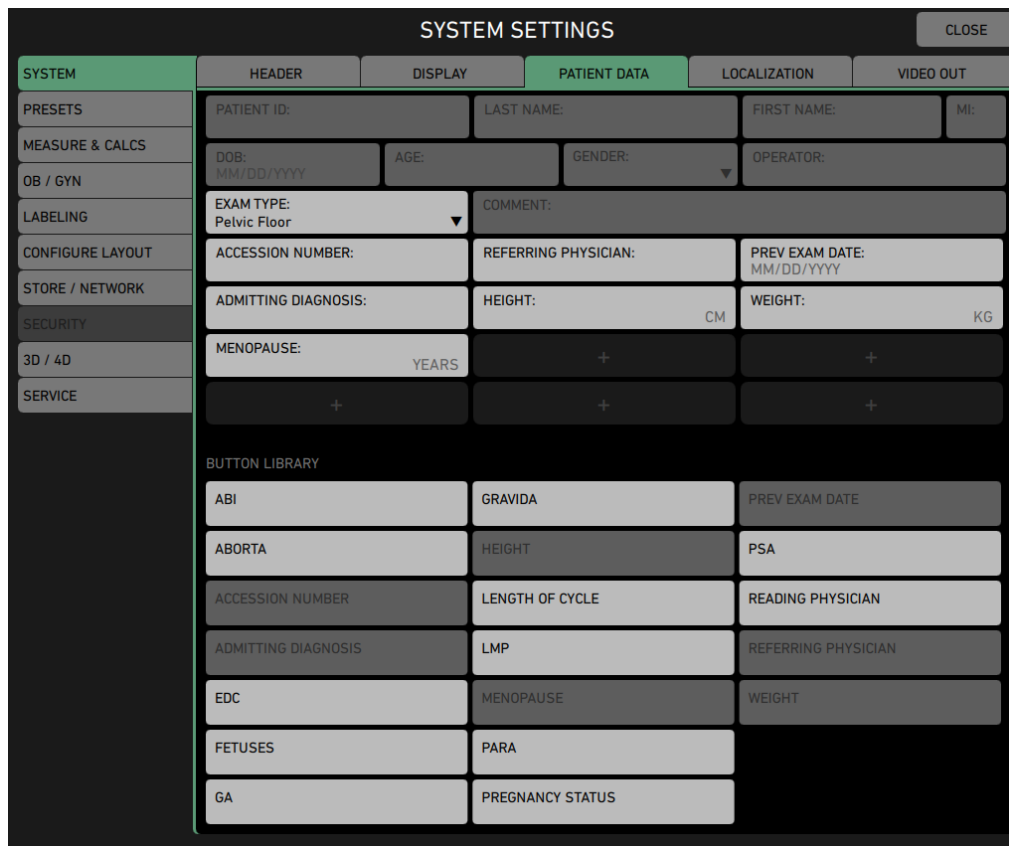
Figure C-5. System Patient Data tab

On the **Patient Data** tab, you can add more fields to the **Patient Details** window.

1 Add a field from the **Button Library** by dragging it to an empty field marked with a +.

The fields will be displayed next time you click the **Patient Details** window.

Localization Tab
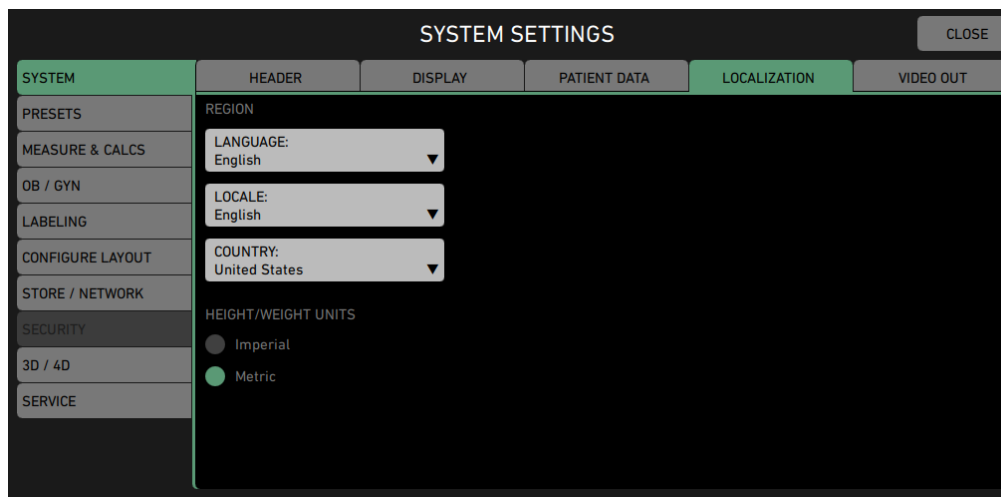
Figure C-6. System Localization tab

On the **Localization** tab, you can adjust language and location settings. Note that changes to these settings require a restart of the system to take effect**.**

Video Out Tab
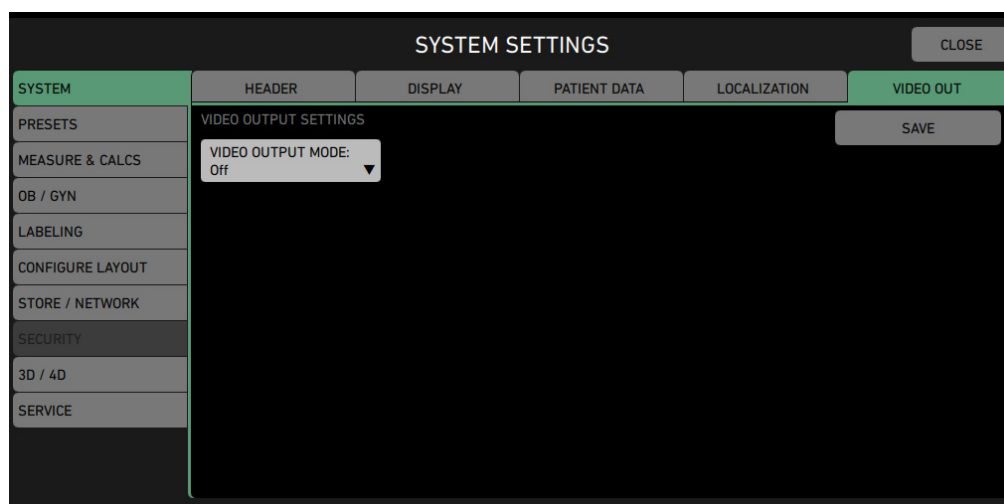
Figure C-7. System Video Out tab

On the **Video Out** tab, you can select **Video Output Settings**.

Preset Window

Available Tab
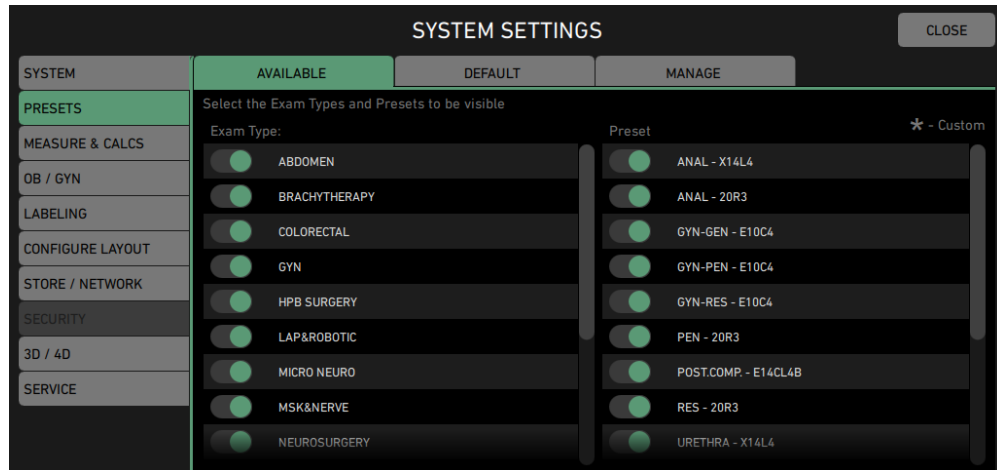
Figure C-8. Available presets

The **Available** tab shows the presets available for the selected **Exam Type**. Use the toggle buttons to select which **Exam Type** and **Presets** should be visible.

Default Tab
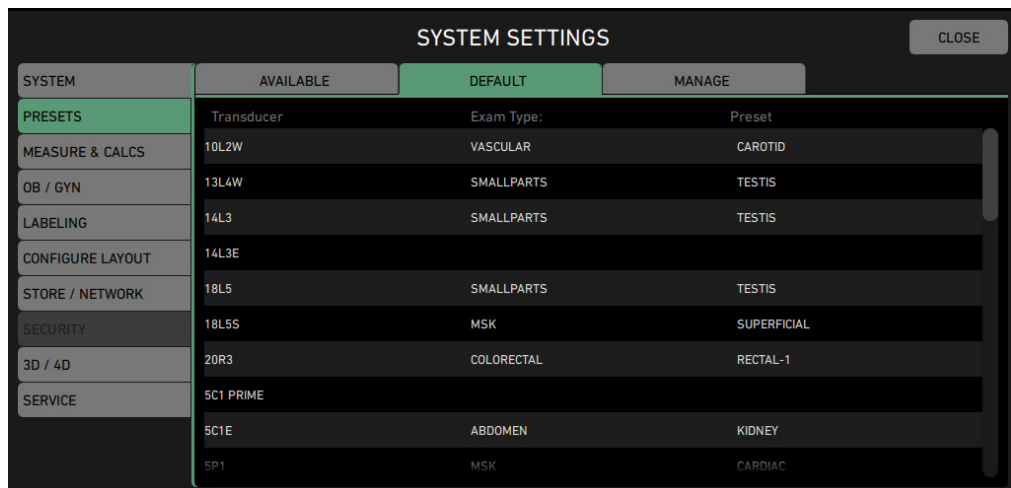
Figure C-9. Default presets

The **Default** tab shows the default presets available for the individual transducers.

To change a default preset:

1 Click on the transducer, exam type, or preset.

A window appears for the transducer.

