bk3500 Ultrasound System

CE 0543

For Professional Users Only

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Contents

Chapter 1
Before You Begin

This is the advanced user guide for the bk3500 Ultrasound System.

The *bk3500 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 bk3500 User Guide before working with the system.*

This guide takes you deeper into the functionality and potential of the bk3500 Ultrasound System.

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
How do I get started and what are the various parts of the touch screen and monitor displays?	"Getting Started" on page 13
Is there an alphabetical list of all the controls on the system?	"Controls on the UI" on page 29
How do you make measurements and calculations for an image, and what measurement tools are available?	"Making Measurements" on page 41
How do you manage the images, clips and reports that are made on the system?	"Documentation" on page 51
What imaging modes are available on the bk3500?	"Imaging Modes" on page 67
What is an examination type, and how does it help with imaging?	"Applications" on page 95
How does DICOM® work with the bk3500?	"DICOM" on page 117
What do various abbreviations mean?	"Glossary" on page 173

Chapter 2
Getting Started

The bk3500 System

Monitor

Touch screen

Control panel

Front handle with release handles

Baskets for accessories

Battery display

Battery cover

Endotransducer holder

Transducer holders

Transducer sockets

Scan engine

Lockable wheels

Battery compartment
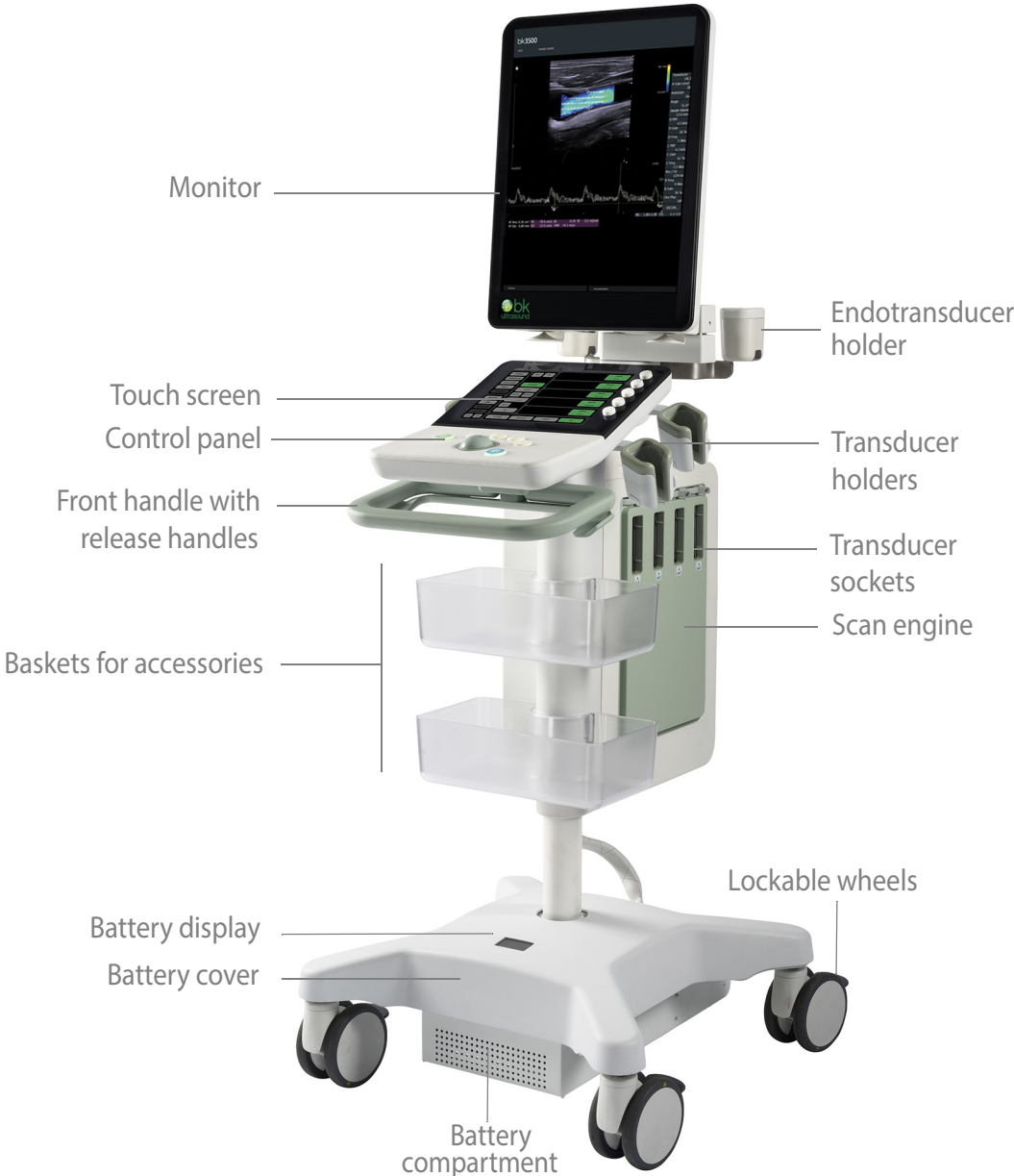
Before You Start

Before you turn on the system, make sure that the installation has been approved by a qualified electrician or by hospital safety personnel.

Read the battery support warnings (warnings with BS numbers) in the Battery Support System section of the *bk3500 User Guide*.

Turning System On and Off

When you turn the system on or off, you must give the system enough time to save and recover open files and unsaved data. Otherwise, a serious system failure may occur that requires technical support.

Make sure the battery is charged. (If it is not, plug in the imaging system to use it or to charge the battery.)
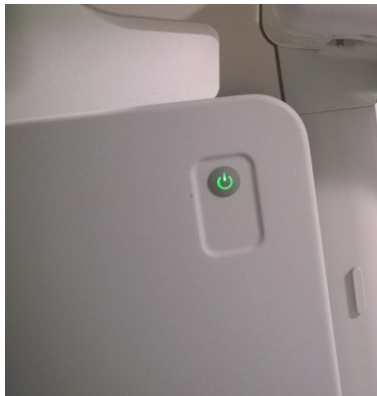
Figure 2-1. The power button on the scan engine.

To turn on:

Press the power button *once*, then wait until startup screen disappears.

If the battery is empty, it is not necessary to turn off the imaging system. Plug the system into a power outlet to recharge the battery while you run on power from the mains power supply.

To turn off:

Make sure system is running. Press the power button *once*.

⚠	**Caution** BS-c2
	Never shut down a system with a battery module simply by unplugging it from the wall. To preserve battery power, shut down the system properly.

Connecting Transducers

Figure 2-2. Transducer plugs and sockets.

To connect:

1   Insert transducer plug into socket with locking lever to the right.

2   Turn locking lever on socket to the left.

To disconnect:

1   Freeze image.

2   Turn locking lever on socket to the right.

3   Remove plug from socket.

NOTE: *If more than one transducer is connected, select a different transducer before you disconnect. Otherwise, the following message will be displayed on the touch screen:*
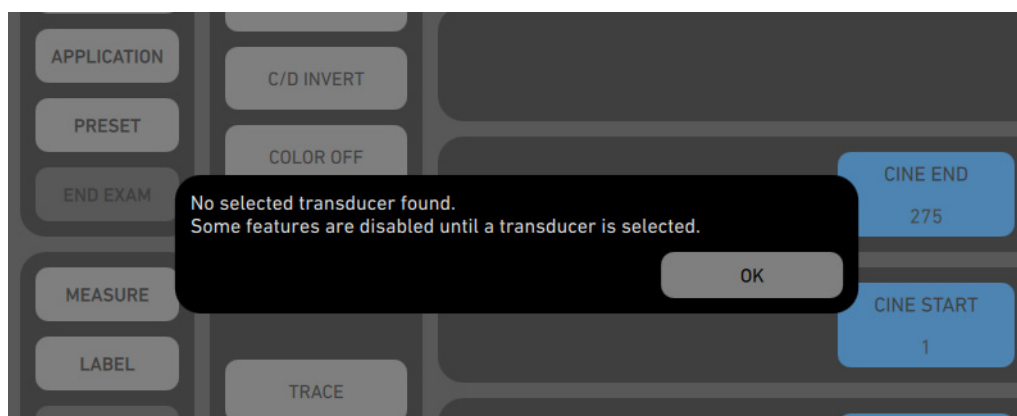
Figure 2-3. Message if the active transducer is disconnected.

Barcode Reader

To enter Patient Information with the barcode reader:

1   Tap the touch screen **Patient** button, or press **Q** to open the patient dialog when exam is not running.

2 With the cursor in the **Patient ID** field, scan the relevant patient barcode with the barcode reader.

3 Continue entering the patient/exam data as required.

NOTE: *Fields that will accept data entry via the keyboard will also accept data scanned with the barcode reader. Simply ensure that the cursor is located in the required field then scan the **relevant** barcode.*

⚠	**WARNING** SR-w2
	To avoid personal injury, connecting/disconnecting the barcode reader and/or printer must be carried out only by BK personnel or authorized representatives.

Control Panel

Figure 2-4. The control panel and touch screen.

Icon	System Control	Functionality
	Trackball	Positions the mouse cursor, measurement cursor and label.

Icon	System Control	Functionality
Q	**QUICK ACCESS** button	Opens the quick exam start-up workflow. When the exam has started, the **Q** button works as an **Auto** button which will automatically optimize the image settings.
2	**2** Button	Live image: Stores a prospective video clip. Frozen image: Stores a retrospective video clip.
●	**SELECT** Button	Provides a wide variety of functions depending on the imaging state, for example toggles between moving/resizing the color box and selects/sets measurements, labels, etc.
⟳	**UPDATE** Button	Provides a wide variety of functions depending on the imaging state, for example toggles between image views and image mode and rotates the transducer on the bodymark icon.
1	**1** Button	Stores the current image.
❄	**FREEZE** Button	Freezes/unfreezes live imaging. A snowflake icon is displayed on the monitor when the image is frozen.
	Touch Screen Dials	Five dials that control touch screen options, which change depending on the imaging mode/state. Once the touch screen option is tapped, turn the related dial to make the relevant adjustments.
	Touch Screen	Displays selectable options. Touch screen buttons may change depending on the chosen imaging mode/state or action.

Quick Access

The **Q** button provides the following basic functions:

- Quick exam start-up

Quick Exam Start-Up

Once the **Q** button is selected, users can navigate through the Quick Exam Start-up using the touch screen:

1 Enter **Patient** Information.

2   Select **Transducer**.

3   Select **Application** (Exam type).

4   Select Imaging **Preset**.

5   Begin the exam.

For the Quick Exam Start-Up:

1 Press the control panel **Q** button.

2 Enter **Patient** information.
The **Patient ID** is filled in automatically with a timestamp, but you can change this to a relevant ID or use a barcode reader. See "Barcode Reader" on page 15.

Figure 2-5. Patient window.

3 Swipe the screen from right to left to enter additional patient information.

Figure 2-6. Second screen in Patient window.

4   Tap the **Exam Info** button to add specific information relevant for the exam, and tap **Next**.

Figure 2-7. Exam Info window.

5   Select **Transducer** (in this case **6C2** is selected).
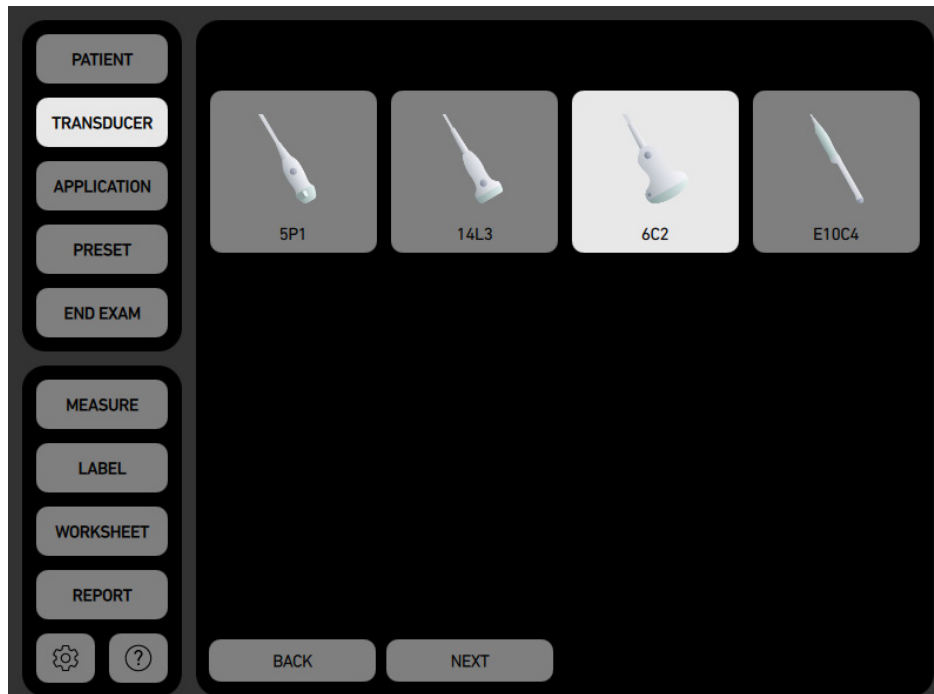
Figure 2-8. List of available transducers (those that are plugged in).

6   Select **Application** (the exam type you intend to perform). The applications available depend on the selected transducer (in this case **6C2**).
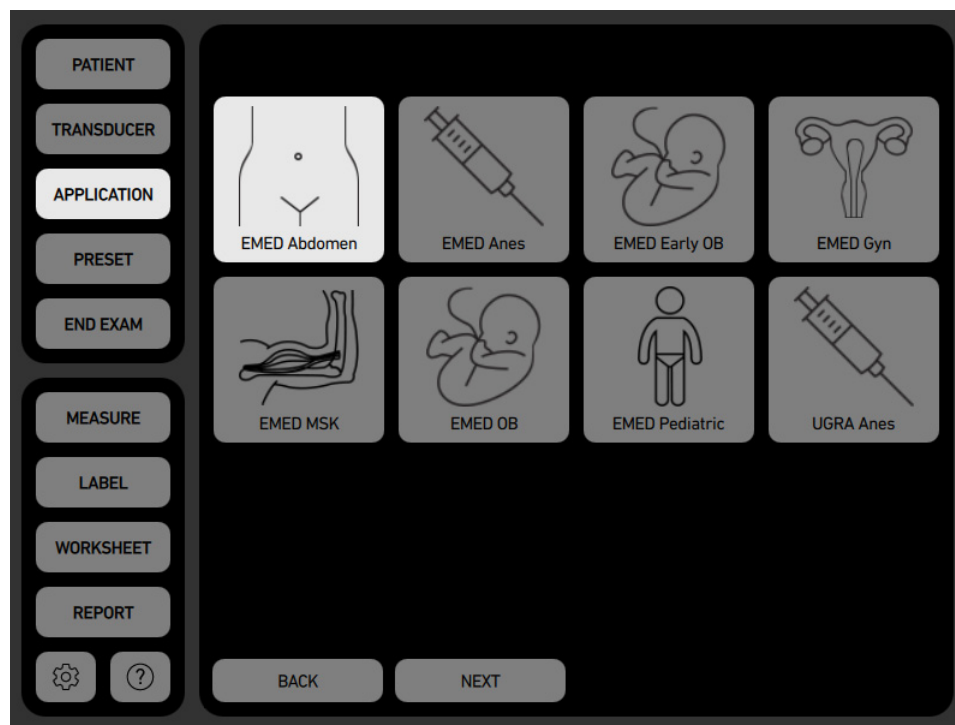
Figure 2-9. List of available applications.

7   Select imaging **Preset**:
The imaging presets available are dependent on the transducer and the application (exam type) selected.
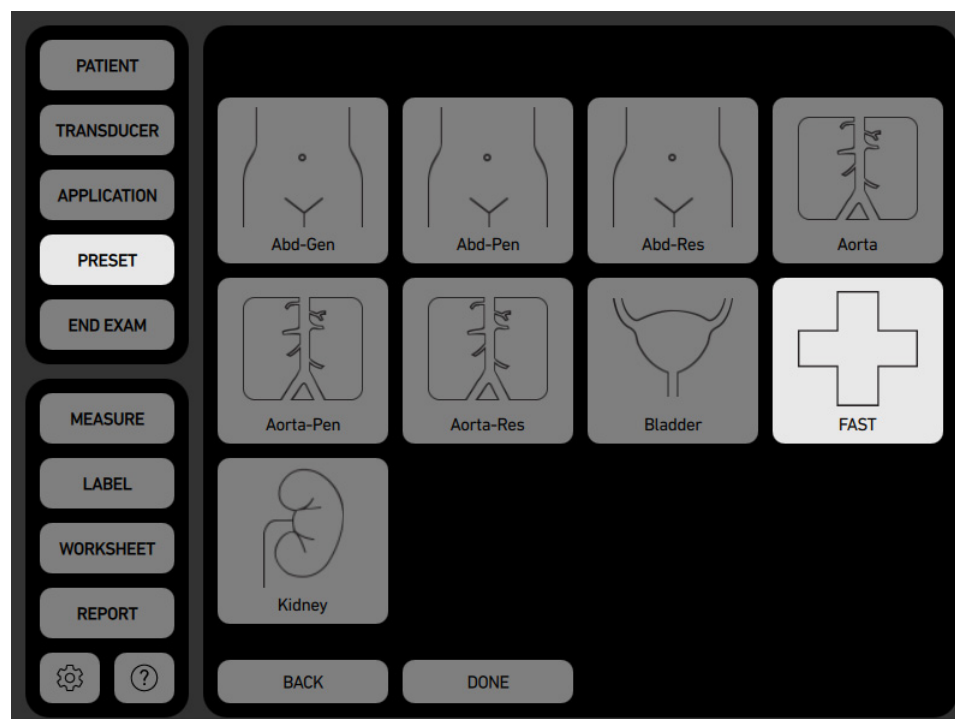
Figure 2-10. Available presets.

8   Begin the exam.
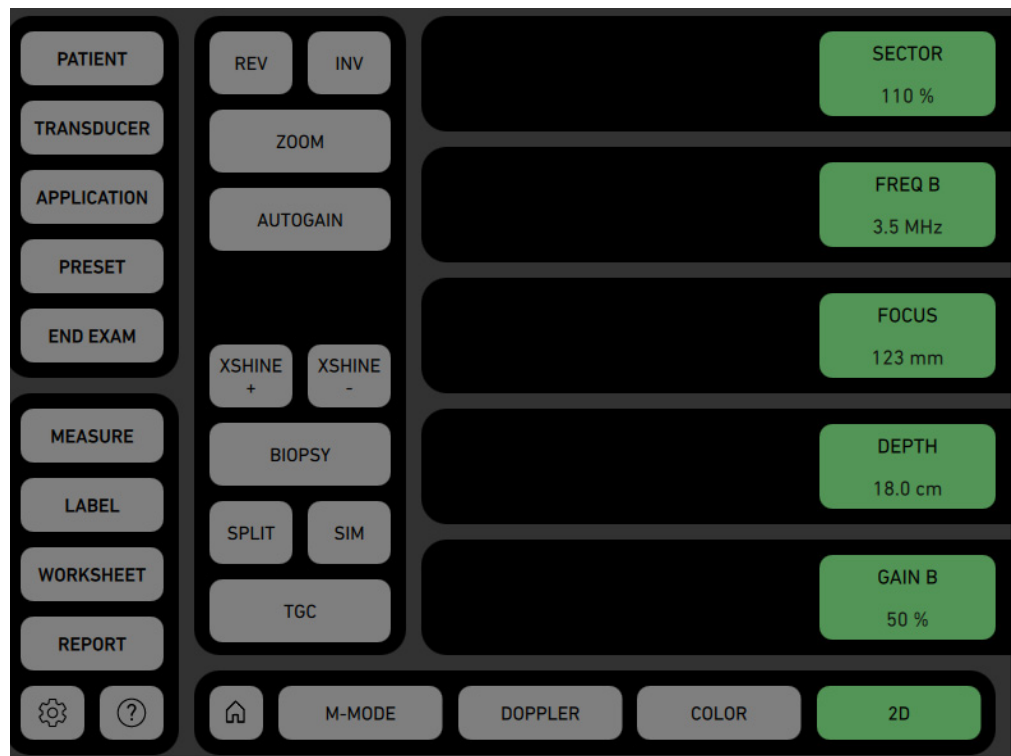
Figure 2-11. The Touch screen in Basic layout during an exam.

When you are finished, select **End Exam**.

⚠	**WARNING** Exam-w2b
	If, after beginning an exam without entering any Patient information, you want to save an image, you must verify that the system auto-created a properly configured Patient ID before exiting the exam. Whenever possible, BK recommends that you also enter a complete Patient Name.

Starting an Exam Using the Touch Screen Buttons

If you have several patients who need the same transducer/application/preset, you can choose not to use the Q workflow and use the touch screen buttons to go directly into the windows you need to update. You can also update details in the patient window and change transducer, application or preset during an exam.

Do as follows:

- Tap the **Patient** button on the touch screen.

- Enter patient information. The **Patient ID** is filled in automatically with a timestamp, but you can change this to a relevant ID or use a barcode reader. See "Barcode Reader" on page 15.

Figure 2-12. Patient window when using the touch screen buttons.

- Swipe the screen from right to left if you need to add more information. Add exam info by tapping the **Exam Info** button. See steps 3 and 4 above.

- To use the transducer, application and preset already selected on the system, tap **Start Exam**. Otherwise, continue your selection by tapping the relevant main button (see Fig 2-18).

- To select **Transducer**, tap the transducer you want. Alternatively, you can press the Smart button on the connected transducer to select it.
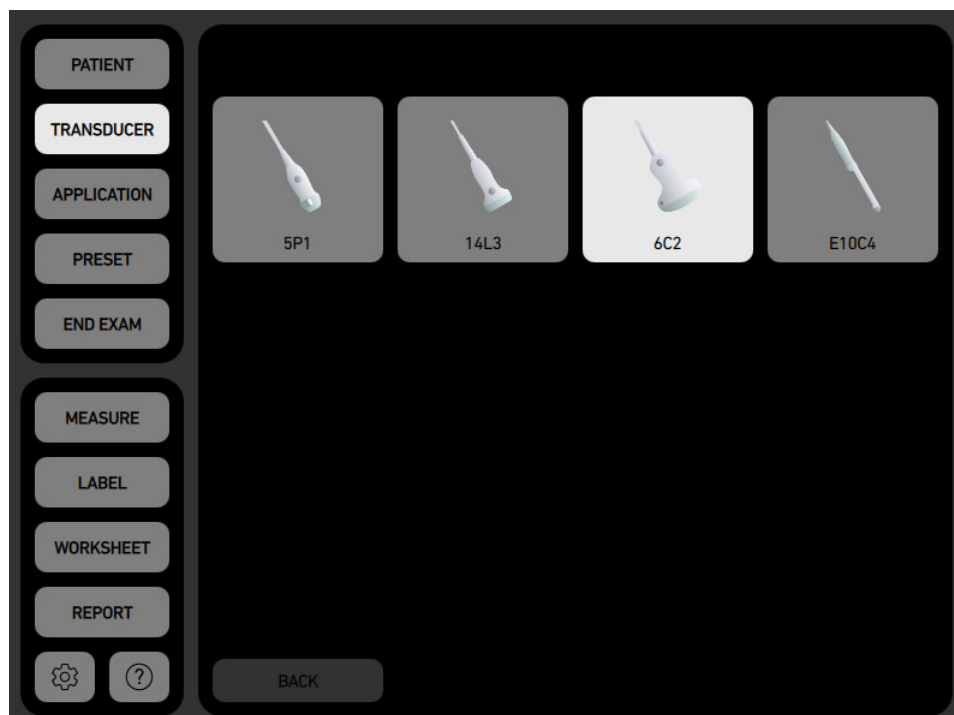
Figure 2-13. Transducer window when using the touch screen buttons.

- To use the application and preset already selected on the system, continue the exam. Otherwise, continue your selection.

- To select **Application**, tap the application you want.
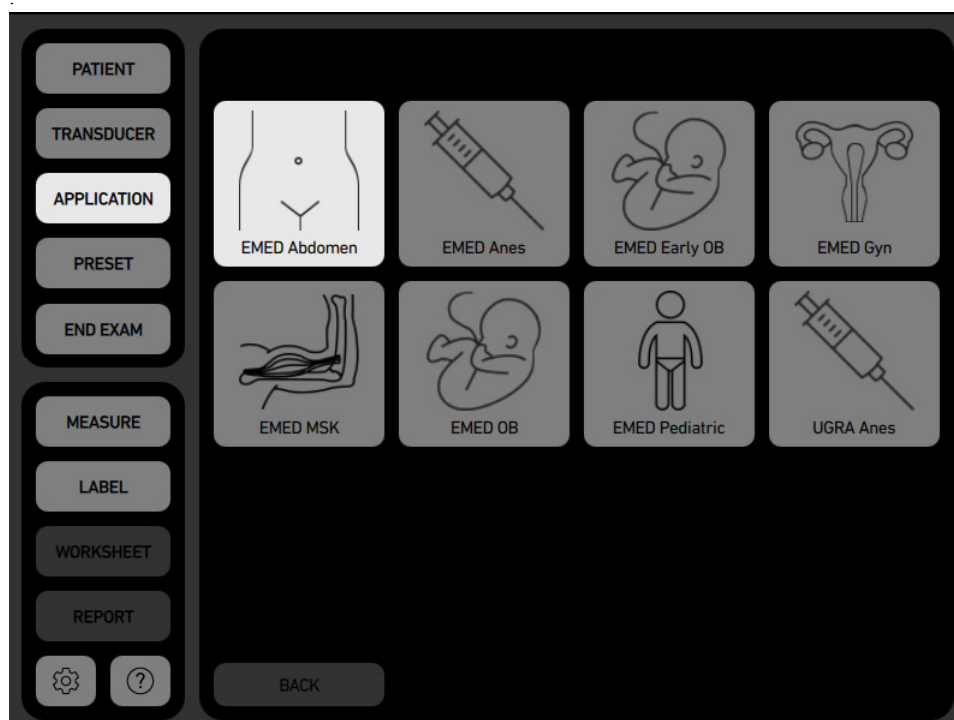
Figure 2-14. Application window when using the touch screen buttons.

To use the preset already selected on the system, continue the exam. Otherwise, continue your selection.

- To select **Preset**, tap the preset you want.
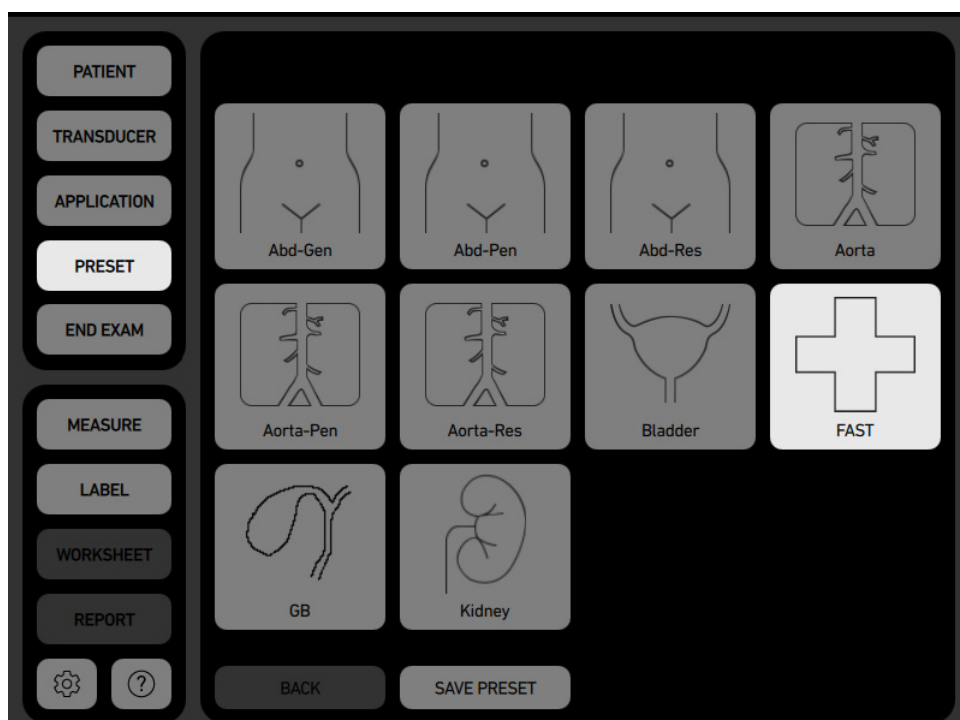
Figure 2-15. The preset window when using the touch screen buttons.

Figure 2-16. The touch screen in Basic layout during an exam.

- The exam ends when you tap **End Exam**.

Monitor and Touch Screen Display

Exam type   Hospital   Patient

Trans-
ducer

Operator

Biopsy line

Image
data
including
battery
status

Measure-
ment
data

Review tab with
browser
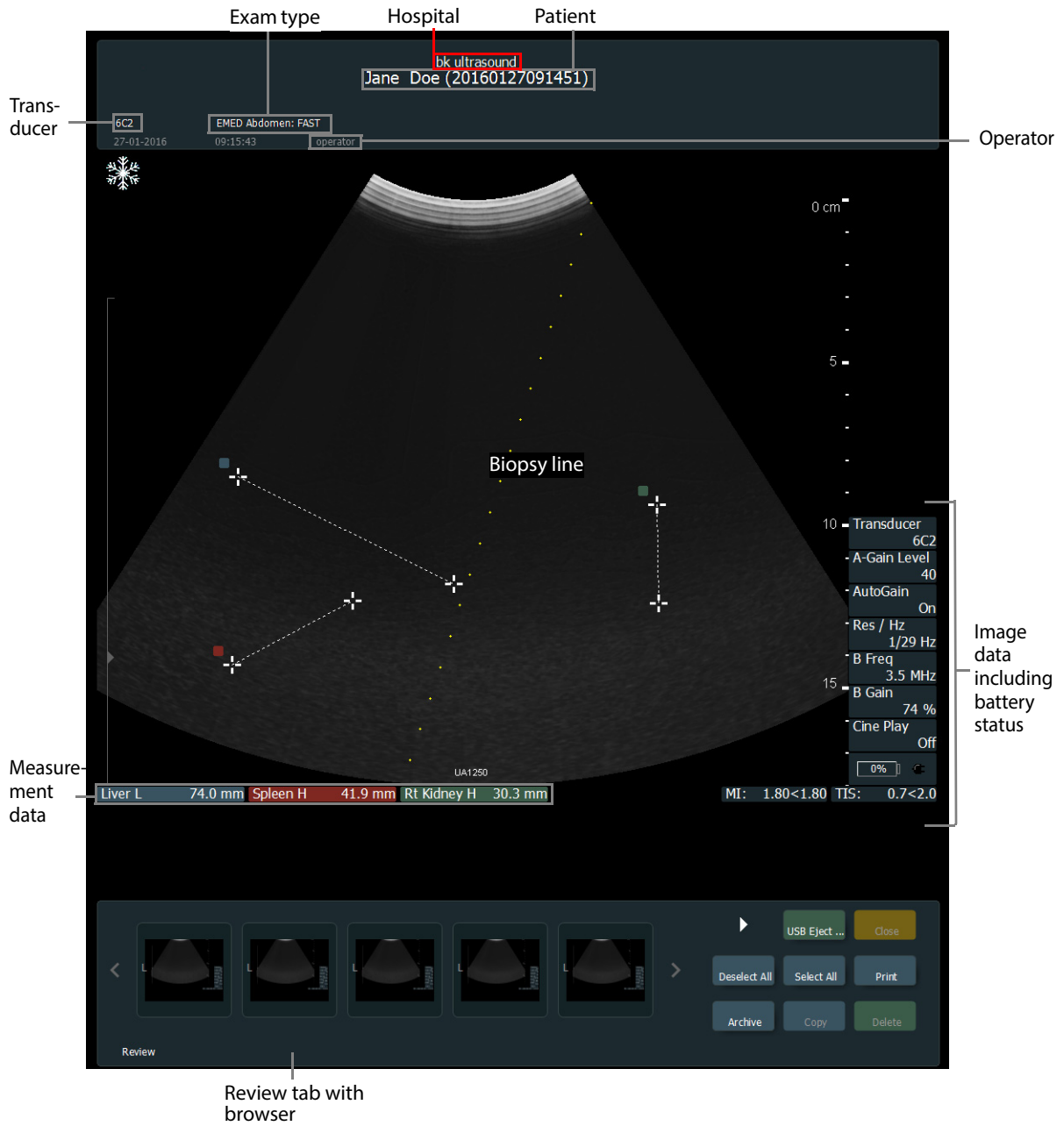
Figure 2-17. Monitor (clinical display).
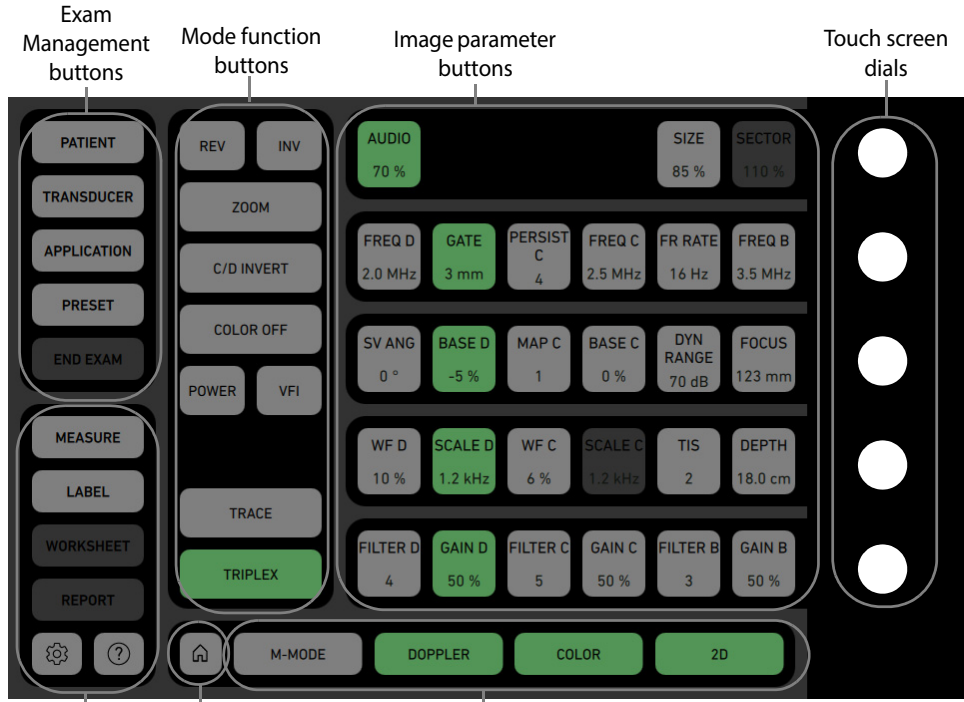
Figure 2-18. Touch screen Advanced layout.
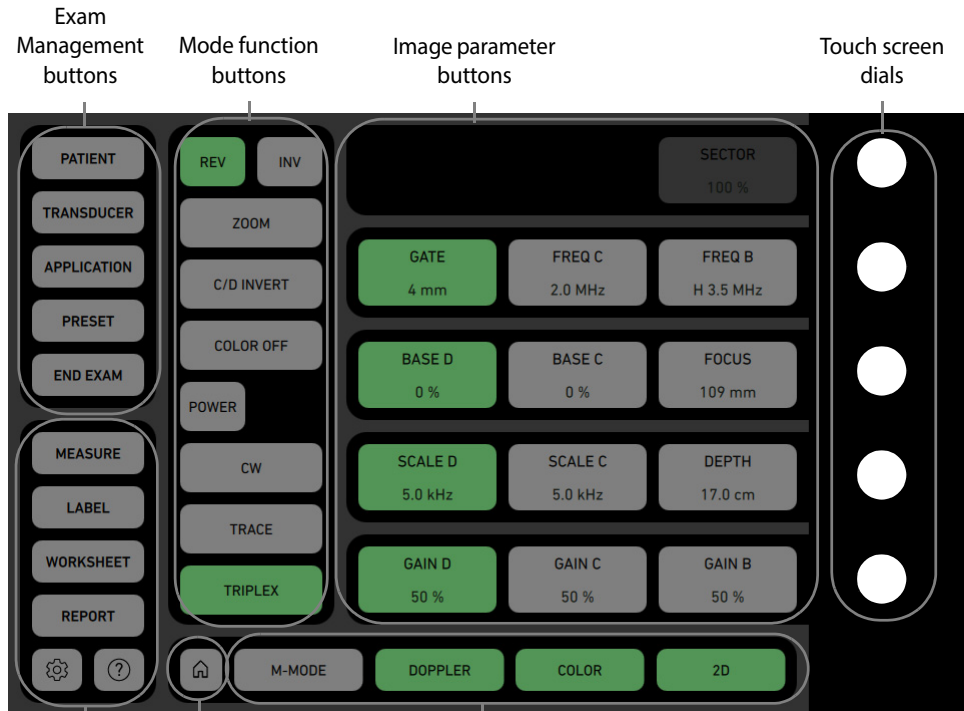
Figure 2-19. Touch screen Basic layout.

Button Group	Functionality
Exam management buttons	The exam management buttons follow the workflow to start an exam for a new patient, or allow the user to change the transducer, application or preset in an exam that has been started.
Mode buttons	The mode buttons allow the user to select mode/modes for the exam. The modes are **M-mode**, **Doppler**, **Color** and **2D** (B-mode).
Mode function buttons	The mode function buttons display the functions available for the selected modes.
Image parameter buttons	The image parameter buttons display the image parameters that can be set for each mode/combination of modes. Tap the image parameter button and turn the related dial to set the parameter.
Function buttons	The function buttons contain the **Measure**, **Label**, **Worksheet**, **Report**, **Settings**, **Help** and **Home** buttons. Tap the **Home** button to return to default settings for the current exam type. The functions are described further in "Setting Up and Customizing Your System" on page 121.

- You select or deselect a button by tapping it.
- The buttons and window elements in the exam management and function button groups are highlighted in white when selected.
- The buttons in the remaining groups are highlighted in green when selected in the live image and in blue when the image is frozen.

Documents

For information about using Documents, see Chapter 6, "Documentation" on page 51.

Measurements and Image Data

For information about making and using measurements on the system, see Chapter 5, "Making Measurements" on page 41.

For information about working with the image, see Chapter 4, "Working with the Image" on page 33.

Review Tab

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

Chapter 3
Controls on the UI

This chapter contains a list of all on-screen and touch screen controls in alphabetical order. Some on-screen and touch screen controls appear only on advanced settings, or when the system has been set up to display them. See Appendix A, "Setting Up and Customizing Your System". Not all of the controls in the list can be configured by the user.

UI Control	Function
Advanced Layout	Display all available touch screen buttons. The user can choose between advanced or basic parameter layout in the **Settings** menu.
Angle	In Doppler mode, correct the Doppler angle.
Application	Select an Application.
Archive	Send to PACS (DICOM), to a network drive, or to a USB storage device.
Auto B-Mode Q button	Use this to restore B Gain to 50% when the exam is running.
Base D	Reposition the Doppler mode baseline to help with aliasing problems. The frequency axis is updated to match the spectrum.
Base C	Reposition the Color mode baseline (offset the Doppler color scale) to help with aliasing problems.
Basic Layout	Display a limited amount of available touch screen buttons. The user can choose between advanced and basic parameter layout in the **Settings** menu.
Biopsy	Display a puncture line.
Bodymark	Place a bodymark on the image.
Brightness	Adjust monitor and/or touch screen brightness. This option is available from the **Settings** menu.
CINE End dial	Set the frame number for the end of a cine loop.
CINE Start dial	Set the frame number for the beginning of a cine loop.
CINE Play ▶	Play a cine loop.
Color Off	Remove the color (flow information) while you are imaging in Color or Power mode. Use this to remove the color temporarily, while keeping the Color box and other settings.
Copy	Copy the selected images to a USB memory device. An option is available to copy without Patient ID. For HIPAA compliance, this option is recommended.
Delete	Delete Labels, measurements and thumbnails selected in the document browser.
Delete All	Delete all measurements and labels.
Depth	Adjust depth.

UI Control	Function
Dyn Rng	Adjust contrast (dynamic range). Lower dynamic range = higher contrast. Higher dynamic range = lower contrast.
End Exam	End current examination.
Exam List	Open the **Examination List** in the **Archive** window.
Filter B + dial	Applies an algorithm that allows the user to adjust the amount of speckle in the ultrasound image.
Filter C + dial	Set amount of color flow smoothing in Color mode.
Filter D + dial	Set amount of smoothing in Doppler mode.
Frame	Select a frame of the cine clip.
Frame Rate + dial	Shows the balance between resolution and frame rate. Higher resolution number means higher resolution, lower resolution number means faster frame rate.
Freeze/ Unfreeze	Freeze all images on the monitor or start imaging (image update) again.
Freq (B Freq, C Freq, P Freq)	Select imaging (transmitted) frequency (B-mode or color flow frequency). The current B-mode imaging frequency is displayed on the screen key. (If harmonic imaging is active, the displayed frequency (H) is the receiving frequency.
Freq. D	Change Doppler frequency.
Gain (B Gain, C Gain, P Gain, D Gain, M Gain)	Adjusts the overall gain. Lighten or darken the image in the different imaging modes. When image is frozen, use **Post Gain**.
Home	Return to default settings for the current exam type.
Hospital Name	In **Settings**, enter name of hospital or institution.
Import Licenses	In **Settings**, import license keys from a file.
Invert	In Color mode, invert color coding of flow information so that flow towards the transducer appears blue and flow away from the transducer appears red. In Doppler mode, invert the spectrum on the monitor.
L/R	Change the left-right image orientation of all modes in the selected view.
Label	Select a label to put on the image.
Login .../Logout	Log on to and log out of the network using network username and password. Requires that password protection is enabled.
MI + dial	Set the maximum allowed mechanical index. When the MI is adjusted in other modes, the TIS, TIB and TIC are updated and displayed as image data on the clinical display.
Patient ID and Patient Name	Individual patient ID. **NOTE:** A patient ID must be entered - either by the system or the user - to capture an image or a clip. Patient name and ID are saved in the patient archive and on the images.
Patient Temperature + dial	If patient temperature is not 37°, tap this and use the related dial to adjust the temperature. Available with the T7P2m TEE transducer only.