2 Select an exam type

3 Select the desired preset for the chosen transducer and exam type

4   Click Save

Manage Tab
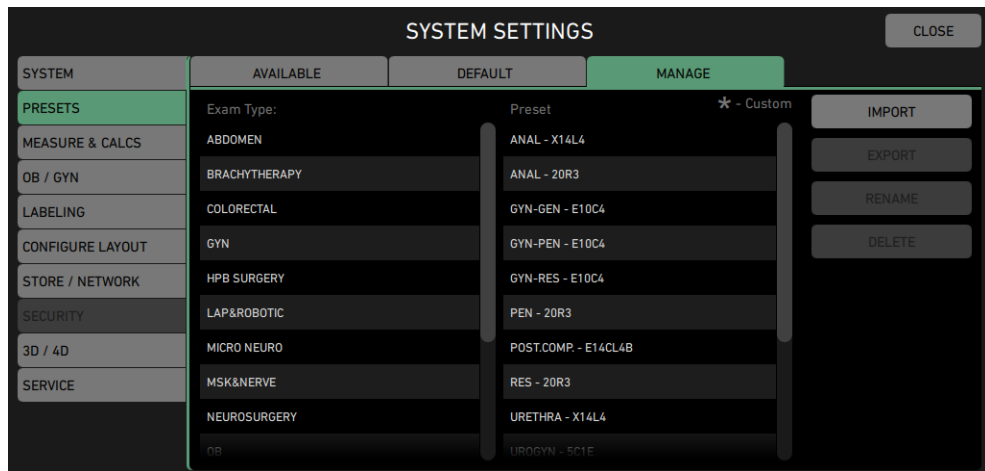
Figure C-10. Manage presets

On the **Manage** tab, you can import and export, rename, and delete presets.

Measure & Calcs Window

General Tab
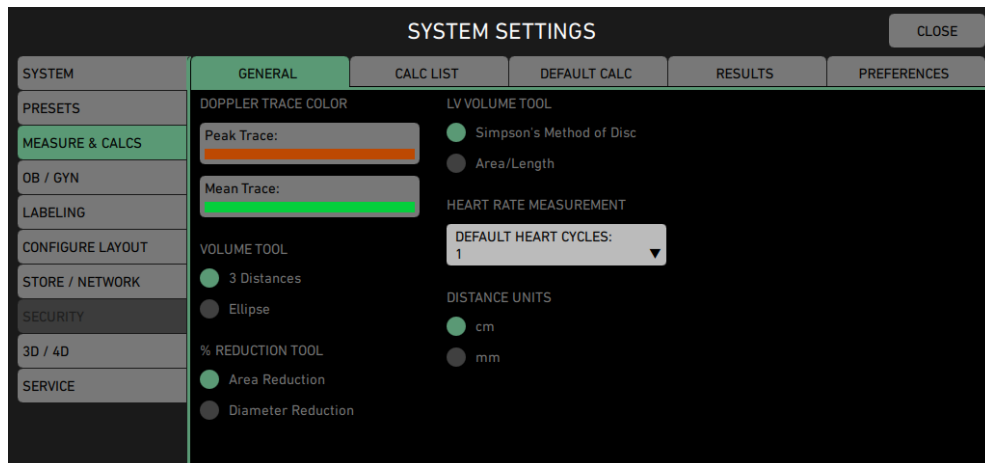
Figure C-11. Measure & Calcs General tab

On the **General** tab, you can:

• Select **Doppler Trace Color** scheme for Peak Trace and Mean Trace.

• Use the radio buttons to decide the behavior of the **Volume Tool**, the **%Reduction Tool**, the **LV Volume Tool**, and the **Distance Units**.

• Set **Default Heart Cycles** on the dropdown menu.

Calc List Tab
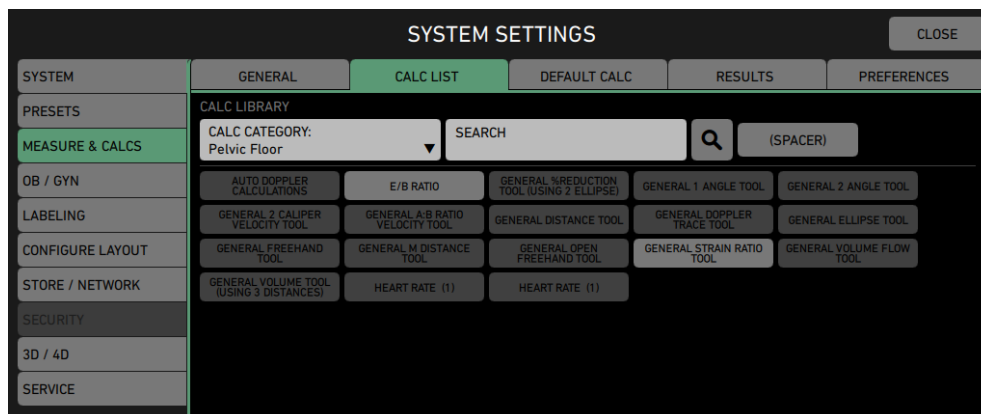
Figure C-12. Measures & Calcs, Calc list tab

On the **Calc List** tab, you can customize your selected calculation packages to fit your needs, and you can select a default calculation to start whenever you click **Freeze**.

To add a calculation to this Calc. Package:

1   In **Calc Library**, select **Calc Category**.

2   Click the calculation you want to add. It will be added immediately to the right of the existing calculations. If the first page is already full, a new page will be added.

3   If you want to add space between the default calculations and the ones you are adding, click **(Spacer)**. This will result in an empty area on the screen, the size of which is dependent on how many spacers you add.

To remove a calculation from this Calc. Package:

1   Click the calculation you want to remove. It will turn green, and the buttons **Remove from Package** and **Restore Default** will be active.

2   Click **Remove from Package**.

To restore default calculations:

• Click **Restore Default**.

Default Calc Tab
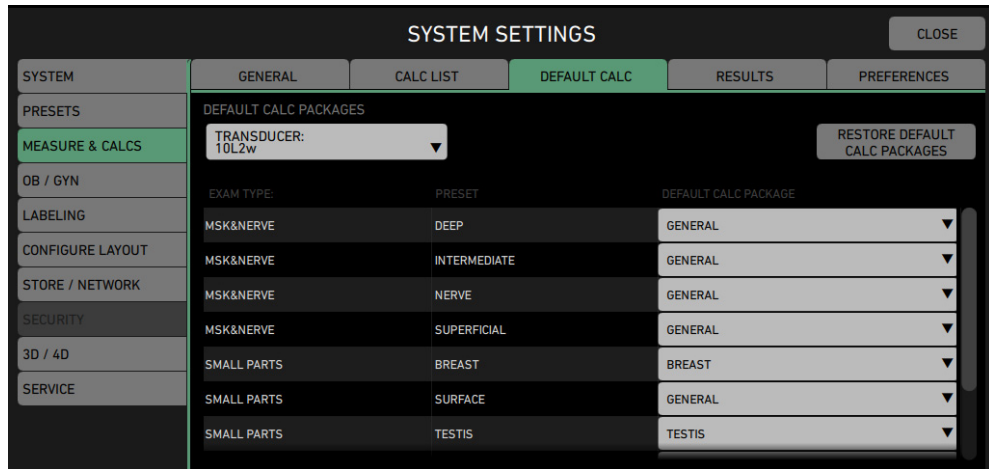
Figure C-13. Measure & Calcs, Default Calc tab

On the **Default Calc** tab, you can see the **Default Calc Packages** for the individual transducers, their exam types, and presets.

To change Default Calc Package:

1   Select transducer on the dropdown menu.

2   Select **Exam Type** and **Preset.**

3   On the dropdown menu **Default Calc Package**, select the calculation package you want.

You can restore all defaults by clicking the **Restore Default Calc Packages** button.

Results Tab
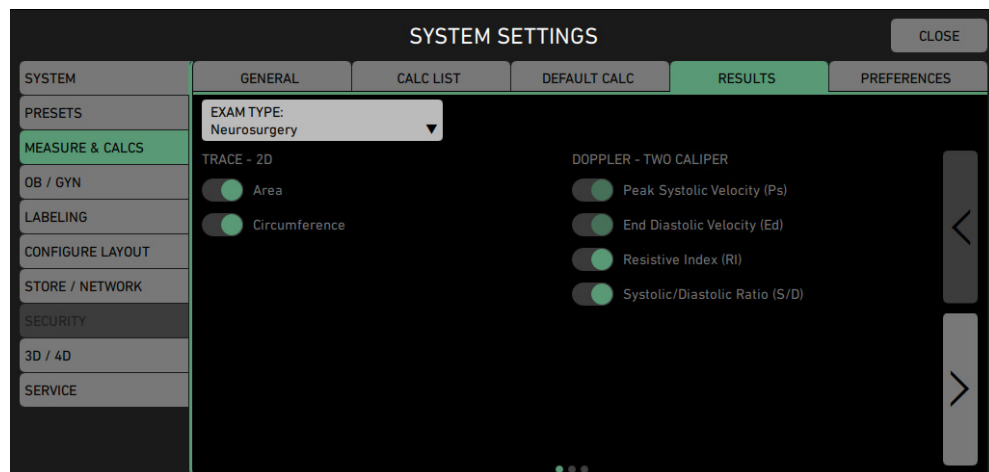
Figure C-14. Measure & Calcs. Results tab.

On the **Results** tab, you can select which results will be displayed when you do the different measurements. Note that you can only change the results when the toggle buttons are highlighted. Use the dropdown to select **Exam Type** and use the arrows on the tab to see all results.

Preferences Tab
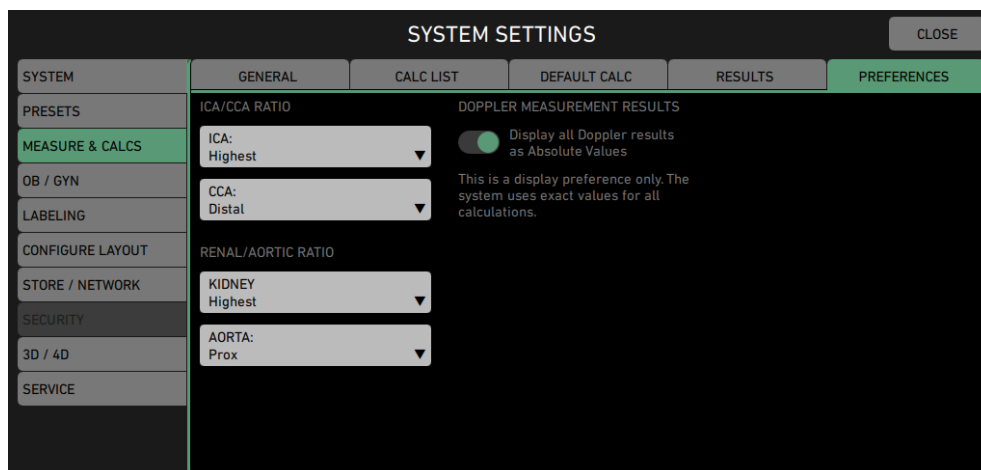
Figure C-15. The Measure & Calcs Preferences tab.

On the **Preferences** tab, you can use the dropdowns to select the **ICA/CCA Ratio**, **Renal/Aortic Ratio,** and decide if you want to see all Doppler results on the monitor in absolute values.

OB/Gyn Window

Preferences tab
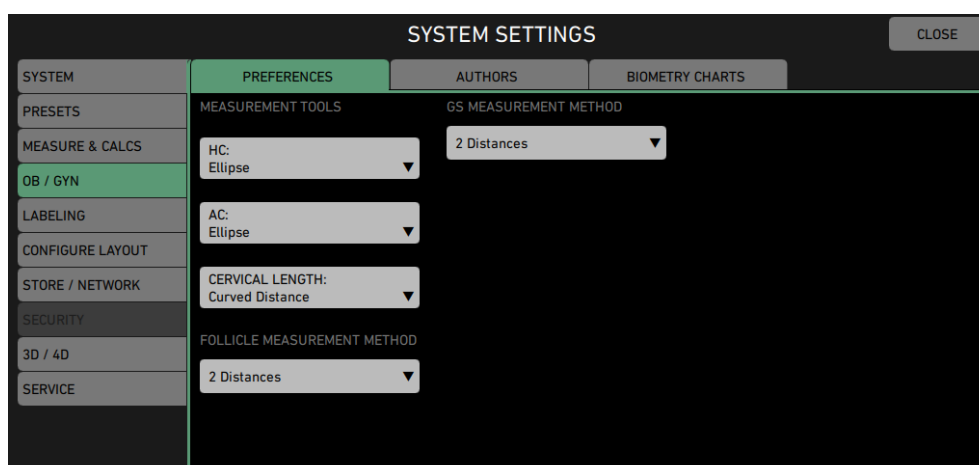
Figure C-16. The OB/GYN Preferences tab

On the **Preferences** tab, you can use the dropdowns to select your preferred **Measurement Tools** and decide which **Follicle** and **GS** measurement method you want to use.

Authors tab
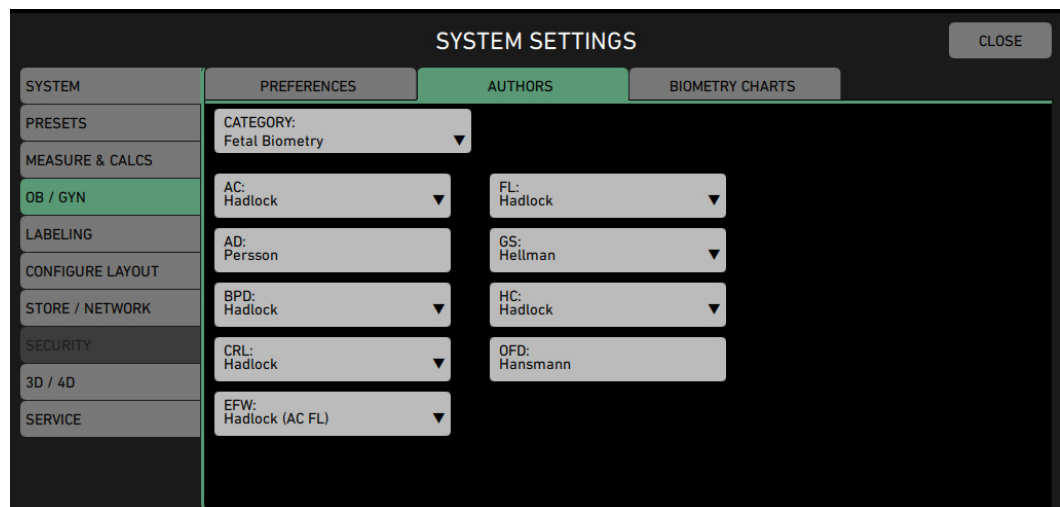
Figure C-17. The OB/GYN Authors tab

On the **Authors** tab, you can use the dropdowns to select between **Fetal Biometry** and **Growth Curves** under **Category**, and then decide which author you prefer for the calculations.

Labeling Window

Labels Tab
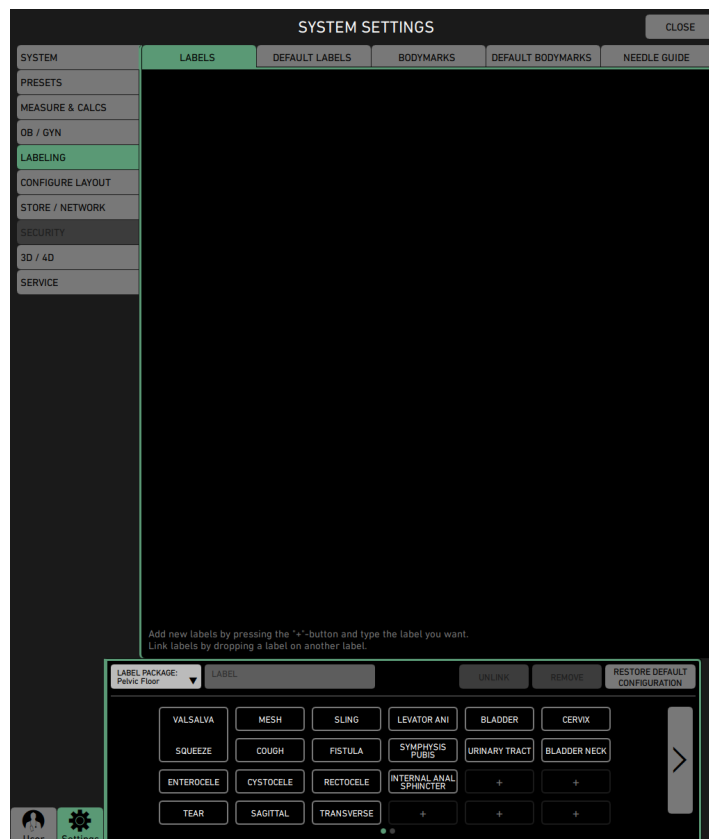
Figure C-18. The Labels tab.

On the **Labels** tab, you can do the following for each **Label Package**:

- Add your own labels. Navigate to the end of the custom labels, click + and type in the label using the keyboard.

- Link labels. Press and hold a button and drag onto another button. To remove the link, click **Unlink**.

- Remove labels you do not need. Click the label to highlight it and then click **Remove**.

- To restore factory defaults, click **Restore Factory Default**. You will be asked to confirm your choice.

Default Labels Tab
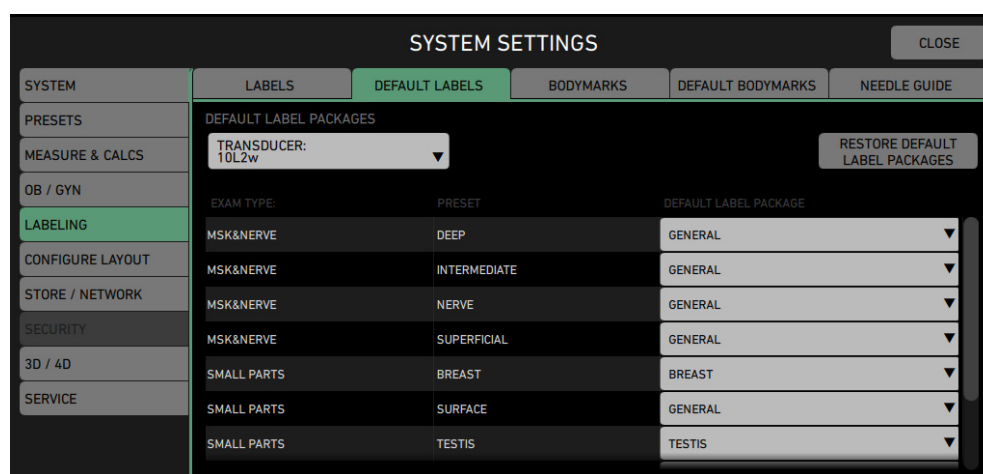
Figure C-19. The Labeling Default Labels tab.

On the **Default Labels** tab, you can see the **Default Label Packages** for the individual transducers, their exam types and presets.

To change Default Label Package:

1 Select transducer on the dropdown menu.

2 Select **Exam Type** and **Preset.**

3 On the dropdown menu **Default Label Package**, select the label package you want.

You can restore all defaults by clicking the **Restore Default Label Packages** button.

Bodymarks Tab
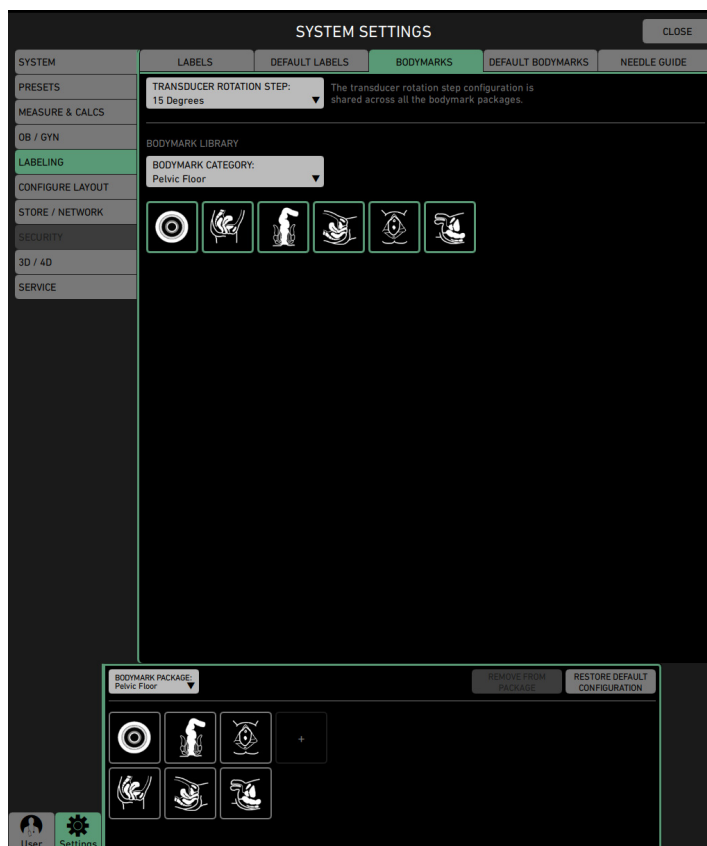
Figure C-20. The Labeling Bodymarks tab.