UI Control	Function
Persist C	Set the persistence level of the ultrasound image in Color mode and Power mode.
Play ▶	Play cine loop.
Post Gain	Adjust the gain of a frozen image. See Gain.
Preset	Select a preset.
Print	Print the selected documents.
Q button in live exam	In B-mode, reset overall gain and TGC curve to the default setup for the preset. **NOTE:** The TGC sliders do not move when you do this. Therefore, the shape of the TGC curve on the monitor may not correspond to the relative position of the sliders on the control panel. In Doppler mode, reset the range and baseline to prevent aliasing and to optimize the display of the Doppler spectrum. **NOTE:** The control panel, except for **Freeze**, is disabled while the scale and baseline are being adjusted. This may take a few seconds.
Real-Time	Turns Real-Time measurements on and off. When in Doppler mode, the **Trace** button provides real-time measurements.
Report	Open a report for the current examination.
SV angle	Adjusts the SV Angle for Doppler angle correction.
Save preset	Save the current setup as a new preset.
Scale C + dial **WF C + dial** **Scale D + dial** **WF D + dial**	Vary the PRF (pulse repetition frequency) to select the range of Doppler velocities (frequencies) that are displayed in the spectrum and/or color-coded. Restricting the range allows you to see velocity differences (within the range) in more detail. **NOTE**: The wall filter value will be changed automatically when you change the Scale (PRF) value.
Sector	Adjust the width of the ultrasound image.
Select All	Select all thumbnails in the document browser.
Settings	Setup of the system.
Sim B/C	Set split-screen view to images simultaneously. (Color or Power mode can be in only one of the views.)
Size	Adjusts the image size.
Split	Split the screen horizontally or vertically to display 2 imaging views at the same time.
Steer C **Steer D**	Change the Doppler beam angle in Color and Doppler modes.
Store Image on PACS	Store the image on a PACS (Picture Archiving and Communications System).
Sweep	In Doppler mode, set the sweep speed to change the number of cycles of the spectrum displayed on the full time axis. In M-mode, set the speed at which the M-mode image sweeps across the monitor.
Trace	Activate automatic Doppler curve tracing (Peak). **NOTE:** Real-Time measurements must be turned on. See Real-Time.

UI Control	Function
Transducer	Select a transducer.
U/D	Change the up-down image orientation of all modes in the selected view. **NOTE:** When you change image orientation, you may need to adjust the TGC settings for the B-mode image.
Update	See update on control panel. Toggle between B-mode and Doppler.
USB Eject...	**Review** tab. Click to eject USB device safely – the system then notifies you when it is safe to remove the device without risk of losing data. If more than one USB device is connected, all will be ejected.
Volume	Adjust the volume of the audio signal in Doppler mode.
WF C **WF D**	Turn the wall filter on (in Color or Doppler mode) and set the cut-off frequency.
X-Shine + **X-Shine -**	Activates the X-Shine function for best needle visibility.
Zoom	Zoom the image.

Chapter 4
Working with the Image

You can work with an image (measuring, labeling, adjusting the color box size etc.) using:

- The trackball and the **Select** key on the control panel to point or select.

- Special keys and dials on the touch screen.

Freezing the Image

When you press the **Freeze** key on the control panel, the active image on the monitor is frozen. A snowflake icon appears on the monitor. If you press **Freeze** again, the image returns to its previous active state.

NOTE: *Some functions are not available when the image is frozen and some are available **only** when the image is frozen. The controls are blue (frozen), green (active), light gray (available), or grayed out (unavailable).*

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 and color) – duplex or triplex imaging. In partial freeze, *either* the Doppler image *or* the 2D-mode image (with or without color flow) is frozen. You can toggle between the two images in a partial freeze.

To start partial freeze:

- Press the **Update** key. This is highlighted in green when available.

  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 (with or without color flow) imaging.

- 2D-modes (with or without color flow) frozen; Doppler mode imaging.

Split Screen

You can split the screen to display 2 views side by side or one over the other. You set up your preferred split screen view in **Settings > User Preferences**.

- If you are using a single-plane transducer, the 2 views contain the same imaging view.
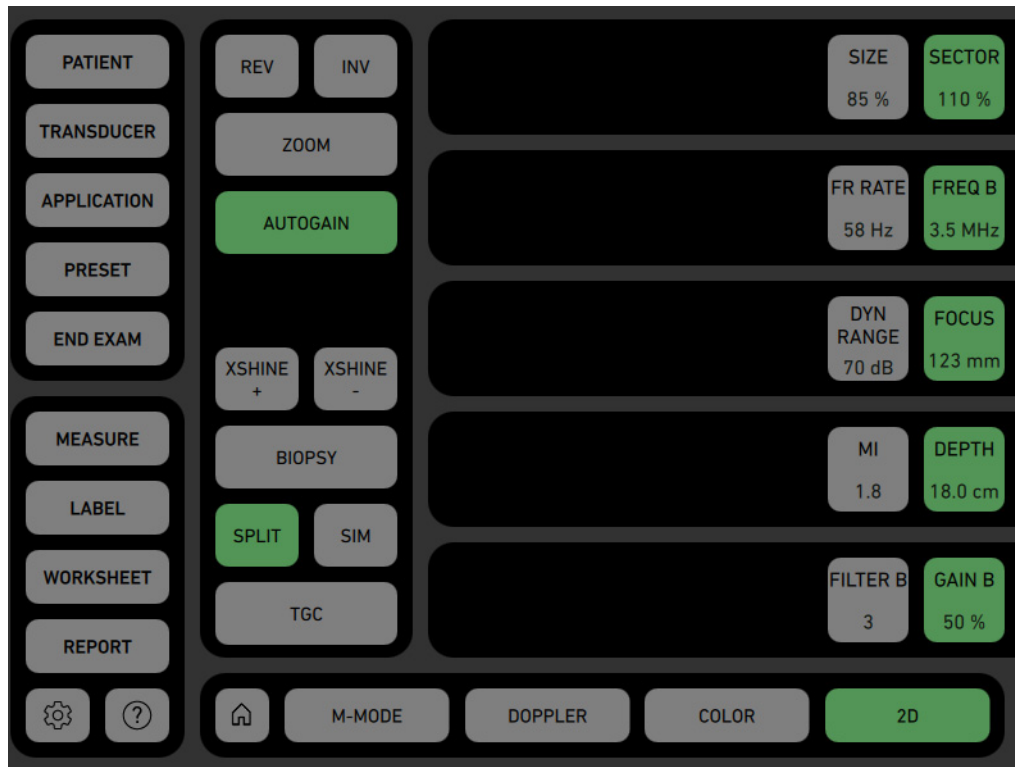
Figure 4-1. **2D** *controls including* **Split.**

1   To split the screen or remove a split:

- Tap **Split**.

To select one of the views:

- Use the **Update** button to change between the left and right or up and down views. This button is highlighted in green when available.

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:

- Tap **Sim** or **Sim B/C**.

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

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

Labels and Bodymarks

In addition to labeling an image during an examination, you can add labels to archived images and to individual frames of archived clips from the same type of ultrasound system.

NOTE: *Labels change color on the clinical display when being manipulated. When the cursor hovers over them, they are yellow. When they are selected, they are blue and can be moved. When in position and the cursor is not nearby, they are gray.* **Select** *places the label.*

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.
- Free-text (type) labels directly on the image or select a pre-defined label.

Figure 4-2. The Text tab on the Label screen.

To select one or several labels:

1. Tap **Label** on the touch screen and select the **Text** tab. The label cursor is a green vertical bar and defaults to the top left of the monitor in the image area.
2. Use the trackball to move the cursor to where you want the label to be placed.
3. Select a pre-defined label from the touch screen or use free text.

Tap **Home** *to make the cursor return to the top left of the monitor. If you select a label and tap* **Home**, *the label will move to the Home position.*

To move a label that you have already positioned on the ultrasound image:

• Use the trackball to point at the label and press **Select**. The label turns blue and you can use the trackball to move it to a new position. Press **Select** again when the label is positioned where you want it.

To remove a label:

• A selected predefined label will remain highlighted on the touchscreen. Tapping the highlighted label on the touchscreen will remove the label (on/off function).

• A free-text label must be selected, using the trackball. Hover over and the label turns yellow, select and the label turns blue and is copied to the label input field on the touchscreen. **X** will delete all free text in the input field.

• If you want to remove only a part of the predefined label (change from left to right, for example), tap the highlighted button on the touch screen for that part:

Tap touch screen button to remove this label from the monitor.

Label in input field.
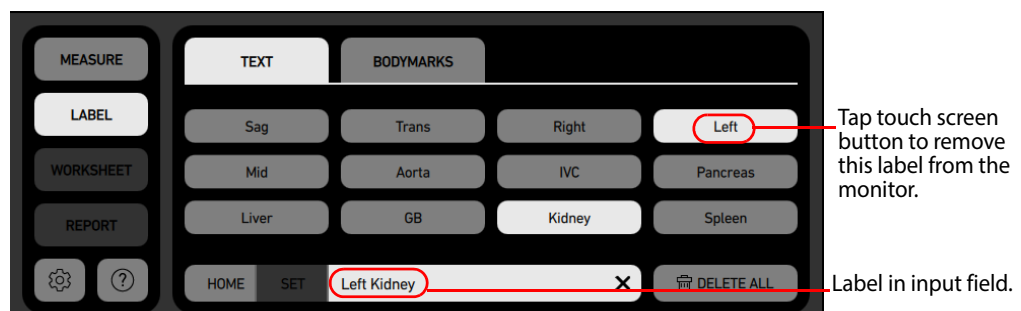
Figure 4-3. Label window with input field

To edit a label on the image:

• **Select** the free-text label you want to edit. The label turns blue and the text appears in the input field. Use the touch screen keyboard to type the changes you want.

Delete All

• Tap **Delete All** to delete all labels on the monitor.

You can select to have all labels deleted from the monitor when you unfreeze the image. See **Clear Text on Unfreeze** option in "Labels Tab" on page 164

Bodymarks

Bodymarks are small bitmaps depicting parts of the body. The bodymarks available depend on the selected Application and Preset.

An imaging plane indicator can be placed on the bodymark to show the imaging position.

Imaging plane indicator
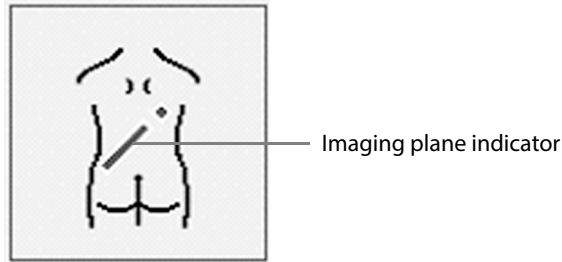
Figure 4-4. Bodymark with imaging plane indicator.

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
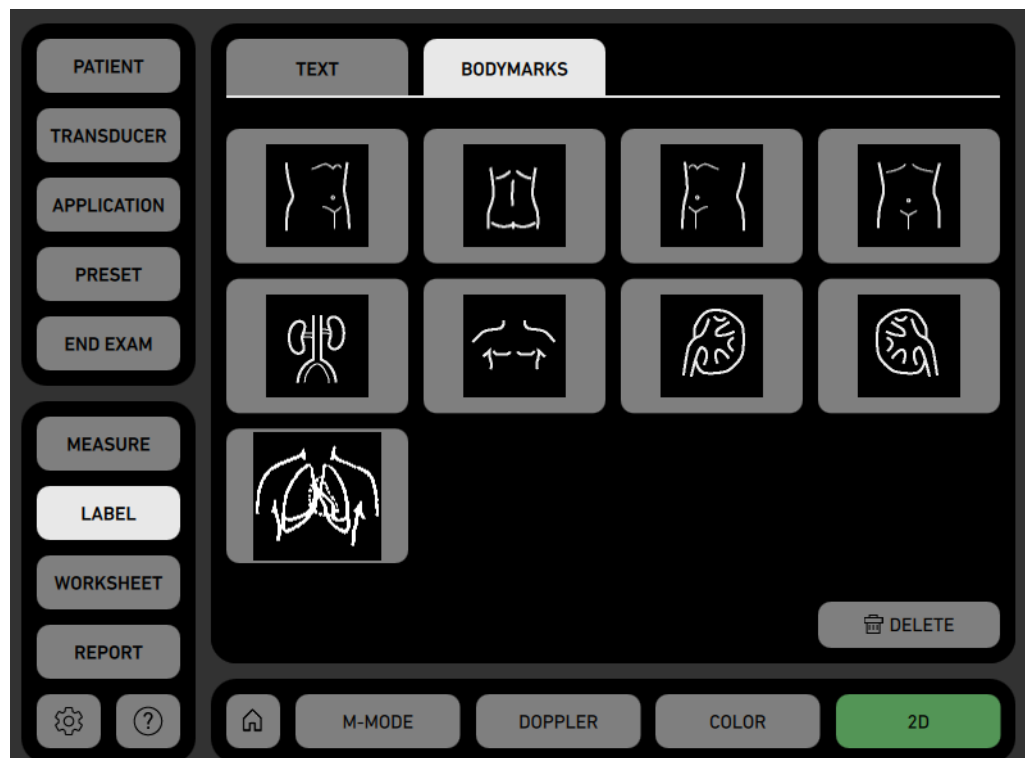
*Figure 4-5. The **Bodymarks** tab on the **Label** screen, showing bodymarks from the EMED Abdomen application.*

To place a bodymark on the image:

1   On the **Bodymark** tab, tap the bodymark you want.

2   The bodymark appears in the lower left corner of the monitor with an imaging plane indicator.

To replace a bodymark:

To replace an existing bodymark, tap the new bodymark on the touch screen **Bodymark** tab.

To remove a bodymark from the monitor:

- Tap **Delete** on the touch screen.

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

Adjusting the Imaging Plane Indicator

To adjust the imaging plane indicator:

- Use the trackball to point at the bodymark and press **Select**.

You can then:

- Press the **Update** button to rotate the imaging plane indicator clockwise. You can hold down the button to make the indicator rotate faster.
- Drag the imaging plan indicator with the trackball.
- Press **Select** again to set the position of the imaging plane indicator.

Cine

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

Freeze the image and turn the related dials to scroll backward or forward through the series. You can also tap the cine indicators **<** or **>** to go backwards and forwards one frame at a time. The vertical bar shows the progress through the images:

Figure 4-6. Cine progress bar.

Image frames 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, size and frame rate.

Images in a clip must be comparable. Therefore, changing certain parameters that affect the image will cause already-stored images to be discarded.

Storing a Video Clip

If the image is frozen, pressing button **2** will store a retrospective clip. The entire number of image frames in the buffer is acquired.

If the image is live, pressing button **2** will store a prospective clip.

The clip storage length can be adjusted in **Settings** (see "Clip Storage and Cine Setup" on page 145) to a maximum length of 10 seconds.

Figure 4-7. Countdown when storing a video clip.

Using Cine

To use the Cine function:

- Freeze the image. The **Cine** screen opens.
- Cine indicators are displayed at the bottom of the screen, with the specific **Cine** buttons to the right next to the related dials.
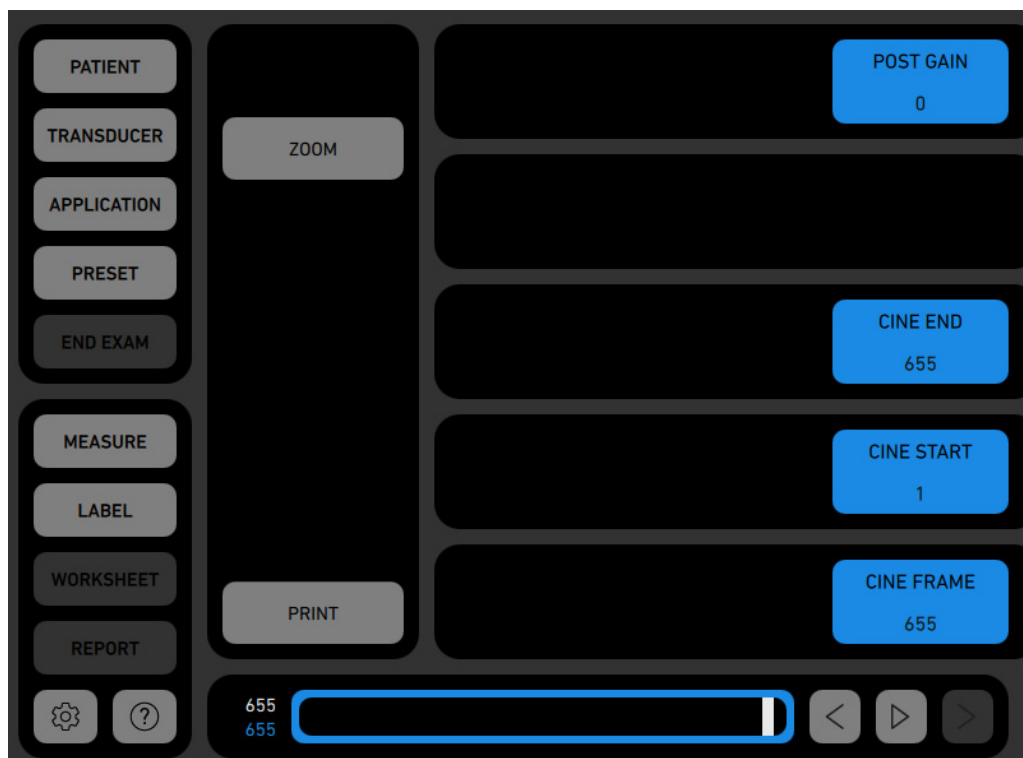
Figure 4-8. The Cine screen.

Start and Stop Markers

Set the Start and Stop markers to indicate the range of images to be displayed in **Cine Play**. You set the **Cine End** and **Cine Start** by tapping the button on the screen and turning the related dial.
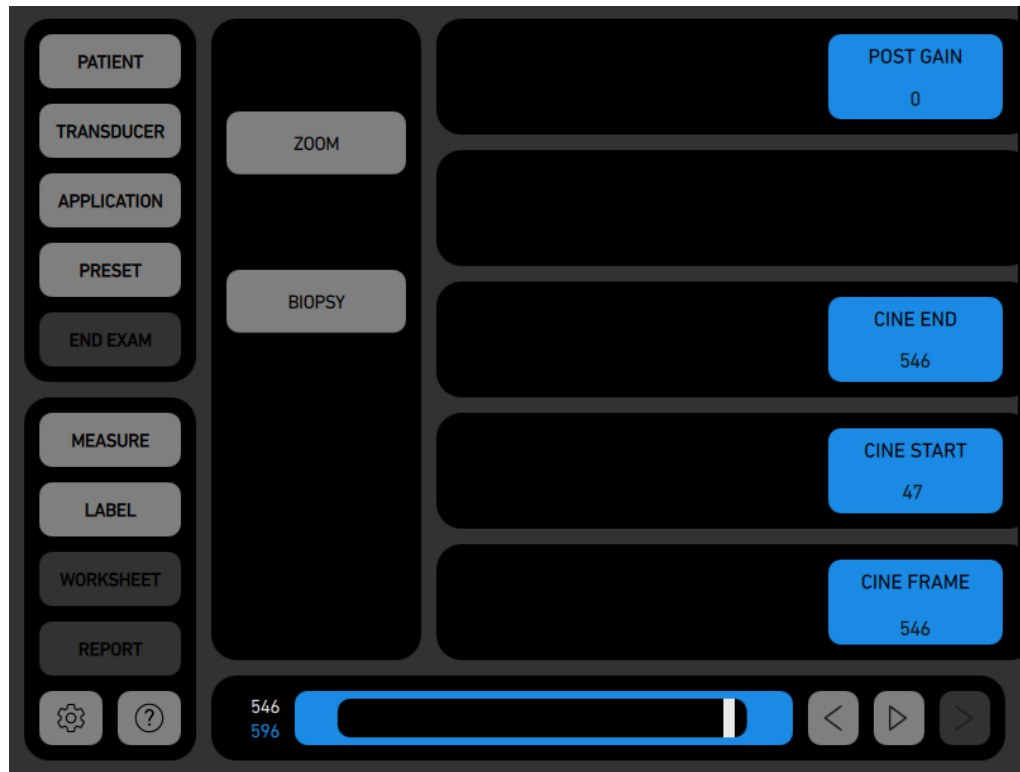
*Figure 4-9. Setting **Cine Start** and **Cine End** using the dials.*

The current frame and the total number of frames are displayed to the left of the progress bar.

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 B-mode image displayed is always the one that corresponds to the position of the Doppler or M-mode cursor. The image (frame) number to the left of the progress bar corresponds to the B-mode image.

To make measurements on a cine image or save it:

1   When the desired image is displayed, tap **Measure**.

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

NOTE: *When you move the cine image, the measurement calipers are removed (because the underlying image is different). If the measurement is not dependent on other measurements for a calculated result, the measurement result will disappear with the calipers.*

Video Display

The image can be displayed on an auxiliary video monitor. To have this set up, contact your BK service representative.

Chapter 5
Making Measurements

Measurements and Calculations

Each Application contains the measuring tools that you need for the calculations contained in the package. 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 can select measurement settings in the **Settings** menu. See "Measurement Settings Tab" on page 124.

You can make measurements on archived 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 55. 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 *bk3500 User Guide* and the Technical Data (BZ2100).

To view the list of measurements:

1   Tap **Measure** on the touch screen. The image is automatically frozen. A default measurement package assigned to the current application is displayed, and a caliper displays on the monitor. This caliper is part of a distance measurement. You can make up to 6 distance measurements on one ultrasound image. Or if required, you can use the touch screen to change these to any other measurements.
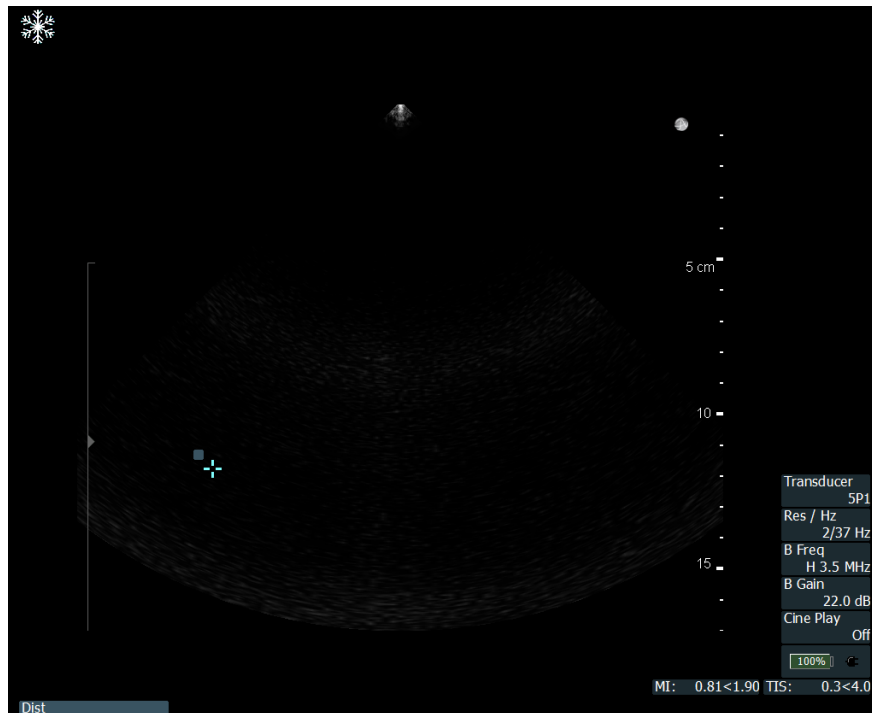
*Figure 5-1. When tapping **Measure**, a distance caliper appears on the monitor.*

Figure 5-2. The measurement window.

2   Several tabs are displayed for different body types related to the application. Tap the relevant tab. Note that when you see two or more dots above the tabs (marked in red above), you can swipe the tabs for further options.

3   The available measurements are displayed on the tab.

4 If you want to use a different measurement package, you can select it on the drop-down menu:.
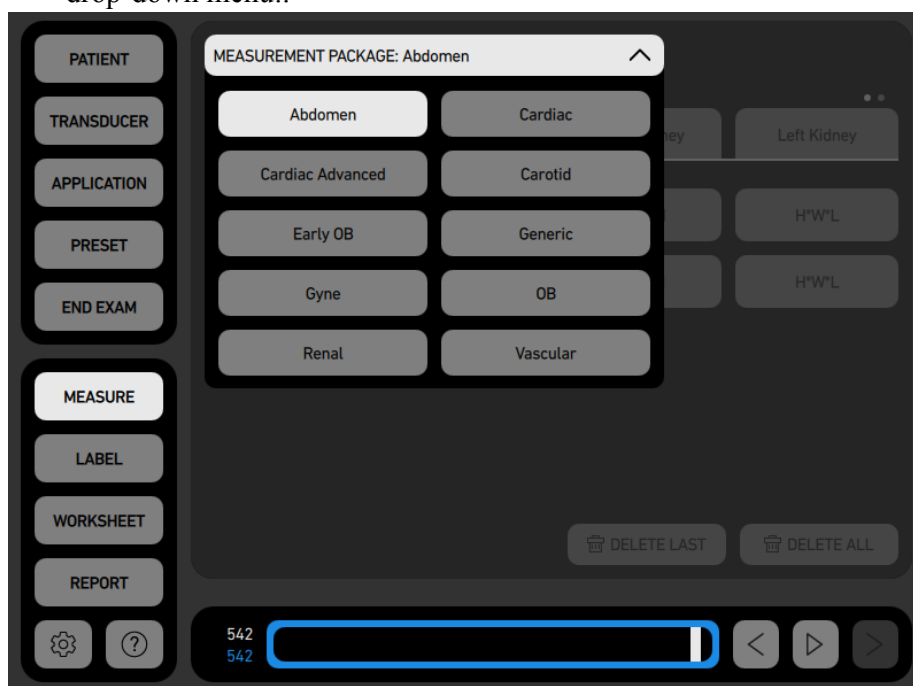
Figure 5-3. The Measurement Package drop-down menu

Doppler Measurements

In Doppler mode, you have access to a specific set of measurements. The button for **Doppler/2D** is top right in the measurement window. Here, you can select the measurements available for the 2D or Doppler mode:
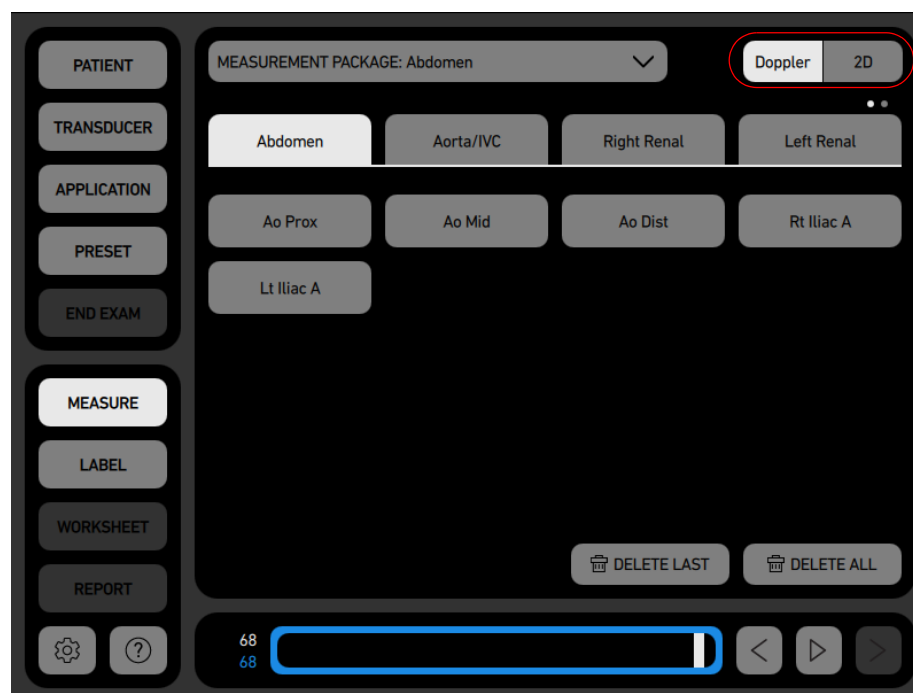
Figure 5-4. Doppler measurements.

M-Mode Measurements

In M-mode, you have access to a specific set of measurements. The button for **M-Mode/2D** is top right in the measurement window. Here, you can select the measurements available for the 2D or M-mode:
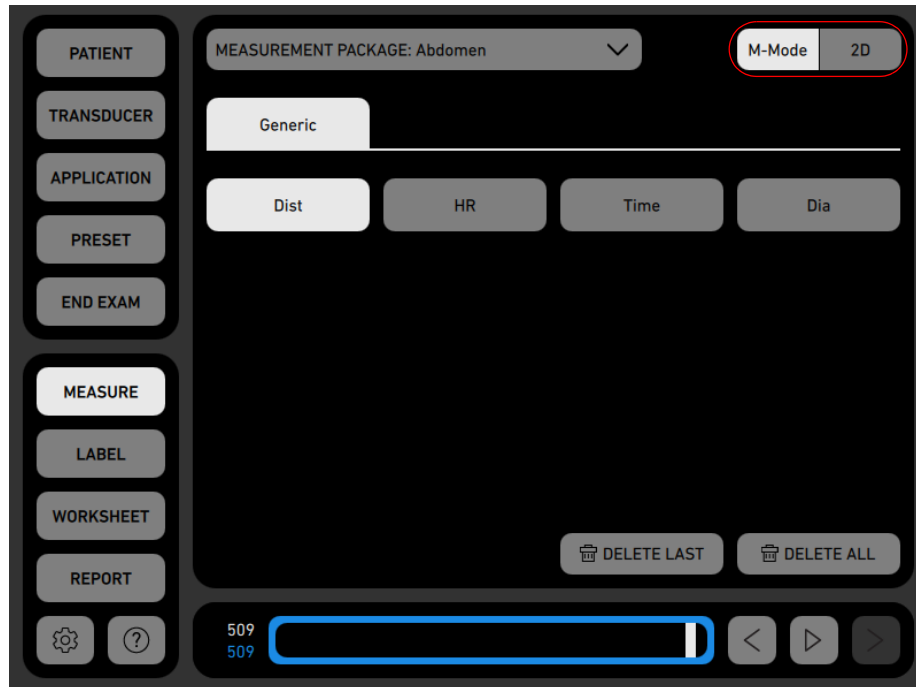
Figure 5-5. M-Mode measurements.

Making a Measurement – General Procedure

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

NOTE: *The image must be frozen to make measurements.*

To make a measurement:

1 Tap the name of the measurement.
A caliper appears on the image.

2 Use the trackball to move the caliper and press **Select** when it is in the correct position.
If the measurement requires 2 calipers, another caliper appears.

3 Drag the second caliper to the position you want and press **Select**.

4 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, and the measurement tool method selected in **Settings**.*

To move a caliper after they have all been positioned:

1 Select the caliper using the trackball and **Select** button.

2 Drag it to the new position.

3 Press **Select**.

What the Measurements Indicate

- **Results** – The results of the measurement are displayed (continuously updated) below the image. The result is color-coded to match a small square next to the measurement on the image.
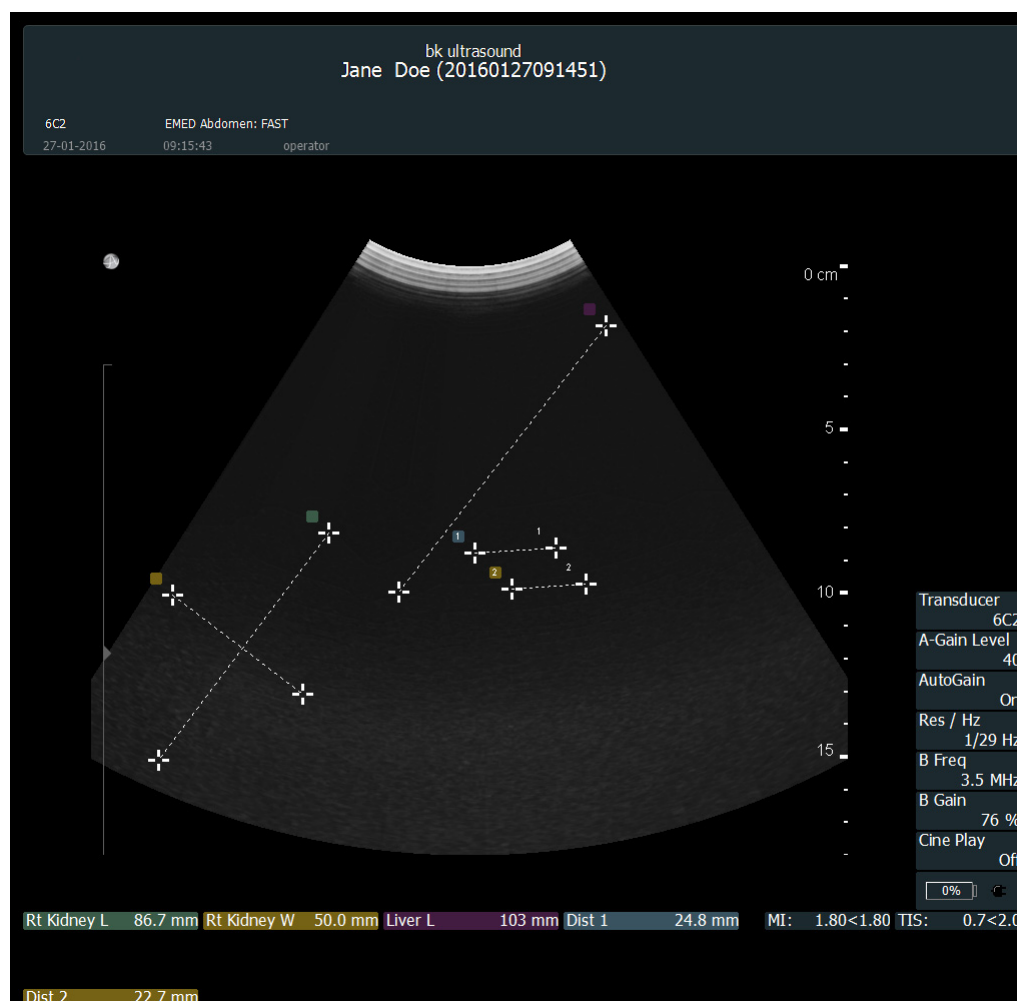
Figure 5-6. Measurements as displayed on the monitor.

Clearing a Measurement

The measurement calipers are removed from the screen if the image becomes active or if the cine frame is adjusted. If the measurement result is dependent on another result for a calculation to be completed, the result remains on the image until the calculation is complete.

To clear a measurement and any current calculations that use the measurement, do the following:

To clear a measurement

- Tap **Delete Last** on the touch screen.

To clear all measurements

- Tap **Delete All** in the **Measurement** window on the touch screen.

NOTE: *If you checkmark the **Clear Measurements From Report on Deletion** in the **Measurement** settings, selecting **Delete Last** or **Delete All** when making measurements will remove the measurement results from the report as well as from the clinical display. See "Measurement Settings Tab" on page 124.*

B-Mode and Color Mode Measuring Tools

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

- Distance
- Ellipse
- Freehand drawing of shapes

To select which measuring tool you want to use, go to **Settings** and select **Measurement Options**.

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 caliper appears for you to position.

Position first caliper.   First caliper positioned;   Second caliper positioned.
                                 position second caliper.
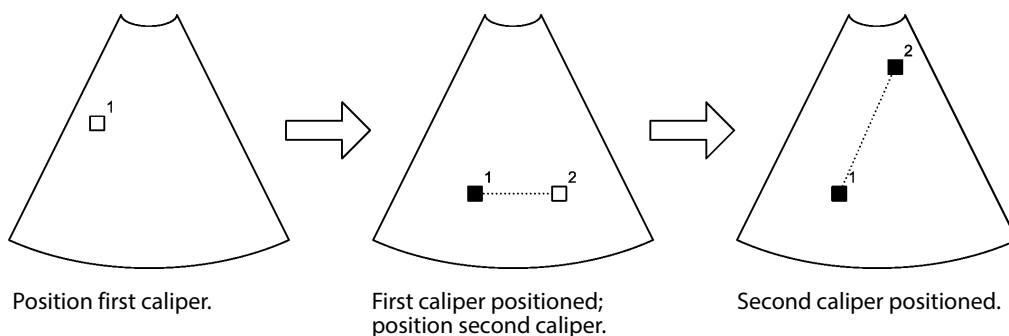
Figure 5-7. Positioning 2 calipers on a B-mode or Color mode image.

NOTE: *The small numbers (1 and 2) shown in Fig 5-7 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   Select the caliper using the trackball and **Select** button.

2   Drag it to the new position.

3   Press **Select**.

Ellipse Measuring Tool

On a B-mode 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 calipers positioned; position third caliper. | All calipers positioned. |
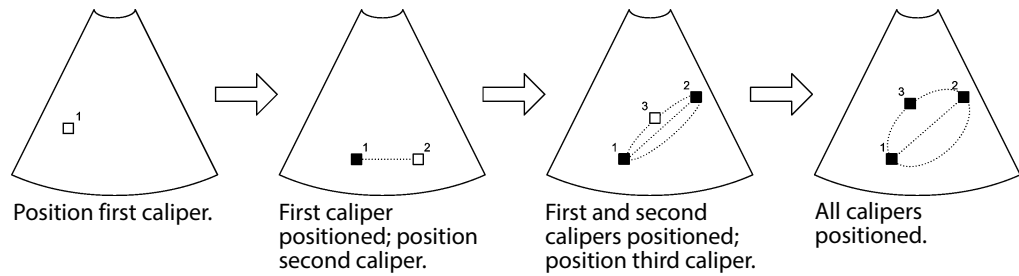
Figure 5-8. Drawing an ellipse.

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 5-9.*
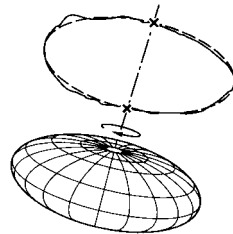
Using the shorter distance as axis of rotation results in an estimated volume of the shape shown here.
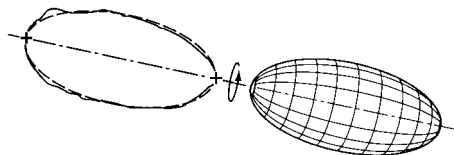
Using the longer distance as axis of rotation results in an estimated volume of the shape shown here.

Figure 5-9. 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 selecting and dragging to a new location. Press **Select** again. See Fig 5-10.

NOTE: *Moving caliper 1 or 2 in an ellipse will automatically move caliper 3.*

| All calipers positioned. | First caliper selected. | First caliper repositioned. |

| All calipers positioned. | Third caliper selected. | Third caliper repositioned. |
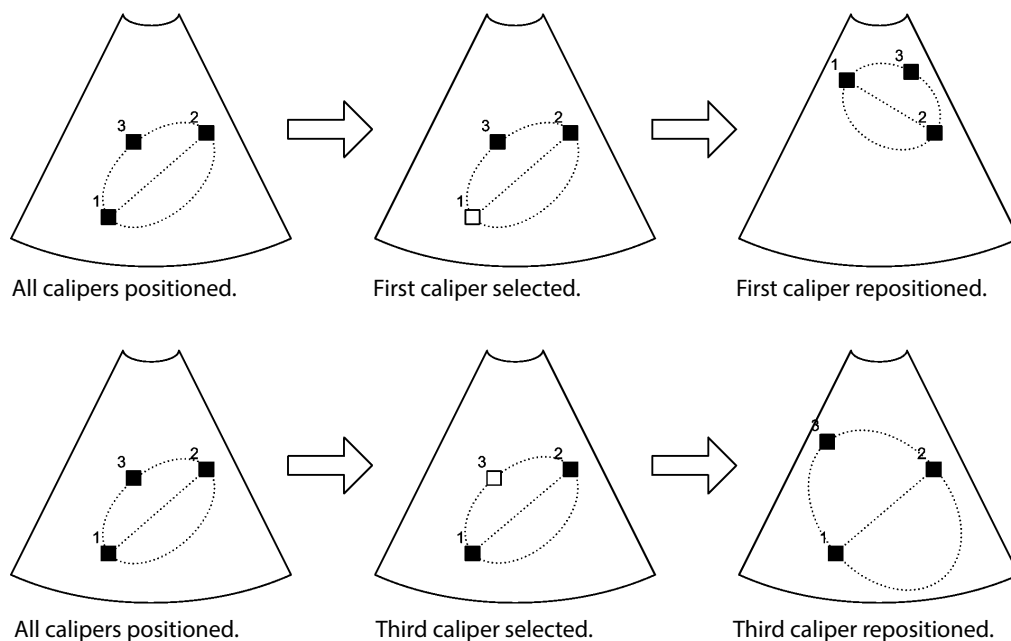
Figure 5-10. Repositioning calipers in an ellipse you have drawn.

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

1 Use the trackball to place the cursor inside or on the ellipse and press **Select**.

The move symbol – plus sign with arrows – appears.

2 Drag it.

3 Press **Select** again.

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

| All calipers positioned. | Entire ellipse selected. | Entire ellipse repositioned. |
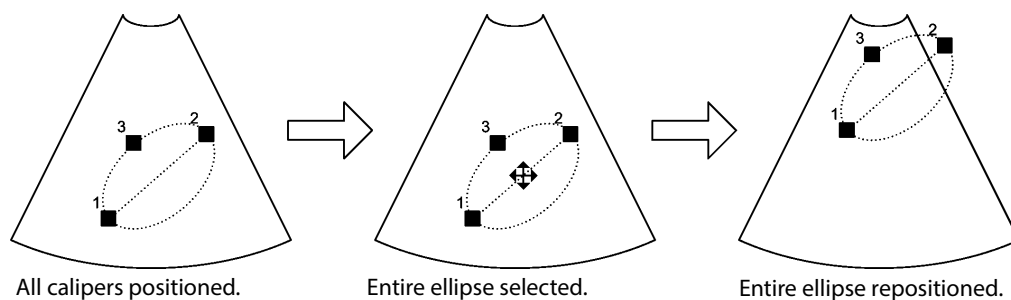
Figure 5-11. Moving an ellipse.

Freehand Drawing on a B-Mode or Color Mode Image

On a B-mode or Color mode image, you can draw a closed shape freehand.

To draw freehand:

1 Tap the name of the measurement.

A drawing cursor appears.

2 Use the trackball to move the caliper and press **Select** when it is in the correct position.

A second caliper appears where you pressed **Select**.

3 Drag it to draw the shape you want.

To delete backward from the cursor, tap **Backtrace**. Tapping **Delete Last** will delete the entire shape.

4 When you have finished drawing, press **Select**.

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.
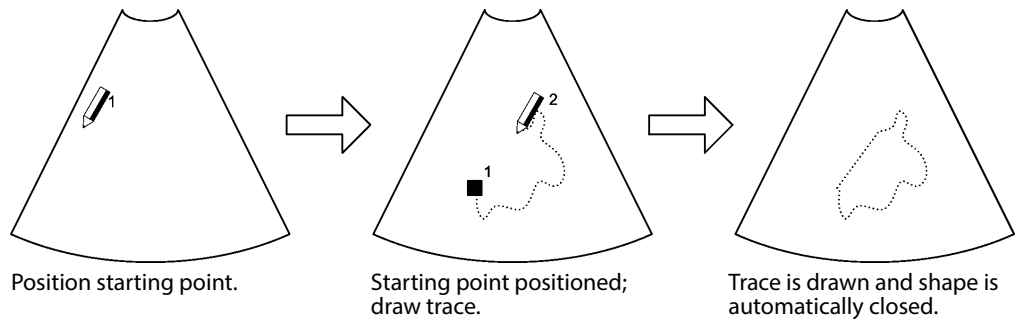
Figure 5-12. Drawing a freehand shape.