On the **Bodymarks** tab, you can do the following for each **Bodymark Package**:

- Decide the degree of rotation of the imaging plane indicator on the bodymark on the **Transducer Rotation Step** dropdown. See "Adjusting the Imaging Plane Indicator" on page 50.

- Add bodymarks from all categories, if you feel you need more than the default images in your **Bodymark Package**. Select a category in the **Bodymark Library**. Click on a bodymark in the **Bodymark Library** to add to the bodymark package selected in the window at the bottom of the monitor.

- Remove bodymarks you do not need. Select the bodymark and click **Remove from Package**.

- To restore default configurations, click **Restore Default Configuration**. You will be asked to confirm your choice.

Default Bodymarks Tab
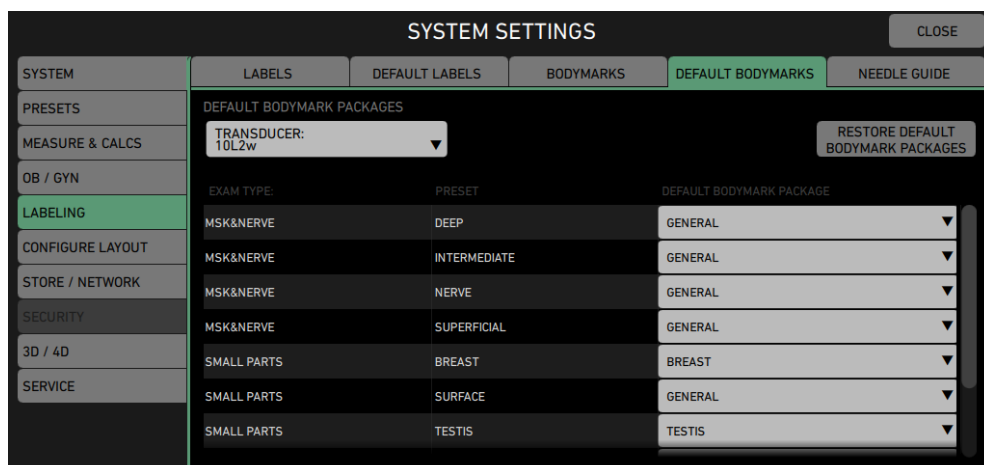
Figure C-21. The Labeling Default Bodymarks tab.

On the **Default Bodymarks** tab, you can see the **Default Bodymark Packages** for the individual transducers, their exam types, and presets.

To change Default Bodymark Package:

1   Select transducer on the dropdown menu.

2   Select **Exam Type** and **Preset.**

3   On the dropdown menu **Default Bodymark Package**, select the bodymark package you want.

You can restore all defaults by clicking the **Restore Default Bodymark Packages** button.

Needle Guide Tab

Clicking the **Open Needle Guide** button opens the **Needle Guide** window on the monitor.
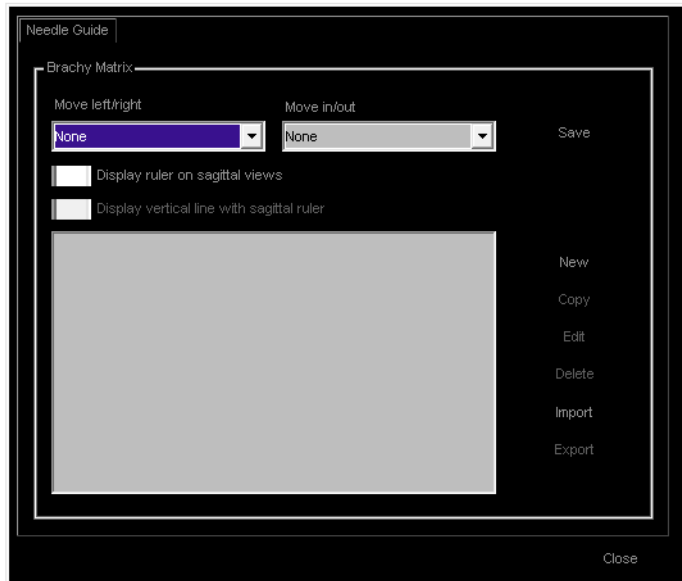
Figure C-22. Needle Guide window on monitor with Brachy Matrix setup.

In the **Brachy Matrix** setup window, you make setup changes to brachy matrices and needle guides. You can:

- Move a programmable brachy matrix or needle guide left, right, in, or out.
- Specify that a brachy ruler is displayed on a sagittal view (E14CL4b transducer)
- Define your own brachy matrix and ruler.

To move the offset in either direction:

- Select the offset you want from the dropdown menu and click **Save**.

Use the trackball and selector keys to navigate the Needle Guide window.

To have a vertical line displayed at the 0 of the brachy ruler:

- Check the **Display ruler on sagittal views** checkbox and click **Save**.

User-Defined Matrices (including Brachy and Transperineal)

User-defined matrices are listed in the lower part of the **Brachy Matrix Setup** window (Fig C-22).

You have the following options for user-defined matrices:

Option	What it does
New	Opens the User-Defined Matrix Wizard so you can define a new matrix.
Copy	Creates a new user-defined matrix as a copy of the currently selected matrix. The name of the new matrix is the name of the existing matrix plus an index number. You can then edit the copy to create a new user-defined matrix.
Edit	Opens the Measurement Definition Wizard so you can edit the selected user-defined brachy matrix.
Delete	Deletes the selected user-defined matrix. You are asked to confirm the deletion.
Import	Imports a matrix from an external storage device. If the system already has a matrix with the same name as the matrix you want to import, the imported matrix will be renamed to the matrix name plus an index number.
Export	Exports the selected matrices to an external storage device.

Table C-1. Options in the Brachy Matrix Setup window.

Using the User-Defined Matrix Wizard

To define a new matrix or edit an existing user-defined matrix:

1 In the **Brachy Matrix Setup** window, click **New**, or select an existing measurement and click **Edit**.

The following window appears:

2 Select the transducer that the matrix will be used with, and name the matrix. click **Next**.

Transverse Matrix - Dimensions

Width in mm   Horizontal holes/cm   Horizontal offset in mm
        70   2   0

Height in mm   Vertical holes/cm   Vertical offset in mm
        70   2   0

Columns: 15
Rows: 15
Column spacing: 5.00 mm
Row spacing: 5.00 mm

< Back   Next >   Cancel

3 Enter the width and height of the matrix, the horizontal and vertical spacing between holes (holes per cm), and the horizontal and vertical offset of the matrix.

The system calculates the number of rows and columns and the hole spacing in each direction. Click **OK** when cautions about this appear on the monitor. When the both offsets are 0, the matrix looks like this:
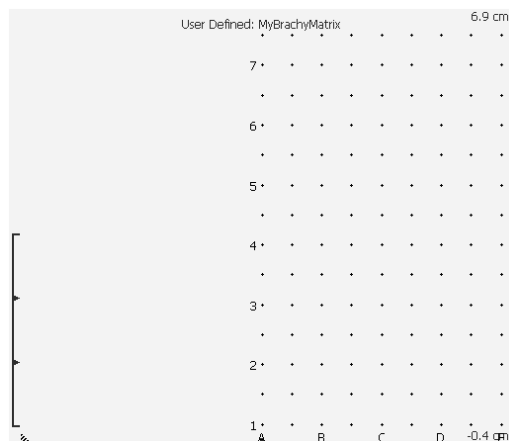
Assuming that the transducer is at the bottom of the image, positive offsets move the matrix to the right or up, negative offsets move it to the left or down.

4 Click **Next**.
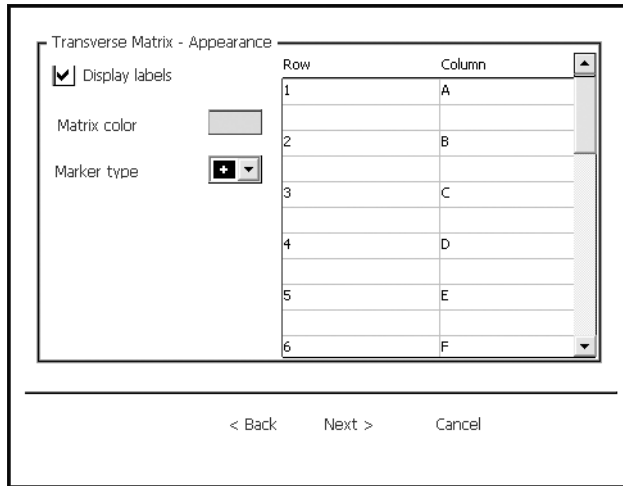
5 Select the symbols (**Marker type**) and color (click the box) that will be used for the matrix. If you check **Display labels**, you can enter names for the rows and columns. click **Next**.
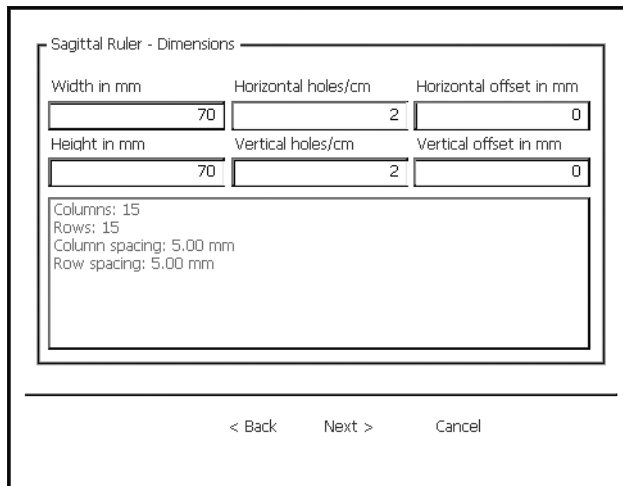
6 Enter the width and height of the ruler, the horizontal and vertical spacing between markers (holes/cm) and the horizontal and vertical offset of the ruler.