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

Shape drawn.   Entire shape selected.   Entire shape repositioned.
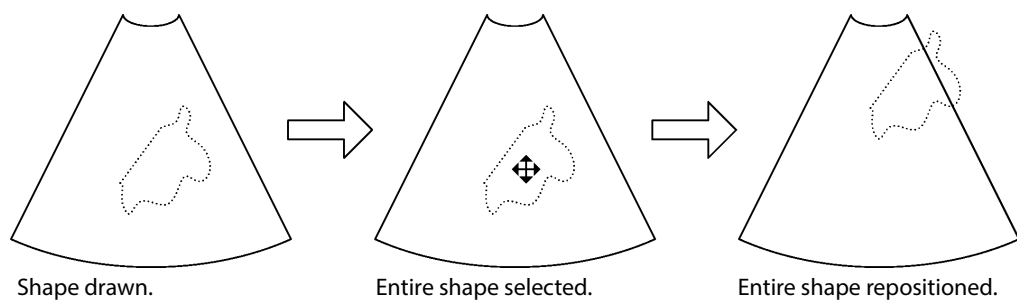
Figure 5-13. Moving a shape you have drawn freehand.

Doppler Mode Measuring Tools

Making measurements on a Doppler mode image is different from measuring on a B-mode 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.

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 caliper position.

Position first marker.   First marker positioned; position second marker.   Second marker positioned; measurement terminated.
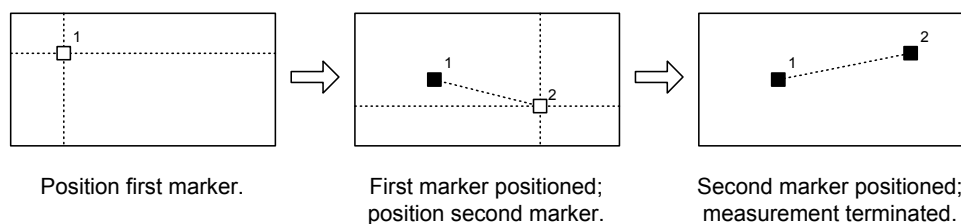
Figure 5-14. Positioning 2 point calipers on a Doppler mode image.

After you position the calipers, you can move one of them by selecting it and dragging it. Press **Select** again when you have positioned it where you want it.

All markers positioned.   First marker selected.   First marker re-positioned.
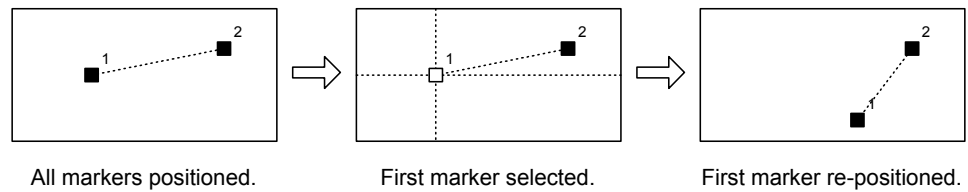
Figure 5-15. Moving a caliper you have placed on a Doppler mode image.

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. This tool is used for measuring Heart Rate with M-Mode and Doppler.

To position the vertical calipers:

1   Tap the name of the measurement.

    A caliper appears on the image.

2   Use the trackball to move the caliper and press **Select** when it is in the correct position. Another caliper appears.

3   Drag the second caliper to the position you want and press **Select**.

Position first line.   First line positioned;   Second line positioned;
                              position second line.   measurement terminated.
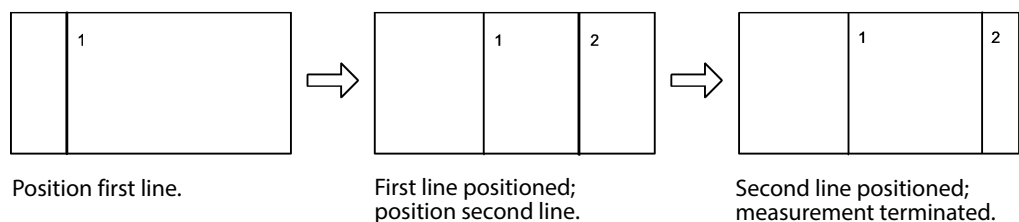
Figure 5-16. Positioning vertical calipers on a Doppler mode image.

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

All lines positioned.   First line selected.   First line repositioned.
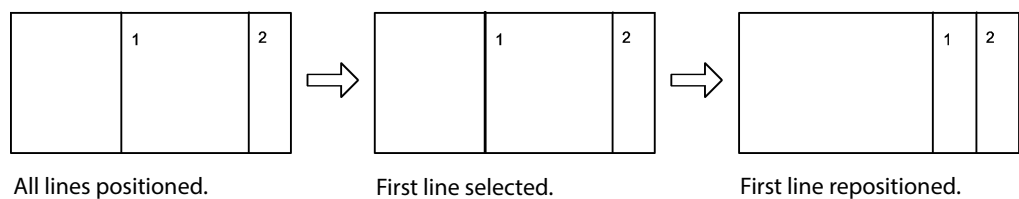
Figure 5-17. Moving a vertical line caliper you have placed on a Doppler mode image.

Chapter 6
Documentation

What are Documents?

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

There are three different types of documents:

* Images
* Clips (video)
* 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 55
* "Deleting Documents or Exams from the System" on page 59

Saving Documents – Capturing Images

You must have a patient ID entered in order to capture images and clips.

Capturing Images

When you have started the exam, press **1** on the control panel to capture an image, press **2** to capture a clip. A countdown timer will be displayed on the review tab.

NOTE: *If an Exam is not running, pressing 1 will start an Exam, and then capture an image. Changes made to the image with the existing preset before an exam is started, using capture 1 or 2 are kept in the stored and live image.*

Saving Reports

To save a report to the patient archiving system, tap **Save** in the **Report** window on the touch screen.

See also "Reports" on page 64

Local Patient Archiving System

The local patient archiving system contains information about patients and examinations, including comments about patients or documents.

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

Reviewing Documents

The Document Browser

Open the document browser by tapping **Search** in the **Patient** window on the touch screen to review and manage images and other documents stored in the patient archiving system. You can select one or more documents so that you can view, copy, or archive them.

You can also use the document browser to review images and other documents stored or archived on external media, including network drives.

You cannot use the document browser to review images and other documents stored on a Picture Archiving and Communication System (PACS).

The document browser on the **Review** tab contains thumbnails of the available documents. If the browser contains so many images that the thumbnails cannot fit on the monitor, you can use arrows at the left and right end of the document browser to scroll through the thumbnails.

When you review a clip, a pause icon appears on the review tab. Select this using the trackball and **Select** button to pause the clip you are reviewing.
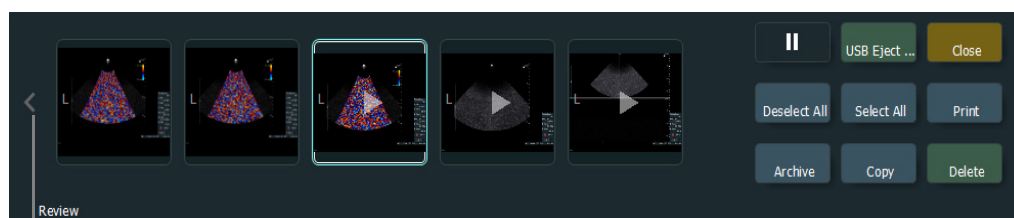
Figure 6-1. The Review tab with the document browser.

To select or deselect an image:

- Select the image thumbnail in the browser using the trackball and **Select** button. The frame around the document turns blue.

To select or deselect all images in the browser:

- Select **Select All** or **Deselect All**.

To view an image:

- Doubleclick the thumbnail.
- The frame around the document being viewed turns white.

To view the previous or next image:

- Tap **Previous** or **Next** on the touch screen.

You see the other documents in the patient archiving system in the **Archive** window. See "Exporting Data" on page 55.

To clear the viewed document from the imaging area:

- Tap **Close** on the touch screen.

The letters L and A on the thumbnail indicate whether the document is archived locally or externally. If it is archived both locally and externally, both L and A are shown. (You must enlarge the thumbnail to see the letters.)

Use the controls on the **Review** tab to manage the documents in the browser. Some are listed in the following table:

Tool	Function
❚❚	Pause icon when clip is being reviewed.
USB Eject...	Safely remove a USB device.
Close	Closes an open document.
Deselect All	Deselects all thumbnails in the document browser.
Select All	Select all thumbnails in the document browser.
Print	Print selected images and reports, or all images from selected patients or examinations to a SONY printer.
Archive	Place documents in the staging area so that they can be archived on a network drive or PACS.
Copy	Copy documents to a USB storage device, with or without patient ID. For patient security, it is recommended to remove the patient ID. Reports cannot be copied with the patient ID removed. You can also copy to a USB storage device in DICOM format.
Delete	Delete the currently selected documents (see page 59).

Table 6-1. Review screen keys.

For reports, you can

- Image the report by pressing button **1**.
- Save the report by tapping **Save** on the touch keyboard.
- Close the report by tapping **Close** on the touch screen.

Viewing Exported Documents on the System

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

Documents that have been archived to a network drive can be accessed, just like documents stored on the system, by selecting an examination in the **Archive** window. (See page 55.)

You can use the document browser to look through documents that you have copied or archived to a network drive or USB storage device.

To view externally stored documents:

1   Insert a USB storage device into the USB connector on the left side of the system neck.

2   Select the **USB** tab at the bottom of the **Archive** window.

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

3   Select **Update** in the **Archive** window.

4   Select a folder.

The document browser is updated with the documents in the selected folder.

Viewing Exported Documents on an External Computer

Formats of Exported Documents

Copied Images Images copied to a USB storage device are stored in DICOM or .bmp format. In .bmp format, they are labeled with a code that specifies the date and time the image was captured. For example, 2D_20131022_135426_FV12345.bmp would be the label on an 2D image of patient FV12345 that was captured on October 22, 2013 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. The filename is formatted like this: <patient ID>_YYYYMMDD_HHmmSS_0000.bmp or .dcm. If copied without patient ID, the patient ID in the file name will be replaced by XX

Copied Video Clips Video clips can be copied in .avi, .mpg or DICOM format.

Archived Images and Video Clips Archived images and video clips (including ones archived on the system) 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 bmp. format. You select the file you want to view.

All *archived* images, whether on the system or on a network drive or PACS system, are stored in a DICOM format; you will not be able to read externally archived documents on a computer unless you have a DICOM viewer.

Viewing Video Clips on a Computer

If the video clip has been exported in DICOM format, you can view it with a DICOM viewer.

·   If the video clip is not saved in DICOM format, you can still view it on a PC, but you must have a codec installed on the PC. You can set up the system to export the codec to an external storage medium. The codec is exported to a folder called **Codec**.

To install the codec on your PC:

1   Use Windows® Explorer to view the contents of your external storage medium.

2   Open the folder called **Codec**.

3   Right-click the file called **lagarith.inf** and click **Install**.
The codec is installed.
NOTE: *Lagarith version 1.3.27.0 is required.*

Exporting Data

You can copy and archive documents so that they are stored outside the system.

Copying When you copy a document, only the document is copied, and not the patient database. You can copy documents to a USB storage device.

Archiving When you archive a document, the patient database is copied along with the document. This ensures that you have a backup of the patient database as well as ultrasound images in case anything happens to the system hard disk.

You can archive documents to a network drive. You can also archive them to a Picture Archiving and Communications System (PACS).

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*: **without patient ID.**

If you archive to a network drive, the archive is password-protected, but you must still be aware that you are exporting confidential data from the system.

Copying to a USB Storage Device

You can copy documents associated with a patient to a USB storage device. The system is set up to copy to this type of device.

You can make more than one copy of a document.

See "Using USB Storage Devices" on page 56.

To copy individual documents or all the documents associated with a specific examination or patient:

1   Select the patient, the examination, or the individual documents you want to copy.

2   Select **Copy.**

3   Select the destination and whether you want to copy in DICOM format or not. Copying the document **without patient ID** is recommended for patient security.

4   The documents are copied to the USB storage device.

Archiving to a Network Drive

To keep a permanent record of documents, you can archive them to a network drive. See "Using a Network Drive" on page 56.

You can archive a document to a network drive only once. The system keeps a record of where the document has been archived so that you can always find an archived document.

To archive all documents for a patient or examination or individual documents:

1   Select the patient, the examination, or the individual documents you want to archive.

2   Select **Archive** on the **Documentation** tab.

3   Select the archive location.

Using USB Storage Devices

If the system is set up to copy to a USB storage device, when you click **Copy,** the copying starts immediately. If more than one USB storage device is connected, choose the local volume to copy to from the list that appears.

NOTE: *Some USB storage devices are configured as two partitions (for example, D: and E:).*

NOTE: *Before you remove the storage device, select USB Eject. You will be notified when it is safe to remove the storage device (no risk of losing data). If more than one storage device is connected, both will be ejected.*

Using a Network Drive

A network drive can be set up for archiving. Contact your BK Service Technician.

The Archive Window (Examination List and Patient Information)

You use the **Archive** window together with the document browser to manage all the documents in the patient archiving system. You can view documents, delete documents, copy documents, archive documents, and send them to a PACS or a DICOM printer.

The **Archive** window also contains information about how much space is left on the system hard disk. See "Hard Disk Quota" on page 61 for more information about the hard disk quota and how to create space on the hard disk.

To open the Archive window:

1   Tap **Patient** on the touch screen and select **Search...**

2   In the window that opens, select the **Archive** tab.

A list of examinations is displayed, including each examination for each patient. Each row represents one examination of one patient.

Patient window.
When you select an exam, patient name and ID is displayed here. This window contains additional fields, depending on examination type

Examination List, *see below*

Free space on hard disk

Filter which patients are displayed, *see Table 6-2*

Select to
- save patient details for all examinations or
- start new exam without clearing image or
- discontinue current exam

Figure 6-2. The Archive window with the Examination List and the Patient window.

Patient Information

To edit the current patient:

1 Tap **Patient** on the touch screen.

2 Update the patient information, using the touch keyboard or a barcode reader.

> **NOTE:** *Fields that will accept data entry via the keyboard will also accept data scanned with the barcode reader. Simply ensure that the cursor is located in the required field then scan the **relevant** barcode.*

3 Tap **Update Details**.

If you forgot to enter new patient details before you started imaging, you can keep the image while you add patient information.

NOTE: *If patient demographics in an archived study need to be edited and saved, you must select **Save patient details** under **More** in the Archive window.*

Examination List

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

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

To see documents from a particular examination, select the row containing the examination. To select more than one row, use the trackball with the **Select** button. The document browser is updated with the thumbnails of documents from the selected examinations.

You can use the controls below the list to filter the information so that only certain patients and examinations are displayed (see Table 6-2).

Select this	Enter this in the next field	Examinations displayed for these patients
Current patient	*Not applicable*	The current patient (the one whose ID is displayed at the top of the monitor)
Patients examined today	*Not applicable*	All patients that have been examined today
All patients	*Not applicable*	All patients
All fields	Any name or number	All patients with data in any field corresponding to the name or number entered in the search field
Search for archived patients	*Not applicable*	All archived patients
Search for non-archived patients	*Not applicable*	All patients with no archived examinations
Search in Patient Name	Name or part of name	All patients with the name searched for
Search in Patient ID	ID or part of ID	All patients with matching digits in Patient ID
Search in Ref. Phy. Name	Name or part of name	All patients with referring physician of that name
Search in Accession Number	Number or part of number	All patients with matching digits in Accession Number
Patients with exams before...	A date	All patients who have any examination before the date you enter in the text box
Patients with exams after...	A date	All patients who have any examination after the date you enter in the text box
Search in Attending Physician	Name or part of name	All patients with attending physician of that name
Search in Performing Operator	Name or part of name	All patients with performing operator of that name
Patients with at least one exam type	Select exam type from drop-down menu	All patients with this exam type

Table 6-2. Ways to select the patients displayed in the Examination List.

Deleting Documents or Exams from the System

You can delete documents and patient records from the system if they have not been archived externally.

If documents have been archived externally, you can delete the documents themselves from the system, but the patient and the reference to the externally archived documents remain.

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

To delete one or more documents (archived or non-archived) from the system:

1   Select the images in the document browser.

2   Select **Delete** on the **Review** tab and confirm that you want to delete the documents.

The selected documents are deleted. If they were archived before they were deleted, the examination record, with a reference to where the documents are archived, remains on the system.

To delete all documents associated with an examination:

1   Select the examination. To select more than one row, use the trackball with the **Select** button.

2   Select **Delete** on the **Review** tab and confirm that you want to delete the documents.

The documents associated with the selected examinations are deleted.

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

To delete an exam with no externally archived documents:

1   Select the row containing the exam. To select more than one row, use the trackball with the **Select** button.

2   Select **Delete** on the **Review** tab.

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

3   Select **Yes**.

All local documents for the exam are deleted. The exam is deleted in the patient archive if documents for the patient have not been externally archived (that is, if they only appeared locally in the patient archiving system).

Starting a New Examination from the Examination List

Tap **Search...** in the Patient window on the touch screen to open the **Archive** window.

You can start a new examination from the **Archive** window. If a patient is selected in the window, the **Patient** window that opens contains patient data for that patient.

If no patient is selected in the **Archive** window, the **Patient** window that opens is empty.

You can also open the **Patient** window by Selecting the Patient name or ID at the top of the monitor.

Entering Dates

There are 2 ways to enter dates:

- Type the date in the date field. When you select the field, the displayed date changes to indicate the correct (numeric) format for entering the date. You must type in numbers for the day, month, and year even if the date is going to be displayed with the month spelled out.

  If you type a date that is not allowed (for example, type 22 for the month), the date is displayed in red until you enter a valid date.

- Select the date from a calendar. Select the arrow to the right of the date field to open the calendar.

1. Select the arrows to scroll through month and year. Use the **Update** button to move back and forth in 10-year steps.

2. Then select the day.

Start Exam

After you have filled in the window, select **Start Exam** to start the exam.

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 PACS (if you have DICOM installed) before you delete them from the hard disk.

NOTE: *If you have archived the documents to a PACS, make sure that they have been transferred successfully into the system before you delete them from the system hard disk.*

Worksheets

During the examination, you can fill in a worksheet for the exam. Tap **Worksheet** on the touch screen to access the worksheet. The default worksheet will be specific to the active exam type and preset.
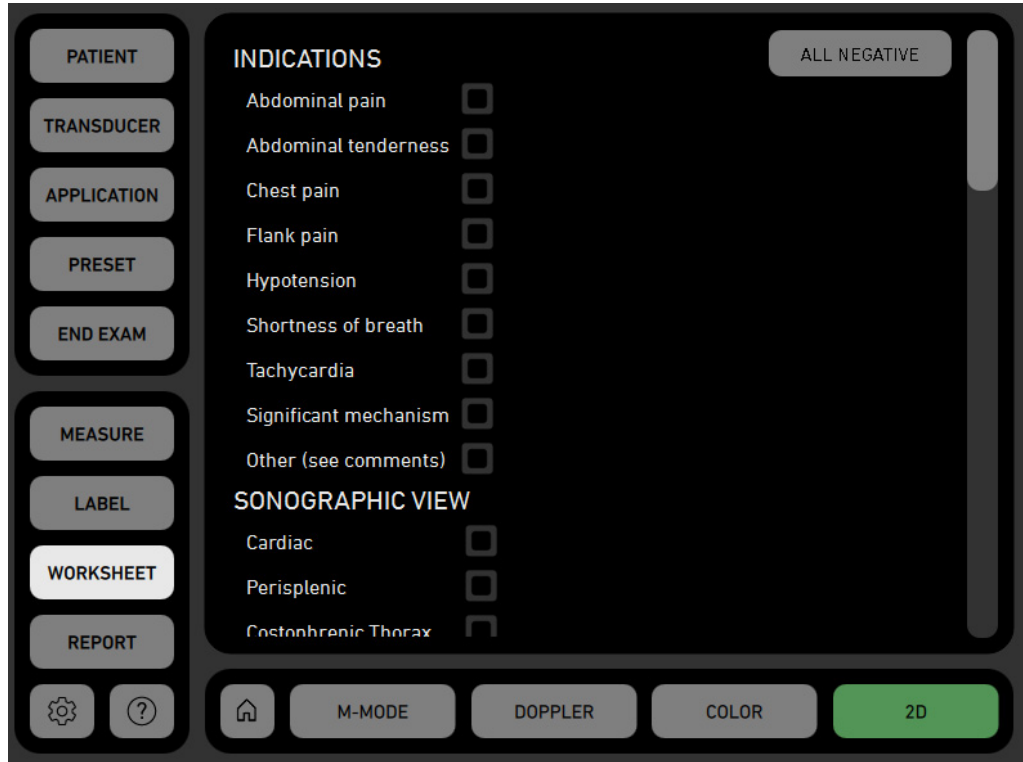
Figure 6-3. Worksheet showing Indications and Sonographic View.
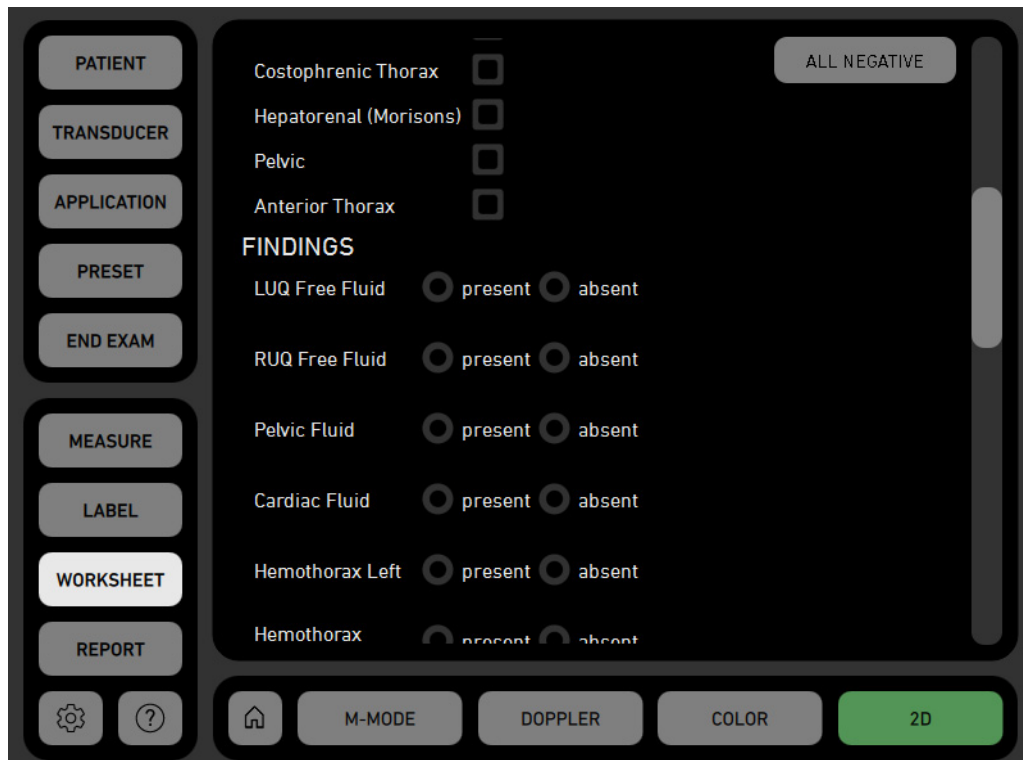
Figure 6-4. Worksheet showing Findings.
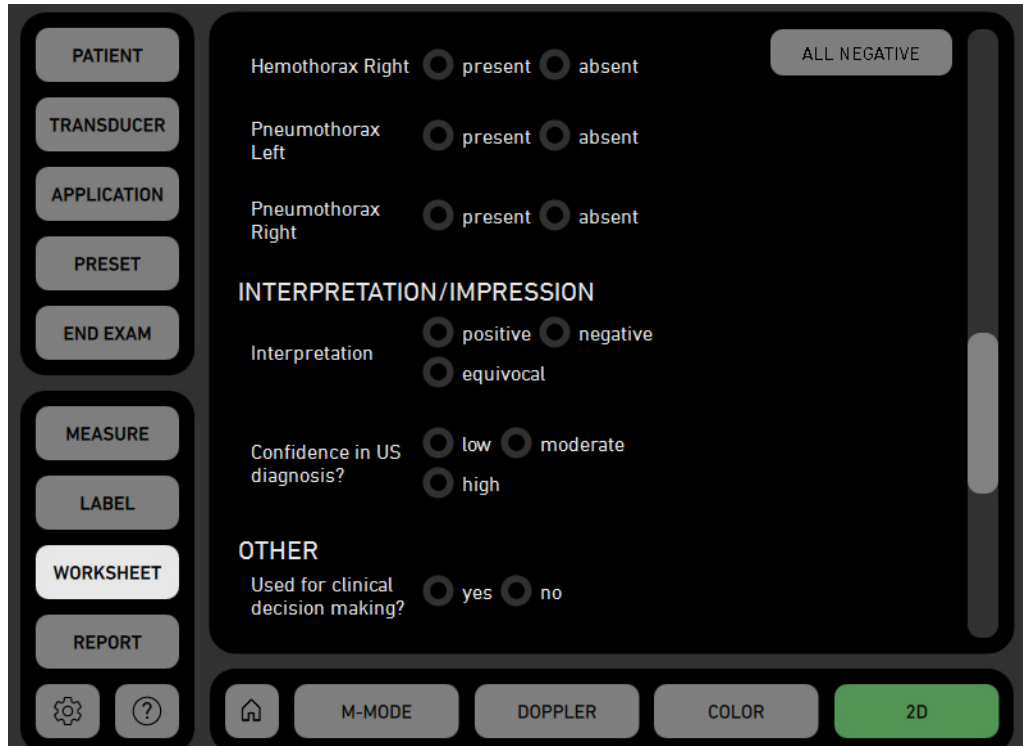
Figure 6-5. Worksheet showing Interpretation/Impression.
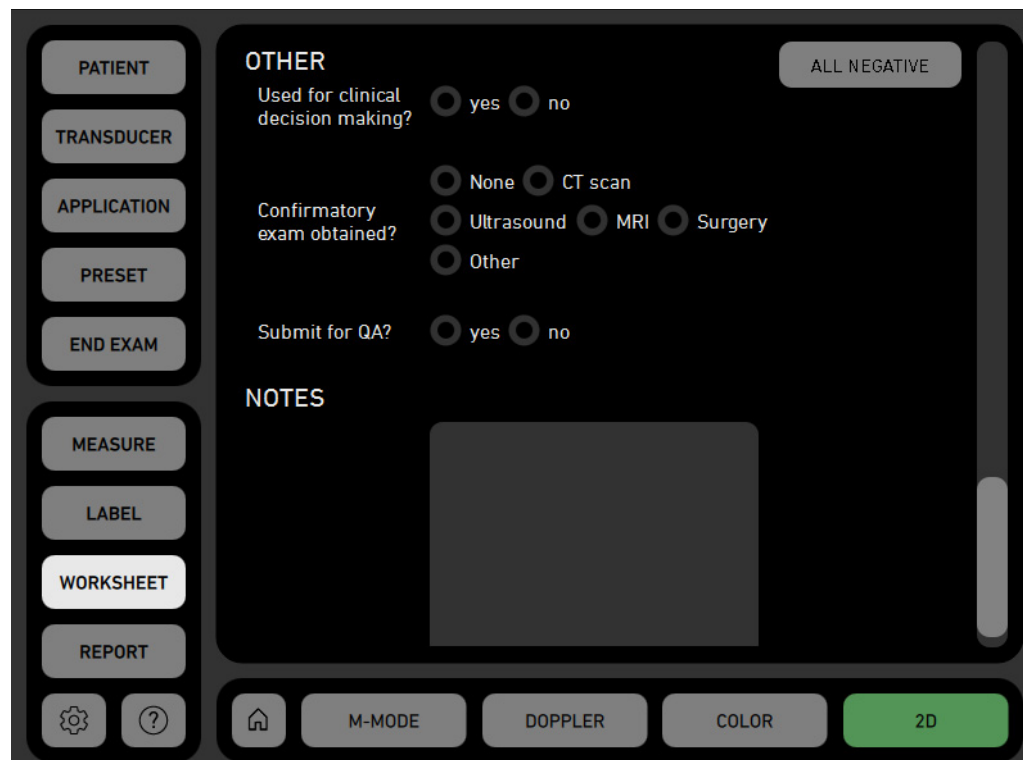
Figure 6-6. Worksheet showing Other and Notes.

Tapping the **All Negative** button will make all options default to no pathology.

Completed data in the worksheet is automatically saved to the current report.

You can import, export and assign worksheets in **Settings**. See "Worksheets Tab" on page 129.

Reports

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

You can save a report to the patient archiving system and view, save or archive it in the same way as you view or save other documents.

Creating a Report

To create a report:

• Tap **Report** on the touch screen.

Figure 6-7. Report with worksheet.

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

If the report has more than one page, tap **Prev Page** and **Next Page** on the touch screen to navigate through the pages.

Patient comments are included in a report. You can also add additional remarks and/or notes.

To add a remark or a note to a report:

- Type in the **Remarks** or the **Notes** area using the touch screen keyboard.

NOTE: *To save the notes added in the remark section of the report, store an image or click* ***Save*** *on the touch screen to capture all information entered in the report.*

Adding Images to a Report

You can select the images you want to add to your report using the **Select** button on the thumbnail images.

To add images to a report:

1 Start the exam and save images, clips, etc.
2 **Select** some of the thumbnail images.
3 Tap **Report** on the touch screen.

   The selected 2D images (but not clips or reports) are added to the report.

   Comments put in the **Patient** window appear in the report.

   You can type in up to 4 lines of remarks on the first page of the report.

Editing a Report

You can edit a report before you save it.

To delete a measurement from a report:

1 Point at the measurement result in the **Measurements** column.

   If the measurement is one that can be deleted, the measurement value is highlighted in red and crossed out.

2 **Select**.

   The measurement is removed from the report.

NOTE: *If you checkmark the* ***Clear Measurements From Report on Deletion*** *in the* ***Measurement*** *settings, selecting* ***Delete Last*** *or* ***Delete All*** *when making measurements will remove the measurement results from the report as well as from the clinical display. See "Measurement Settings Tab" on page 124.*

Printing a Report

To print a report:

- Tap **Print** on the touch screen.

   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. Reports cannot be exported in PDF format.*

Saving a Report to the Local Patient Archiving System

To save the report to the local patient archiving system:

- Tap **Save** in the **Report** window on the touch screen.

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 Sheet. See also the Safety chapter in the *bk3500 User Guide*.

⚠	**Caution** Print-c1
	The quality of a printed ultrasound image may vary, depending on the printer.

Printing Thumbnail Images

To print thumbnail images (including archived ones) without opening them:

1. Select the thumbnails you want to print.
2. Tap **Print** on the touch screen.
3. Select the printer you want on the drop-down menu that appears.
   The images are printed.

Printing Images Displayed on the Monitor

To print an image displayed on the monitor:

- Tap **Print** on the touch screen.

Chapter 7
Imaging Modes

Imaging Modes

The bk3500 has various imaging modes:

- 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 the tissues.

- 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 B-mode image across the monitor. The M-mode image illustrates a time series of images along this line.

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 on the right side of the monitor, under the image area.

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 *bk3500 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 (TIB – bone, TIC – cranial, TIS – soft tissue).

- TI limit (not exceeding the factory-set limits).

To select tissue type:

1 Tap **Settings** on the touch screen, and make sure that **Advanced** layout is selected.

2 Select **Thermal Index Type** by tapping **TIB**, **TIC**, or **TIS**.

3 Close the **Settings** window.

See "Thermal Index Type" in "Setup and Customize" on page 121.

To adjust the TI limit in B-Mode:

- Tap **MI** and turn the related dial to adjust TIB, TIC or TIS.

To adjust the TI limit in Doppler:

- Tap **TI** and turn the related dial to adjust TIB, TIC or TIS.

The current TI is displayed as **TIx:z.z<y.y**, where x is S, C, or B; y.y is the limit you select; and z.z is the actual TI.

B-Mode

Focus

The ultrasound image is focused sharply within a selected zone, while the rest of the image is not as well focused.

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.
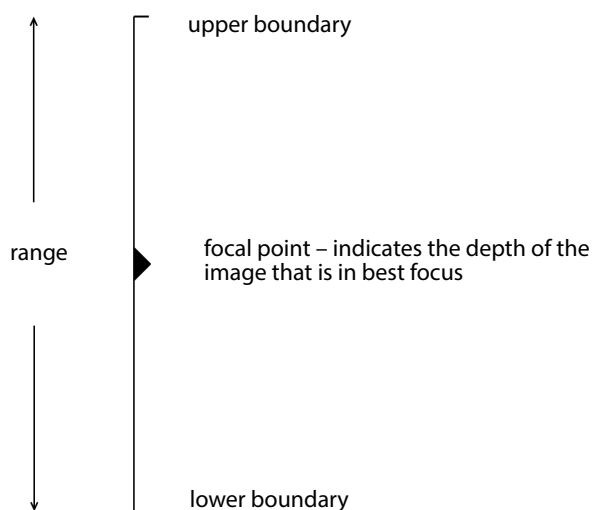
Figure 7-1. The Focus indicator.

The focal point triangle indicates the depth of the image that is in best focus – the focal point.

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

To adjust focus position:

1 Tap the **Focus** button on the touch screen.
2 Use the related dial to increase or decrease the focus depth.

Or you can:

1 Select the **Focus** indicator by pointing at it with the trackball and pressing **Select**. The focus bar displays as a dotted line.
2 Move the pointer to the desired position on the focus bar.
3 Press **Select**.

Tru-Focus

Selected transducers are equipped with Tru-Focus. 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 tapping the **Gain** button and turning the related dial.

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.
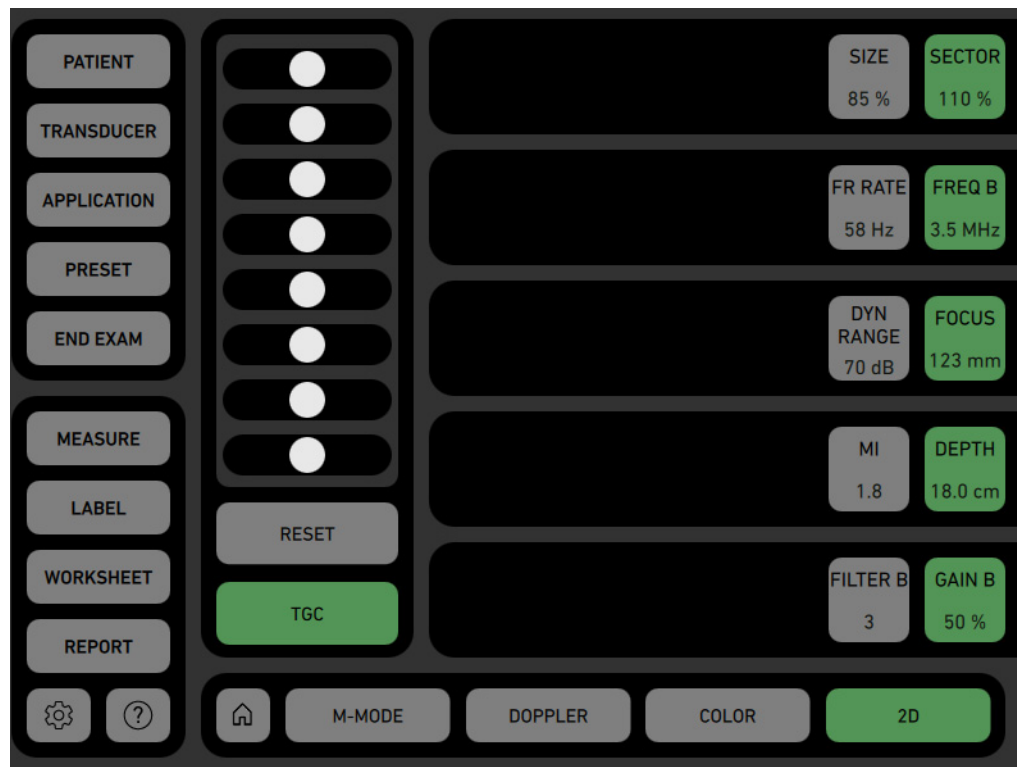
Figure 7-2. TGC sliders on the touch keyboard.

To open:

Tap **TGC** on the touch screen.

To close:

Tap **TGC** on the touch screen.

To reset the curve to default:

Tap **Reset**.

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. The adjusted TGC curve will be displayed on the touch screen when the TGC window is open.

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: *The top slider adjusts the part of the image that is closest to the transducer.*

The TGC adjustments are available in 2D, 2D/Color Flow and 2D/M-Mode.

NOTE: *Remember to close the TGC curve by tapping **TGC**. When the TGC curve is open on the touch screen, it will hide other mode function buttons that may be required.*

NOTE: *The TGC curve is reset when an exam is ended.*

Auto Gain

Auto gain is available as default on presets and transducers. 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/deactivate Auto gain:

- Tap **Autogain** on the touch keyboard.

Sector

You can adjust the width of the ultrasound image using the **Sector** button on the touch screen: Tap **Sector** and turn the related dial.

Size

You can adjust the image size using the **Size** button on the touch screen: Tap **Size** and turn the related dial.

Zoom

To activate Zoom:

Tap the mode function button **Zoom**. An ROI (Region of Interest) box appears on the image.

To move the ROI box:
1   Use the trackball to point inside the box and press the **Select** button on the control panel.
2   Drag the box to a new position using the trackball.

To zoom the ROI box:
1   Use the trackball to point inside the box and press the **Select** button on the control panel.
2   Point to a corner of the box, **Select** it and drag the corner using the trackball.

Depth

With a full B-mode image, you adjust the depth to cut out parts below the part you are interested in. The image always includes the transducer surface, so with this button, you can change the magnification of the image, stretch, or compress 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:
•   Tap **Depth** on the touch screen and use the related dial to increase or decrease the depth.

Gray Scales

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

To select the gray scale in B-mode:
1   Use the trackball to navigate to the upper right of the image area.
    A gray scale bar appears.
2   Use the **Select** button on the gray scale bar and select the preferred gray scale.

To select the gray scale in M-mode:
•   **Select** the gray scale bar to the right of the M-mode image and select the preferred gray scale.

Tissue Harmonic Imaging (True Echo Harmonics – TEH)

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

In normal B-mode 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 bk3500 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.

Advantages

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

Limitations

- Best in mid-range depth – the specific depth range for which harmonic imaging works best depends on the transducer as well as other factors.
- Reduced penetration.
- Reduced lateral resolution.
- Reduced frame rate.

To turn TEH on or off:

Make sure that you are imaging in B-mode (imaging is not frozen).

Harmonic frequencies available are specific to each transducer. The Harmonics can be adjusted along with the fundamental frequencies using the dial related to the **FREQ B** button on the touch screen.

When you turn the frequency to where harmonic imaging is off, B-mode imaging resumes with fundamental frequency.

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.

X-Shine

X-Shine uses an adjustment of ACI (Angular Compound Imaging) plus improved focusing to help the user see the needle during interventional procedures. A needle icon indicates where you will get the best visibility.

X-Shine is available as an option (license).

> ⚠ **WARNING** GS-w1
>
> To ensure safe and proper use of the equipment, before you attempt to use BK equipment, you should be trained in ultrasonography or be under the supervision of someone who is trained in ultrasonography. You should also be thoroughly familiar with the safe operation of your ultrasound system: read all the user documentation that accompanies it.
>
> In addition, if your system interacts with other equipment directly or indirectly, you need to make sure the interactions are both safe and secure.
>
> No further training is required, but BK Ultrasound offers training in how to use the system. Consult your BK representative for information.

> ⚠ **WARNING** P-w4
>
> The puncture line on the image is an indication of the expected needle path. To avoid harming the patient, the needle tip echo should be monitored at all times so any deviation from the desired path can be corrected.

Figure 7-3. Image showing the X-shine icon (X-Shine function activated) and inserted needle.

Activate X-Shine Imaging

In B-mode, you can access X-Shine by tapping **X-shine +** or **X-Shine -** on the touch screen. **X-Shine +** and - places the needle icon on opposite sides of the image.
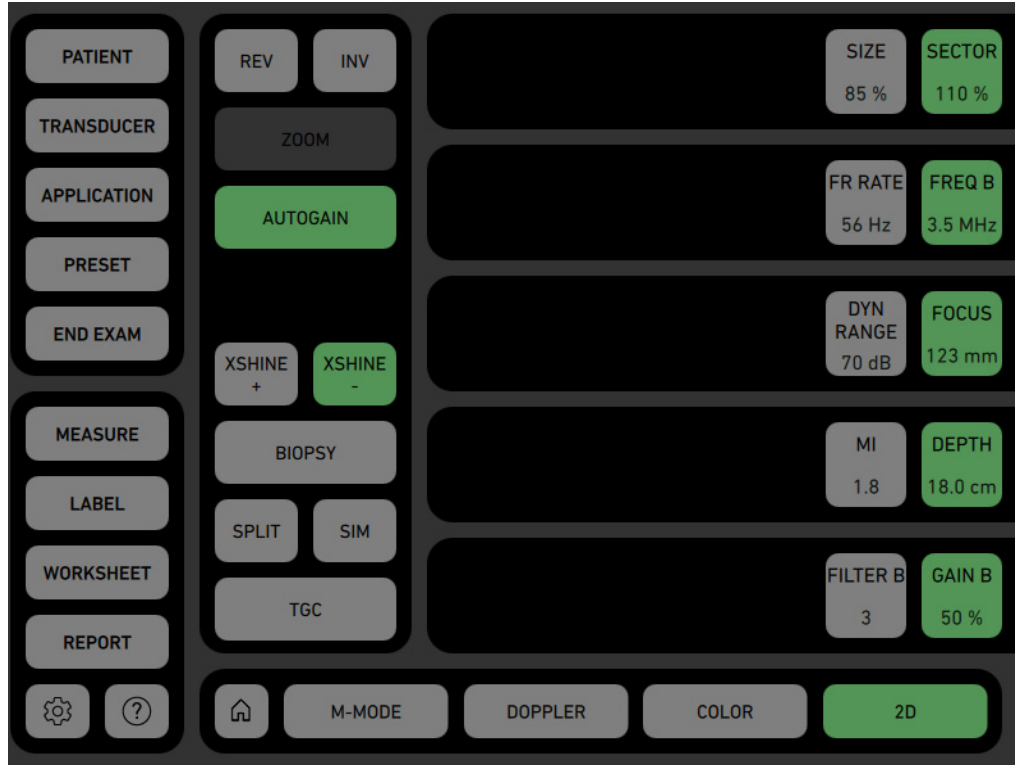
Figure 7-4. Touch screen with X-Shine - button activated.

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

NOTE: *X-Shine is available in B-Mode only.*

See the bk3500 Product Data Sheet for a list of transducers that support X-Shine.

Combination Modes

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:

- B+Color
- B+Doppler
- B + M
- B+Color+Doppler

To return to imaging with B-mode alone after you have been using it in combination with other modes, tap **2D**.

To add another imaging mode:

- Tap the **Color**, **Doppler**, or **M** button. The mode function buttons will change depending on the selected imaging mode.

To remove an imaging mode from the combination:

*   Tap the button for the mode you want to remove.

To return from a combined mode to B-mode only:

*   Tap the **2D** button.

Color Mode and Power Mode

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

Color Submodes

When you tap the **Color** button, 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 76).
*   **Power** (power Doppler)

One submode is available in **Doppler** mode imaging:

*   **CW** (See "Continuous Wave Doppler Mode" on page 89) Available on the 5P1 transducer only.

The selected color submode is remembered throughout the exam, unless you deselect it again.

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 7-1. Default color coding in Color mode.

Color Box

When Color mode or Power mode imaging is turned on, a color box is superimposed on the B-mode 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 B-mode image. The view must be imaging when you do this.

To resize the color box:

1 Press the **Select** button on the control panel.

2 Use the trackball to expand or reduce the color box.

3 Press **Select** to save the resized color box.

To move the color box:

1 Use the trackball to move the box.

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:

• Tap **Map C** on the touch screen to cycle through the available color maps.

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

Vector Flow Imaging (VFI)

Vector Flow Imaging is available as an option on the bk3500 Ultrasound System.

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 the following transducers:

Transducer	Recommended max. depth of using VFI
6C2	60 mm
14L3	30 mm
10L2w	30 mm
8L2	40 mm

VFI can be useful for the 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.

NOTE: *Vector Flow Imaging is only available with certain transducers and certain Applications and presets.*

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

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 alleviates the problem of achieving 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. By pointing at the **Color Map** and pressing **Select**, you can choose between 3 different VFI color options.

214.3 cm/s

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.

0.0 cm/s

3 VFI color options. First 2 options activate the Color Square.
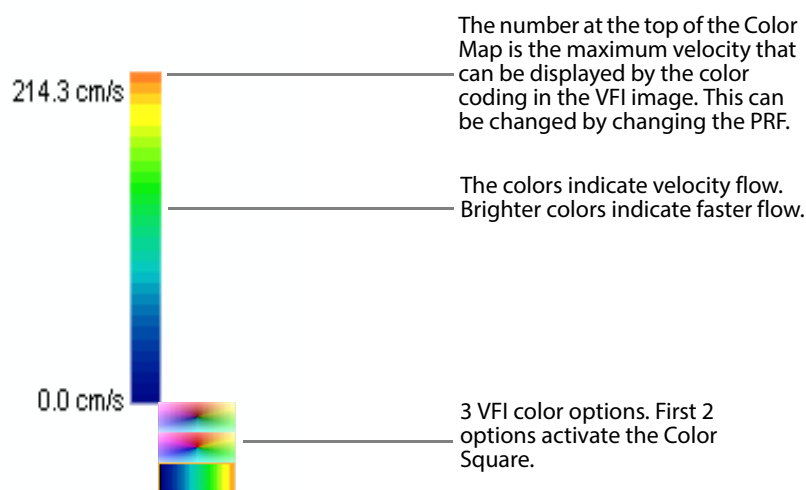
Figure 7-5. Explanation of the Color Map for Vector Flow Imaging.

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 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).
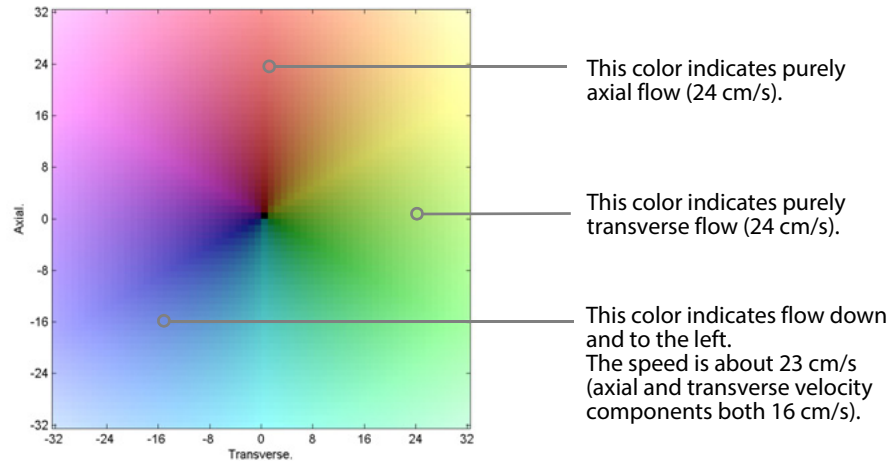
Figure 7-6. Explanation of the Color Square for Vector Flow Imaging. The values are only for illustrative purposes, as the color information is intended to be qualitative rather than quantitative.

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 in **Color** mode by tapping **VFI**. VFI is available as a color submode with the 6C2, 14L3, 10L2w and 8L2 transducers. VFI Assist is available when the **AV Fistula, Carotid VFI** or **VFI Volume Flow** preset is selected.
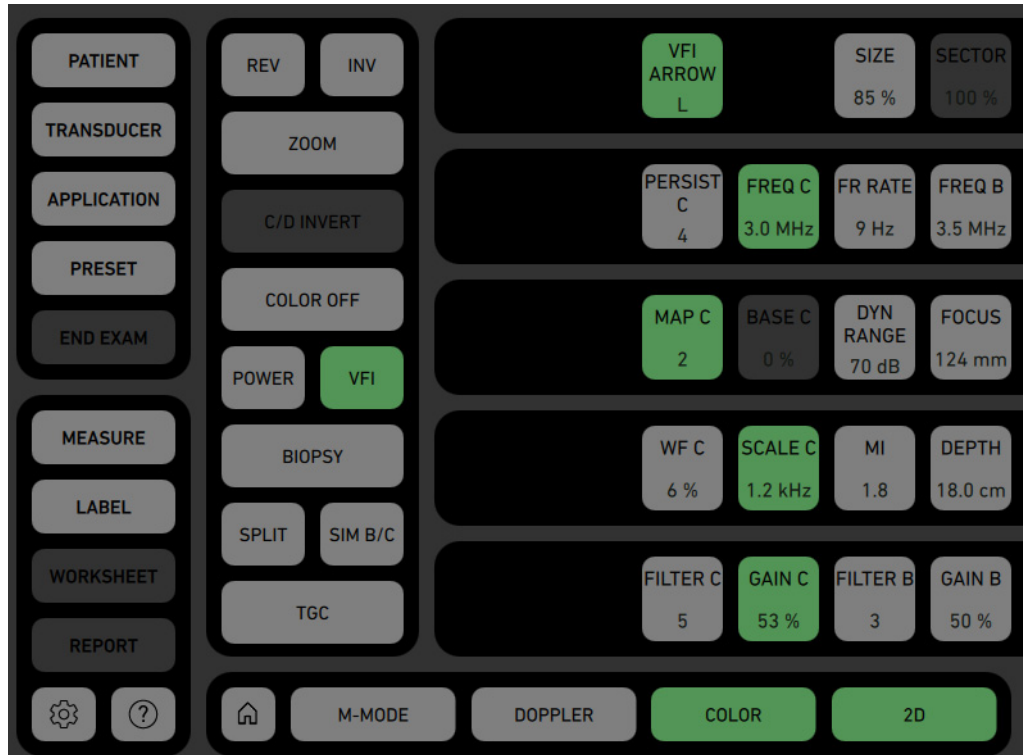
Figure 7-7. VFI button on the touch screen in Color mode.

> ⚠️ **WARNING** VFI-w1
>
> Before you turn on VFI, check the B-mode image to make sure there are no artifacts visible in the blood vessel. If there are strong artifacts in the B-mode image, the arrows in VFI may be pulled to point in a more axial direction (toward or away from the transducer), especially in low flow situations with correspondingly low PRF. These artifacts will not affect the color mode (CFM) image, so it is important to check in B-mode.

Streamlined VFI Workflow

VFI can be utilized to ease workload when determining peak systolic velocity or calculating volume flow rate.

In the **VFI Volume Flow** preset, VFI can assist the user with:

- Doppler gate placement
- Angle correction
- Assisted Doppler steering
- Inverting the Doppler spectrum (when needed)
- Selecting the appropriate Scale/PRF (Pulse Repetition Frequency)
- Assisted Volume Flow Estimation

Assisted Doppler Gate Placement

Assisted Doppler gate placement is a method for selecting the optimal Doppler gate position when measuring the peak systolic velocity in arteries. The method uses VFI data to analyze where to place the Doppler gate at the highest velocity within the color box and the ROI (region of interest). The VFI data is also used to display and update flow direction, velocity, and Doppler in real-time.

⚠️ Arrow aliasing	**WARNING** VFI-w2 Check to make sure the VFI arrows are not aliasing before you activate the assisted Doppler gate placement. Otherwise, the Doppler gate will not be positioned correctly.

Angle Correction

The angle of the flow at the position of the Doppler gate (selected either manually by the user or by the VFI data) is estimated and displayed in real-time. The estimated direction of the flow is indicated visually by the line passing through the Doppler gate (See Fig 7-9).

Assisted Doppler Steering

From the indication of the flow, the appropriate Doppler steering is selected using VFI data. Gate steering is updated dynamically. The steering angle corresponding to the angle of the flow is displayed in real-time, making it easier to monitor when the desired Doppler angle of 60° is achieved.

Inverting the Doppler Spectrum

Automatic inversion of the Doppler spectrum is activated when the gate steering changes from right to left.

Selecting the Appropriate Scale/PRF

If the manually specified Scale/PRF is too low or too high, it can be adjusted using VFI data.

To activate assisted Scale/PRF adjustment:

• In **Doppler**, tap the **Scale C** touch screen button.

When assisted Scale/PRF adjustment is activated, enabling Doppler mode will change the Scale/PRF based on the VFI data.

• Adjust **Scale** using the related dial.

• If the **Scale** adjustment is not satisfactory, you can revert to adjusting Scale/PRF and the Doppler baseline using the **Q** button. This adjusts Scale/PRF (and Doppler baseline) using only the Doppler spectrum. However, this can cause the VFI signal to alias. Therefore, adjusting Scale/PRF using the **Q** button should only be done when the Doppler gate is at the maximum velocity position.

Assisted Volume Flow Rate Estimation

Volume flow rate is an indication of the amount of blood that passes through a vessel over a specific time span, typically [ml/min]. Assisted volume flow rate estimation uses VFI data and Pulsed Wave Doppler (PWD) to calculate the volume flow rate in a vessel. Assisted volume flow rate estimation uses VFI data to outline the vessel and extend the Doppler gate to cover the entire vessel. Visual diameter markers are inserted for the user to inspect. If preferable, you can manually adjust the visual diameter markers.

⚠ Diameter markers	**WARNING** VFI-w3 Check to make sure that the diameter markers correspond to the inner vessel wall and that the connecting line between the markers is perpendicular to the direction of the vessel. Otherwise, the real-time volume flow measurement may not be precise.

⚠ Doppler gate large enough	**WARNING** VFI-w4 Check to make sure that the Doppler gate covers the entire vessel. Otherwise, the real-time volume flow measurement may not be precise.

⚠ Doppler gate only over one vessel	**WARNING** VFI-w5 Check to make sure that the Doppler gate only covers one vessel. Otherwise, the real-time volume flow measurement may not be precise.

⚠ Doppler spectrum aliasing	**WARNING** VFI-w6 Check to make sure that the Doppler spectrum does not alias. Otherwise, the real-time volume flow measurement may not be precise.
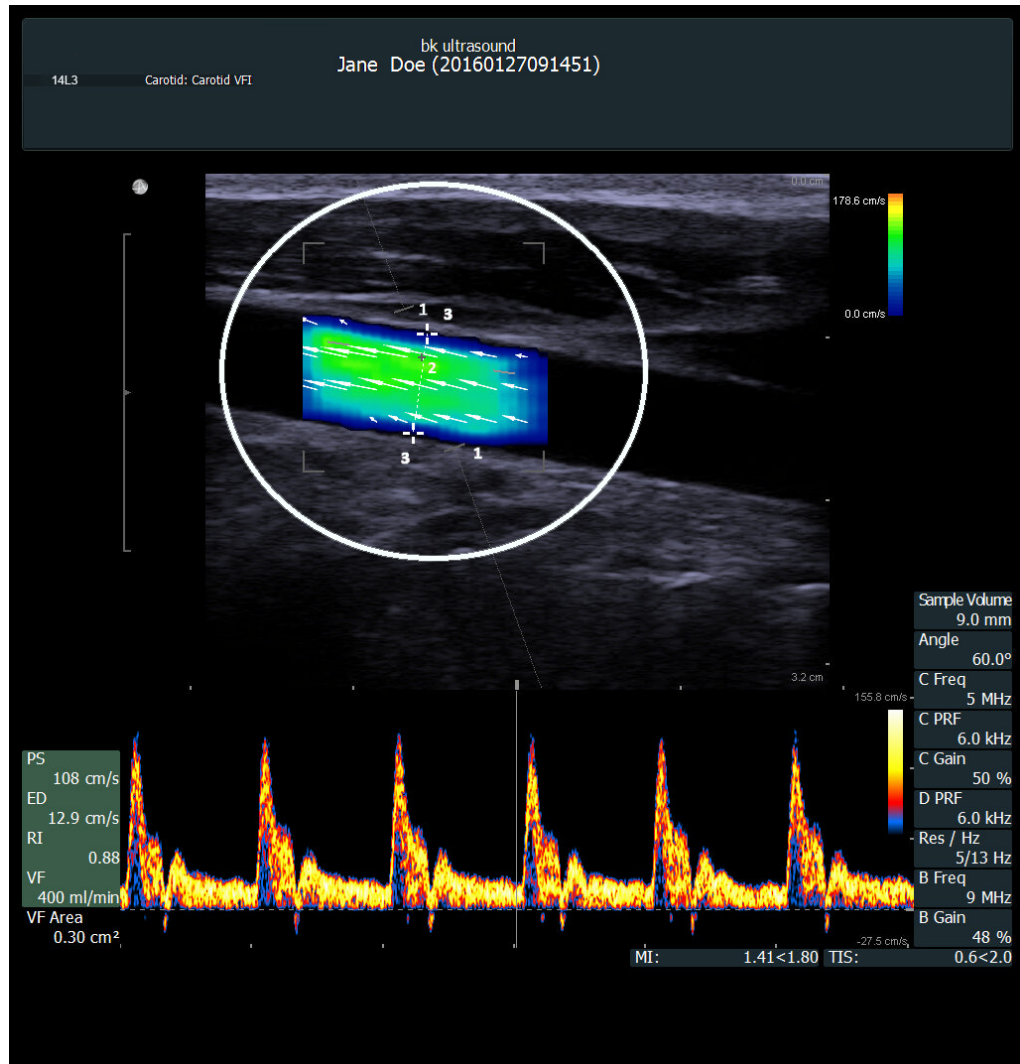
Figure 7-8. Outline of VFI workflow with 14L3 transducer.

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, B-mode must be imaging.

To turn on Doppler mode:

- Tap the **Doppler** button.

  The Doppler indicator, including both the Doppler line and the Doppler gate, appears superimposed on the B-mode image and the Doppler spectrum appears.

To position the Doppler gate on a larger B-mode image, select the Doppler gate using the trackball and the **Select** button.
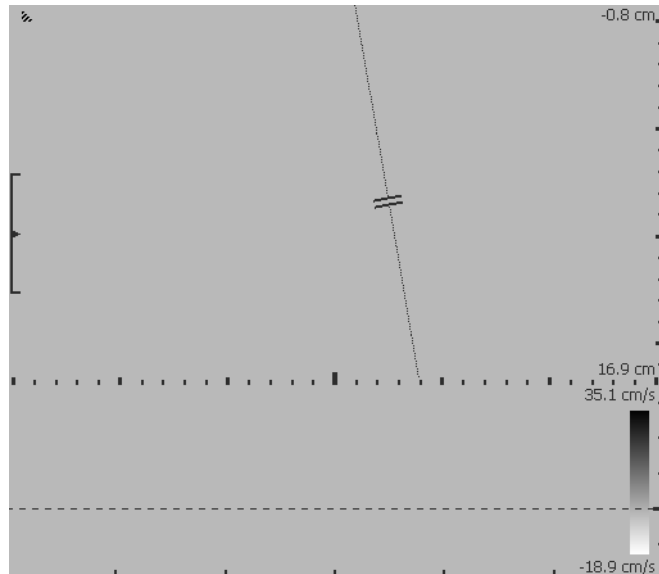
Figure 7-9. The Doppler indicator (line and gate) superimposed on a B-mode image.

Fig 7-10 shows information available in Doppler indicators.
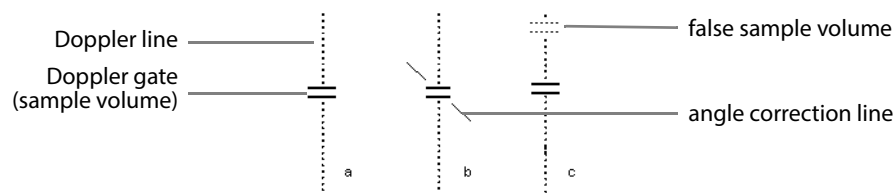
Figure 7-10. Doppler indicators (three examples).

Fig 7-10 (a)   The dotted line represents the Doppler line. The lines at right angles to that show the Doppler gate.

Fig 7-10 (b)   A diagonal line (relative to the Doppler line) indicates a sample volume with angle correction.

Fig 7-10 (c)   The horizontal dotted lines show the false sample volume in HPRF (see page 84).

To turn off Doppler mode:

• Tap the **Doppler** button or the **2D** button.

Adjusting the Doppler Mode Image

Doppler Indicator

When Doppler mode imaging is turned on, the Doppler indicator is superimposed on the B-mode image.

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

To move the Doppler gate:

- Use the trackball to move the Doppler gate. The color box follows the Doppler gate.

  The sample volume line moves along with the gate.

To resize the Doppler gate:

- Tap **Gate Size** on the touch screen and turn the related dial to resize the gate.

Duplex and Triplex

To use Duplex:

- Tap the **Duplex** mode function button on the touch screen for simultaneous live 2D and doppler imaging.

- Press the **Update** button to cycle between the modes: live 2D/live Doppler/Duplex.

To use Triplex:

- Tap the **Triplex** mode function button on the touch screen for simultaneous live 2D/Color flow/Doppler imaging.

- Press the **Update** button to cycle between the modes: live 2D and Color flow/Live Doppler/Triplex.

Independent D-Mode/C-Mode Steering

Independent steering of **Doppler** and **Color** is possible using the **Steer** touch screen buttons. To enable independent steering, tap **Steer D** or **Steer C** when **Doppler** and **Color** are activated.

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

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 **Q** button.

NOTE: *The control panel (except for **Freeze** ❋) is disabled while the scale and baseline are being adjusted. This may take a few seconds.*

Doppler Trace (Automatic Curve Tracing)

The system can automatically calculate and display a curve that traces the peak values of the Doppler spectrum. See "Doppler Measurements" on page 98 for a description of the curves.

To turn the Trace display on or off:

- Tap **Trace** on the touch screen.The calculations will be displayed in real time.

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 7-10 on page 83.

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

NOTE: *The real-time values obtained in trace are constantly updated. The real-time results will not appear in the report. To capture the real-time results displayed, store the image by pressing the **1** button.*

You can select which real-time calculations are displayed on the image at application level. Tap **Settings** > **Measurements** > **Result Settings**.

M-Mode

To turn M-mode on or off:

- Tap the **M** button on the touch screen.

M-mode (motion mode) ultrasound is produced by slowly sweeping one line of a B-mode 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 B-mode. Selecting any other mode will turn off M-mode.

You can return to imaging with B-mode alone by tapping the **2D** button.

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

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 B-mode 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 7-11). You can adjust how the two windows are displayed. See how to do that in the **Settings** appendix, "Doppler and M-Mode Monitor Layout" on page 142.

B-mode
image

M-mode
image
appears
here
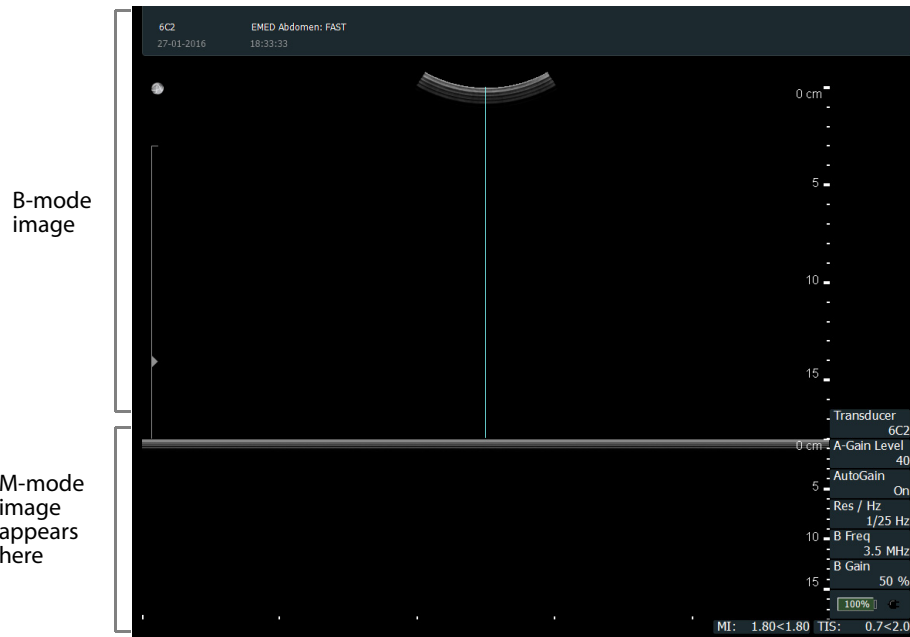
Figure 7-11. M-mode image.

M-Mode Line

The M-mode line (see Fig 7-11) shows the path of the M-mode image in the B-mode window. You can adjust the path of the image by moving the M-mode line using the trackball.

M-Mode Image Ruler

The M-mode image ruler scales the ruler range of the B-mode image to the M-mode image. Any given value will represent the same position on both the M-mode and B-mode images.
It is not possible to change the ruler.
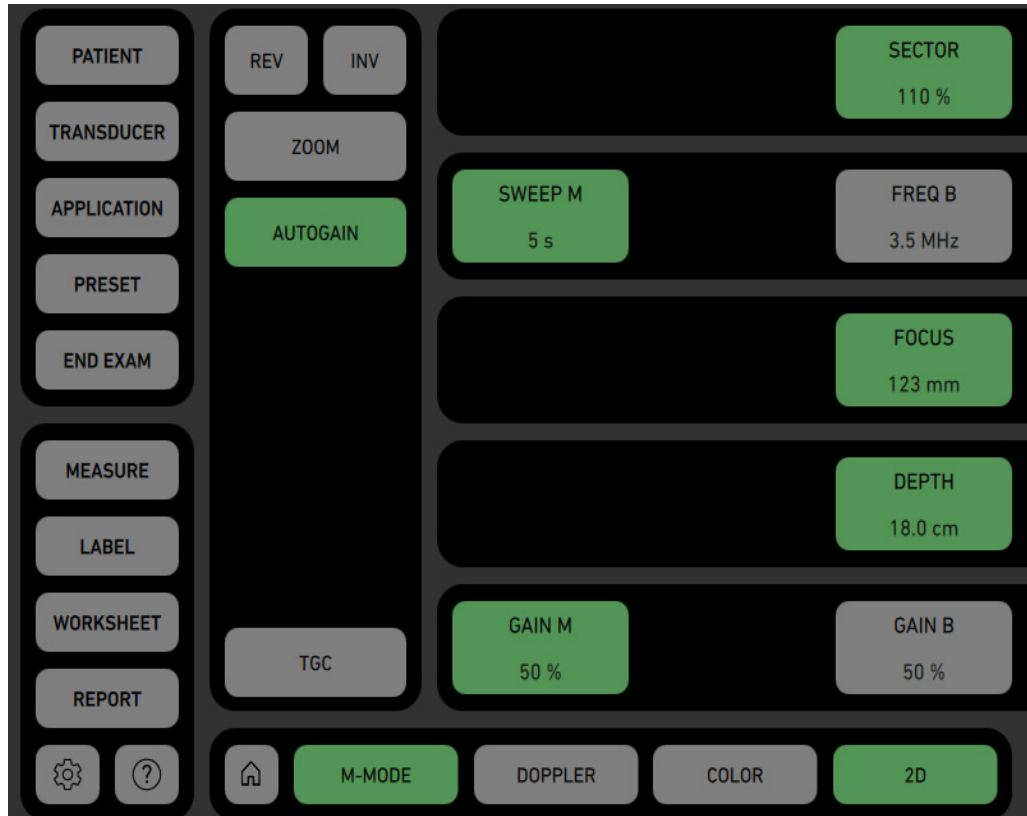
Figure 7-12. The touch screen showing M-Mode in basic layout.

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. CW Doppler is only available with the 5P1 transducer.

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 below the image data fields on the monitor.

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 on the right side of the monitor, under the image area.

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 *bk3500 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 (TIB – bone, TIC – cranial, TIS – soft tissue).
- TI limit (not exceeding the factory-set limits).

To select tissue type:

1 Tap **Settings** on the touch screen, and make sure that **Advanced** layout is selected.
2 Select **Thermal Index Type** by tapping **TIB**, **TIC**, or **TIS**.
3 Close the **Settings** window.

See "Thermal Index Type" in "Setup and Customize" on page 121.

To adjust the TI limit in B-Mode:

- Tap **MI** and turn the related dial to adjust TIB, TIC or TIS.

To adjust the TI limit in Doppler:

- Tap **TI** and turn the related dial to adjust TIB, TIC or TIS.

The current TI is displayed as **TIx:z.z<y.y**, where x is S, C, or B; y.y is the limit you select; and z.z is the actual TI.

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 by pressing **Update**.

To turn on CW Doppler mode:

Make sure that you are imaging in B-mode (with or without color) and doppler is active.

- Tap the **CW** mode function button.
- Position the CW doppler line.
- Press **Update** to see the CW spectrum.

To unfreeze the CW Doppler spectrum:

- Press the **Update** button.

NOTE: *The B-mode image (with or without color flow) is frozen while the live CW Doppler spectrum is displayed.*

To switch between live B-mode (with or without color flow) and live CW Doppler mode:

- Press the **Update** button.
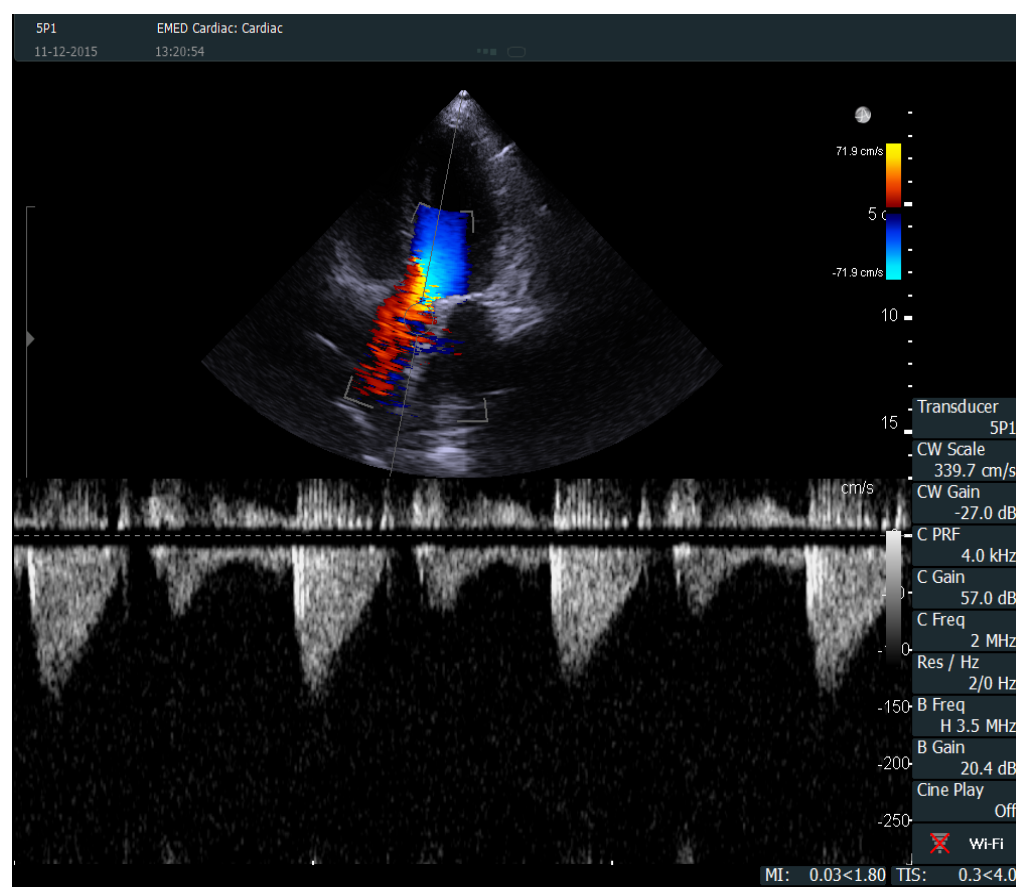
Figure 8-1. The CW Doppler line superimposed on a B-mode image.

To turn off CW Doppler mode:

- Tap **CW** or tap **Doppler**. To exit the combined modes completely, tap **2D**.

Note that if you select CW as Doppler mode, CW is remembered as default throughout the exam until you turn it off again.

CW Doppler Line

CW Doppler information is acquired along the full length of the CW Doppler line. When CW Doppler is turned on, the CW Doppler line is superimposed on the B-mode image.

region of best focus
(focus region indicator)
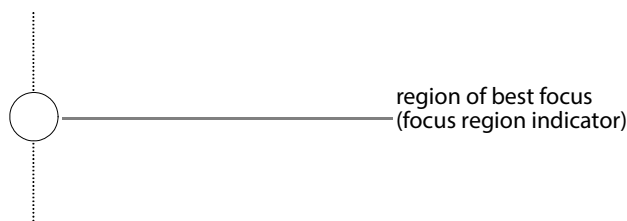
Figure 8-2. CW Doppler line.

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 B-mode image.

You can adjust the position of the line to get information from samples in various parts of the B-mode 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   Select the CW Doppler line by placing the cursor on it and pressing **Select**.
2   Drag 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.

CW Controls on the Touch Keyboard
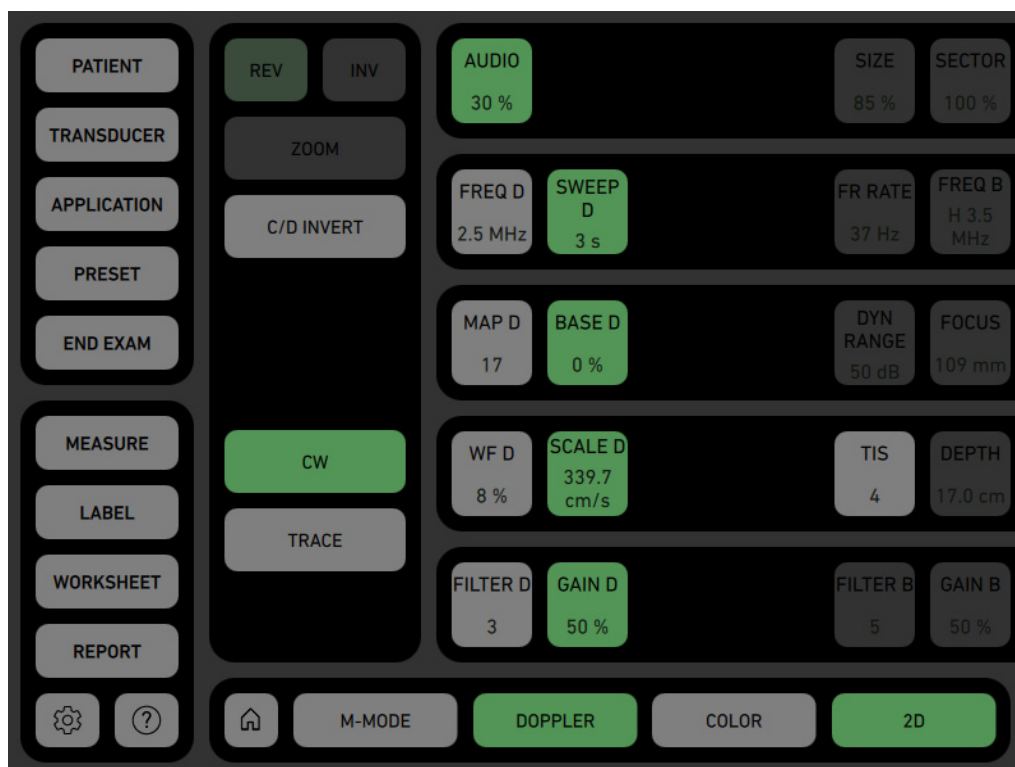
Figure 8-3. The CW controls on the touch keyboard.

NOTE: *The CW parameter values are displayed as CW on the clinical monitor. The CW adjustments on the touch screen are labeled with **D**.*

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:

*   Tap the **Audio** button on the touch screen and use the related dial.

Adjusting the Doppler Mode Image

Doppler Trace (Automatic Curve Tracing)

You can have the system automatically calculate and display a curve that traces the peak values of the Doppler spectrum.

To change which curve is displayed:

1   Tap **Trace** on the touch screen to turn it on or off.

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 **Q** button.

NOTE: *The control panel (except for* **Freeze** ✽*) is disabled while the scale and baseline are being adjusted. This may take a few seconds.*

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:

*   Tap **Gain D** on the touch screen and use the related dial to adjust the gain. The current Doppler gain setting (a percentage) is displayed on the button.

Scale

The view must be imaging when you vary the scale of the displayed spectrum.

To auto adjust the velocity scale:

*   Press **Q**.

    The vertical scale is updated to match the spectrum.

To manually adjust the velocity scale:

*   Tap **Scale D** on the touch screen and use the related dial to adjust the velocity scale. The current setting is displayed on the button.

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

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

Wall Filter

The view must be imaging when you set the cutoff frequency for the wall filter.

To set the cutoff frequency for the wall filter:

*   Tap **WF D** on the touch screen and use the related dial to adjust the value. The current setting is displayed on the button.

Invert

To invert the spectrum or to return to the default:

- Press **Update** to stop imaging view.
- Tap **Doppler Invert** to toggle between the default and inverted spectrum coding.

    The frequency axis is inverted to match the spectrum.

Baseline

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

To auto adjust the baseline:

- Press **Q**.

    The frequency axis is updated to match the spectrum.

To manually adjust the baseline:

- Tap **Base D** on the touch screen and use the related dial to adjust the value. The current setting is displayed on the button.

Sweep Speed

You can adjust the sweep speed to change the number of cycles of the spectrum displayed on the full time axis. The view must be imaging when you do this.

To select the sweep speed:

- Tap **Sweep D** on the touch screen and use the related dial to adjust the submode.

    The time axis is updated.

Chapter 9
Applications

Before You Begin

Before reading about the Applications, 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 Therapy section of the Safety chapter in the bk3500 User Guide.

⚠	**WARNING P-w1** Before you start imaging, verify that the type number or name of the transducer and the type number or description of the puncture attachment you are using match the number displayed on the monitor. Also make sure that the needle guide is positioned correctly. If the numbers do not match, or if the needle guide position is not correct, the puncture line on the monitor may not correspond to the true puncture path in the tissue. In case of any inconsistency, stop imaging, turn off the system, and contact your local BK representative.

NOTE: *Make sure the needle guide number on the monitor corresponds to the guide you are using. If it doesn't, use the trackball and **Select** button on the number on the monitor to choose the proper needle guide.*

What Is an Application?

An Application is a pre-defined configuration for the layout and user interface of the monitor.

Your choice of Application determines:

- Patient information fields needed for the examination.
- Specialized presets.
- Layout of touch screen buttons (including which buttons are available).
- Labels and bodymarks.
- Reports and worksheets.
- Measuring tools and 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 Application and a preset.

The following Applications are available on the system:

EMED

- Abdomen
- Anes
- Cardiac
- Early OB
- Gyn
- MSK
- OB
- Pediatric
- Small Parts
- Soft Tissue
- Vascular
- Thoracic

UGRA

- Anes
- Vascular
- Cardiac
- MSK
- Thoracic

The information in the first part of this chapter applies to all Applications. Any additional information that applies to certain applications is described in the following sections:

- "Using the OB and Gyn Applications" starting on page 103.
- "Using the Cardiac Application" starting on page 105.

Measurements

Each Application contains a set of measurements and calculations that are appropriate for a specific type of examination. Measurements vary according to the specific Application, but the general instructions for making a measurement are the same.
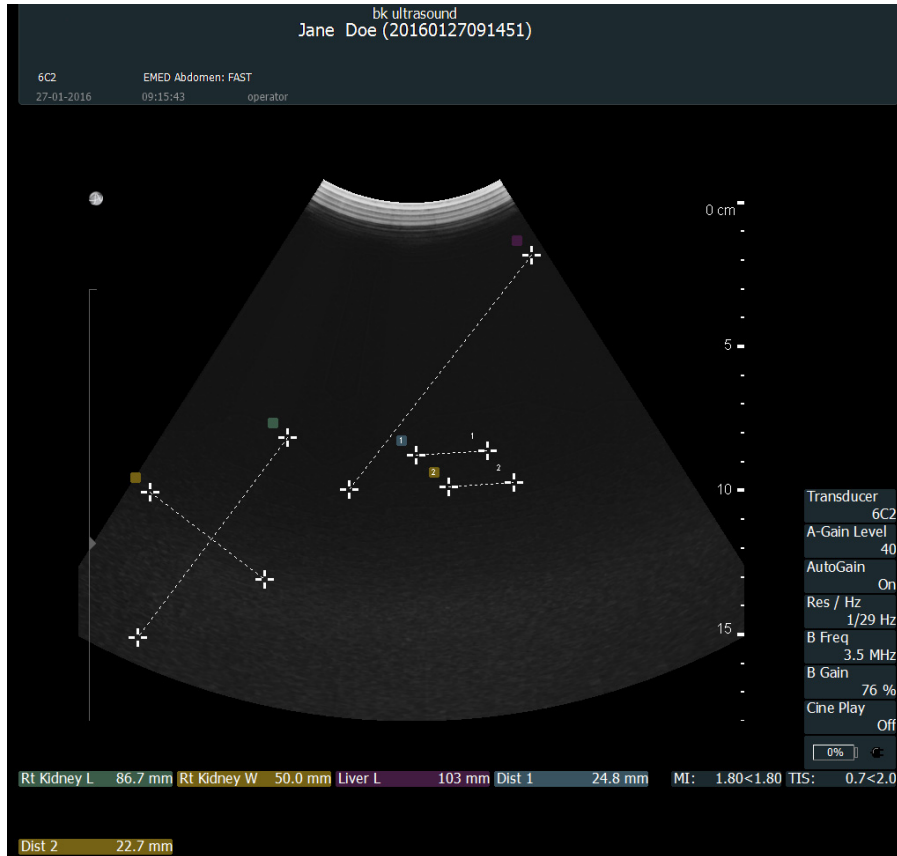
Figure 9-1. Making measurements, monitor.

Figure 9-2. Making measurements, touch screen.

To make a measurement:

1 Freeze the image.

2 Tap **Measure** on the touch screen and the relevant measurement package for the active exam will appear.

3 Select which measurement you want to make. The selected active measurement is highlighted on the touch screen and the appropriate measuring caliper or tool appears on the image.

4 Position the caliper where you want it (or draw with the drawing tool).

If another caliper is needed, it appears after you position the previous one.

5 Continue to position all needed calipers.

After you have positioned all the calipers, the result appears at the bottom left side of the monitor, see Fig 9-1 above.

See also "Measurements and Calculations" on page 41 and "Measurement Settings Tab" on page 124.

Doppler Measurements

Many Applications 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 84) or manually and then make measurements on the curve.

This is the curve typically used:

This curve	is a trace of...
Peak (Max)	maximum points of the spectrum (those farthest from the baseline).

Table 9-1. The Doppler curve.

⚠️ **WARNING M-w2**

Drawings of Doppler curves, manual and automatic, are meant as tools for positioning cursors so that measurements based on the curves can be calculated automatically. The system has no facilities for checking whether the automatic measurements are reasonable. Curves drawn on very noisy spectra may lead to misplacement of measurement cursors. Make sure that measurement cursors are positioned so that the results are reasonable. If they are not, you must adjust the position of the cursors manually.

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		
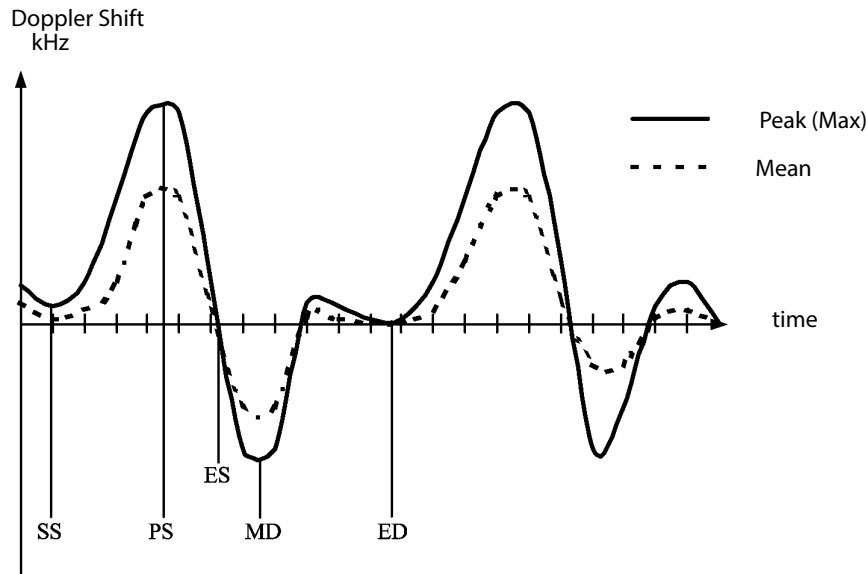
Figure 9-3. Doppler spectrum including vascular calculation markers.

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.

Stenosis

The stenosis 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 stenosis measurements for the **Carotid** or **Vascular Access** presets, tap **Measure**. In the Vascular measurement package, select the **Vascular** tab to access **%ST Dist**, **%ST Freehand** and **%ST Ellipse**.