The system calculates the number of rows and columns and the hole spacing in each direction. When the both offsets are 0, the matrix looks like this:
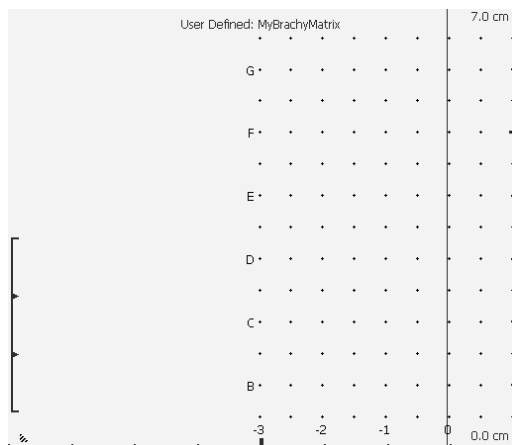
Assuming that the transducer is at the bottom of the image, positive offsets move the matrix to the right or up, negative offsets move it to the left or down.

click **Next**.
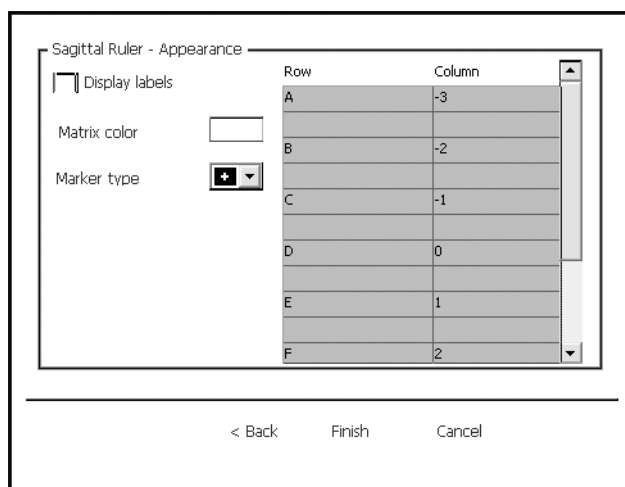
7   Select the symbols (**Marker type**) and color (click the box) that will be used for the ruler. If you check **Display labels**, you can enter names for the rows and columns.

NOTE: *If you want to be able to have a vertical line displayed at the 0 of the brachy ruler (see page 270), you must name one of the columns "0".*

8   Click **Finish**.

NOTE: *You must disconnect and reconnect the transducer for the changes to take effect.*

Matrix Alignment and Calibration

NOTE: *The best accuracy that can be expected is a 3mm deviation.*

Check the alignment of a reusable needle guide or transperineal biopsy matrix if you have any reason to suspect that it has been damaged. BK Medical recommends that you check them once a month, or more often in case of heavy use.

To check the alignment of puncture guides and matrices:

1   Fill a suitable tank with saline. The concentration of the saline depends on the room temperature. It should be 4% NaCl at 25°C (77°F) and 5% NaCl at 20°C (68°F).

2   Assemble the needle guide (or brachy stepper and grid) and attach it to the transducer.

3   Turn on the system and connect the transducer.

4   Immerse the transducer tip in the saline.

5   Start imaging to produce an image on the monitor.

6   Press the **Biopsy** key on the keyboard to superimpose the puncture line or matrix on the monitor image.

7   Insert a needle through the puncture guide or grid.

8   Watch the image of the needle tip and measure its deviation from the puncture line or matrix point shown on the monitor.

9   Decide whether the accuracy is acceptable.

10   If the accuracy is not acceptable, contact your BK Medical service representative.

To calibrate programmable matrices:

1   Fill a suitable tank with saline. The concentration of the saline depends on the room temperature. It should be 4% NaCl at 25°C (77°F) and 5% NaCl at 20°C (68°F).

2   Turn on the system and connect the transducer.

3   Make sure that the correct transducer type number is displayed the top of the monitor, followed by **T**, indicating that you are imaging in the transverse plane.

4   Press the **Biopsy** key on the keyboard to superimpose the matrix on the monitor image.

5   Click **Needle Guide** on the monitor.

The list of needle guides appears.

6   click the matrix you want to calibrate.

7   Mount the transducer in the holder, by twisting the probe in, and put the transducer pin in the slot on the holder.

8   Then put the transducer (mounted in the holder, and with the grid attached) into the saline, making sure that the transducer arrays are fully immersed.

9   Verify that there is a image on the monitor, and that the image isn't frozen.

10   Insert a needle through hole D4 in the grid.

The needle echo appears on the monitor.

If the echo is superimposed on the dot in the matrix on the monitor, then insert a needle through B4 and F4. If the echo for the needles in these holes are also in the correct position, no further adjustment is required.

11   If the needle echo is not in the correct position relative to the matrix on the monitor, open **Settings**. Click **Labeling** and select **Needle Guide**.

12   Click the **Needle Guide** button to open the **Needle Guide** window on the monitor.

13   Here you will be able to move the template to the right or to the left, and in and out. (In = closer to the transducer/down on the monitor; Out = farther from the transducer/up on the monitor.)

14   Whenever you make changes to the matrix, remember to save your settings. Then repeat the process from step 10 to verify that the needle echo is superimposed on the correct dot in the matrix.

15   It may be necessary to adjust the stepper as well. Consult the stepper user guide for instructions. After you adjust the stepper, use the earlier steps in this procedure to verify that the matrix is calibrated properly.

Configure Layout Window

Figure C-23. Configure Layout window.

The **Configure Layout** window lets you configure the buttons for each **Exam Type** and mode according to your needs and preferences.

To add buttons in the parameter area, do as follows:

1   Select **Exam Type** on the dropdown, and mode below.

2   Drag the buttons you want from the **Controls Library** to the empty buttons (marked with a +) in the parameter area.

The fields will be displayed next time you click the Exam Type/mode you have configured.

To remove buttons from the parameter area:

•   Drag the buttons to the **Controls Library**.

To restore default configuration:

- Click **Restore Default Configuration**. You will be asked to confirm your choice.

Store/Network Window

Store/Clip Tab
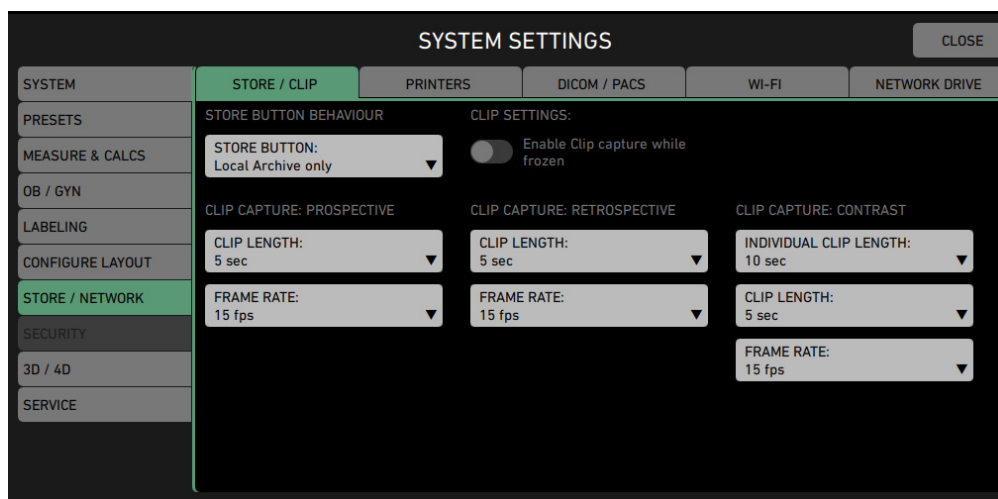
Figure C-24. Store/Clip tab.

On the **Store/Clip** tab, you can select where the images are stored and the clip length and frame rate of prospective and retrospective clips.

Use the **Store Button** dropdown to select where to store images. When storing to the **Local Archive**, you can see all data in the **Patient List.**

In **Clip Settings**, select if you want clip capture to be active when the image is frozen. This is valid for retrospective clips only.

Use the **Clip Length** and **Frame Rate** dropdowns to select these values for prospective captures (recording) or retrospective captures (capturing video clips based on the most recent cine loop).

Use the **Individual Clip Length, Clip Length**, and **Frame Rate** dropdowns to select these values for contrast captures.

Printers Tab
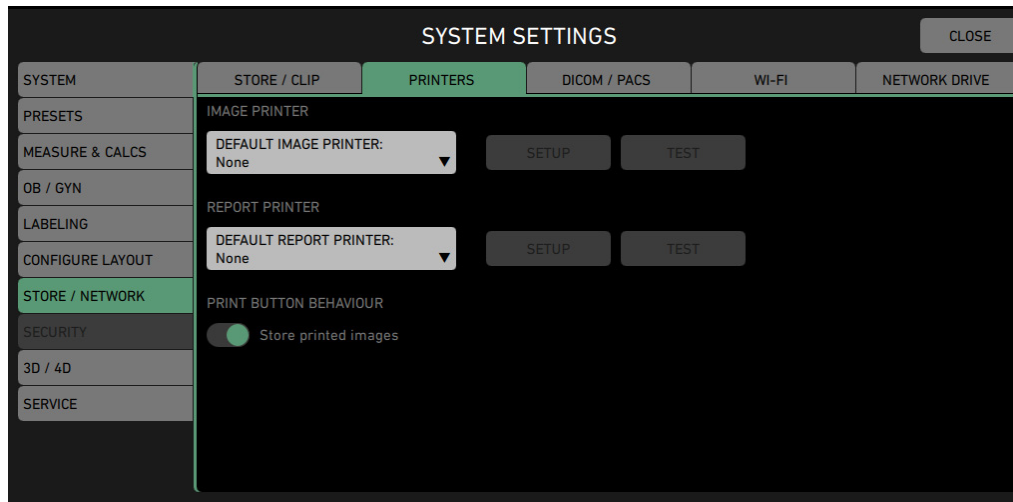
Figure C-25. Printers tab.

On the **Printers** tab, you can select and set up default printers. Use the dropdowns and the **Setup** and **Test** buttons to set up your printer.