Stenosis Based on Ellipses or Freehand Drawings

You define the default measurement type for this measurement in **Settings** on the touch screen, see Appendix A, "Setting Up and Customizing Your System".

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

- Total lumen of the vessel.
- Residual lumen of the vessel.

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

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 B-mode 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).

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

TAM (Time Average Mean) and TAMX (Time Average Max)

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

You can measure TAM and TAMX in different ways:

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

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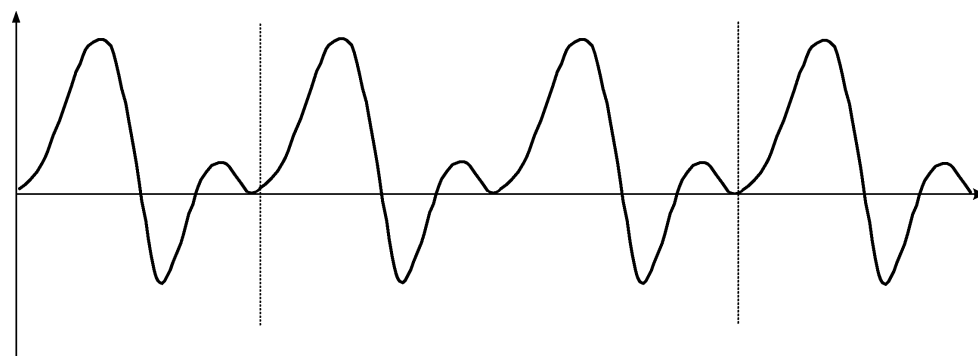
Figure 9-4. Measuring TAM on the Doppler spectrum.

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

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 calipers for measuring RI and PI is indicated in Fig 9-3. "Mean" in the Pulsatility index formula is the averaged max flow velocity.

RI (Resistance Index)

To calculate RI and the A/B, place one caliper to measure Peak Systolic Frequency (PS) and one to measure End Diastolic Frequency (ED).

To measure RI:
1   In the **Generic** measurement package, tap **RI**.
2   Position the first caliper to measure PS.
    The PS measurement is displayed.
3   Position the second caliper to measure ED.
    The ED measurement is displayed.
    The calculated RI value is displayed.

PI (Pulsatility Index)

You can measure PI in different ways:

- Automatic – the Doppler curve is drawn automatically and you position calipers on it.

- Manual – you draw the Doppler curve manually (freehand).

- Real-time – the system calculates and displays PI automatically in real time. See "Real-Time Measurements" on page 102.

  Measurement results displayed in Real-time can be changed at application and preset level in **Settings**. See "Result Settings" on page 127.

To measure PI automatically:

1 Tap **Measure** and select the **Generic** measurement package.

2 Tap **Auto**

3 Position one vertical bar at the *start systolic* (SS) frequency.

4 Position the second vertical bar at the *end diastolic* (ED) frequency.

The PI measurement is displayed at the bottom of the image.

If more than one cycle is included between the time cursors, the calculated PI is an average over the cycles.

To measure PI manually:

1 In the **Generic** measurement tab, tap **PI**.

2 Position the caliper on the *start systolic* (SS) frequency and press **Select**.

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 Press **Select**.

The PI measurement is 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
- VF
- MD
- PI
- RI
- HR
- TAM
- TAMX

To turn real-time measurements on and off:

- Go to **Settings > Measurements > Result Settings**. Here, you can select which measurements you want in real-time. See "Result Settings" on page 127.

When real-time measurements are turned on, automatic curve tracing can also be turned on. See "Doppler Trace (Automatic Curve Tracing)" on page 84. Make sure that the trace appears to be a good fit to the spectrum *so that the basis for the real-time calculation is correct.*

NOTE: *If you freeze the image when real-time measurements are selected, the real-time results are also frozen.*

NOTE: *There is no anatomical label associated with the real time measurements. The real time measurements are updated continuously. Real time measurements displayed on the clinical image will be captured when the image is stored. The result displayed is the last measured value.*

Carotid Velocities

Measurements of the ICA, CCA, ECA and V1 and V2 are carotid velocities that are used to calculate the extent of stenosis in the carotid vessels.

The displayed velocity ratios are constantly updated as you change the measurement of either of the velocities in the ratio.

Doppler measurements that can be used to accurately assess flow-limiting stenosis are:

- Peak systolic velocity – determined at the point of maximum stenosis. The peak velocity is measured at the peak systolic point of the cardiac cycle.
- End diastolic velocity – determined at the point of maximum stenosis. The end diastolic velocity is measured at the end point of the cardiac cycle.

Carotid Measurements

The carotid measurement package has a tab for **Right Carotid**, a tab for **Left Carotid** and a **Generic** tab.

Structured Reporting

You can measure velocities and ratios at three sites: proximal, mid and distal.

Tap **Report** to view the calculated results. A result in the report that becomes highlighted when the trackball pointer is positioned over it can be edited with the **Select** button.

Calculations

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

Using the OB and Gyn Applications

The OB and Gyn Applications are designed for use in obstetrical and gynecological ultrasound applications.

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 instead of the last menstrual period date to estimate the GA and EDC.

Enter the information you want to use under **Exam Info** in the **Patient** window on the touch screen.

Patient Setup

The **OB** tab under **Exam Info** in the **Patient** window for this Application contains the following special fields:

Field	Enter this information
LMP	Date of last menstrual period.
Previous Exam Date	Last time the patient was examined.

Table 9-3. Special fields in Patient window for OB and Gyn Applications.

Making Measurements

For detailed instructions for using the measuring tools, see "Measurements and Calculations" starting on page 41.

If the result of a measurement is outside the allowed range of values, this is indicated on the monitor:

>>>> too high   <<<< too low

If this happens, you may have made a mistake in your measurement or you may be trying to use a measurement that is inappropriate (for example, for the GA).

Nuchal Translucency

Nuchal translucency measurements require special training. See Caution NT-C1 in the Measurements section of the Safety chapter in the *bk3500 User Guide*.

Calculation Methods

General Information

This Application 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 weeks and days, FW in grams (g), and distances are in millimeters (mm).

Obstetrics Reports

Obstetrics reports can contain 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 "Reports" on page 64.

Example of an OB Report

Here is an example of a report.

NOTE: *The reports on the system will not look exactly like the one illustrated here.*

Measurement Report				12:33:57 1/1
<Change hospital name in general window>				20-06-2016

JANE DOE, NO ID
LMP: 22-11-2015

OB Measurements					
	Measurements		Mean	GA	EDC
BPD - **Hadlock**	74.8 mm	72.1 mm	73.4 mm	29w 5d	31-08-2016
HC - **Hadlock**	281 mm	274 mm	278 mm	29w 1d	04-09-2016
AC - **Hadlock**	269 mm	263 mm	266 mm	30w 3d	26-08-2016
FL - **Hadlock**	58.2 mm	57.6 mm	57.9 mm	30w 0d	29-08-2016

	Clinical	Ultrasound	
GA:	30w 1d	29w 6d	
EDC:	28-08-2016	30-08-2016	
Remarks:			

Figure 9-5. First page of an OB report.

Using the Cardiac Application

The Cardiac Application is designed for use in cardiac ultrasound applications.

Measurements and Calculations

Basic Cardiac Measurements

- LV Vol (Left Ventricular Volume)
  - EF (Ejection Fraction)
- PFV (Peak Flow Velocity)
  - PG (Pressure Gradient)
- VTI (Velocity Time Integral)
  - PG (Pressure Gradient)
  - MPG (Mean Pressure Gradient)
- HR (Heart Rate)

LV Vol (Left Ventricular Volume)

B-Mode Methods for Measuring LV Vol

SINGLE PLANE Method:

Cardiac Package: **LV EdV SP** (Left Ventricle End diastolic Volume Single Plane) and **LV EsV SP** (LV End systolic Volume Single Plane)

- 2 measurement tools are available:

    Method of Discs (MOD) : Simpsons Method of Discs (factory default)

    Area-Length (A/L)

You can select the preferred tool in **Settings** > **Measurements** > **Cardiac Settings**.

1   Acquire an apical four-chamber view and trace the Left Ventricular cavity at the ventricular end diastole frame (after the mitral valve closure or the time in the cardiac cycle when the cardiac chamber dimension is the largest). Press **Select**. Position the length caliper to measure the left ventricular end diastolic length from the mid mitral annulus to the cardiac apex.
This will yield the left ventricular end-diastolic volume (LV EdV)

2   In the same apical four-chamber view, using the cine function, obtain an image of the ventricular end systole (defined as the frame preceding the mitral valve opening or the time in the cardiac cycle when the cardiac chamber dimension is the smallest). Trace the Left Ventricular cavity in end systole. Press **Select**. Position the length caliper to measure the left ventricular end systolic length from the mid mitral annulus to the cardiac apex.
This will yield the left ventricular end-systolic volume

3   Once both end diastolic and end-systolic measurements are obtained, press **Select** and the following results are calculated and displayed:

    Left Ventricle End diastolic Volume (LV EdV)

    Left Ventricle End systolic Volume (LV EsV)

    Ejection Fraction (EF)

    Stroke Volume (SV)

BIPLANE Method:

Cardiac Advanced Package: **LV 4C EdV** (Left Ventricle four-chamber End diastolic Volume) and **LV 4C EsV SP** (Left Ventricle four-chamber End systolic Volume) **LV 2C EdV** (Left Ventricle two-chamber End diastolic Volume) and **LV 2C EsV** (Left Ventricle two-chamber End systolic Volume).

- 2 measurement tools are available:

    Method of Discs (MOD) : Simpsons Method of Discs (factory default)

    Area-Length (A/L)

You can select the preferred tool in **Settings** > **Measurements** > **Cardiac Settings**.

1   Acquire an apical four-chamber view and trace the Left Ventricular cavity at the ventricular end diastole frame (after the mitral valve closure or the time in the cardiac cycle when the cardiac chamber dimension is the largest). Press **Select**. Position the length caliper to measure the left ventricular end diastolic length from the mid mitral annulus to the cardiac apex: this will yield the left ventricular four-chamber end-diastolic volume (LV4C EdV). Press **Select**.

2   In the same apical four-chamber view, using the cine function, obtain an image of the ventricular end systole (defined as the frame preceding the mitral valve opening or the time in the cardiac cycle when the cardiac chamber dimension is the smallest). Trace the Left Ventricular cavity in end systole. Press **Select**. Position the length caliper to measure the left ventricular end systolic length from the mid mitral annulus to the cardiac apex. This will yield the left ventricular four-chamber end-systolic volume (LV 4C EdV). Press **Select**.

3   The Apical two-chamber view is then acquired and the same end-diastolic and end-systolic measurements are performed. These measurements will yield the left ventricular two-chamber end-diastolic volume (LV 2C EdV) and left ventricular two-chamber end-systolic volume (LV 2C EsV). Press **Select** and the following results are calculated and displayed:

> End diastolic volume four chamber
>
> End diastolic volume two chamber
>
> End systolic volume four chamber
>
> End systolic volume two chamber
>
> Ejection Fraction (EF)
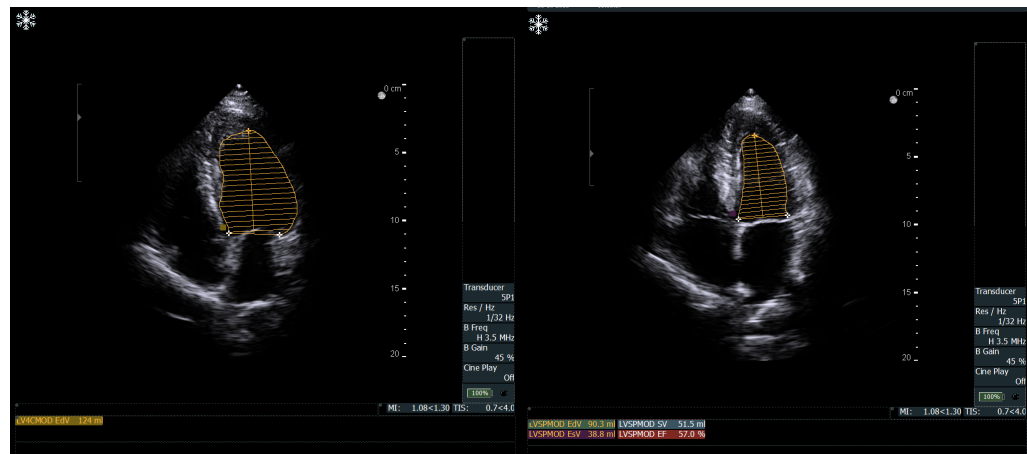>
> Stroke Volume (SV)

Figure 9-6. Biplanar Method of Disc AP4 Diastole (left) and Systole (right) measurements.

Figure 9-7. Biplanar Method of Disc AP2 Diastole (left) and Systole (right) measurements.

LV(4) Method:

1   Tap **Measure**.

2   In the **Cardiac Measurement Package**, select the **LV/LA** tab.

3   Tap **LV(4)**

4   A vertical measurement cursor appears to prompt you to measure the following:

- IVS d (Interventricular Septum in diastole)

- LVD d (Left Ventricular Diameter in diastole)

- LVPW d (Left Ventricular Posterior Wall in diastole)

5   The cursor changes to prompt you to measure the following:

- LVD s (Left Ventricular Diameter in systole)

6   Press **Select** and the following calculation results will appear automatically on the monitor:

>   EdV (End Diastolic Volume)
>
>   EsV (End Systolic Volume)
>
>   LVM (Left Ventricular Mass)
>
>   FS (Fractional Shortening)
>
>   EF (Ejection Fraction)
>
>   SV (Stroke Volume)
>   (Height and weight must be entered in the **Patient** window to calculate SV.)

LV(6) Method:

1   Tap **LV (6).**

2   A vertical measurement cursor appears to prompt you to measure the following:

- IVS d (Interventricular Septum in diastole)

- LVD d (Left Ventricular Diameter in diastole)

- LVPW d (Left Ventricular Posterior Wall in diastole)

3 The cursor changes to prompt you to measure the following:

- IVS s (Interventricular Septum in systole)
- LVD s (Left Ventricular Diameter in systole)
- LVPW s (Left Ventricular Posterior Wall in systole)

4 Press **Select**, and the following calculations appear automatically on the monitor:

> EdV (End Diastolic Volume)
>
> EsV (End Systolic Volume)
>
> LVM (Left Ventricular Mass)
>
> FS (Fractional Shortening)
>
> EF (Ejection Fraction)
>
> SV (Stroke Volume)
> (Height and weight must be entered in the **Patient** window to calculate SV.)

LA Vol (Left Atrium Volume)

B-Mode Methods for Measuring LA Vol

Cardiac and Advanced Cardiac Packages: **LA EdV** (Left Atrium End diastolic Volume) and **LA EsV** (Left Atrium End systolic Volume) using the A/L measurement tool.

1 Acquire an apical four-chamber view. Trace the Left atrial cavity at end-systole. Click **Select**. Position the length caliper to measure the length of the left atrium. The left atrial end-systolic or maximum volume is calculated (LA EsV)

2 In the same apical four-chamber view, using the cine function, obtain an image of end diastole. Trace the Left atrial cavity and click **Select**. Position the length caliper to measure the length of the left atrium The left atrial end-diastolic or minimal volume is calculated (LA EdV)

RA Vol (Right Atrium Volume)

B-Mode Methods for measuring RA Vol

Cardiac and Advanced Cardiac Packages: **RA EdV** (Right Atrium End diastolic Volume) and **RA EsV** (Right Atrium End systolic Volume) using the A/L measurement tool.

1 Acquire an apical four-chamber view. Trace the Right atrial cavity at end-systole. Click **Select**. Position the length caliper to measure the length of the right atrium. The right atrial end-systolic is calculated (RA EsV)

2 In the same apical four-chamber view, using the cine function, obtain an image of end diastole. Trace the Right atrial cavity and click **Select**. Position the length caliper to measure the length of the right atrium The right atrial end-diastolic or minimal volume is calculated (RA EdV)

Doppler Measurements

PFV (Peak Flow Velocity):

1   Freeze Doppler spectrum and tap **Measure**.

2   In the **Cardiac Measurement Package**, select the **Aortic Valve** tab.

3   Tap **PFV AV**.

4   Place cursor at peak velocity.

5   Press **Select** to finish measurement.

System automatically calculates:

•   PFV (Peak Flow Velocity) (cm/sec)

•   PG (Pressure Gradient) (mm Hg)

VTI (Velocity Time Integral):

1   Freeze Doppler spectrum and select **VTI LVOT**.

Measurement line appears.

2   Place line at beginning of Doppler waveform.

Another measurement line appears.

3   Place this line at the end of the Doppler waveform.

A cursor appears.

4   Place cursor at Doppler baseline at first line and use trackball to trace waveform to second line.

5   Press **Select** to finish the measurement.

6   System will automatically calculate:

•   ET (Ejection Time) (ms)

•   VTI (Velocity Time Integral) (cm)

•   PFV (Peak Flow Velocity) (cm/sec)

•   PG (Pressure Gradient) (mm Hg)

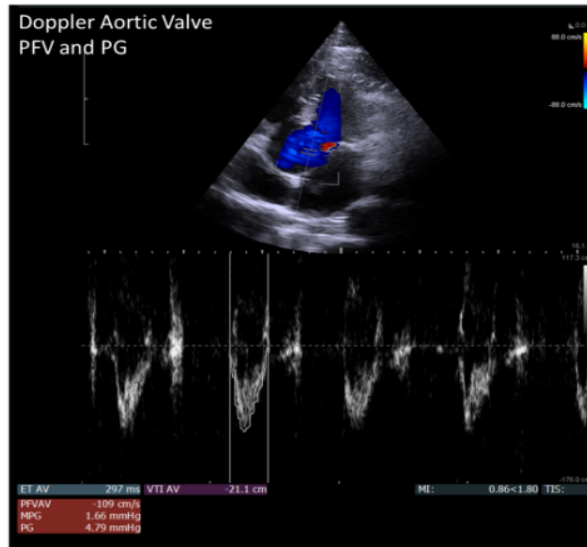•   MPG (Mean Pressure Gradient) (mm Hg)

Figure 9-8. Doppler Aortic Valve PFV and PG measurements.

RVSP:

Cardiac and Advanced Cardiac Packages: **RVSP** (Right Ventricle Systolic Pressure).

1 Acquire a Doppler velocity measurement of the Tricuspid Valve (TV). With a single caliper measure the peak velocity (TR PkV). The RVSP is calculated and dependent on the Right Atrium Pressure selected by the user. The default is 3mm/Hg.

• Right Atrium Pressure options are available to the user in **Settings > Measurements > Cardiac Settings**. The user selectable values are 3mmHg/ 8 mmHg/ 15mm/Hg. The selected value is applied to the velocity measurement.

HR (Heart Rate)

In M-mode:

1 Freeze the image and tap **Measure**.

2 In the **Cardiac Measurement Package**, select the **LV** tab.

3 Tap **HR**.

4 Place first cursor line at the beginning of a cardiac cycle (use the trackball) and press **Select** to set its position.

5 Drag second cursor line to the end of the number of cycles you are measuring. The number of cycles can be changed in **Settings > Measurements : Method: Heart Rate**. See "Measurement Settings Tab" on page 124.

HR is displayed, averaged over the number of cycles you have selected.

In Doppler mode:

1 Freeze the image and tap **Measure**, or select **Trace** on the touch screen to get Real-Time measurements.

2 In the **Cardiac Measurement Package**, select the **General** tab.

3 Tap **Real-Time**.

HR is displayed. It is averaged over 8 beats.

M-Mode Measurements

LV(6) Method:

1 Tap **Measure**.

2 In the **Cardiac Measurement Package**, select the **LV/RV** tab.

3 Tap **LV (6).**

4 A vertical measurement cursor appears to prompt you to measure the following:

- IVS d (Interventricular Septum in diastole)

- LVD d (Left Ventricular Diameter in diastole)

- LVPW d (Left Ventricular Posterior Wall in diastole)

5 The cursor changes to prompt you to measure the following:

- IVS s (Interventricular Septum in systole)

- LVD s (Left Ventricular Diameter in systole)

- LVPW s (Left Ventricular Posterior Wall in systole)

6 Press select, and the following calculations appear automatically on the monitor:

- EdV (End Diastolic Volume)

- EsV (End Systolic Volume)

- LVM (Left Ventricular Mass)

- FS (Fractional Shortening)

- EF (Ejection Fraction)

- SV (Stroke Volume)
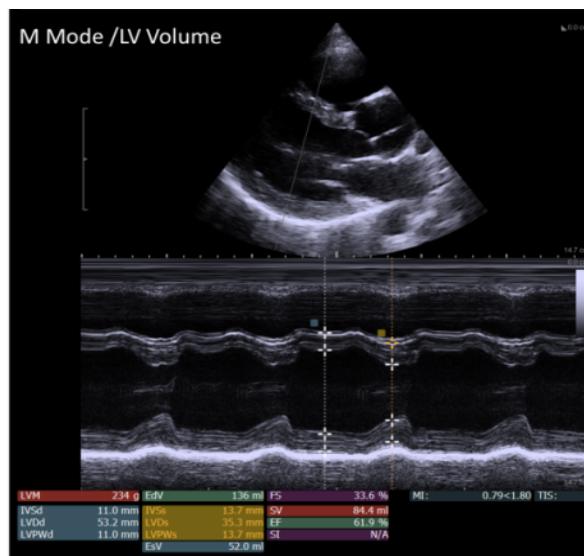 (Height and weight must be entered in the **Patient** window to calculate SV.)

Figure 9-9. M-Mode/LV Volume measurements.

LV(4) Method:

1 Tap **LV(4)**

2   A vertical measurement cursor appears to prompt you to measure the following:

- LVD s (Left Ventricular Diameter in systole)

3   Press **Select** and the following calculation results will appear automatically on the monitor: EdV (End Diastolic Volume)

- EsV (End Systolic Volume)
- LVM (Left Ventricular Mass)
- FS (Fractional Shortening)
- EF (Ejection Fraction)
- SV (Stroke Volume)
(Height and weight must be entered in the **Patient** window to calculate SV.)

FATE (Focus Assessed Transthoracic Echocardiography)

FATE is a form of specialized cardiac imaging for emergency medicine use, developed in Denmark. It covers M-mode measurements 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   In M-mode, tap **Measure**.

2   In the **Cardiac Measurement Package**, select the **FATE** tab.

3   Tap **MSS**.

4   Measure the distance between MV e-point and IVS in systole.
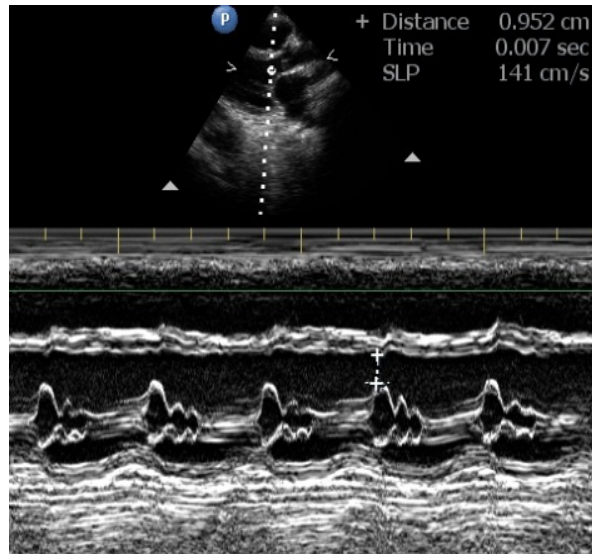
MSS calculation appears.

Figure 9-10. MSS measurement.

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   In the **Cardiac Measurement Package**, select the **FATE** tab.

2   Tap **MAPSE**.

3   Place the cross at the highest systolic excursion.

4   Tap **MAPSE** again.

5   Place the next cross at the lowest diastolic excursion.

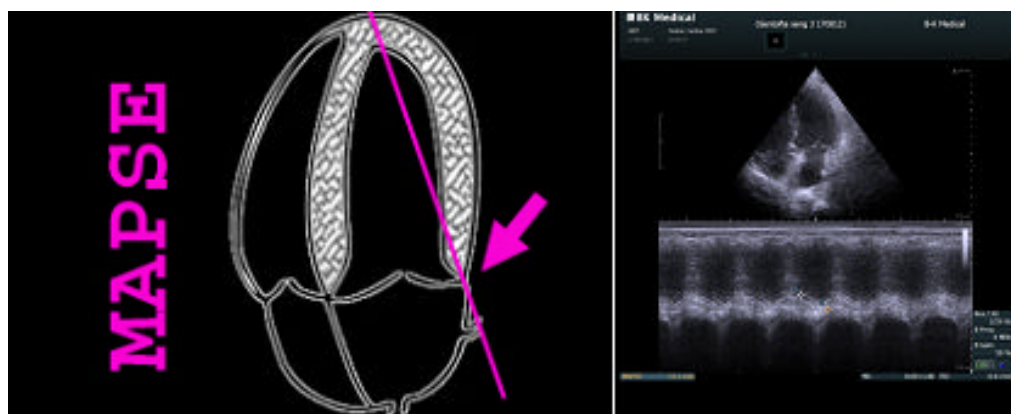The vertical distance is now measured between the two crosses.

Figure 9-11. Measuring MAPSE.

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 In the **Cardiac Measurement Package**, select the **FATE** tab.

2 Tap **TAPSE.**

3 Place the cross at the highest systolic excursion.

4 Tap **TAPSE** again.

5 Place the next cross at the lowest diastolic excursion.

The vertical distance is now measured between the two crosses.

Where to Find More 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 UI").

- 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 C, "Measurement Abbreviations").

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

Chapter 10
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, using the **Search** button on the touch screen. To select a patient from the worklist:

1   Press **Select** on 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.

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_20131022_135426_FV12345.dcm would be the label on an 2D image of patient FV12345 that was captured on October 22, 2013 at 1:54:26 P.M. (13:54:26).

Archiving to a PACS

If you have DICOM installed on your system, you can archive images and clips to a PACS.

To archive all documents for a patient or examination or individual documents:

1   Using the trackball and **Select** button, select the patient, the examination, or the individual documents you want to archive.

2   Select **Archive** on the **Documentation** tab, and select the **PACS** system you want to archive to.

Reports

It is possible to export DICOM Structured Reports.

Queue

When you archive 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 10-1. DICOM status indicators.

If you select the DICOM status indicator, the **DICOM Status** window appears.
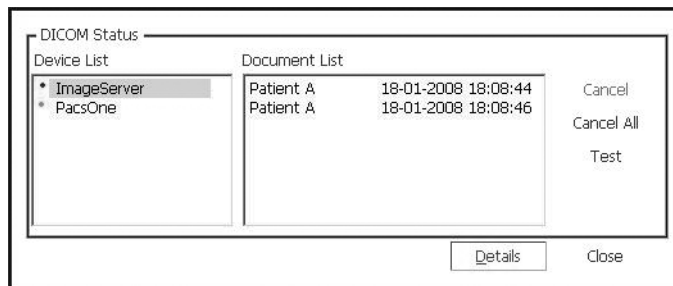
Figure 10-1. The DICOM status window.

The colors of the status indicator next to a device in the **Device List** are the same as described in Table 10-1. If a device has a red or yellow indicator, you can select the device name to see a list of unsent documents displayed in the **Document List**. To check the DICOM storage commitment status for the sent documents, you can search for patients with committed documents in the **Archive** window (see page 55).

You have the following options:

• **Cancel** – cancels the selected document.

• **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, select **Update**.

Deleting a Document

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

Discontinuing an Examination with an MPPS Server

If an MPPS server is configured, you can discontinue the current examination. Click **More** and select **Discontinue Examination** to end the examination; the system will send a DISCONTINUE message back to the MPPS server. You will be prompted to confirm that the examination must be discontinued. Discontinuing the examination clears the current patient data and closes the **Patient** window.

Discontinued examinations can be retrieved from the Patient List for later completion; see Table 6-2, "Ways to select the patients displayed in the Examination List.," on page 59. The *bk3500 Service Manual* contains instructions for service personnel to use when configuring a MPPS server.

If you try to start or resume examinations on patients with discontinued examinations, you will be prompted to choose between these options:

- Continue the existing examination
- Delete existing examination and start a new examination
- Cancel.

Appendix A
Setting Up and Customizing Your System

Setup and Customize

The bk3500 includes default setups that are created to optimize the ultrasound images and make it easy for you to use the different transducers, Applications, and presets. You can customize the system so that it is easy to enter and select exactly the information you need.
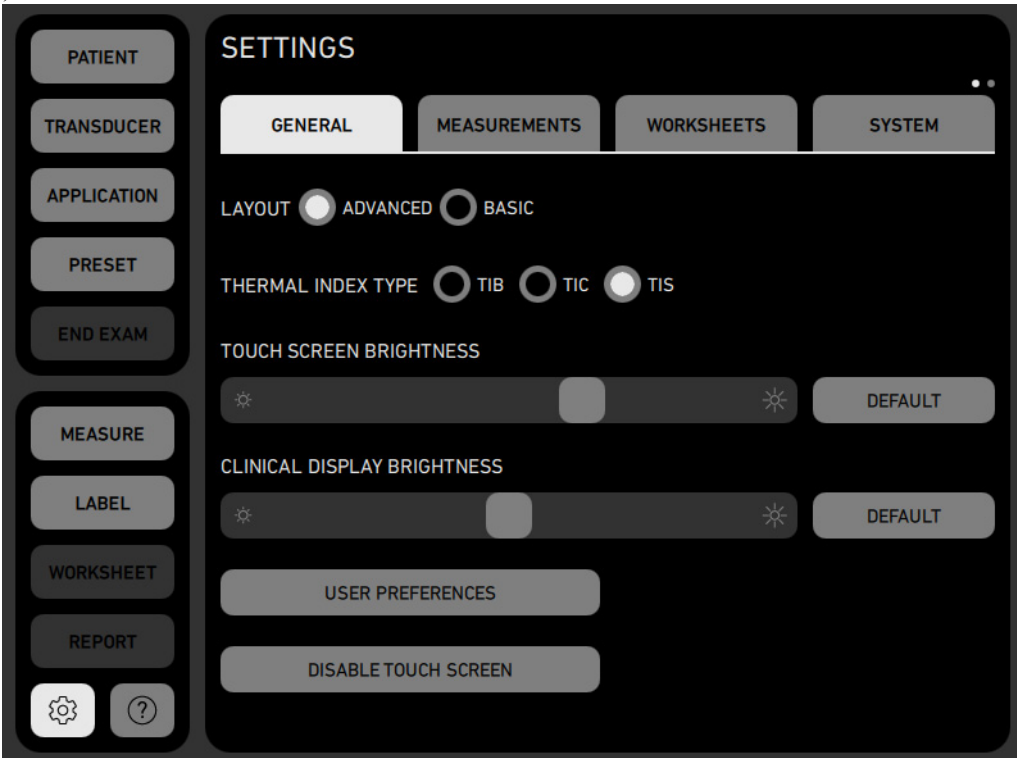

Figure A-1. The Settings screen. Note the two dots above the System tab indicating that there are more tabs when you swipe the tab area.

In the Settings screen, you can select the following tabs:

- **General** for layout, TI, quick access to **User Preferences** and other settings
- **Measurements** to set up the measurements you want to use.
- **Worksheet** to import/export worksheets, worksheet assignments and resetting factory defaults.
- **System** includes:
  - **Remote Support** for remote access from service specialists.
  - **Service Mode**
  - **Wi-Fi** for setup of wi-fi networks.
  - **Operator List** to create a list of operators.
  - **Customize** for customizing the default setups.
  - **Advanced** to have the system further customized by a BK service representative.
  - **About** for license information about the system.
- **Labels** to manage, assign, import/export and reset word libraries. Also to select if labels should still be displayed after unfreeze.

General Tab

Layout

In **Layout**, you can choose between **Basic** and **Advanced**:

Figure A-2. Basic layout.

Figure A-3. Advanced Layout.

Thermal Index Type

Select tissue type between TIB (bone), TIC (cranial) or TIS (soft tissue). See "Adjusting the Thermal Index Limit" on page 67.

Other Settings

- Use the sliders to adjust the brightness on the touch screen and clinical display, or tap the **Default** button to return to default brightness.

- Tap **Disable Touch Screen** if you want to clean the touch screen while the system is working.

User Preferences

Tap **User Preferences** to set additional settings:

- Select between horizontal or vertical **Split Layout**

- Checkmark the box **Enable Sound on Touch Screen** if you want keyboard taps to click.

- Checkmark the box **Show Attending Physician** if you want that function. If **Show Attending Physician** is not selected, the performing physician will be displayed in the **Patient** window instead of the attending physician.
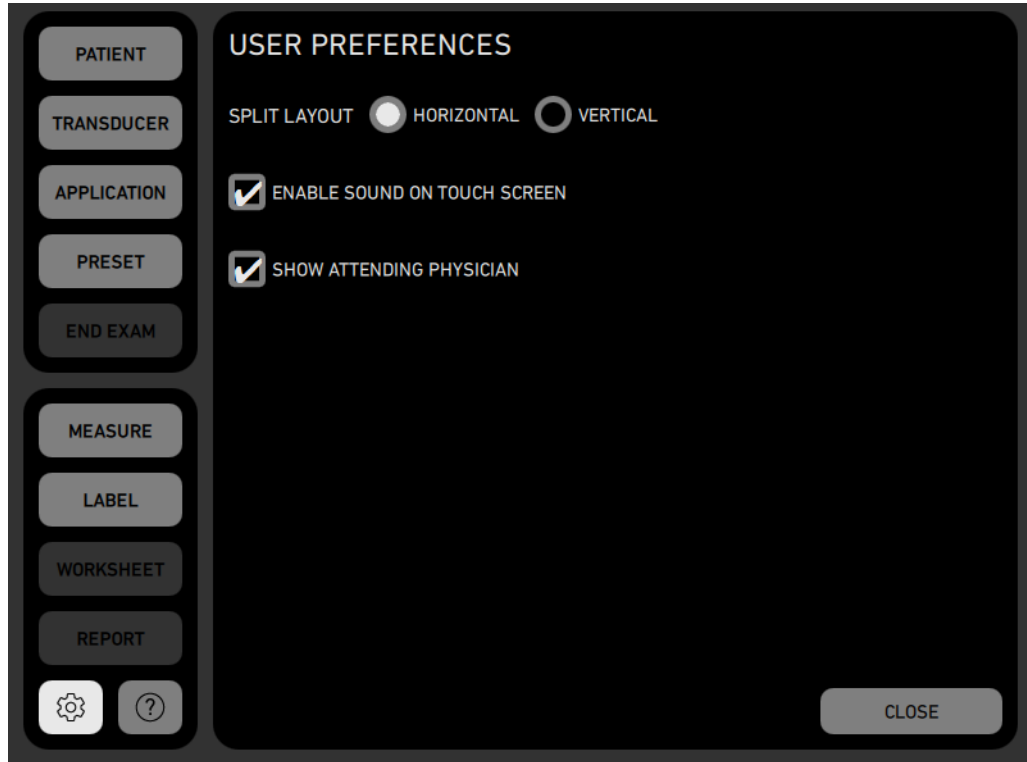
Figure A-4. User Preferences.

Measurement Settings Tab
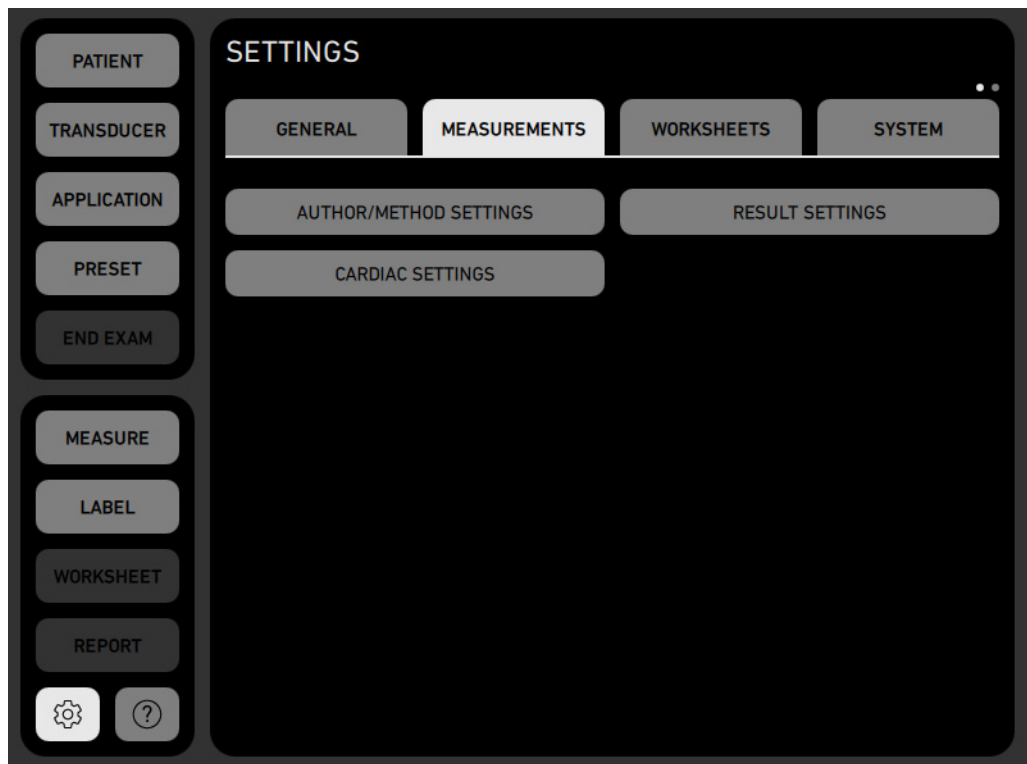
Figure A-5. Measurement Settings. Use the options on this screen to set up the measurements you need for the current application.
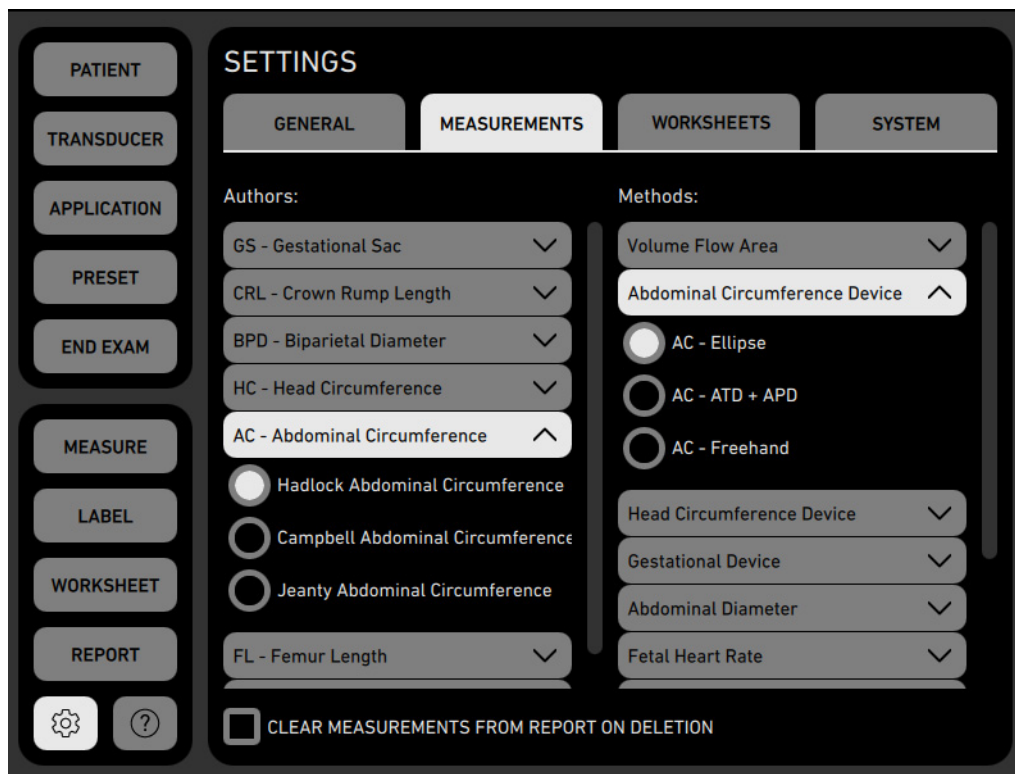
Author/Method Settings

Figure A-6. Author and Method tab

Select the measurement settings by tapping the author and method you want for each measurement.

If you checkmark the **Clear Measurements From Report on Deletion**, selecting **Delete Last** or **Delete All** when making measurements will remove the measurement results from the report as well as from the clinical display.

Note that you can set the **Heart Rate** under **Methods:**
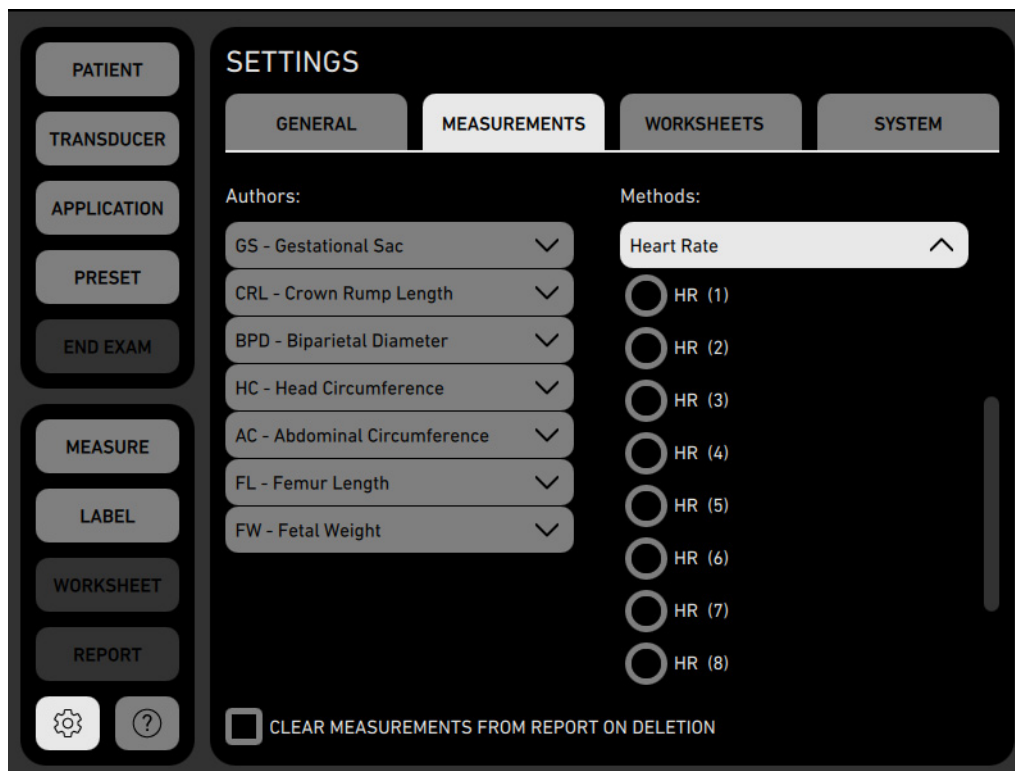
Figure A-7. Heart Rate option under Methods.

Result Settings
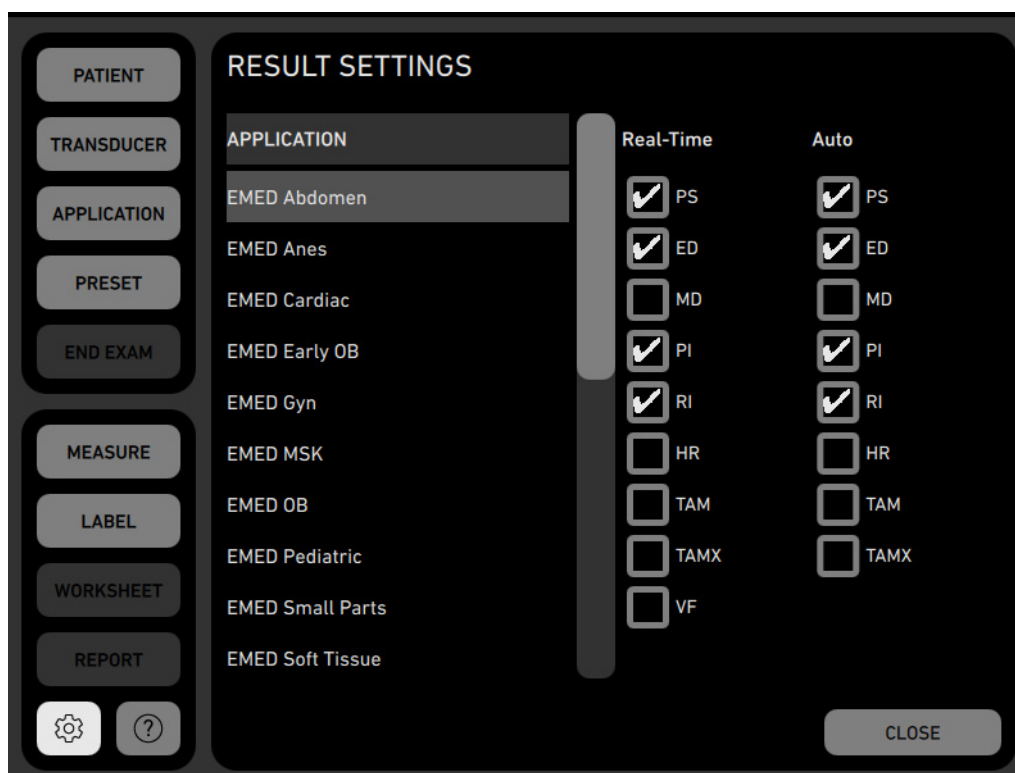
Figure A-8. Result Settings tab

The **Result Settings** are default for the selected application and preset, but you can change them here to fit your needs.

Cardiac Settings
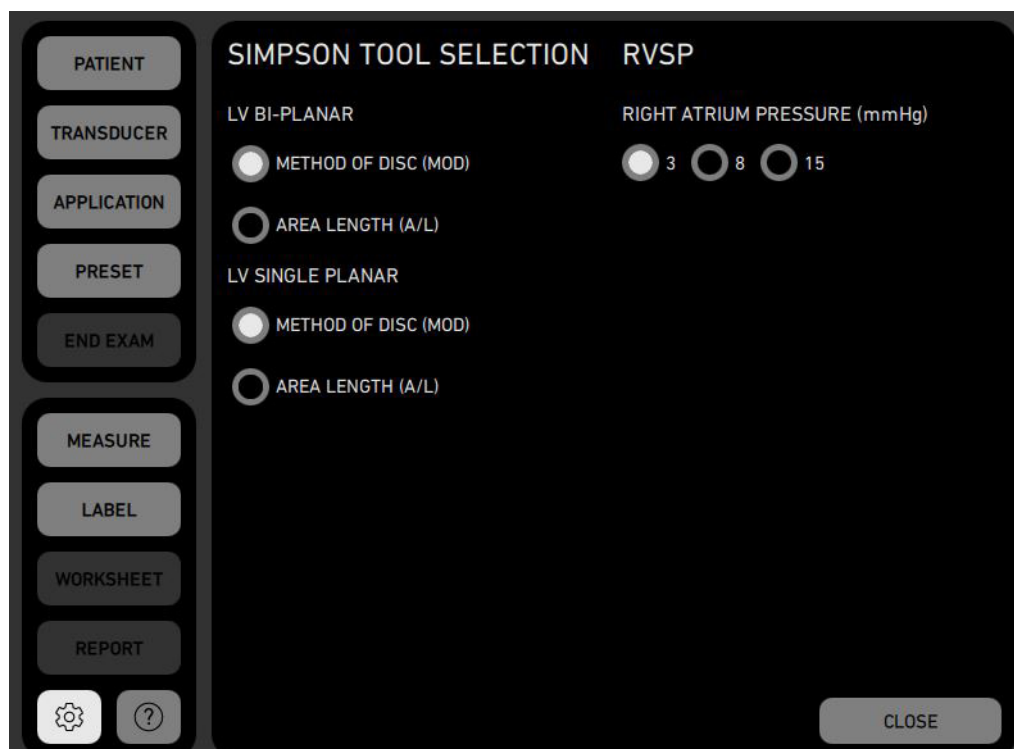
Figure A-9. Cardiac Settings tab.

In **Cardiac Settings** you can select your preferred Simpson measurement tool. Default selection is **Method of Disc (MOD)**. You can also set the **RVSP** to 3, 8 or 15 mmHg. Default selection is **3**.

Worksheets Tab

Figure A-10. The Worksheets tab.

On the **Worksheets** tab, you can export and import worksheets, as well as edit the worksheet assignments for bk3500 applications and presets.

Worksheet Export

You can export the Factory or User worksheet by tapping **Export**. If a User worksheet exists, it is exported by default. If a User worksheet does not exist, a Factory worksheet is exported.

Worksheets are exported to the following path on a USB drive: *\bkUltrasound User Settings\ProtocolSuite\bk3500\worksheet.xml*.

To export a worksheet:

1   Tap **Export**. The software automatically detects if a USB device is attached to the system. If a USB device is not detected the following message will appear:

Figure A-11. Worksheet Settings screen with undetected USB warning.

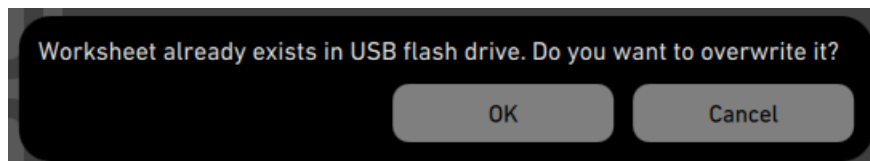**2**   If the system detects an existing worksheet on the USB drive, the following message will appear:

Figure A-12. Warning about existing worksheet.

3   If the worksheet export is successful, the following message will appear:

Figure A-13. Worksheet Settings screen with successful export message.

Worksheet Import

You can import worksheets from a USB drive.

To import a worksheet:

1 Tap **Import**. The software automatically detects if a USB device is attached to the system. If a USB device is not detected the following message will appear:

Figure A-14. Worksheet Settings screen with undetected USB warning.

2 If the system detects an existing worksheet, the following message will appear:
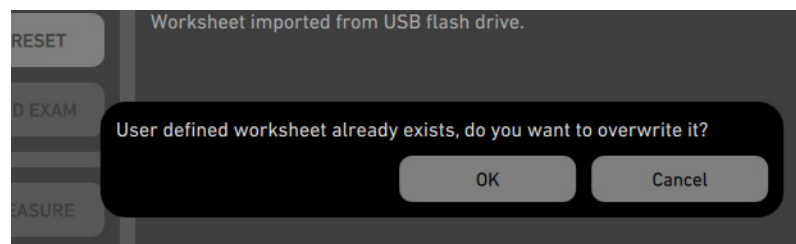

Figure A-15. Warning about existing worksheet on system.

3 If the worksheet import is successful, the following message will appear:
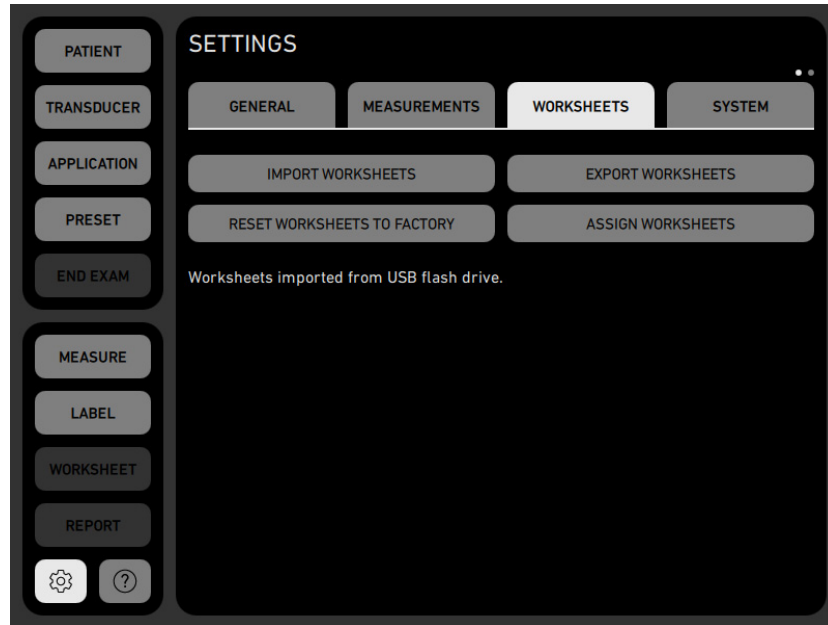
Figure A-16. Worksheet Settings screen with successful import message.

Worksheet Assignments

The Worksheet Assignments feature allows you to change worksheet assignments for each application and preset.

To change worksheet assignments:

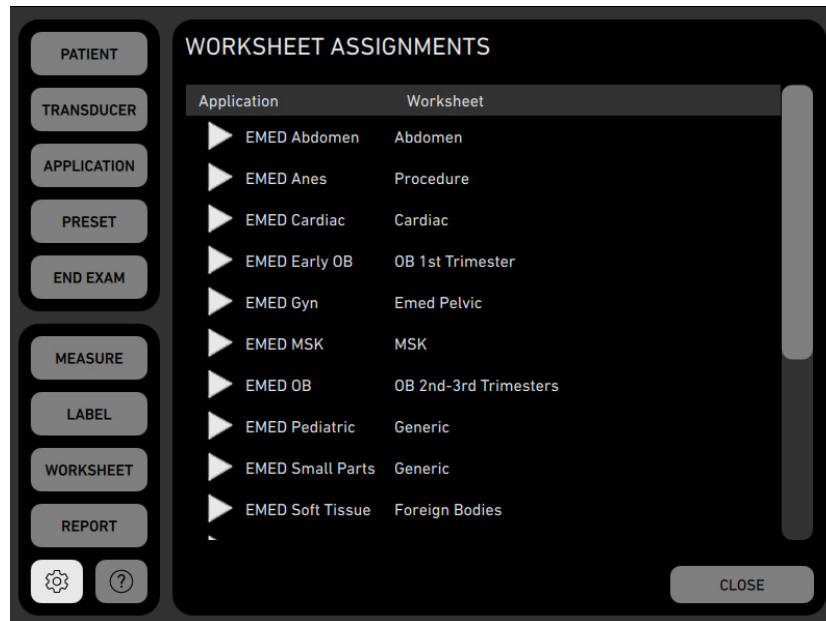1   Tap **Worksheet Assignments** to open the worksheet assignments page and display all applications.

Figure A-17. List of applications and corresponding worksheets.

2   Tap the white triangles to display the presets associated with individual applications. The second column displays the worksheet assignment for the preset.
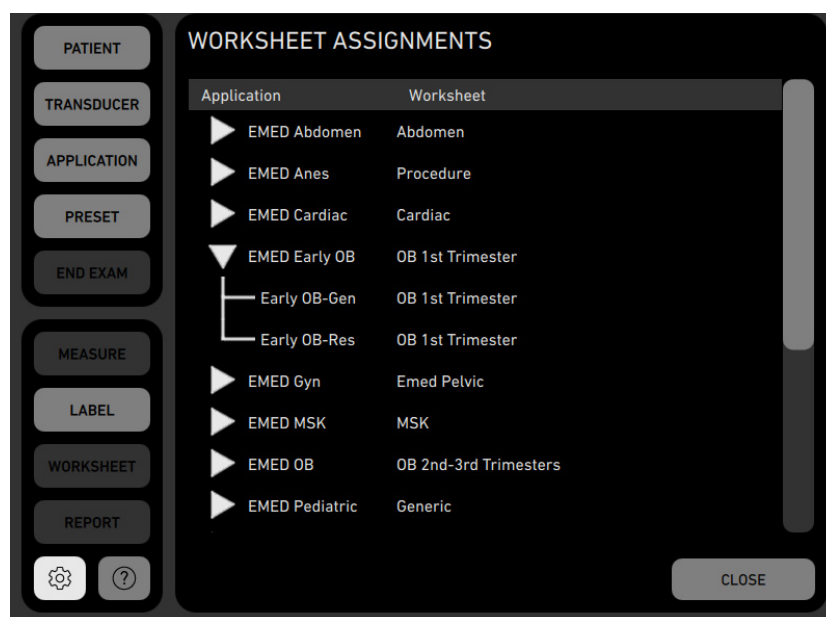

Figure A-18. Applications and associated presets.

3   Tap an application or preset to access the assignment for the selected application or preset. This action opens a second list, displaying all available worksheets. The highlighted worksheet is the current assigned worksheet.
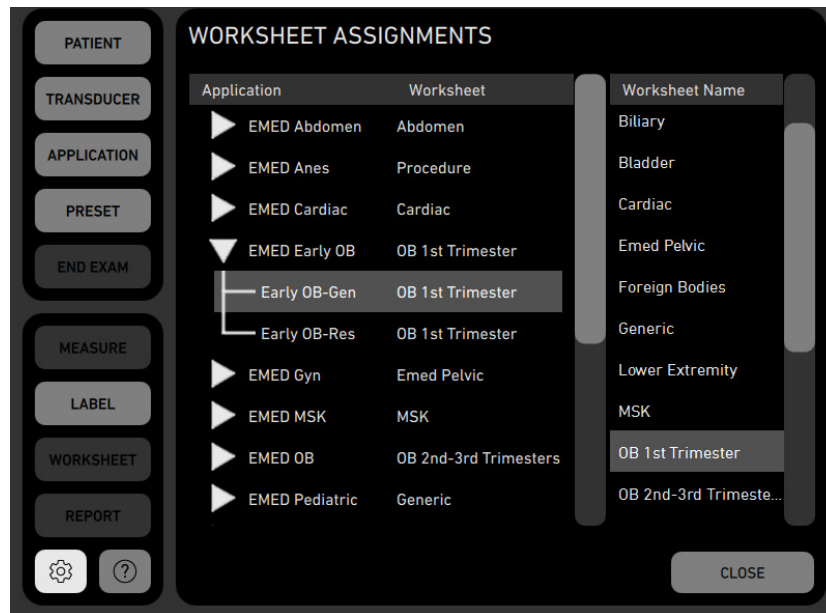

Figure A-19. Expanded screen displaying all available worksheets.

4   Tap a worksheet from the **Worksheet Name** list to change the assignment for the selected application or preset. The assignment for the application or preset is automatically updated in the Worksheet list.
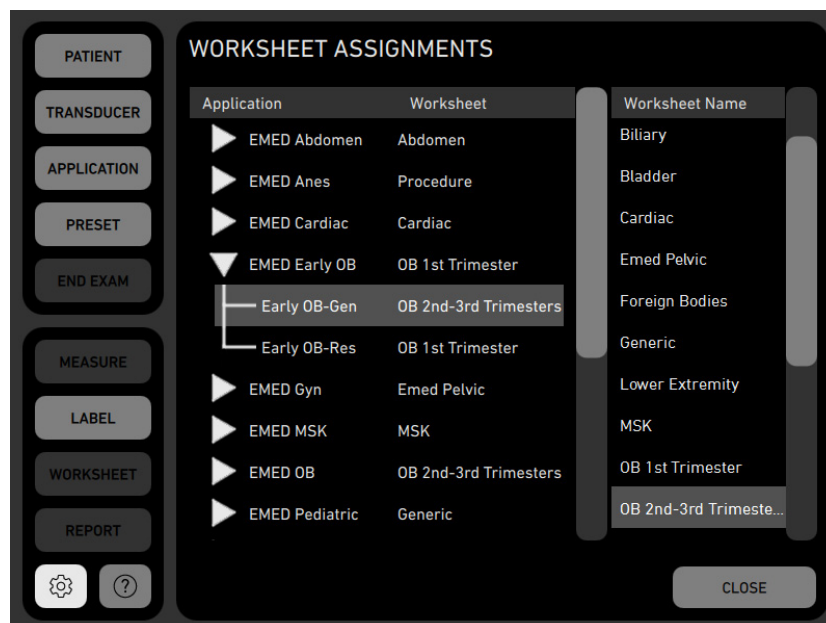

Figure A-20. Worksheet Name list selection

5 Not all presets have a uniquely-assigned worksheet, but instead inherit worksheet assignment from their applications. In this instance, changing worksheet assignment for the application will automatically change the assignment for the presets.

Figure A-21. Presets without uniquely assigned worksheets.

Reset Worksheet to Factory

The **Reset Worksheet to Factory** button allows the user to reset the worksheet file and its assignments back to a factory state. The button is enabled only if a user worksheet exists, or assignments have been modified by the user. Tapping the button will delete worksheet.xml and worksheet_assignments.xml.

The System Tab

On the **System** tab, you can setup and customize a range of different areas:

Figure A-22. The System tab.

Remote Support

You can have remote support from BK Ultrasound if service diagnostics should be necessary.

Tap **Remote Support** to give a BK service representative access to your system.

Figure A-23. Remote Support dialog box on the Clinical Display.

You will get a pass code to enter in the system to give the necessary access.

Figure A-24. Remote Support touch screen.

Service Mode

This function is password protected for use by BK service representatives.

Wi-Fi

To connect to a wireless network, tap the **Wi-Fi** button, choose the appropriate network and type in the password:
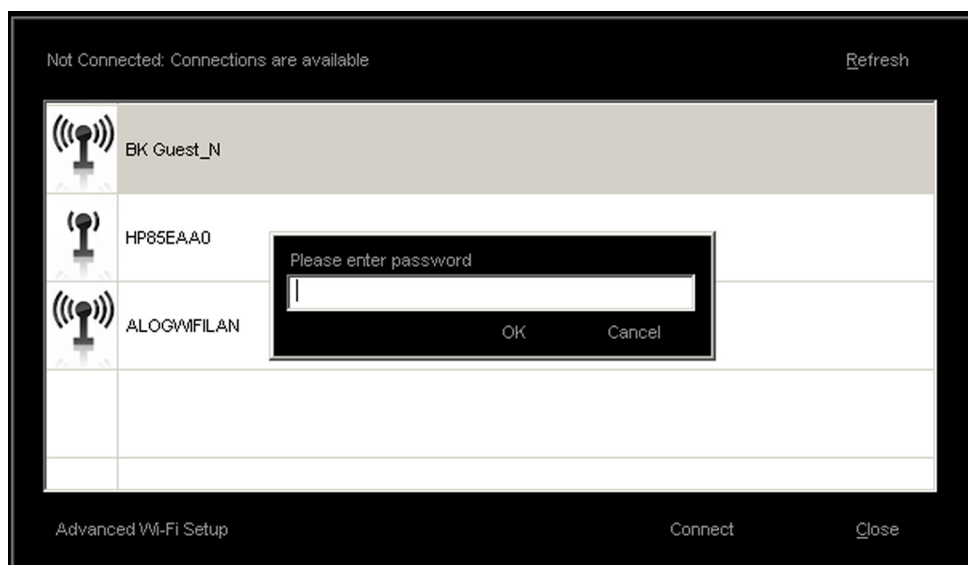

Figure A-25. Wi-Fi connection window.

You only have to type in a password the first time you connect to a specific network. When you turn on the system, an attempt is made to reconnect to the network that the system was connected to before it was turned off.

An advanced Wi-Fi setting option is available on the system using Windows configurations. Always follow the security procedures that have been established for your hospital, clinic or institution, as well as national guidelines. Contact your BK service representative for more information.

Additional characteristics

Frequency band	2.412~2.4835 GHz
Data throughput	Max. 150 Mbps
Latency	Depends on network setup
Integrity	Full integrity of archiving operations
Security characteristics	Support for WEP, WPA and WPA2 encryption. Enterprise encryption (802.1x) requires assistance from an authorized BK service representative
Spectrum management	None required

Table A-1. Additional characteristics.

When you transmit data over a wireless network, some special considerations apply. In particular, the network connections must be set up correctly. See Warning GS-w1:

⚠️ Proper Training	**WARNING** GS-w1 To ensure safe and proper use of the equipment, before you attempt to use BK equipment, you should be trained in ultrasonography or be under the supervision of someone who is trained in ultrasonography. You should also be thoroughly familiar with the safe operation of your ultrasound system: read all the user documentation that accompanies it. No further training is required, but BK offers training in how to use the system. Consult BK for information.

NOTE: *The system only supports one network at a time.*

If the system loses connection with the network while transmitting (for example, because it is moved out of range of the network during a transmission), the pending data is stored temporarily and re-transmitted when the connection is re-established.

For information on saving and printing using the DICOM protocol, see the DICOM chapter in the *Advanced User Guide* for the relevant system.

⚠️	**Caution:** Wifi-c1 The network must be set up correctly so that data is sent to the correct location. Otherwise data can be lost or accessed by unauthorized people.

⚠	**Caution:** Wifi-c2
	A safe encrypted protocol for data transmission, approved by the hospital, must be used. This is to prevent unauthorized people from getting access to the data.

Operator List

Tap **Operator List** to open the **Operator/Physician List Editor** where you can populate, edit, import or export the list of operators/physicians who will be using the system.
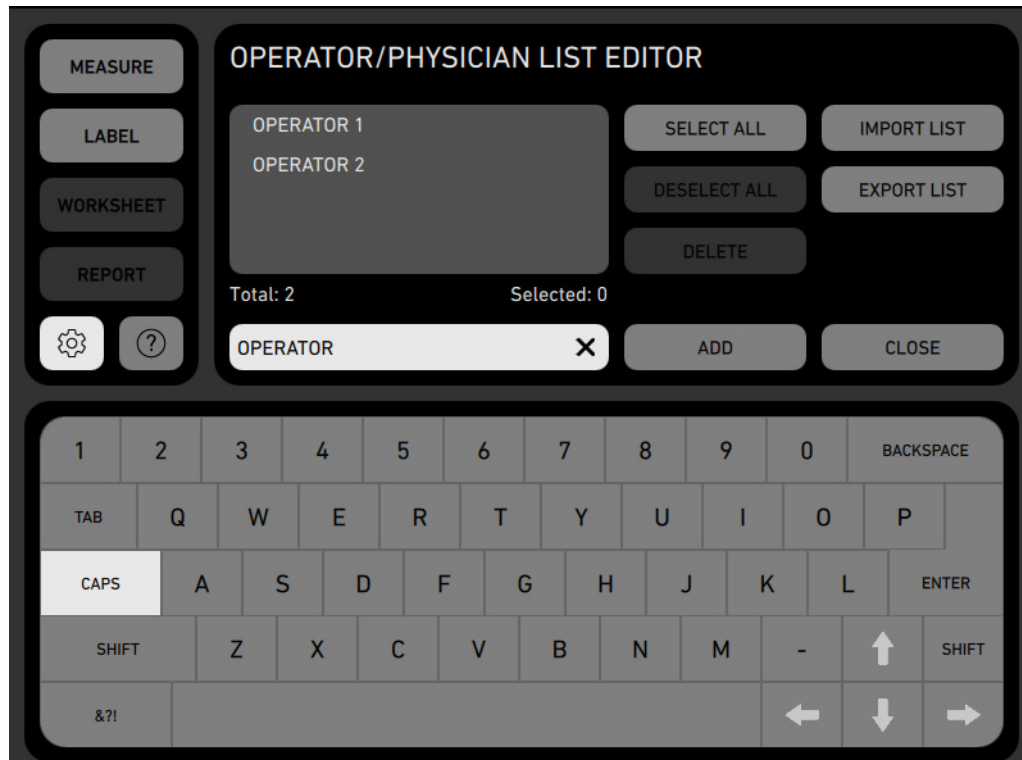

Figure A-26. The Operator/Physician List Editor.

Any operator or physician that has been added in the **Patient** information window is automatically added to the operator/physician list when an exam is started or details are updated.

Operator/Physician List Editor

To use the editor:

- Fill in or add to the list by typing the operator name in the input field and tapping **Add**.

- The list will be blank when you type, unless the name you are typing is already on the list, but you can see all the names on the list again when you tap **Add.**

- If you try to add a user who is already on the list, you will see the name on the list and a warning message will be displayed above the **Add** button. Click **X** to empty the input field.
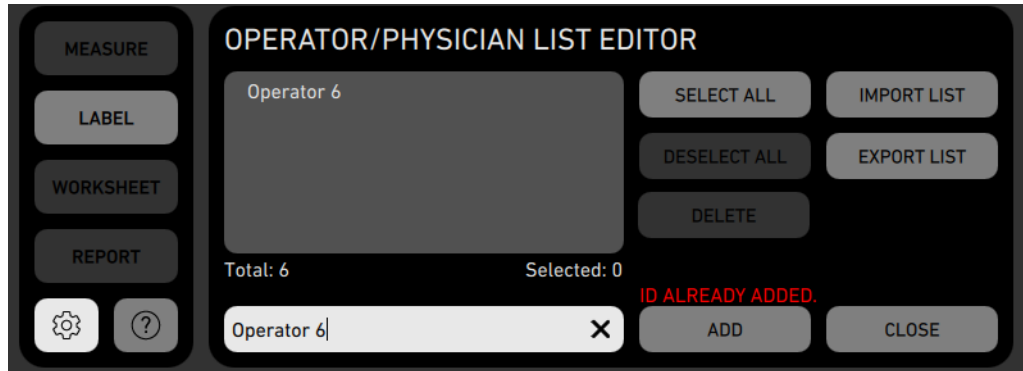
Figure A-27. Warning message for duplicated operator.

- Delete names from the list by tapping on them and tapping **Delete.** You can select as many names as you like:
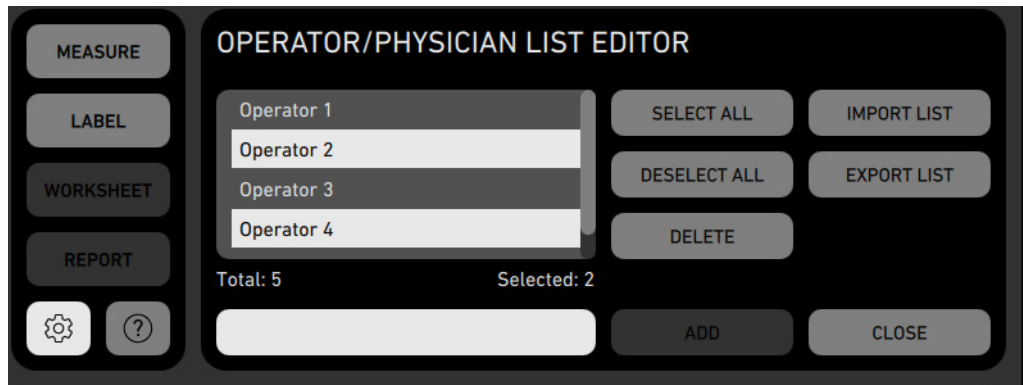

Figure A-28. Selected names on the Operator list.

- If you delete more than one name from the list, a dialog box is displayed for confirmation:
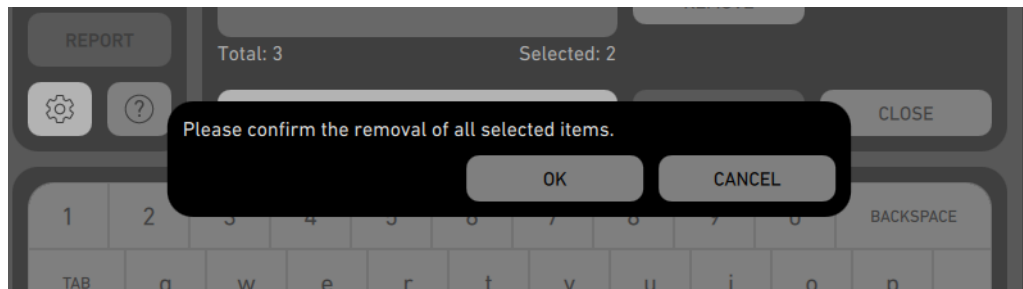

Figure A-29. Confirmation dialog for accepting removal of operator names.

- Deleting one name from the list will give no confirmation dialog before the name is deleted.
- Use the **Select All** and **Deselect All** buttons to select or deselect all names on the list.

Export List

When you are done editing your list, you can export it for use on another bk3500 system. The list is exported to the following path on a USB drive: *\bkUltrasound User Settings\Operator\PerformingPhysicians.bin*.

To export an operator list:

1 Tap **Export List** to the right of the current list. The software automatically detects if a USB device is attached to the system. If a USB device is not detected the following message will appear:
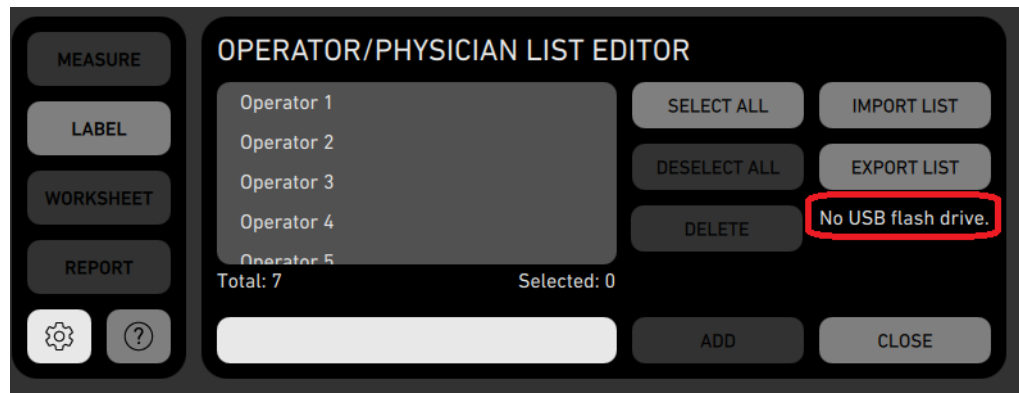

Figure A-30. Operator list with undetected USB warning.

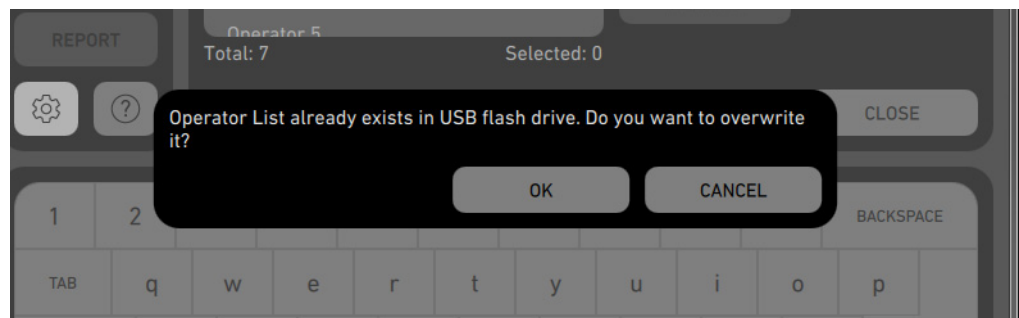**2** If the system detects an existing operator list on the USB drive, the following message will appear:

Figure A-31. Operator list with existing list warning.

3 If the operator list export is successful, no message will be displayed.

Import List

You can import an operator list to the system.

To import an operator list:

1 Tap **Import List** to the right of the operator list. The software automatically detects if a USB device is attached to the system. If a USB device is not detected the message in Fig A-30 above will be displayed.

2 If the system detects an existing operator list, the following message will appear:
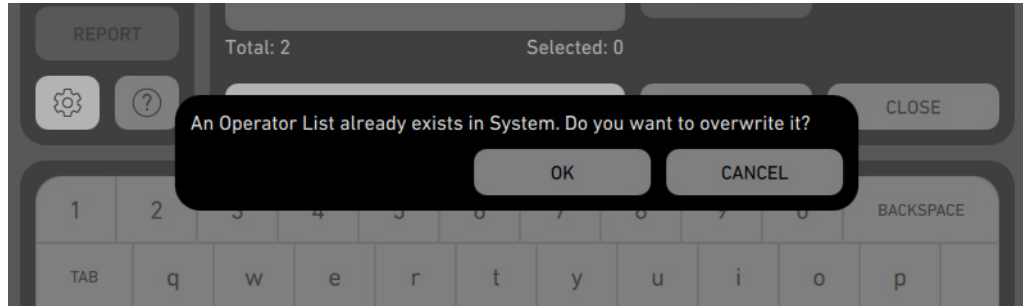
Figure A-32. Operator list with existing list warning.

3 If the operator list import is successful, no message will be displayed.

To close the **Operator/Physician List Editor** window, tap **Close**.

Customize

Note that the Pro Packages mentioned in this section and on the clinical display monitor screens are called Applications in the rest of the bk3500 Advanced User Guide and on the touch screen.

Tap **Customize** to access the customization windows.

All descriptions in this chapter assume that you already have the customization window displayed on the monitor.

The window for customization of your system opens. In this window, you can customize the following details for your system:

- Image layout, page 142
- General system settings, page 143
- Measurements, page 154
- License, page 158
- Exporting and importing data, page 159
- DICOM setup, page 162

To open the tabs in the individual customization windows, do as follows:

- Use the trackball to position the cursor on the tab and press **Select**.

*In this chapter, this action will be called **Click**.*

Doppler and M-Mode Monitor Layout

When you image in Doppler or M-mode, a B-mode image is also present on the monitor.

- The split between the modes can be vertical or horizontal.
- The size of the Doppler or M-mode image can be small, medium or large.

To open the Screen Layout Setup window:
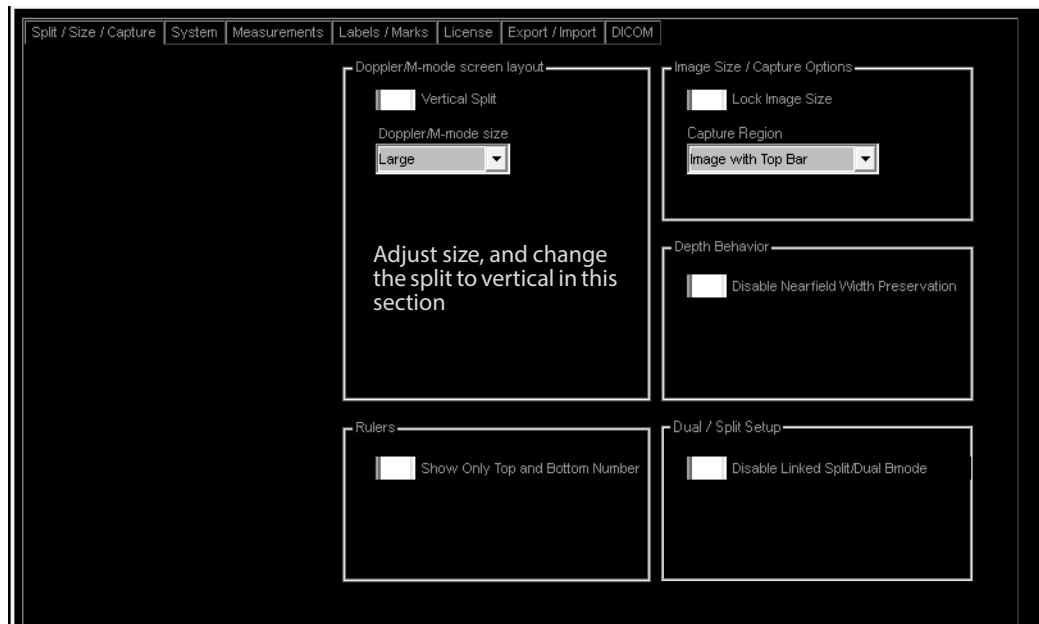
- Click the **Split/Size** tab.

Figure A-33. The Screen Layout Setup window.

Depth Behavior

The system is set to preserve nearfield width when you decrease the depth of the image. You can change this here. If you check this, the tissue at the side of the image will not be visible when the depth is decreased.

System Setup

Under the **System** tab, you will find:

- General Setup, page 143.
- Clip Storage Setup, page 145.
- Printer Setup, page 146.
- Network Drive Setup, page 148.
- Version Information, page 149.
- Video I/O, page 150.
- Battery Support, page 151
- Miscellaneous, page 152.

This section describes what you can configure and customize in each of these areas.

General Setup

In the **General Setup** window, you can change location information, video output format, date and time.

NOTE: *You can reset the system to the factory default setup in this window.*

To open the General Setup window**:**

- Click the **System** tab.

Figure A-34. The General Setup window.

Location Information

Institution information is displayed above the patient name at the top of the monitor and included in documents archived to a DICOM system. It appears in all documentation of the image. Because of space limitations, very long hospital names will be reduced in size or even truncated on the monitor. Consider using a shortened version of your hospital name instead.

Video Format

You can select PAL or NTSC for video output. For more information about video settings, see "Video I/O Setup" on page 150.

Date/Time

You cannot change existing time stamps on the ultrasound image.

To change the date or time:

• Click **Date/Time** in the **General Setup** window (Fig A-34).

A message appears, stating that existing time stamps cannot be changed. When you accept the statement, the **Date/Time Properties** window appears.

To change the date or time format:

• Select the date or time format in the **General Setup** window (Fig A-34).

Restoring the Factory Setup

To restore all factory default settings on the system, click **Reset System Setup to Factory Defaults...** See Fig A-34.

NOTE: *If you restore the factory default settings, you will lose all customizations that have been made to the system.*

Clip Storage and Cine Setup

You can use the **Clip Storage and Cine Setup** window to change how the Clip Browser and Cine functions work.

To open the Clip Storage and Cine Setup window:

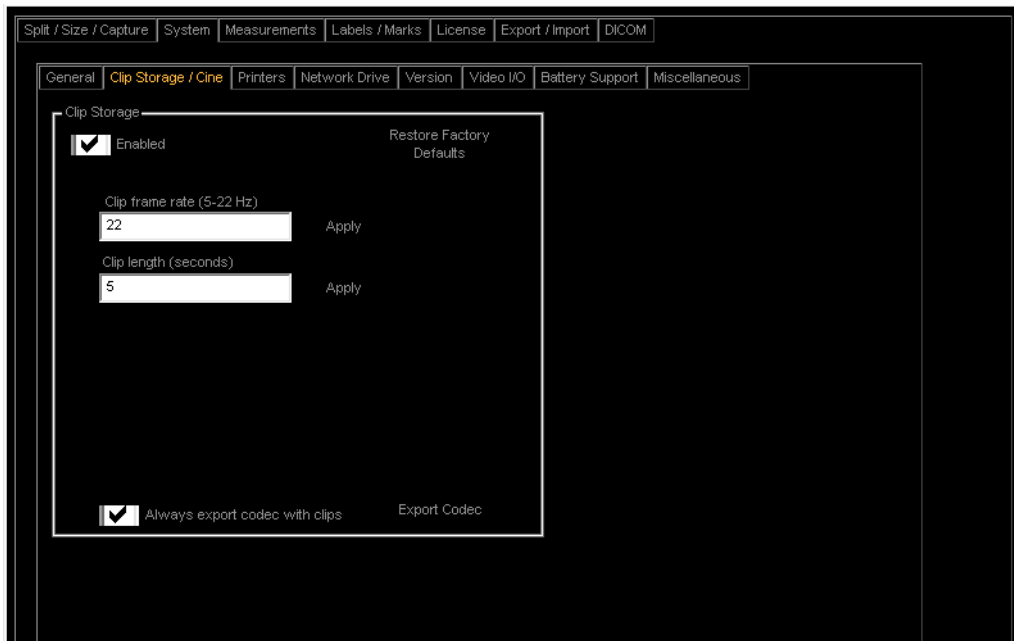• Click the **System** tab, and then the **Clip Storage/Cine** tab.

Figure A-35. The Clip Storage and Cine Setup window.

The options in the **Clip Storage and Cine Setup** window are explained in Table A-2.

Clip Storage and Cine Options

Option	What it does
Enabled	Enables clip storage on the system.
Frame rate	Sets the frame rate (from 5–22 Hz) for capturing clips. Enter a frame rate and click **Apply**.
Clip length	Sets the length of clips that are stored (in seconds). The maximum possible length depends on the frame rate you set. Enter a clip length and click **Apply**.
Always export codec with clips	When checked, the codec is exported every time you copy a clip to an external medium.
Restore Factory Defaults	Restores factory default clip storage or cine settings.
Export Codec	Exports the Clip Storage codec to a CD/DVD or USB device.

Table A-2. Settings in the Clip Storage and Cine Setup window.

Printer Setup

You can set up the paper size and print a test page to check the settings for your printers in the **Printer Setup** window. You can also set up an office printer on a network.

To open the Printer Setup window:

- Click the **System** tab, and then the **Printers** tab.

NOTE: *Click **Setup** in the **Printer Setup** window if you want to adjust the color, contrast, or brightness of a printer. Do not use this new window to change anything else because your settings will be overruled by the settings in the **Printer Setup** window.*

In this window, you can also specify whether images printed with a USB printer are archived automatically. (If the patient ID is missing, the printed image is not archived.)
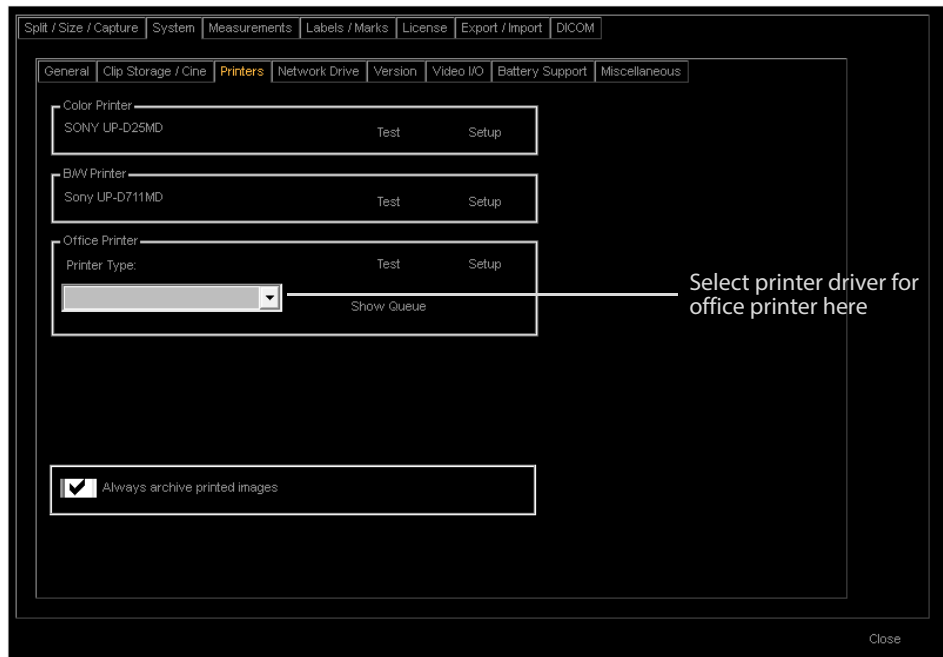
Figure A-36. The Printer Setup window.