To set up the Report Printer:

1   Select one of the 3 generic printer drivers and click **Setup**. The **HP Universal Printing PS** window is displayed on the monitor.
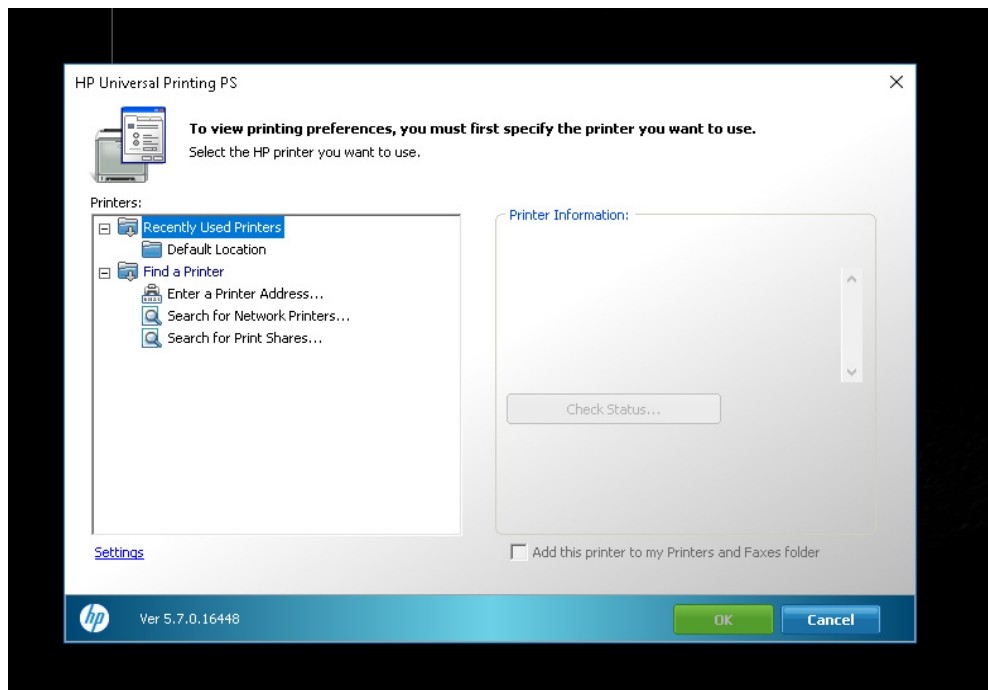
Figure C-26. The Printer Setup window

2   Under **Find a Printer**, use the trackball and selector keys select **Enter a Printer Address** and type in the IP adress of the printer, or

3   Click **Search for Network Printers** to connect to your preferred printer.

Use the toggle button to decide **Print Button Behavior**.

DICOM/PACS Tab

DICOM is not installed on the bk3000 or bk5000 as a default. You must purchase a DICOM license from BK Medical before a qualified service technician can install DICOM on your system. The *bk3000 Service Manual* and *bk5000 Service Manual* contain instructions for service personnel to use when setting up your DICOM system.

If DICOM is enabled on your system, various DICOM setup windows can be accessed by clicking the **DICOM** tab.

NOTE: *Changing the DICOM setup can cause your system not to work properly. For example, you may be unable to print to a DICOM printer. All changes to the DICOM setup should be made by qualified service personnel only*
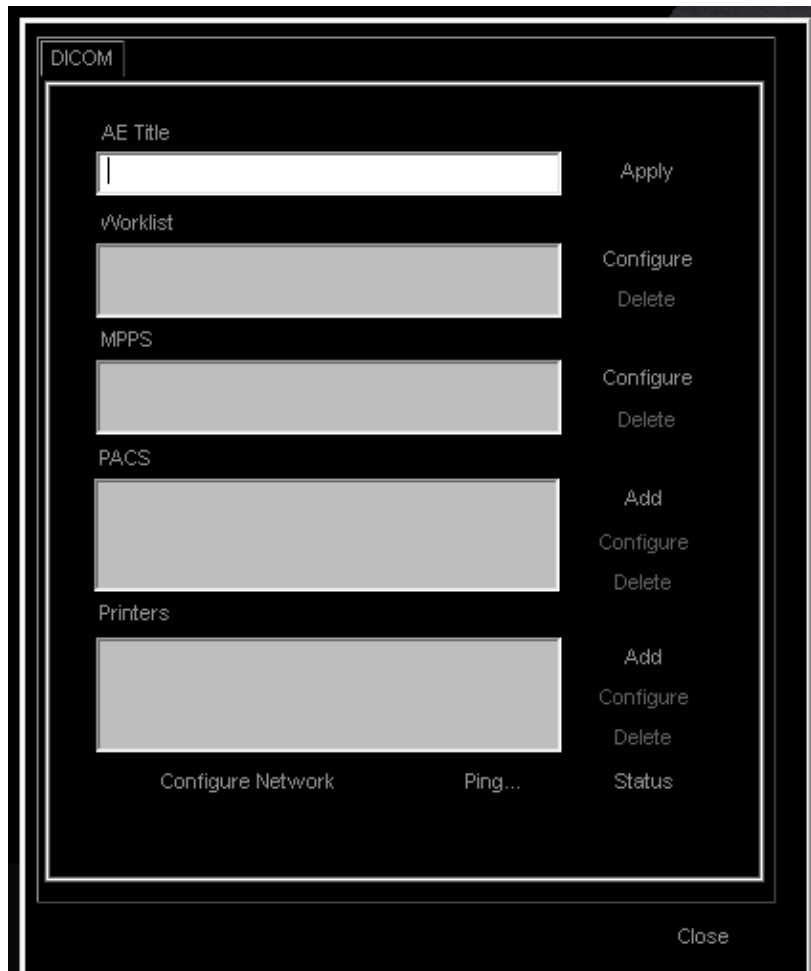
Figure C-27. DICOM window on monitor

You can open the **DICOM Status Window** by clicking **Status**.

Wi-Fi Tab
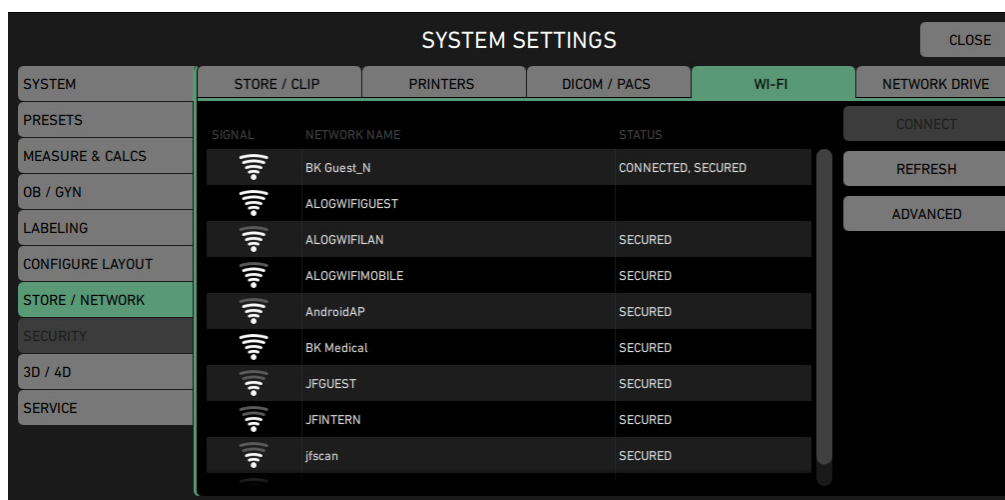
Figure C-28. Wi-Fi tab.

Do as follows to connect to a Wi-Fi network:

- Choose the appropriate network and click **Connect**. If you cannot find your network on the **Wi-Fi** tab, click **Refresh**.

- Type in the password and wait for the system to connect.

- For more Wi-Fi configurations, click **Advanced**. This option is protected by a password.

See also the section on **Wireless Networks** in the *bk3000 & bk5000 User Guide*.

Network Drive
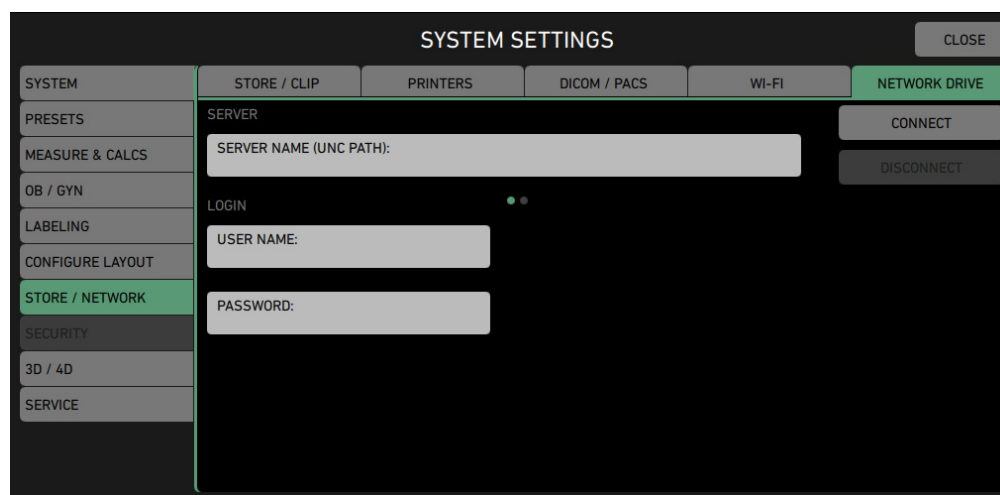
Figure C-29. Store/Network - Network Drive tab

To connect to a network drive, type in the name of your server. Then log in to the server with your user name and password and click **Connect**.

The *bk3000 Service Manual* and the *bk5000 Service Manual* contain instructions for service personnel to use when setting up your network drive.

Security Window

This window is only available to system administrators.

General Tab
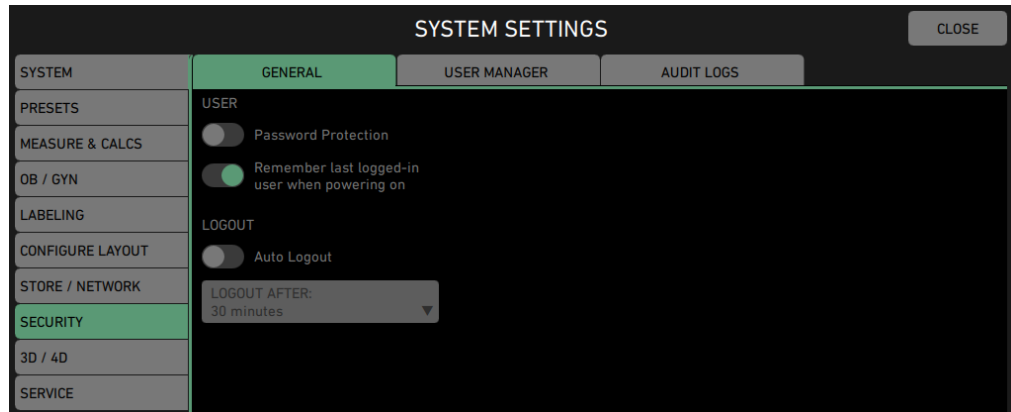
Figure C-30. Security - General tab.

On the **General** tab, you can select if the system must be password-protected, if the system should remember the last logged-in user when starting up, and if the user should be logged out automatically after a specified period.

User Manager Tab
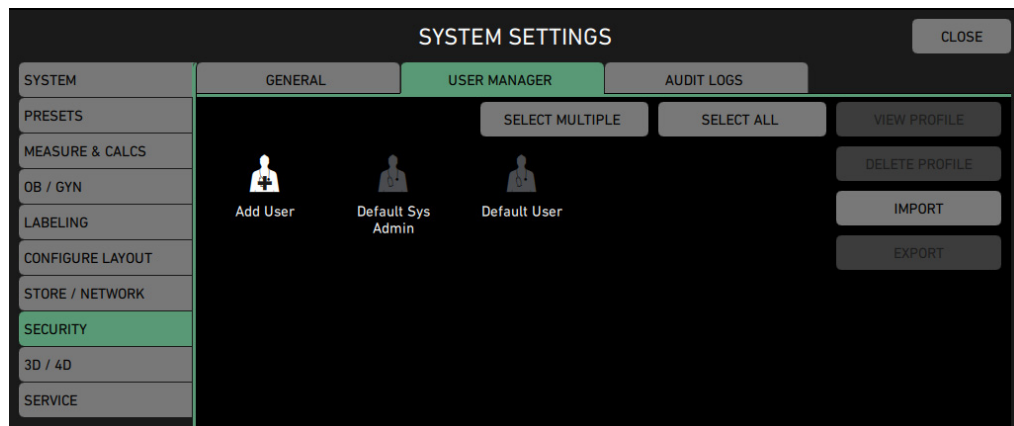
Figure C-31. Security - User Manager tab.

On the **User Manager** tab, you can create and administer users.

To create users:

1 Click the **Add User** icon to add one or several users.

2 If relevant, apply the user profile settings of another user from the dropdown menu.

3 Fill in all of the columns to identify each user.

4 Use the toggle button to select if the users should be allowed to modify their own profiles.

5 Click **Next**

6 Click **Add** to create the users.

For each individual user, you must view and edit the profile in order to select specific settings for this user.

View Profile

To view and edit user profile:

1 Select user and click **View Profile**.

2 In the **General** view, add or replace user photo.

3 Click the toggle button to select if **Password required during login** should be activated.

4 If a password is required, type in the password according to the instructions on the screen.

5 Use the radio buttons to select if the user should have a **Regular Profile** or be a **System Administrator**.

6 Click the toggle button to select if the user should be able to modify the profile. This does not allow the user to change a regular profile into a system administrator.

To edit User Preferences:

• In the **View Profile** window, click **Preferences**.
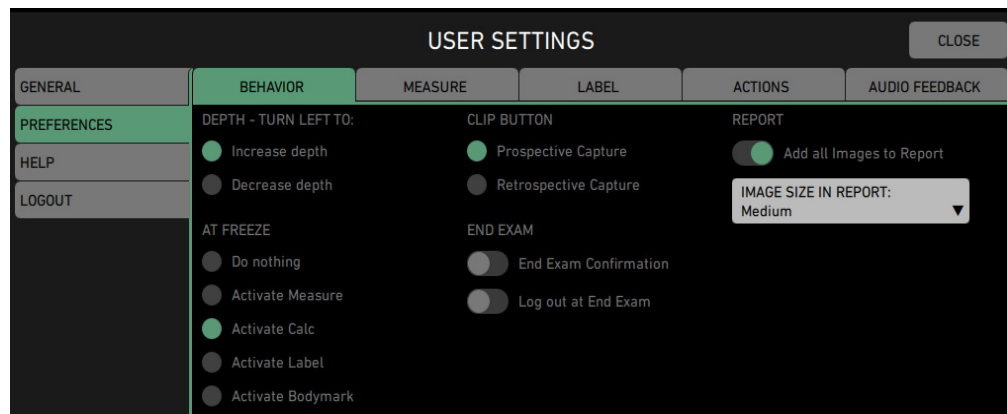
Figure C-32. User Preferences, Behavior tab

On the **Behavior** tab, you can:

• Select sliding direction on the **Depth** bar.

• Select system reaction **At Freeze**.

• Decide if the **Clip Button** should record a prospective or retrospective video clip.

• Decide if the user should receive a confirmation or be logged out at the end of the exam.

• Select if all images from the current exam should automatically be added to the **Report**, and select default size of these images.
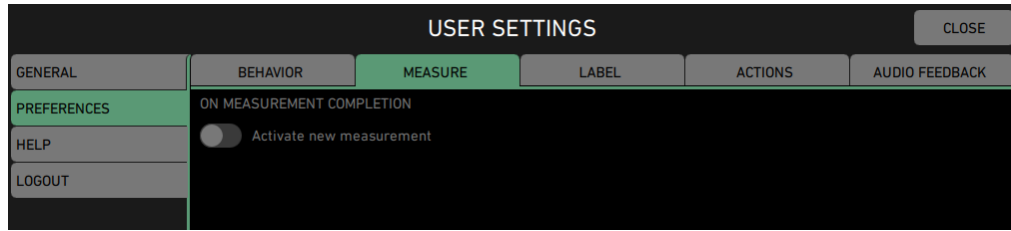
Figure C-33. User Preferences, Measure tab.

On the **Measure** tab, you can:

- Decide how the system should react on measurement completion.
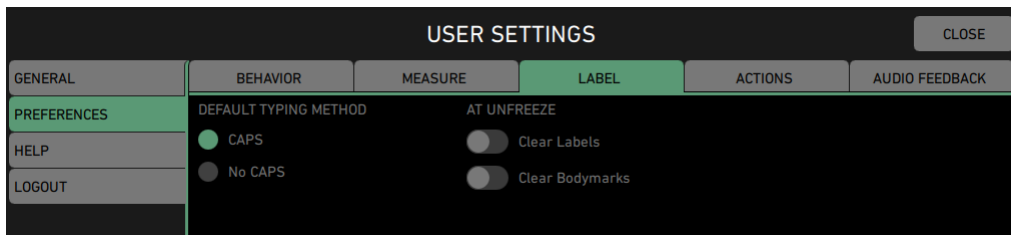
Figure C-34. User Preferences, Label tab.

On the **Label** tab, you can:

- Decide whether typed-in labels should appear in **Caps** or not.
- Select if labels or bodymarks should be cleared at Unfreeze.
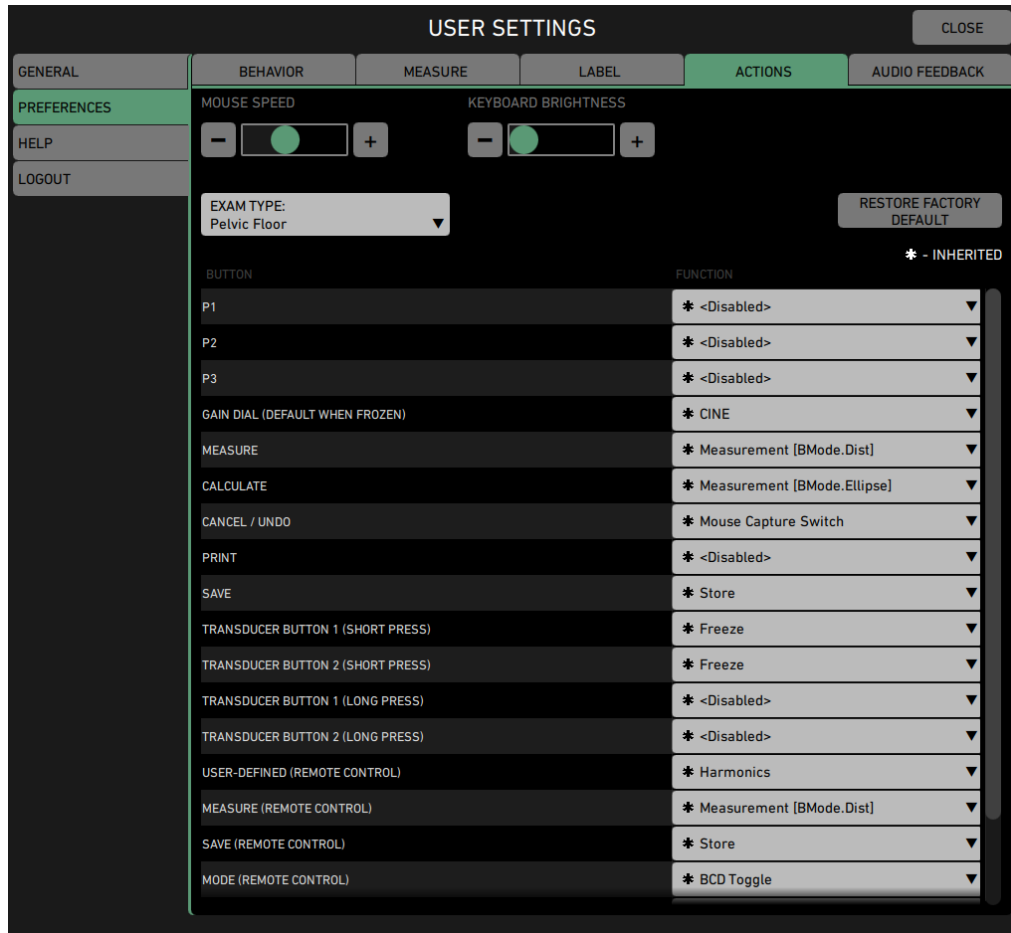
Figure C-35. User Preferences, Actions tab.

On the **Actions** tab, you can:

- Set the **Keyboard Brightness**.
- Select **Mouse Speed**.
- Select functions for buttons on the dropdown menus.
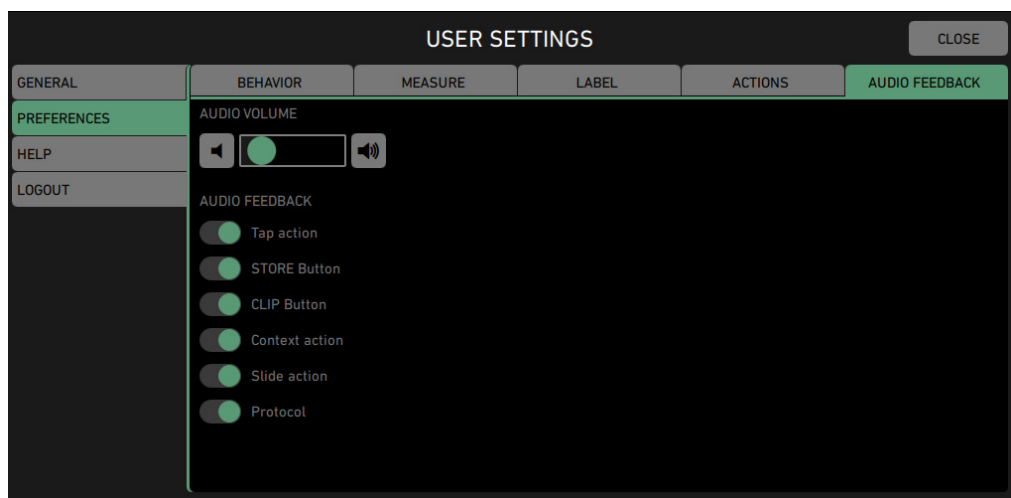
Figure C-36. User Preferences, Audio Feedback tab

On the Audio Feedback tab, you can:

- Adjust **Audio Volume**.
- Select or deselect actions, buttons, and protocol for Audio Feedback.