Color Printer and **B/W Printer** are for thermal printers. An **Office Printer** means one that supports ordinary A4 or letter-size paper.

Setting Up an Office Printer

The Office Printer setup configures one of the pre-installed drivers (PCL5, PCL6 or PS) to work with the particular office printer you have configured.

NOTE: *You cannot connect an office printer directly to a USB connector on the system. You must connect it through a network. The only printers you can connect directly are the ones specified in the Product Data Sheet for the system.*

To set up an office printer:

1 Click **Setup.**

2 Give the printer a name in the **Printer Name** field.

3 Type the printer's IP address in the **Network Address** field.

4 Click **Install**.

The name you have given to the printer appears in the **Printer Name** field at the top of the window.

5 Click **Close**.

You can type the server name here

You can give the printer a name here and type the printer's network address here
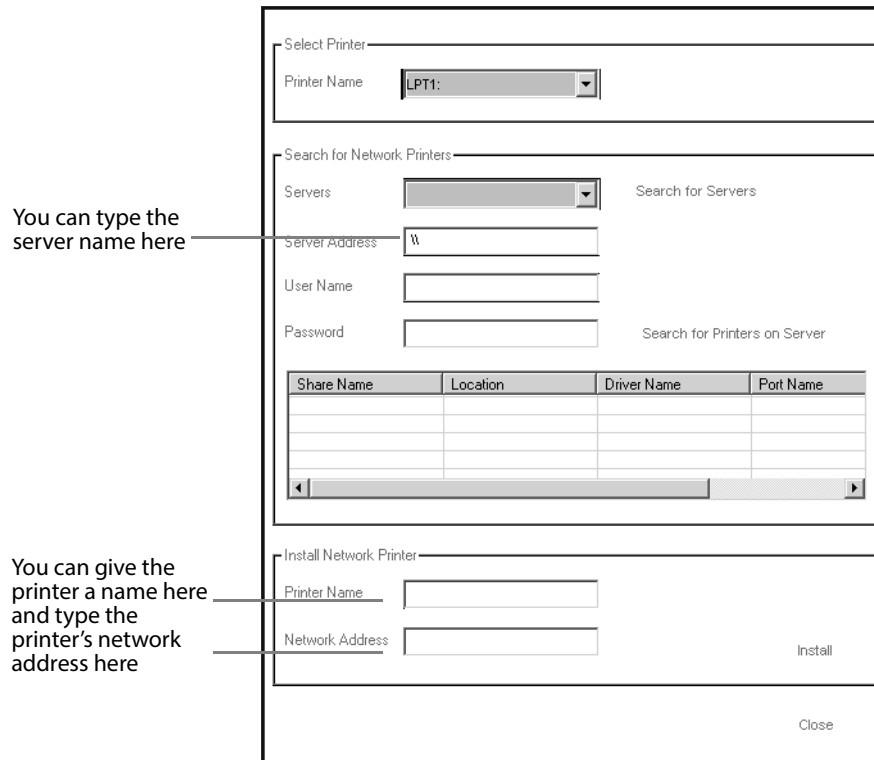
Figure A-37. The Printer Configuration window.

Network Archiving

In the **Network Drive Setup** window, you can set up a network drive for archiving. Enter the UNC path to the network drive and your network username and password. You can leave the password blank, but then you will be prompted for it each time you try to access the network (unless you have the same usernames and passwords for the network and the system – see "The Archive Window (Examination List and Patient Information)" on page 56.)

To open the Network Drive Setup window:

- Click the **System** tab, and then the **Network Drive** tab.
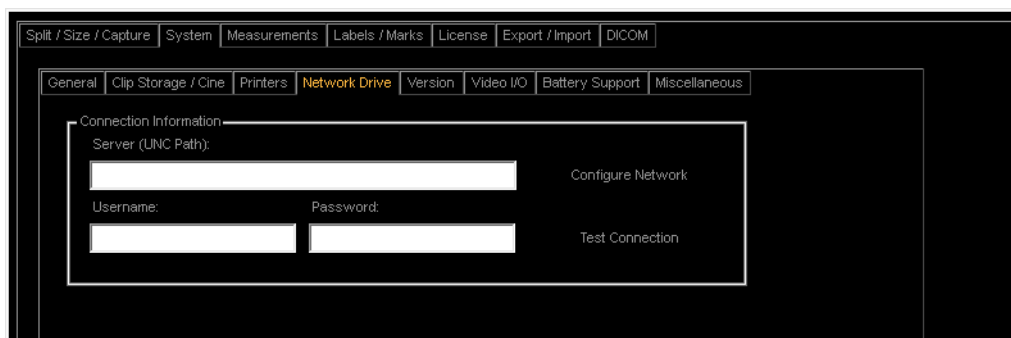

Figure A-38. The Network Drive Setup window.

Version Information

The **Version Information** window contains information about the software and hardware versions installed on your system.

You can also see how much free space is left on your hard disk.

In this window, you can also export a log file that contains information about the system since the last software upgrade. You can email this to your BK service representative, for example, if you need support.

To open the Version Information window:

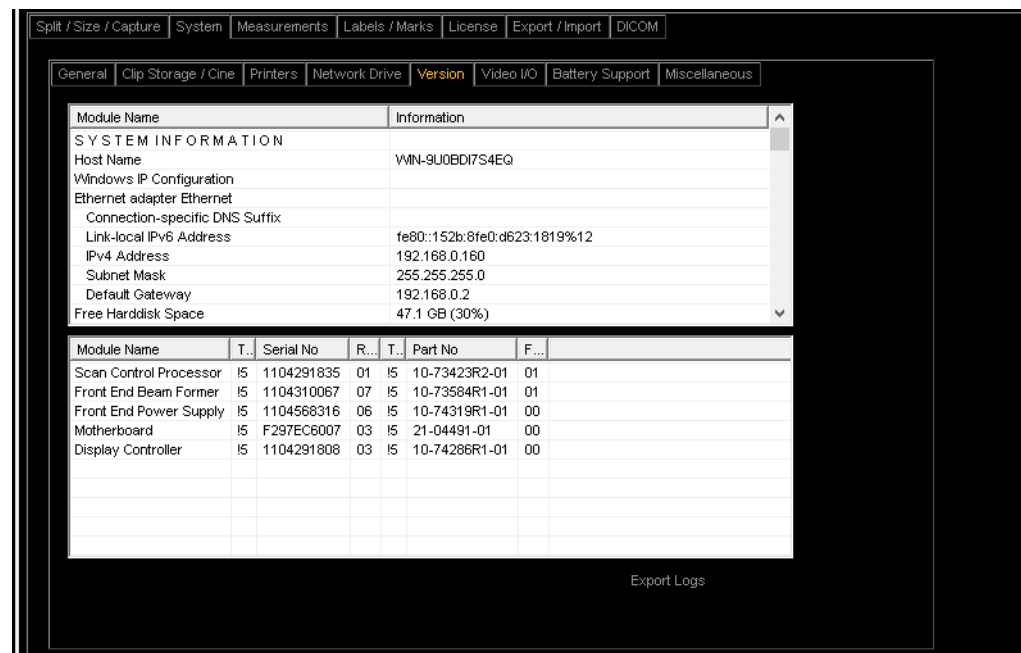• Click the **System** tab, and then the **Version** tab.

Figure A-39. The Version Information window.

To export a log file:

1 Insert a USB device into the system.

2 On the **Version** tab, click the ▼ that appears to the right for the drop-down menu **Export Logs**.

3 Select **USB Device**.

4 In the window that opens, click **Full** and type a comment, including the time and details about what you were doing when an error occurred.
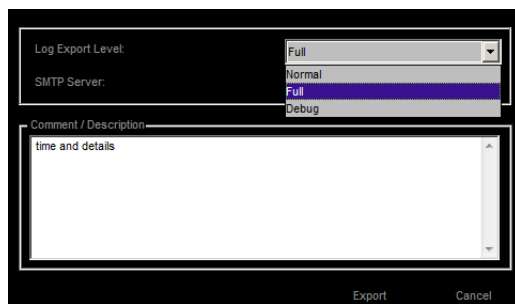

Figure A-40. The Export window.

5 Click **Export**.

A log file is created and copied to your USB device.

6 To send it to the BK Service department, zip the file and send it to support@bkultrasound.com.

Video I/O Setup

Video I/O format (NTSC or PAL) is changed in the **General Setup** window (see page 144).
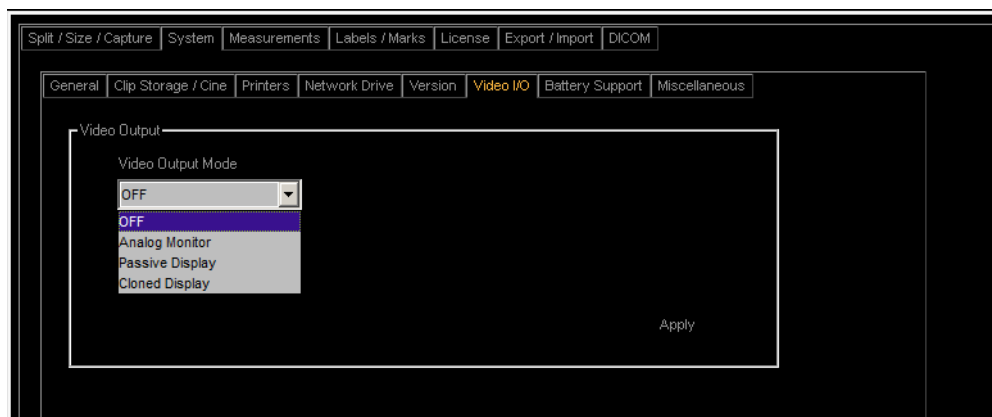

Figure A-41. The Video I/O Setup window.

In the **Video I/O Setup** window, you can specify the Video Output Mode:

- **OFF** – Video outputs are disabled. This is the default setting. If you are not using the video output, use this setting.

- **Analog Monitor** – Sends the video signal to S Video. The format is Passive Display.

- **Passive Display** – This gives a big ultrasound picture, but the not all of the rest of the system monitor is displayed. Patient name and ID are included, along with some settings and measurements.

   With Passive Display, you can set the text font size and the color mode. Color mode is either Color or Black & White.

- **Cloned Display** – The video image is an exact copy of everything you see on the system monitor.

Because the system monitor is rotated to use a portrait mode display, the signal on the video output is also rotated 90°; this cannot be changed from the system. You must adjust this on the external equipment to avoid seeing the video image rotated.

Figure A-42. Cloned video display if external monitor is not rotated.

The cloned display output has an aspect ratio of 4:5. You must adjust your external equipment for that ratio to avoid a pixilated image. The resolution on the internal monitor is 1024x1280. (This is because the monitor, with a standard resolution of 1280x1024, has been rotated 90°.)

After you make any changes in this window, click **Apply**.

NOTE: *Changes will not take effect until you restart the system.*

Battery Support Setup

You can customize the battery operation in the **Battery Support Setup** window.

In the **Battery Support Setup** window, you can define the use of

• Alarms (for low and critical low battery)

• Power profile

To open the Battery Support Setup window:

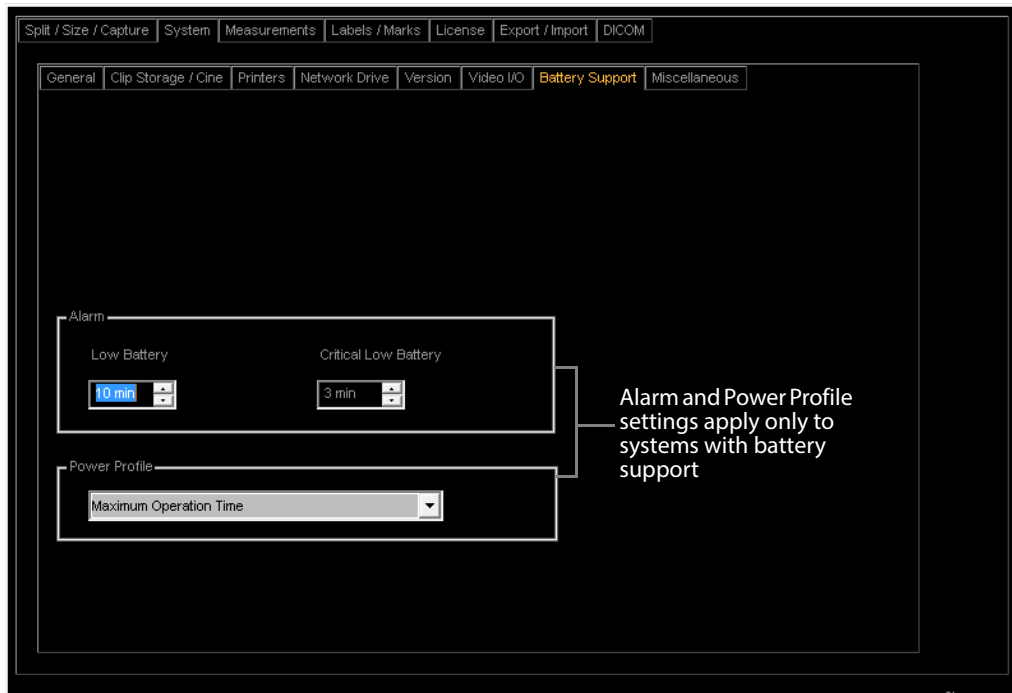• Click the **System** tab, and then the **Battery Support** tab.

Figure A-43. The Battery Support Setup window.

You can define when alarms should be triggered to warn about low or critically low battery charge.

- **Low battery** – When the battery is low on charge, this alarm is triggered to warn the user that only *x* number of minutes of charge remain in the battery.

- **Critical low battery** – When the battery is critically low on charge, the system initiates shut down. The default setting is 3 minutes.

When either of these alarms are triggered, the user must take action to recharge the battery by plugging in to a power source.

You can decide how to power your system in the **Power Profile** field.

- **Maximum Operation Time** enables you to use the battery to the fullest extent. This is the factory default setting.

- Select **Maximum Battery Life** if you want to save battery and optimize battery lifespan. This is also considered better for the environment. Here, charging is inhibited if a battery charge level is greater than 80%.

For more information about using the battery support, see the *bk3500 User Guide*.

Miscellaneous System Setup

You can use the **Miscellaneous System Setup** window to customize a variety of functions.

To open the Miscellaneous System Setup window:

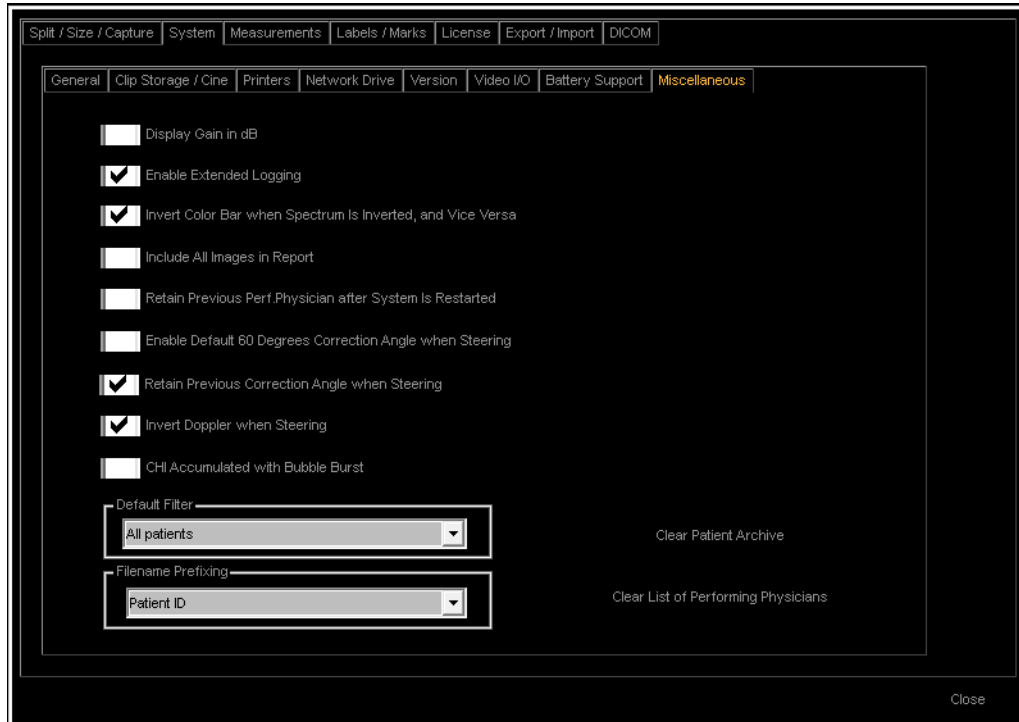- Click the **System** tab, and then the **Miscellaneous** tab.

Figure A-44. The Miscellaneous System Setup window.

You have the following options in the **Miscellaneous** system setup window:

Option	What it does
Display gain in dB	If checked, gain is displayed in dB. If unchecked, gain is displayed as a percentage.
Enable Extended Logging	Enables extended logging.
Invert Color Bar when Spectrum Is Inverted	Inverts the color bar to correspond to inverted spectrum.
Include All Images in Report	If checked, all images are saved to a report. If unchecked, only images that are manually selected are saved to the report.
Retain Previous Perf. Physician after System is Restarted	Keeps the setting for performing physician so you don't have to enter it the next time you start the system.
Enable Default 60 Degrees Correction Angle when Steering	Sets correction angle to 60 degrees when steering is enabled or changed. If unchecked, the correction angle is independent of steering.
Retain Previous Correction Angle when Steering	Use the correction angle that was used the last time steering was enabled.
Invert Doppler with Steering	Keeps the same state of the Doppler when steering changes.
Default Filter	Sets a default filter to filter the patients displayed in the Examination List on the monitor. You can use this to show only the current patient.
Filename Prefixing	You can select either patient ID, last name or comments as the prefix to the filename for all exported files and reports, to make identification and sorting easier.
Clear Patient Archive	Clears the entire patient archive. This action is password protected.
Clear List of Performing Physicians	Clears all the names of performing physicians. This action is not password protected.

Table A-3. Settings in the Miscellaneous System Setup window.

Measurements

Curves

NOTE: *Consult a BK service representative before you make any changes to the curves.*

You use the **Curve Setup** window to define a curve or to edit an existing user-defined one.

To open the Curve Setup window:

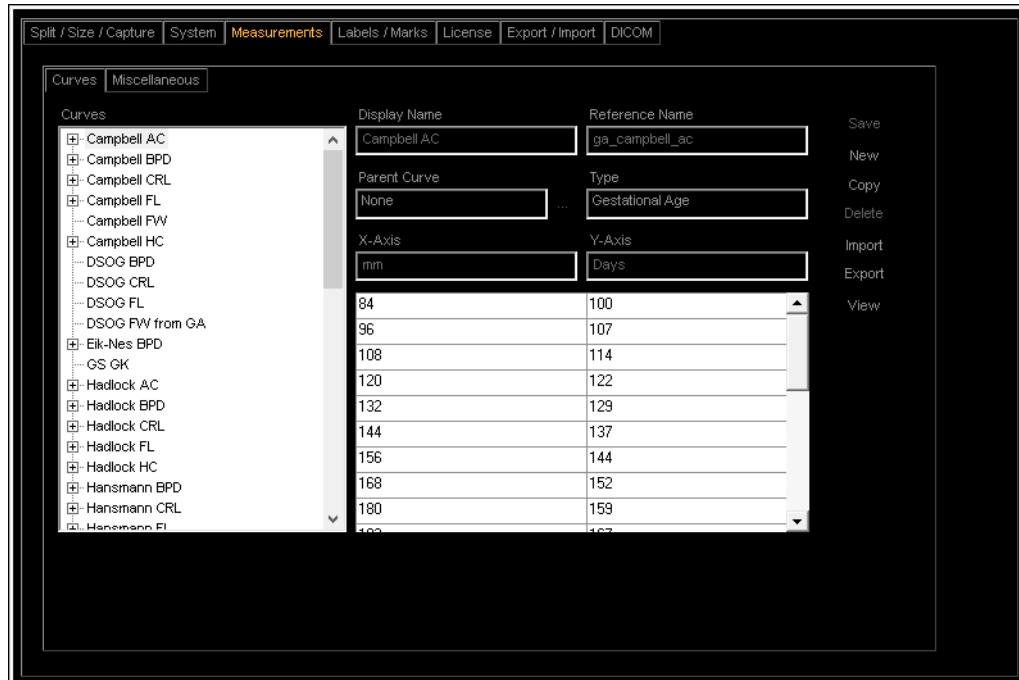- Click the **Measurements** tab and then the **Curve** tab.

Figure A-45. The Curve Setup window.

The **Curve Setup** window has a list of curves on the left, fields containing information about the curves in the middle, and a list of options on the right.

The list contains all available curves, including all user-defined ones. The list is displayed in a the form of a "tree". If a curve appears with a + to the left of it, it has related (percentile) curves that will be displayed with it. Click on the + to expand the tree and see the related curves. The + becomes a - when the list is expanded. Click - to collapse the list again.

NOTE: *The percentile curves are called "child" curves. The curve that they are related to (and displayed with) is called the "parent" curve.*

When the window opens, no curve is selected, and the information fields are blank.

When a curve in the list is selected, the information fields contain information about the selected curve. If the selected curve is user-defined, you can edit the information in the fields.

The actual values of the curve are listed below the other information fields.

Information Field	Contents
Display Name	The name you give the curve. It will appear with this name on the system. You are warned if you try to give a curve a name that is not unique, but you can do it anyway.
Reference Name	The reference name is used to reference curves from measurement formulas. The reference name must be unique. That will be checked when you click **Save**.
Parent Curve	The parent curve that will be displayed with the curve you are defining. Click to select a parent curve from a list.
Type	The type of curve: • Gestational Age • Fetal Weight From Gestational Age • None (some other type or not a specific type) Measurements based on a GA-curve will be available in the reports. The default FW-curve will also be available in the reports.
X-Axis	A label for the x-axis of the curve.
Y-Axis	A label for the y-axis of the curve.
Curve Values	The curve values are entered in the spreadsheet-like control at the bottom of the dialog. The left column is the x-axis and the right column the y-axis. You do not have to enter the values in a sorted order. The database will sort the x-values ascending. If a cell in the left column is empty, the y-value next to it is not used. There is no limit to the number of values you can enter to define a curve.

Table A-4. Information fields in the Curve Setup window.

You have the following options in the **Curve Setup** window:

Option	What it does
Save	Saves a curve that you have edited or defined.
New	Blanks all the curve values so you can insert new ones to create a new curve.
Copy	Creates a copy of the selected curve. Child curves are not included in the copy and must be copied separately. **Curve Type**, **X-axis**, **Y-axis** and points are copied. **Display Name**, **Reference Name** and **Parent Curve** are left blank so you can fill them in to create a new curve.
Delete	Deletes the selected curve. If the selected curve is a parent curve the children will be deleted as well. You are asked to confirm that you want to delete the curve.
Import	Imports a curve from an external storage device.
Export	Exports a curve to an external storage device. If the curve is a parent curve, the children will be exported as well.
View	Displays the currently selected curve. The curve dialog is opened and curve is displayed. This is very useful for verifying that curve points are positioned correctly.

Table A-5. Options in the Curve Setup window.

Creating and Editing Curves

To create a new curve:
1 Open the **Curve Setup** window.
2 Click **New**.
3 Fill in the information fields and the values you want for the curve.
4 Click **Save**.

To edit an existing curve:
1 Open the **Curve Setup** window.
2 In the list on the left, click the curve you want to edit.
3 Edit the information fields (including the curve values) as you want to.
4 Click **Save**.

NOTE: You can only edit curves that you have defined. Curves that come with the system cannot be edited.

Miscellaneous Measurement Setup

To open the Miscellaneous Measurement Setup window:
• Click the **Measurements** tab and then the **Miscellaneous** tab.
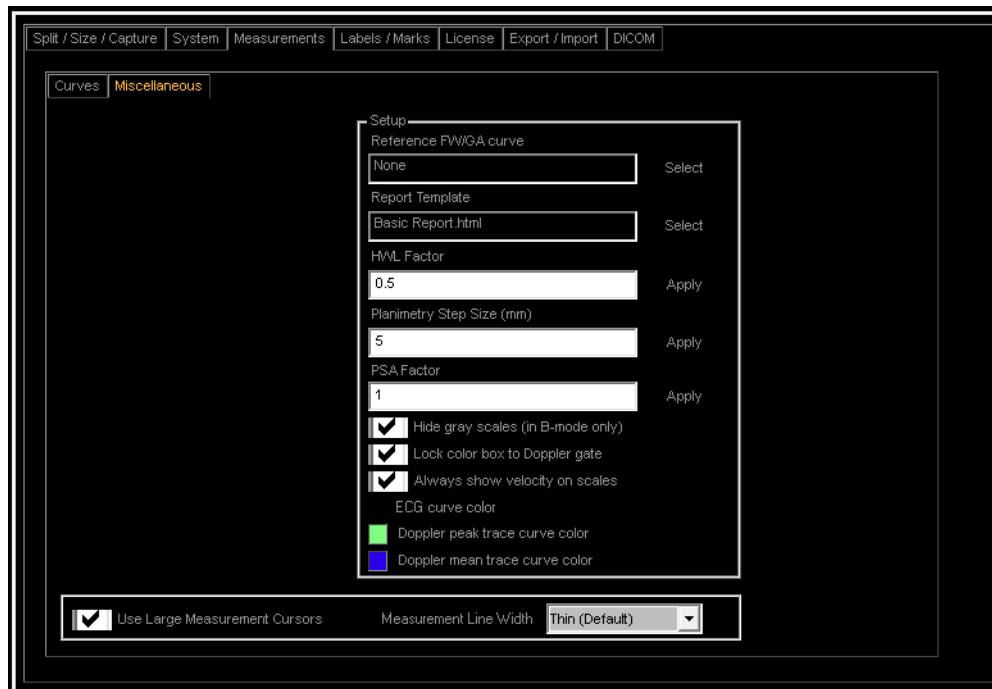
Figure A-46. The Miscellaneous Measurement Setup window.

In this window, you can specify:

- The FW/GA curve that is used as a reference curve when you create a report.
- The report template that will be used for the active Application.
- The HWL factor.
- Whether gray scales are hidden in B-mode.
- Whether the color box is locked to the Doppler gate – if you leave this box unchecked, the color box will not move when you drag the Doppler gate.
- Whether Doppler and Color measurements are always shown in cm/s (velocity) or whether they are in kHz when the Doppler angle correction is turned off.
- Whether Doppler real-time calculations are displayed all the time.
- The color for the Doppler peak or mean trace curve – to change the color, click the colored box and select the color you want.
- Whether you want displayed measurement cursors to be larger.

NOTE: *The settings that are changed in this dialog apply to the active Application.*

Licenses

Some functions of the bk3500 are optional; you must have a specific license to use them. The available options also depend on the system version you purchased.

When you purchase an option, you receive a 16-character license key. To activate the option, you must type the license key into the **License Manager** window.

To add a license:

1   Click the **License** tab.
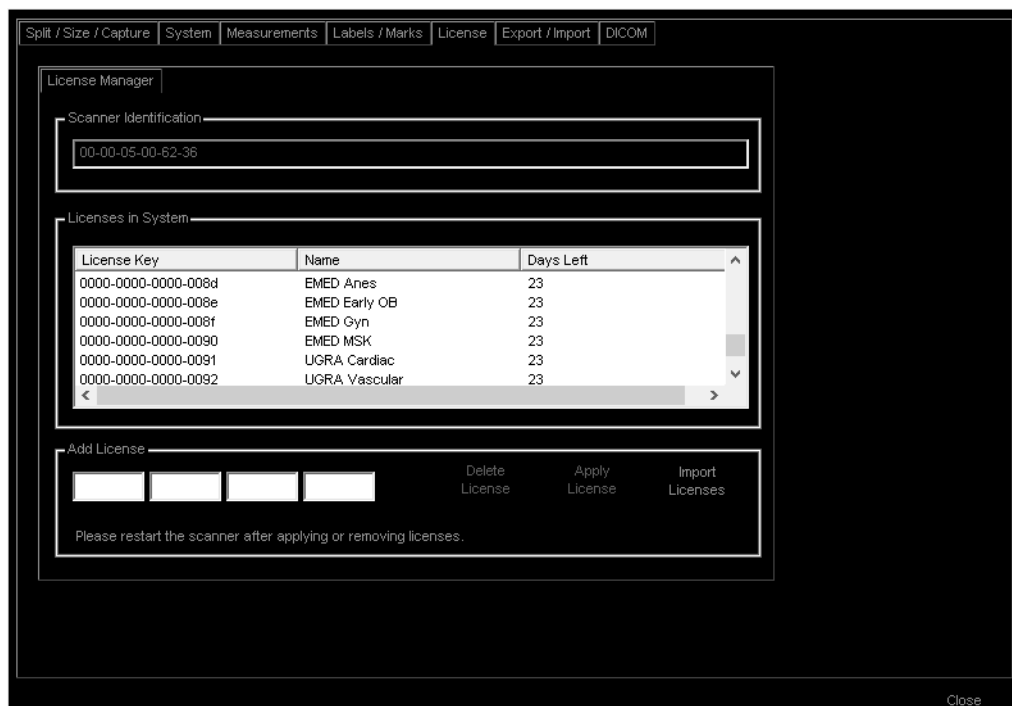
The **License Manager** window opens.

Figure A-47. The License Manager window.

2 Type the license key in the fields in the **Add License** box.

3 Click **Apply License**.

The **Licenses in system** list is updated.

4 Close the **License Manager** window.

You must restart the system before you can use the option.

NOTE: *A license key is valid for only one system and one option. You must have a different key for each option and for each system.*

NOTE: *You cannot edit the Scanner identification number. It is a unique number generated by the system.*

Importing and Exporting System Configurations

You can export or import a Preset to or from an external storage device, and you can decide which Applications will appear on the touch screen.

Click **Export/Import tab t**o open the Export/Import window.

Importing or Exporting Presets

You can export presets to a USB storage device and then import them to another bk3500 system. You can also export customized setups before an upgrade as a backup.

After a software upgrade, you must import presets you have created or modified back into the system.

To export a preset:

1   Click the **Export/Import** tab.
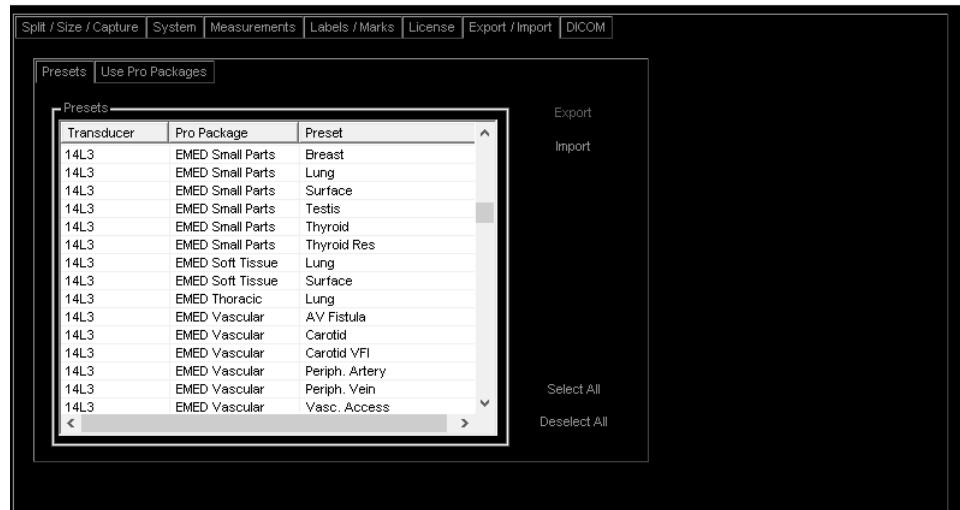
The **Presets** window opens.

Figure A-48. The Preset Export/Import window.

2   Select the presets that you want to export, and click **Export**.

When you point to **Export**, a triangle appears to the right of it. Click the triangle to choose USB storage device.

NOTE: *If you export to a USB storage device, make sure that it is not set to be write-protected.*

You are prompted for a file name to which the presets will be saved.

The selected presets are saved, with their existing names, as part of the named file.

To import a preset:

1   In the **Preset Export/Import** window (Fig A-48), click **Import**.
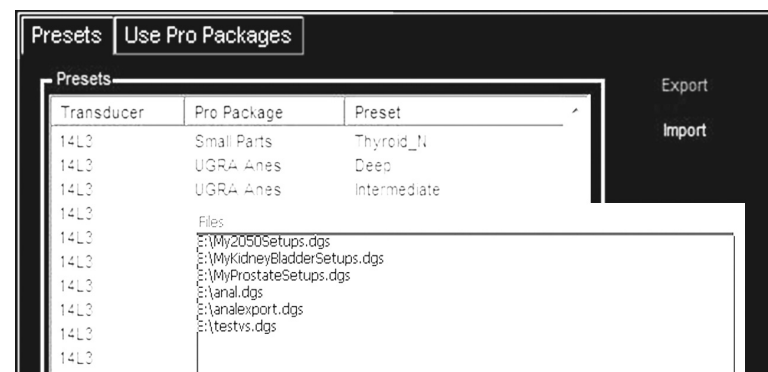
The **Files List** window appears.

Figure A-49. The Files List window.

The Files List lists all preset files (filename.dgs) that are on USB devices connected to the system.

NOTE: *A.dgs file may contain more than one preset.*

2   Select the file you want to import from and click **OK**. You can select only one file at a time.

The **Import Presets** window appears.

Figure A-50. The Import Presets window.

This window lists all the presets in the selected file. For each preset, you can see the transducer and Application it is associated with (if it was exported as part of a Application).

3   In the left-hand list, select the presets you want to import.

4   In the right-hand list, select the Application you want to import them to.

5   Click **Import**.

NOTE: *If the name of an imported preset is the same as one that already exists in the Application, you will end up with 2 presets with identical names.*

Use Pro Packages (Applications)

Click the **Export/Import** tab and then the **Use Pro Packages** tab.

Figure A-51. The Export/Import window opened to the Pro Packages.

Unchecked Pro Packages (Applications) will not appear on the touch screen.

DICOM Setup

DICOM is installed on the bk3500 as a default.

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 A-52. The DICOM setup window.

Advanced

When tapping **Advanced**, the following touch screen window is displayed:
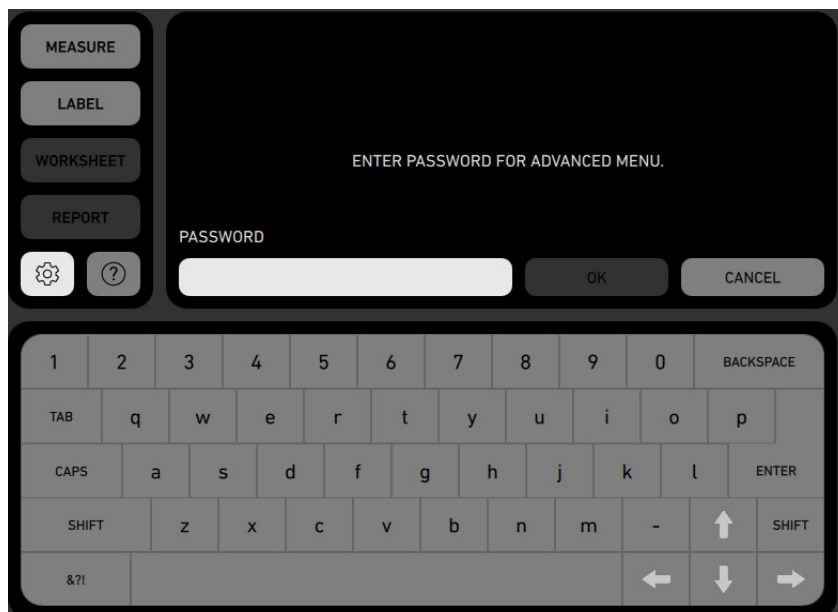
Figure A-53. The Advanced screen. The password is only available to BK service representatives.

To have the system customized to further fit your needs, contact your BK service representative.

About

Tap **About** for information on software versions, serial number and licenses:

Figure A-54. The About screen

Labels Tab
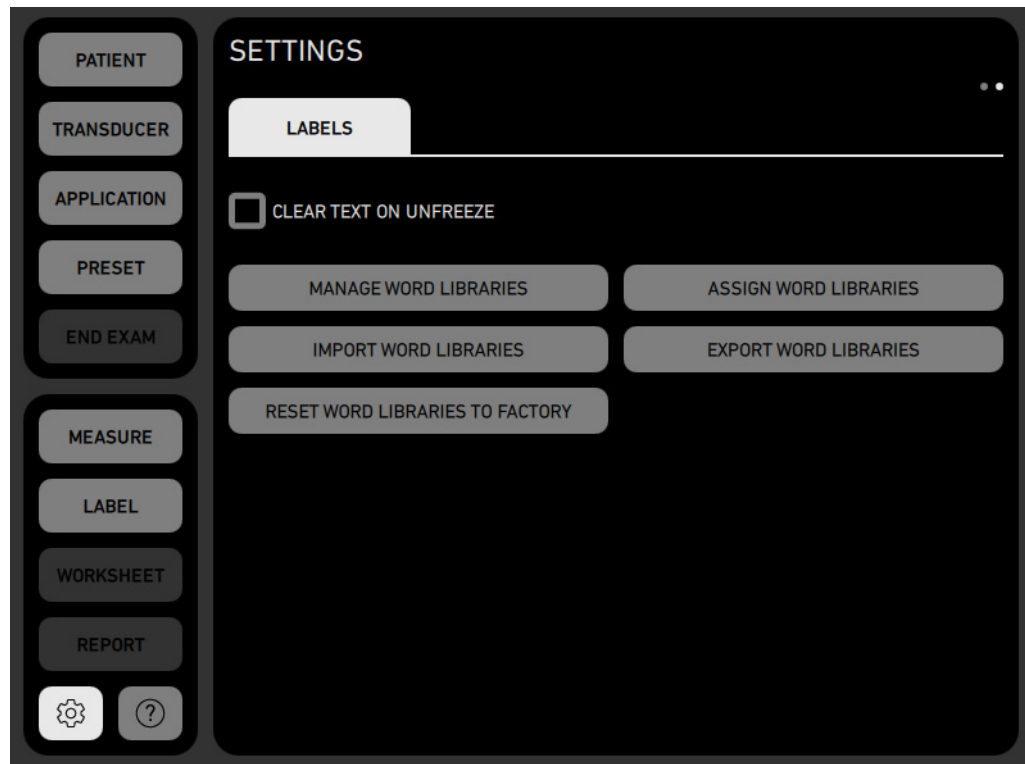
Figure A-55. The Labels Settings tab.

Checkmarking **Clear Text on Unfreeze** will delete all labels from the monitor when the image is no longer frozen.

Word Library Management

A Word Library is a collection of labels for a specific application/preset. You can create new word libraries, assign them to applications and presets, and import or export them. You can also reset the word libraries to factory defaults.

Tap **Manage Word Libraries** to access the Word library management window.

Figure A-56. Word Library Management window. The stars indicate factory-defined libraries.

Here, you can add, edit, copy, rename and delete word libraries.

Add Word Library

1   Make sure that none of the existing libraries are selected on the list.

2   Tap **Add** to add an empty word library.

3   Type the name of the library in the text box (here: Cardiac new):
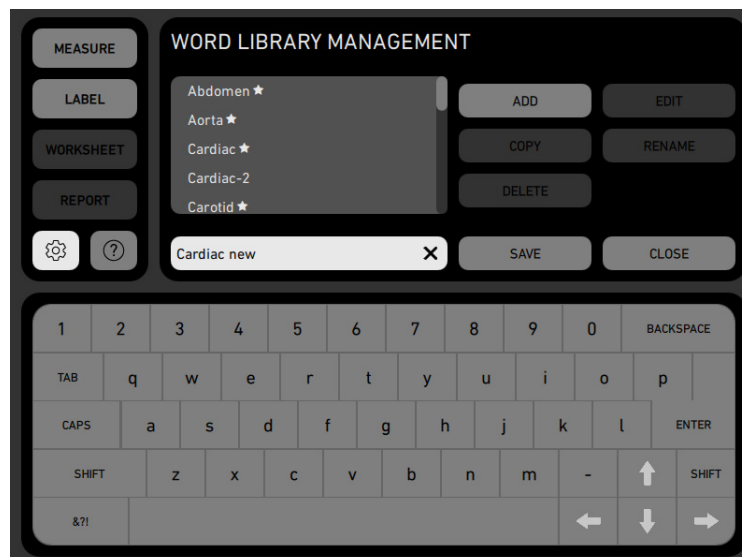
4   Tap **Save** or Enter to add the library.

If an identical library name is already on the list, an error message will tell you that the name already exists, and you will have to edit the name to save the library.