Click **Close** to exit **User Preferences**.

Audit Logs
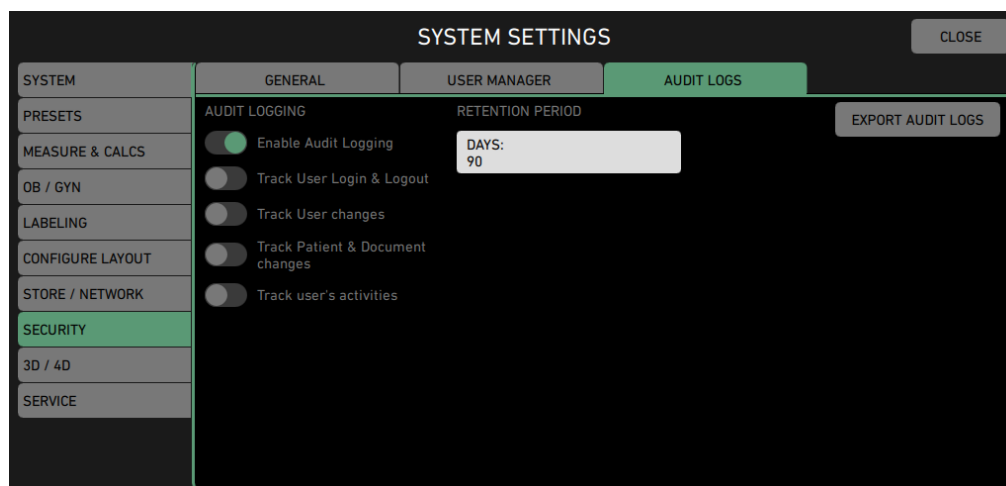
Figure C-37. Security window, Audit Logs.

Audit Logs will provide a log of basic operations on the system.

On the **Audit Logs** tab, you can:

- **Enable Audit Logging** or decide not to log.
- **Track User Login & Logout** to see how many different users are using the system.
- **Track User Changes** to see what changes users make to preferences and setup.
- **Track Patient & Document Changes** to see changes to the patient data.
- **Track User's Activities** to see which primary functions the user has performed in the exam.
- Decide retention period for the data
- To export the audit logs, click **Export Audit Logs**.

3D/4D

On the **3D/4D General** tab, you can decide whether the system will select the 3D region of interest marker automatically or not.

Service Window

General Tab
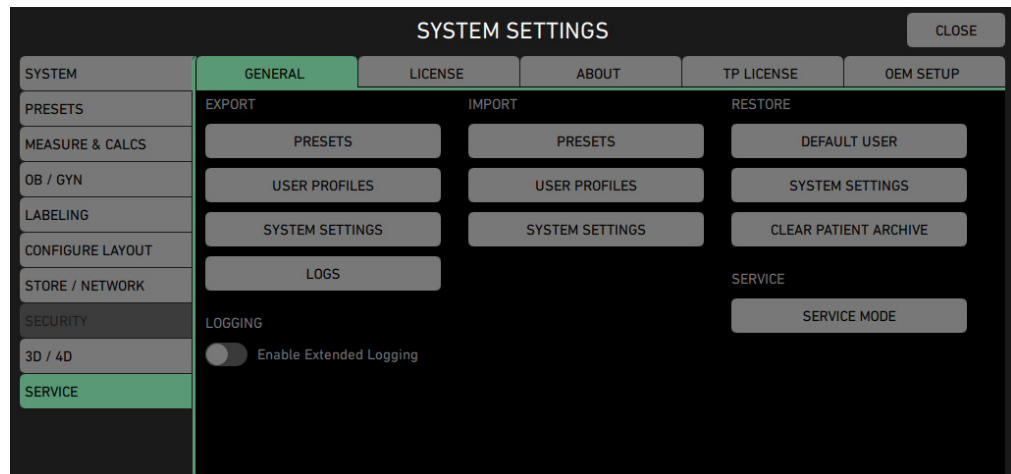
Figure C-38. Service General tab.

On the **General** tab, you can select **Enable Extended Logging**. You can also export and import **Presets**, **User Profiles,** and **System Settings**, and export **Logs**. And you can restore the **Default User**, **System Settings,** and **Clear Patient Archive**.

Access **Service Mode** by clicking the button. This mode is password protected.

License Tab
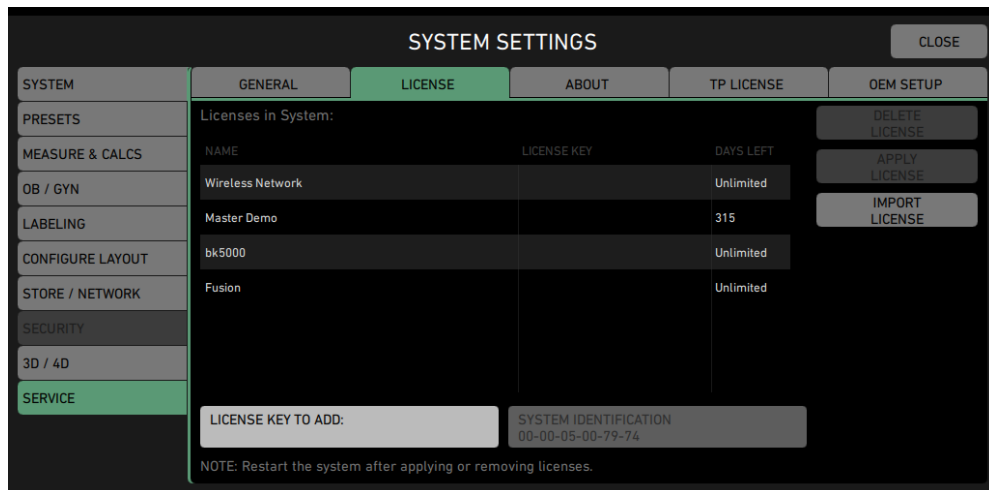
Figure C-39. The Service License tab.

On the **License** tab, you add, delete, and import licenses.

To add a license:

1   Type in the license in the **License key to add** field.

2   Click **Apply License**.

3   Restart the system to activate the license.

To delete a license:

- Select the license you want to delete and click **Delete License**.

You must restart the system after any changes to the licenses in order for the changes to take effect.

About Tab
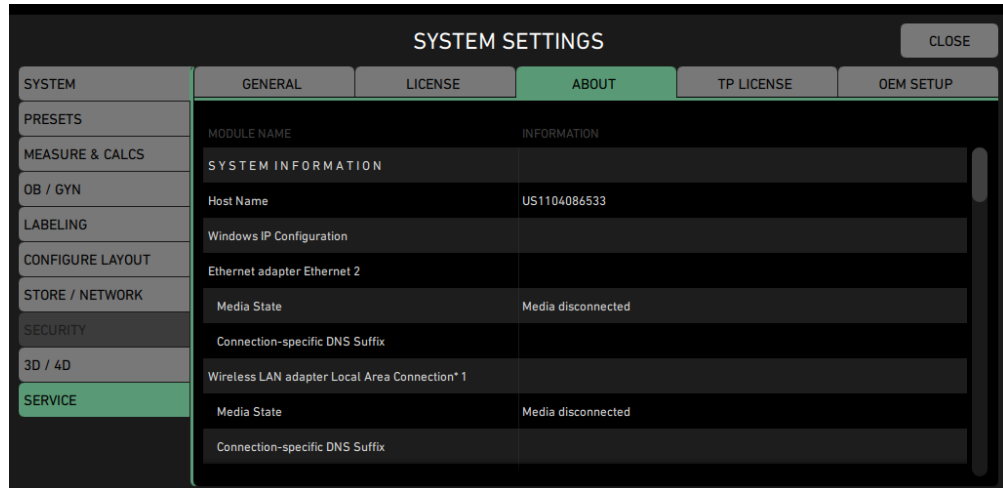
Figure C-40. Service About tab.

On the **About** tab, you will find information about e.g. the version of the installed software, which will be useful if you need service for the system.

TP Licenses Tab
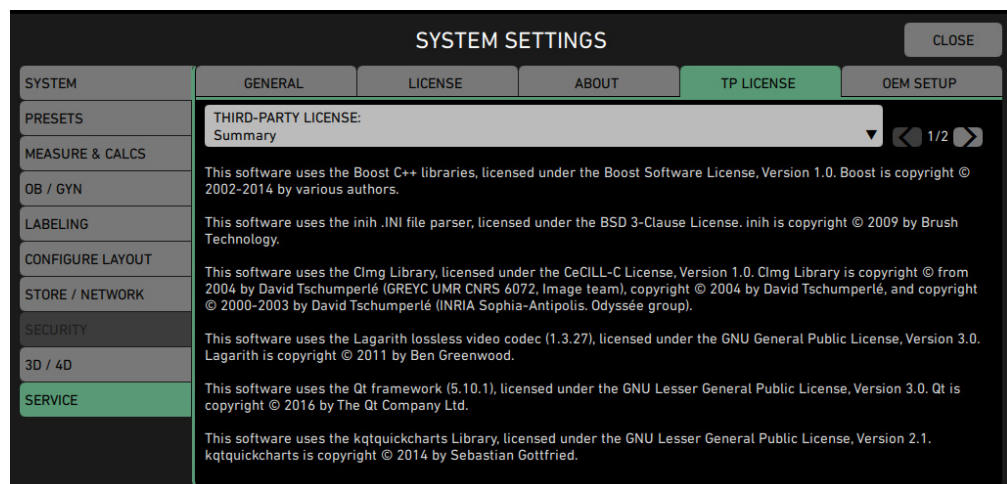
Figure C-41. Service - TP Licenses tab.

On the **TP Licenses** tab, you can see which third party licenses are used for the system installation.

OEM setup

This functionality is only available for service personnel and is protected by a password.

OEM setup

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