5   The newly added library is selected, so tap **Edit** to add labels to the library.
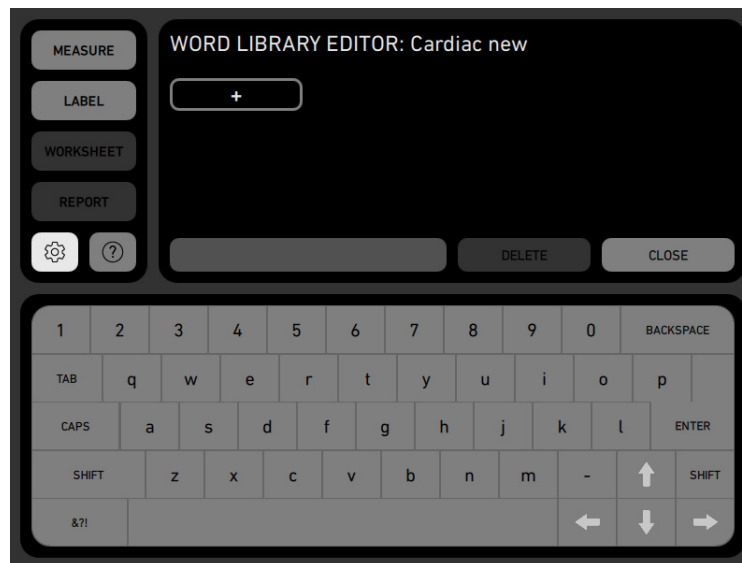
6   Tap the blank label with the plus sign (placeholder) and type in the new label in the text field:
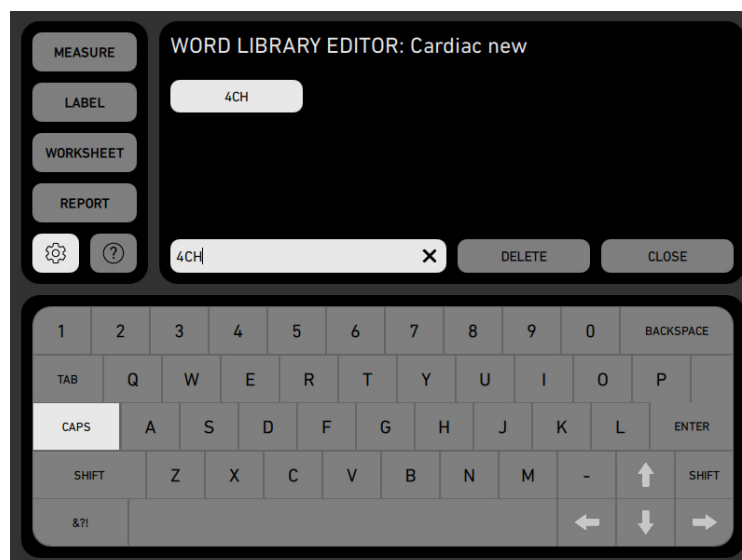
7   Tap Enter to save the label. A new placeholder will be displayed. If the current page is full, the placeholder will be on the next page. Swipe the label area to get to it.

8   When you're done creating labels for your new word library, tap **Close** to return to **Word Library Management**.

9   Tap **Save** on the pop-up message to save your changes:
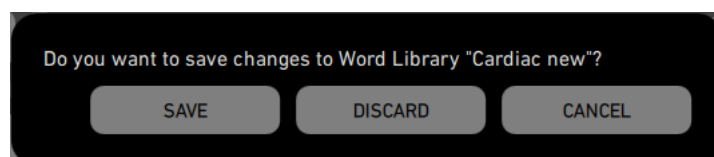
Edit a Word Library

You can edit all word libraries on the list, also the factory-defined libraries. Editing a factory-defined word library creates a user-defined version of the library (with the same name, but without the star) that hides the factory-defined version.

1   Select an existing word library and tap **Edit**. The pre-defined labels in the selected word library will be displayed for editing.
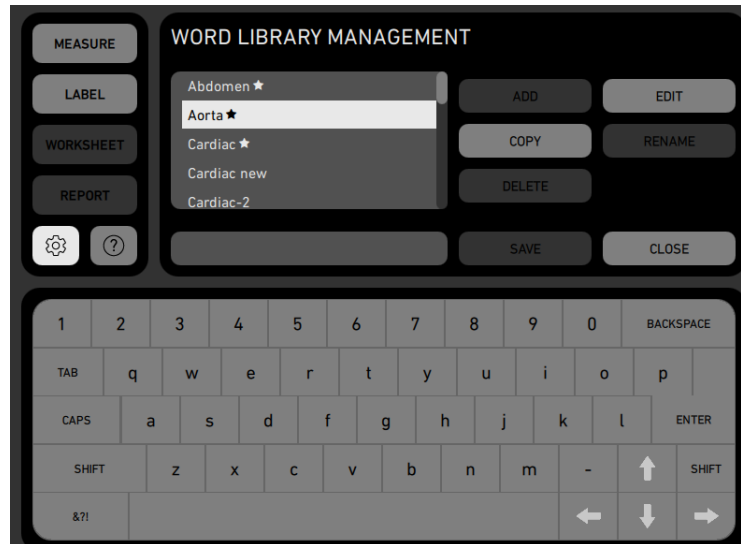
2   Select a pre-defined label. It will appear in the edit text box for editing:

3   Edit the labels you want to change, or add new labels as described above.

4   You can also delete pre-defined labels. Deleting a pre-defined label will turn the label into a placeholder, where you can add a new label.

5   Tap **Close** to return to **Word Library Management**.

6   Tap **Save** on the pop-up message to save your changes:
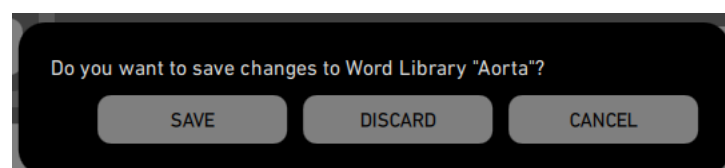
Copy a Word Library

1 Select a word library and tap **Copy**. The copy will have the same name as the original, but with an added version number, here **Cardiac-2**:

2 You can now edit or add to the labels as described above.

Rename a Word Library

You can only rename a user-defined word library. When renaming a word library, any application or preset assigned the original library name is assigned the new library name.

If you have edited a factory-defined word library (for example **Cardiac *,** which then becomes **Cardiac** without a star) and afterwards rename it, the original factory-defined word library (**Cardiac *)** will be unhidden.

1 If you want to rename a user-defined word library, e.g. the **Cardiac-2** library, select it from the list and tap **Rename:**

2 Type in a new name in the text field and tap **Save**.

If an identical library name is already on the list, an error message will tell you that the name already exists, and you will have to edit the name to save the library.

Delete a Word Library

You can only delete user-defined word libraries. Deleting the word library un-hides any factory-defined word library with the same name (and restores the star after the name). Any applications or presets assigned the deleted libraries will be reassigned to the factory-defined libraries.

1 Select a user-defined library and tap **Delete**.

2 Tap **OK** on the pop-up message to confirm:
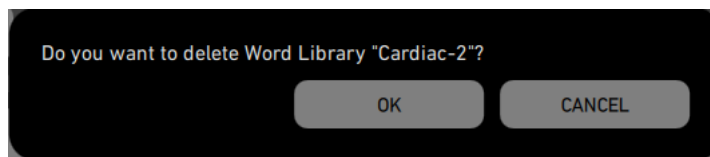
Assign Word Libraries

Every application and preset is assigned a word library. You can see the labels of the word library assigned to the active preset on the **Text** tab of the **Label** window. See "Labels" on page 35.

In **Labels**, tap **Assign Word Libraries** to access the Word Library Assignments window.
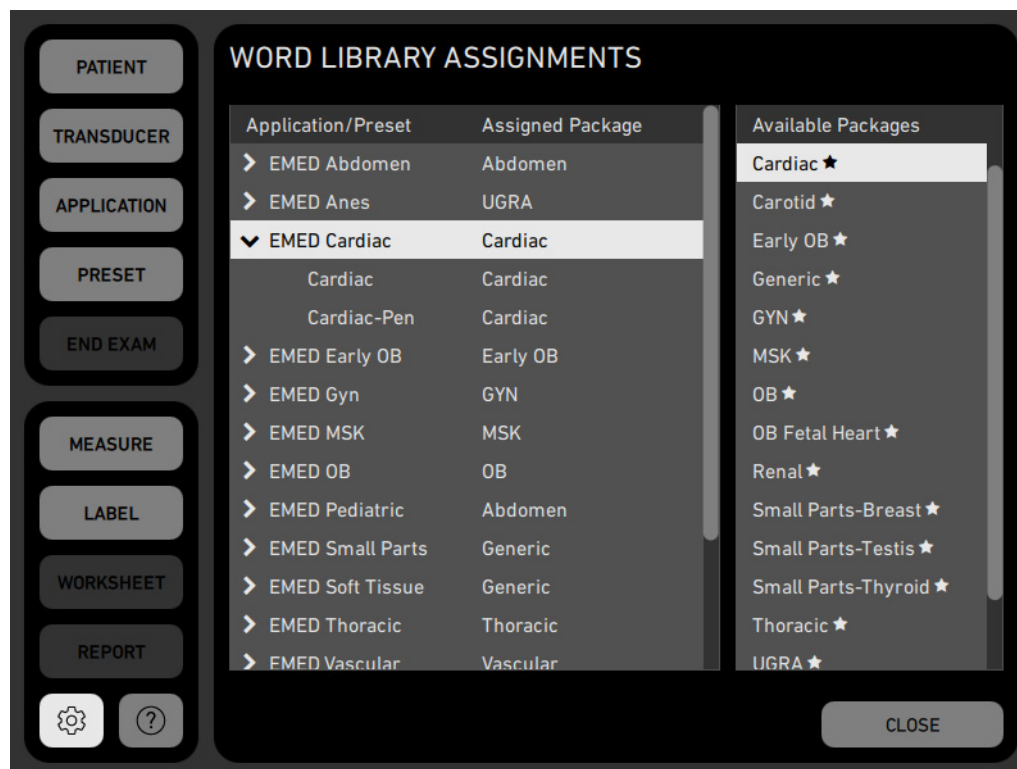
Figure A-57. Word Library Assignments window.

The **Application/Preset** column on the left lists all presets available on the system, grouped by application. The **Assigned Package** column shows the name of the word library assigned to each preset and application. Tap **>** to see the presets of an application. A word library can be assigned at the preset level, or a word library can be assigned to all presets in the Application at the Application level.

The list of **Available Packages** on the right lists all word libraries available on the system. Factory-defined word libraries are marked with a star.

Selecting a word library in the list on the right assigns this library to any selected application or preset in the table on the left. Note that you can always reset the word libraries to factory default by tapping **Reset Word Libraries to Factory** on the **Labels** tab.
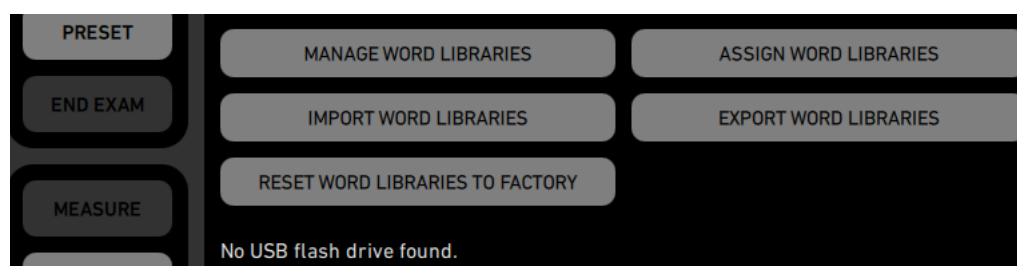
Import Word Libraries

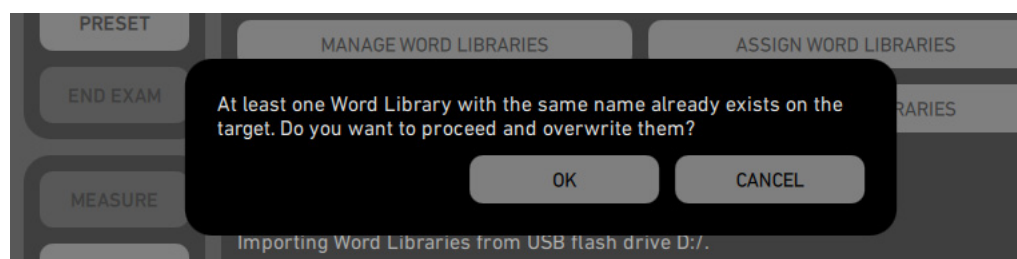Note that all imported word libraries are considered user-defined.

1   In **Labels**, tap **Import Word Libraries**. If the import is successful, you will see this message:
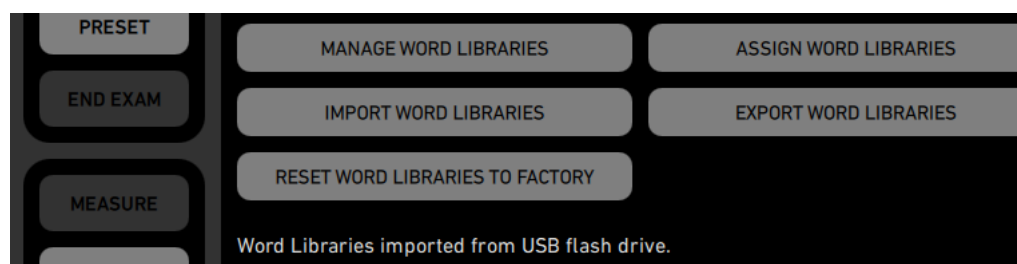
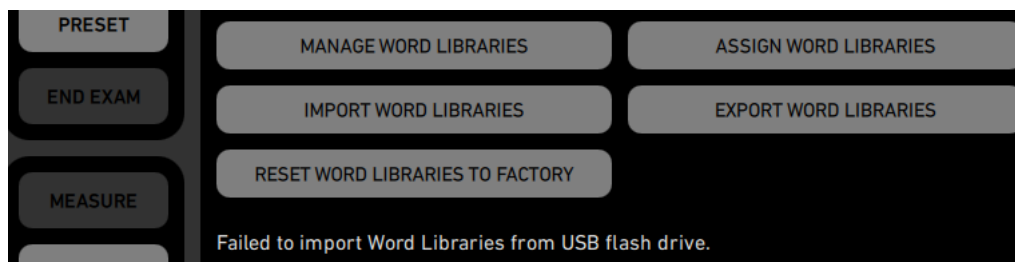However, if there is no USB drive connected to the system, the following message will be displayed:

If any existing word library on the system has the same name as the library being imported, the following pop-up message will be displayed:


Should you decide to import the library anyway, any existing user-defined libraries with the same name is overwritten, and any factory-defined libraries with the same name is hidden by the newly imported library.

If there are no word libraries on the USB drive or the import fails for any reason, the following message is displayed:
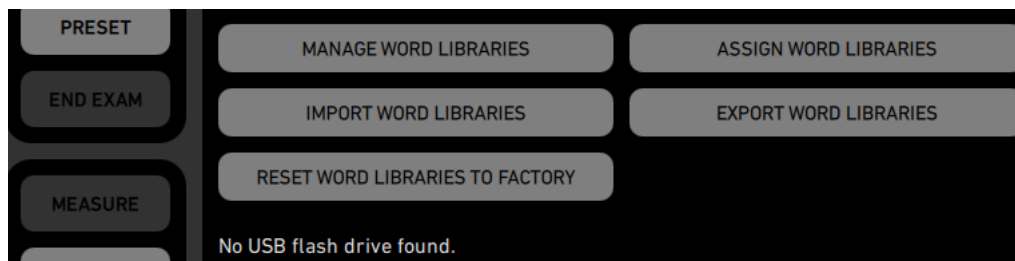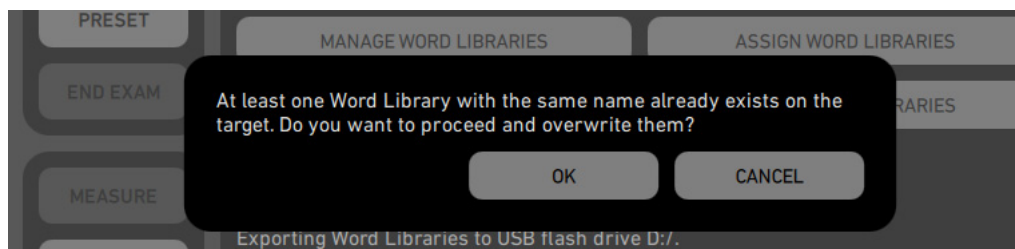

Export Word Libraries

1   In **Labels**, tap **Export Word Libraries**. If the export is successful, you will see this message:
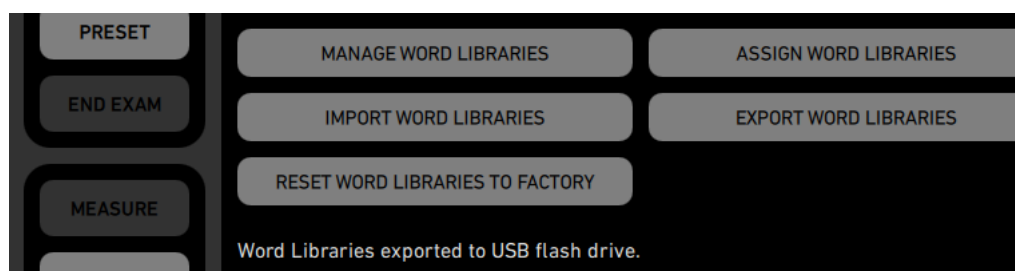
However, if there is no USB drive connected to the system, the following message will be displayed:

If the USB drive already contains word libraries from a previous export and if any of these libraries has the same name as one of the libraries being exported, the following pop-up message will be displayed:

Should you decide to export the library anyway, any existing libraries on the USB drive with the same name is overwritten.
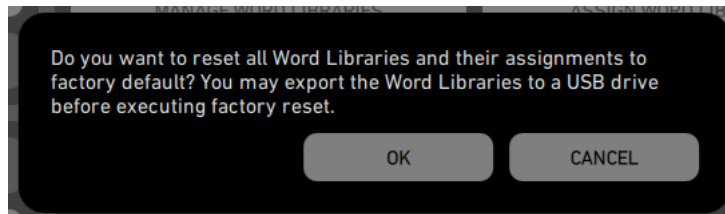
If the export fails for any reason, the following message is displayed:

Reset Word Libraries to Factory

To reset all word libraries to factory default, do the following:

1 Tap **Reset Word Libraries to Factory**.

2 A pop-up message is displayed. You will be asked to confirm and advised to export the user-defined word libraries to a USB drive, before you continue:

3 Tap **OK** to reset the libraries to factory default or **Cancel** to export the user-defined libraries first.

Appendix B
Glossary

This glossary contains explanations of terms and abbreviations that appear in the user guide or on the monitor. Measurements are listed in Appendix C, "Measurement Abbreviations".

Term	Explanation
A/B	Stuart index. PS/ED.
ACI	ACI (Angular Compound Imaging) 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 ACI 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.
Adaptive Speckle Reduction	See ASR.
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 (see the *bk3500 User Guide*).
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.
Angular Compound Imaging	See ACI.
Application	An application package containing presets, measuring tools and calculation formulas.
array transducer	A transducer that consists of a set of transducer elements, each capable of transmitting and receiving ultrasound.
ASR	Adaptive Speckle Reduction. With ASR, an automatic speckle suppression algorithm continuously analyzes the ultrasound image signal. The algorithm is applied to reduce the speckle noise and improve the visualization of tissue structures in the ultrasound image. ASR supports all transducers.
Auto	Available in the Generic Measurement tab as well as the Generic tab in all measurement packages in Doppler mode.
B/A	End Diastole/Peak Systole
baseline	The baseline separates forward flow from reversed flow in Doppler imaging. Moving the axis can help overcome aliasing problems.

Term	Explanation
bodymark	A small anatomical drawing positioned on the image to help identify it in documentation.
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 B-mode image. The color box outlines the area of the tissue in which flow information is available.
color Doppler	See Color mode.
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 B-mode 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 B-mode 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, B+Color, B+Color+Doppler, B+Doppler, B+M-Mode.
DecT	Flow Deceleration Time.

Term	Explanation
depth	With a full B-mode 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**: 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 B-Mode and Doppler. See combination mode.
dynamic range	The number of steps (gray scale change) between black and white.
EDC	Expected date of confinement.
EMC	Electromagnetic compatibility.
Enhanced Tissue Definition	See ETD.
ESD	Electrostatic discharge.
ETD	Enhanced Tissue Definition. With ETD, 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. ETD supports all array transducers.
F1, F2	Frequency at position of marker 1 or 2 (when you make a measurement).
FFT	Fast Fourier Transform. FFT is a method of calculating the Fourier Transform (frequency spectrum) of something that is moving as a function of time. It is used to calculate the spectrum displayed in Doppler mode imaging.
FOI	Field of interest. The area within the B-mode image where resolution and focus are maximal.
freeze	Stop updating the image so an unchanging image is displayed. A snowflake appears on the monitor. **NOTE:** 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 when the image was frozen, not the time when it was printed.
gain	The overall amplification that is applied to ultrasound echoes from all depths.

Term	Explanation
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.
IOP	Intraoperative – during a surgical operation.
label	Text positioned on the image to label it. See page 35.
LC	Length of cycle.
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).
LMP	Last menstrual period. LMP is the abbreviation on reports. The field in the **Patient** window for this information is Last Menst. Date.
MPG	Mean Pressure Gradient.
MPPS	Modality Performed Procedure Steps. If an MPPS server is configured, you can discontinue the current examination. See page 119.
MV All	Mitral valve all points.
NEMA	Association of Electrical and Medical Imaging Equipment Manufacturers (National Electrical Manufacturer's Association)
OB	Obstetrics.
PACS	Picture Archiving and Communications System (DICOM).
pan	Move the image so that different parts of the total scanned image are displayed on the screen.
PE	Previous examination.
PED	Previous examination date.
persistence	Persistence is the amount of time over which B-mode 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.
POI	Point of interest.

Term	Explanation
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.
pulse repetition frequency	The rate at which pulses of ultrasound waves are transmitted and received in PW (pulsed-wave) Doppler imaging.
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.
Sector	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.
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.
screen key	A control on the monitor that looks like a key or button.
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.

Term	Explanation
T-area	Transverse Area.
TEH	True echo harmonics. BK Ultrasound'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 B-Mode, Color and Doppler. See combination mode.
uniform focus	An enhanced focusing method to give full focus in the entire depth of the ultrasound image. This method is only available on selected transducers. Uniform focus can not be adjusted.
voxel	A three-dimensional pixel. A **vo**lume pi**xel**.
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.

Appendix C
Measurement Abbreviations

Generic Measurements

Generic

Measurement	Definition	Results Displayed on Monitor
Dist	Distance	Dist
Ellipse	General Ellipse	Area/Vol
Freehand	General Freehand	Circ/Area
%Stenosis	% Stenosis	Inner/Outer/% Stenosis
L	Length	L
H	Height	H
W	Width	W
Volume	Volume	L/H/W/V

Generic Doppler

Measurement	Definition	Results Displayed on Monitor
Real time	Real-Time	PS/ED/PI/RI/VF
Auto	Auto Doppler Calculations	PS/ED/RI/PI
PI	Pulsativity Index (manual)	PI
HR	Heart Rate	HR(3)
PS	Peak Systole	PS
ED	End Diastole	ED
RI	Resistive Index	PS/ED/RI/ and S/D ratio
S/D Ratio	Systolic to Diastolic ratio	PS/ED/RI/ and S/D ratio
V1	Velocity 1	V1
V2	Velocity 2	V2
V1/V2	Velocity Ratio	V1/V2/Acc and V1/V2 ratio
Acc	Acceleration	V1/V2/Acc and V1/V2 ratio

Measurement	Definition	Results Displayed on Monitor
Vol Flow	Volume Flow (Auto)	VF Area/VF Dia/PS/ED/PI/RI/Vol Flow
TAMX	Time Average Max	TAMX
VTI	Generic Velocity Time Integral	ET/PFV/PG/MPG/VTI

Abbreviated results

Abbreviated Result on Monitor	Abbreviated Result Definition
PS	Peak Systole
ED	End Diastole
PI	Pulsativity Index
RI	Resistive Index
VF	Volume Flow
S/D Ratio	Systolic/Diastolic ratio
Acc	Acceleration time
VF Area	Volume Flow Area
VF Dia	Volume Flow Diameter
Vol Flow	Volume Flow
ET	Ejection Time
PFV	Peak Flow Velocity
PG	Pressure Gradient
MPG	Mean Pressure Gradient
VTI	Velocity Time Integral

Generic M-Mode

Measurement	Definition	Results Displayed on Monitor
Dist	M Distance	Dist
Time	M Delta Time	Time
HR	Heart Rate (M-Mode)	HR(x)
Dia	M Diameter	Dia

Abdomen

Abdomen (B-Mode)

Measurement	Definition	Results Displayed on Monitor
Dist	Distance	Dist
Liver L	Liver Length	Liver L
GB Wall	Gall Bladder Wall	GB Wall
CBD	Common Duct	CBD
Rt Kidney L	Rt Kidney Length	Rt Kidney L
Rt Kidney H	Rt Kidney Height	Rt Kidney H
Rt Kidney W	Rt Kidney Width	Rt Kidney W
Rt Kidney V	Rt Kidney Volume	Rt Kidney V
Lt Kidney L	Lt Kidney Length	Lt Kidney L
Lt Kidney H	Lt Kidney Height	Lt Kidney H
Lt Kidney W	Lt Kidney Width	Lt Kidney W
Lt Kidney V	Lt Kidney Volume	Lt Kidney V
Spleen L	Spleen Length	Spleen L
Spleen H	Spleen Height	Spleen H
Spleen W	Spleen Width	Spleen W
Spleen V	Spleen Volume	Spleen V

Aorta/IVC (B-Mode)

Measurement	Definition	Results Displayed on Monitor
Ao Prox AP	Aorta Prox (AP)	Ao Prox AP

Measurement	Definition	Results Displayed on Monitor
Ao Mid AP	Aorta Mid (AP)	Ao Mid AP
Ao Dist AP	Aorta Distal (AP)	Ao Dist AP
Rt Iliac A AP	Rt Iliac A (AP)	RIliacA AP
Lt Iliac A AP	Lt Iliac A (AP)	LIliacA AP
Ao Prox W	Aorta Prox W	Ao Prox W
Ao Mid W	Aorta Mid W	Ao Mid W
Ao Dist W	Aorta Distal W	Ao Dist W
Rt Iliac A W	Rt Iliac A W	RIliacA W
Lt Iliac A W	Lt Iliac A W	LIliacA W
IVC Dia	Inferior Vena Cava Vessel outside diameter	IVC dia

Right Kidney (B-Mode)

Measurement	Definition	Results Displayed on Monitor
Rt Kidney L	Rt Kidney Length	Rt Kidney L
Rt Kidney H	Rt Kidney Height	Rt Kidney H
Rt Kidney W	Rt Kidney Width	Rt Kidney W
Rt Kidney V	Rt Kidney Volume	Rt Kidney V
Pre Void Bl V	Pre Void Bladder Volume	Pre Void Bl L/Pre Void Bl H/Pre Void Bl W/Pre Void Bl V
Post Void Bl V	Post Void Bladder Volume	PostVoidBl L/PostVoidBl H/PostVoidBl W/PostVoidBl V

Left Kidney (B-Mode)

Measurement	Definition	Results Displayed on Monitor
Lt Kidney L	Lt Kidney Length	Lt Kidney L
Lt Kidney H	Lt Kidney Height	Lt Kidney H
Lt Kidney W	Lt Kidney Width	Lt Kidney W
Lt Kidney V	Lt Kidney Volume	Lt Kidney V
Pre Void Bl V	Pre Void Bladder Volume	Pre Void Bl L/Pre Void Bl H/Pre Void Bl W/Pre Void Bl V
Post Void Bl V	Post Void Bladder Volume	PostVoidBl L/PostVoidBl H/PostVoidBl W/PostVoidBl V

Generic (B-Mode and M-Mode)

All labels and tools from Generic Package, see "Generic Measurements" on page 179.

Abdomen (Doppler)

Measurement	Definition	Results Displayed on Monitor
Ao Prox	Aorta Prox	Ao Prox
Ao Mid	Aorta Mid	Ao Mid
Ao Dist	Aorta Distal	Ao Dist
Rt Iliac A	Rt Iliac Artery	RIliacA
Lt Iliac A	Lt Iliac Artery	LIliacA

Aorta/IVC (Doppler)

Measurement	Definition	Results Displayed on Monitor
Ao Prox	Aorta Prox	Ao Prox
Ao Mid	Aorta Mid	Ao Mid
Ao Dist	Aorta Distal	Ao Dist
Rt Iliac A	Rt Iliac Artery	RIliacA
Lt Iliac A	Lt Iliac Artery	LIliacA

Right Renal (Doppler)

Measurement	Definition	Results Displayed on Monitor
Prox RRA	Right Kidney Prox RRA	ProxRRA
Mid RRA	Right Kidney Mid RRA	MidRRA
Dist RRA	Right Kidney Dist RRA	DistRRA

Left Renal (Doppler)

Measurement	Definition	Results Displayed on Monitor
Prox LRA	Left Kidney Prox RRA	ProxLRA
Mid LRA	Left Kidney Mid RRA	MidLRA
Dist LRA	Left Kidney Dist RRA	DistLRA

Generic (Doppler)

All labels and tools from Generic Package, see "Generic Measurements" on page 179

Carotid

Right Carotid - Doppler

Measurement	Definition	Results Displayed on Monitor
Rt Prox CCA	Right Proximal Common Carotid Artery	RCCAp
Rt Mid CCA	Right Mid Common Carotid Artery	RCCAm
Rt Dist CCA	Right Distal Common Carotid Artery	RCCAd
Rt Bulb	Right Bulb	Rt Bulb
Rt Prox ICA	Right Proximal Internal Carotid	RICAp
Rt Mid ICA	Right Mid Internal Carotid Artery	RICAm
Rt Dist ICA	Right Distal Internal Carotid Artery	RICAd
Rt ECA	Right External Carotid Artery	Rt ECA
Rt Vertebral A	Right Vertebral Artery	RVertA
Rt Subclav A	Right Subclavian Artery	RSClavA

Left Carotid - Doppler

Measurement	Definition	Results Displayed on Monitor
Lt Prox CCA	Left Proximal Common Carotid Artery	LCCAp
Lt Mid CCA	Left Mid Common Carotid Artery	LCCAm
Lt Dist CCA	Left Distal Common Carotid Artery	LCCAd
Lt Bulb	Left Bulb	Lt Bulb
Lt Prox ICA	Left Proximal Internal Carotid Artery	LICAp
Lt Mid ICA	Left Mid Internal Carotid Artery	LICAm
Lt Dist ICA	Left Distal Internal Carotid Artery	LICAd
Lt ECA	Left External Carotid Artery	Lt ECA
Lt Vertebral A	Left Vertebral Artery	LVertA
Lt Subclav A	Left Subclavian Artery	LSClavA

Generic

All labels and tools from Generic Package, see "Generic Measurements" on page 179

OB

OB

Measurement	Definition	Author(s)	Results Displayed on Monitor
BPD	Biparietal Diameter	BPD - Hansmann	BPD / GA / EDC
		BPD - Tokyo	BPD / GA / EDC
		BPD - Robinson	BPD / GA / EDC
		BPD - Kurtz	BPD / GA / EDC
		BPD - Hobbins	BPD / GA / EDC
		BPD - Hadlock	BPD / GA / EDC
		BPD - Campbell	BPD / GA / EDC
		BPD - Jeanty	BPD / GA / EDC
		BPD - Eik-Nes	BPD / GA / EDC
		BPD - Persson	BPD / GA / EDC
		BPD - DSOG	BPD / GA / EDC
OFD	Occipito-frontal Diameter	OFD - Hansmann	OFD / GA / EDC
HC	Head Circumference	HC - Hansmann	HC / GA / EDC
		HC - Hadlock	HC / GA / EDC
		HC - Campbell	HC / GA / EDC
AC	Abdominal Circumference	AC - Hadlock	AC / GA / EDC
		AC - Campbell	AC / GA / EDC
		AC - Jeanty	AC / GA / EDC
AD	Abdominal Diameter	AD - Persson (AC)	AD / GA / EDC
		AD - Persson (APD + ATD)	AD / GA / EDC
FL	Femur Length	FL - Hansmann	FL /GA / EDC
		FL - Tokyo	FL /GA / EDC
		FL - Hadlock	FL /GA / EDC
		FL - Campbell	FL /GA / EDC
		FL - Persson	FL /GA / EDC
		FL - DSOG	FL /GA / EDC
Dist	Distance	N/A	Dist

Measurement	Definition	Author(s)	Results Displayed on Monitor
Cervix L	Distance	N/A	Cervix L

Advanced OB

Measurement	Definition	Results Displayed on Monitor
Tibia	Tibia	Tibia
Fibula	Fibula	Fibula
Foot	Foot	Foot
Lat Vent	Lateral Ventricle	Lat Vent
Cerebellum	Cerebellum	Cerebell
Nuchal Thick	Nuchal Fold Thickness	Nuchal Th
Humerus	Humerus	Humerus
Radius	Radius	Radius
Ulna	Ulna	Ulna
Binoc D	Binocular Distance	Binoc D
Clav	Clavicle	Clav

AFI

Measurement	Definition	Results Displayed on Monitor
LUQ - AFI	Left Upper Quadrant Amniotic Fluid Index	LUQ - AFI
LLQ - AFI	Left Lower Quadrant Amniotic Fluid Index	LLQ - AFI
RUQ - AFI	Right Upper Quadrant Amniotic Fluid Index	RUQ - AFI
RLQ - AFI	Right Lower Quadrant Amniotic Fluid Index	RLQ - AFI

Early OB

Measurement	Definition	Author(s)	Results Displayed on Monitor
GS	GS Mean Sac Diameter	GS - Hansmann	GS / GA / EDC
		GS - Tokyo	GS / GA / EDC
		GS - Hellman	GS / GA / EDC

Measurement	Definition	Author(s)	Results Displayed on Monitor
CRL	Crown Rump Length	CRL - Hansmann	CRL / GA / EDC
		CRL - Tokyo	CRL / GA / EDC
		CRL - Robinson	CRL / GA / EDC
		CRL - Hobbins	CRL / GA / EDC
		CRL - Hadlock	CRL / GA / EDC
		CRL - Campbell	CRL / GA / EDC
		CRL - Jeanty	CRL / GA / EDC
		CRL - DSOG	CRL / GA / EDC
		CRL - Persson	CRL / GA / EDC
BPD	Biparietal Diameter	BPD - Hansmann	BPD / GA / EDC
		BPD - Tokyo	BPD / GA / EDC
		BPD - Robinson	BPD / GA / EDC
		BPD - Kurtz	BPD / GA / EDC
		BPD - Hobbins	BPD / GA / EDC
		BPD - Hadlock	BPD / GA / EDC
		BPD - Campbell	BPD / GA / EDC
		BPD - Jeanty	BPD / GA / EDC
		BPD - Eik-Nes	BPD / GA / EDC
		BPD - Persson	BPD / GA / EDC
		BPD - DSOG	BPD / GA / EDC
Dist	Distance	N/A	Dist
Cervix L	Distance	N/A	Cervix L

Estimated Fetal Weight

Measurement	Definition	Author(s)	Results Displayed on Monitor
EFW	Estimated Fetal Weight - a calculated measurement based on user settings	FW-Warsof (AC,BPD)	N/A
		FW-Eik-Nes (BPD,ATD)	N/A
		FW-Hadlock (AC,FL)	N/A
		FW-Hadlock (AC,FL,BPD)	N/A
		FW-Shepard (AC,BPD)	N/A
		FW-Campbell (AC)	N/A
		FW-Persson (BPD,AD)	N/A
		FW-Persson (BPD,AD,FL)	N/A
		FW-DSOG (BPD,AD)	N/A
		FW-DSOG (BPD,AD,FL)	N/A

Maternal Doppler

Measurement	Definition	Results Displayed on Monitor
Lt Uterine A	Left Maternal Uterine Artery	L UterA Ps
		L UterA Ed
		L UterA RI
		L UterA S/D
Rt Uterine A	Right Maternal Uterine Artery	R UterA Ps
		R UterA Ed
		R UterA RI
		R UterA S/D

Measurement	Definition	Results Displayed on Monitor
Lt Ovarian A	Left Maternal Ovarian Artery	L OvarA Ps
		L OvarA Ed
		L OvarA RI
		L OvarA S/D
Rt Ovarian A	Right Maternal Ovarian Artery	R OvarA Ps
		R OvarA Ed
		R OvarA RI
		R OvarA S/D

Fetal Doppler

Measurement	Definition	Results Displayed on Monitor
Umb A	Umbilical Artery	Umb A Ps
		Umb A Ed
		Umb A RI
		Umb A S/D
FH	Fetal Heart Rate	FH(x)
FH	Fetal Heart Rate (M-Mode)	FH(x)

Generic

All labels and Tools from Generic Package, see "Generic Measurements" on page 179

Early OB

Early OB

Measurement	Definition	Author(s)	Results Displayed on Monitor
GS	GS Mean Sac Diameter	GS - Hansmann	GS / GA / EDC
		GS - Tokyo	GS / GA / EDC
		GS - Hellman	GS / GA / EDC
CRL	Crown Rump Length	CRL - Hansmann	CRL / GA / EDC
		CRL - Tokyo	CRL / GA / EDC
		CRL - Robinson	CRL / GA / EDC
		CRL - Hobbins	CRL / GA / EDC
		CRL - Hadlock	CRL / GA / EDC
		CRL - Campbell	CRL / GA / EDC
		CRL - Jeanty	CRL / GA / EDC
		CRL - DSOG	CRL / GA / EDC
		CRL - Persson	CRL / GA / EDC
BPD	Biparietal Diameter	BPD - Hansmann	BPD / GA / EDC
		BPD - Tokyo	BPD / GA / EDC
		BPD - Robinson	BPD / GA / EDC
		BPD - Kurtz	BPD / GA / EDC
		BPD - Hobbins	BPD / GA / EDC
		BPD - Hadlock	BPD / GA / EDC
		BPD - Campbell	BPD / GA / EDC
		BPD - Jeanty	BPD / GA / EDC
		BPD - Eik-Nes	BPD / GA / EDC
		BPD - Persson	BPD / GA / EDC
		BPD - DSOG	BPD / GA / EDC
Dist	Distance	N/A	Cervix L
Cervix L	Distance	N/A	Dist

Right Ovary

Measurement	Definition	Results Displayed on Monitor
Rt Ovary L	R Ovary Length	Rt Ovary L
Rt Ovary W	R Ovary Width	Rt Ovary W
Rt Ovary H	R Ovary Height	Rt Ovary H
Rt Ovary V	R Ovary Volume	Rt Ovary V

Rt Ovary Doppler

Measurement	Definition	Results Displayed on Monitor
Rt Ovarian A	Right Maternal Ovarian Artery	R OvarA Ps
		R OvarA Ed
		R OvarA RI
		R OvarA S/D

Left Ovary

Measurement	Definition	Results Displayed on Monitor
Lt Ovary L	L Ovary Length	Lt Ovary L
Lt Ovary W	L Ovary Width	Lt Ovary W
Lt Ovary H	L Ovary Height	Lt Ovary H
Lt Ovary V	L Ovary Volume	Lt Ovary V

Lt Ovary Doppler

Measurement	Definition	Results Displayed on Monitor
Lt Ovarian A	Left Maternal Ovarian Artery	L OvarA Ps
		L OvarA Ed
		L OvarA RI
		L OvarA S/D

Uterus

Measurement	Definition	Results Displayed on Monitor
Uterus L	Uterus Length	Uterus L
Uterus W	Uterus Width	Uterus W
Uterus H	Uterus Height	Uterus H
Uterus V	Uterus Volume	Uterus V

Uterus Doppler

Measurement	Definition	Results Displayed on Monitor
PIUA	Pulsativity Index Uterine Artery (manual)	PIUA
Lt Uterine A	Left Maternal Uterine Artery	L UterA Ps
		L UterA Ed
		L UterA RI
		L UterA S/D
Rt Uterine A	Right Maternal Uterine Artery	R UterA Ps
		R UterA Ed
		R UterA RI
		R UterA S/D

OB

Measurement	Definition	Author(s)	Results Displayed on Monitor
BPD	Biparietal Diameter	BPD - Hansmann	BPD / GA / EDC
		BPD - Tokyo	BPD / GA / EDC
		BPD - Robinson	BPD / GA / EDC
		BPD - Kurtz	BPD / GA / EDC
		BPD - Hobbins	BPD / GA / EDC
		BPD - Hadlock	BPD / GA / EDC
		BPD - Campbell	BPD / GA / EDC
		BPD - Jeanty	BPD / GA / EDC
		BPD - Eik-Nes	BPD / GA / EDC
		BPD - Persson	BPD / GA / EDC
		BPD - DSOG	BPD / GA / EDC
OFD	Occipito-frontal Diameter	OFD - Hansmann	OFD / GA / EDC
HC	Head Circumference	HC - Hansmann	HC / GA / EDC
		HC - Hadlock	HC / GA / EDC
		HC - Campbell	HC / GA / EDC
AC	Abdominal Circumference	AC - Hadlock	AC / GA / EDC
		AC - Campbell	AC / GA / EDC
		AC - Jeanty	AC / GA / EDC
AD	Abdominal Diameter	AD - Persson (AC)	AD / GA / EDC
		AD - Persson (APD + ATD)	AD / GA / EDC
FL	Femur Length	FL - Hansmann	FL / GA / EDC
		FL - Tokyo	FL / GA / EDC
		FL - Hadlock	FL / GA / EDC
		FL - Campbell	FL / GA / EDC
		FL - Persson	FL / GA / EDC
		FL - DSOG	FL / GA / EDC
Dist	Distance	N/A	
Cervix L	Distance	N/A	

Fetal Doppler

Measurement	Definition	Author(s)	Results Displayed on Monitor
Umb A	Umbilical Artery	N/A	Umb A Ps
			Umb A Ed
			Umb A RI
			Umb A S/D
FH	Fetal Heart Rate	N/A	FH(x)
FH	Fetal Heart Rate (M-Mode)	N/A	FH(x)

Generic

All labels and tools from Generic Package, see "Generic Measurements" on page 179.

Gyne

Uterus (B-Mode)

Measurement	Definition	Results Displayed on Monitor
Dist	Distance	Dist
Uterus L	Uterine Length	Uterus L
Uterus W	Uterine Width	Uterus W
Uterus H	Uterine Height	Uterus H
Uterus V	Uterine Volume	Uterus V
Endom	Endometrial Thickness	Endom

Right Ovary (B-Mode)

Measurement	Definition	Results Displayed on Monitor
Dist	Distance	Dist
Rt Ovary L	R Ovary Length	Rt Ovary L
Rt Ovary W	R Ovary Width	Rt Ovary W
Rt Ovary H	R Ovary Height	Rt Ovary H
Rt Ovary V	R Ovary Volume	Rt Ovary V

Left Ovary (B-Mode)

Measurement	Definition	Results Displayed on Monitor
Dist	Distance	Dist
Lt Ovary L	L Ovary Length	Lt Ovary L
Lt Ovary W	L Ovary Width	Lt Ovary W
Lt Ovary H	L Ovary Height	Lt Ovary H
Lt Ovary V	L Ovary Volume	Lt Ovary V

Bladder (B-Mode)

Measurement	Definition	Results Displayed on Monitor
Pre Void Bl V	Pre Void Bladder Volume	Pre Void Bl L/Pre Void Bl H/Pre Void Bl W/Pre Void Bl V
Post Void Bl V	Post Void Bladder Volume	PostVoidBl L/PostVoidBl H/PostVoidBl W/PostVoidBl V
Dist	Distance	Dist

Generic (B-mode and M-Mode)

All labels and tools from Generic Package, see "Generic Measurements" on page 179.

Uterus (Doppler)

Measurement	Definition	Results Displayed on Monitor
Rt Uterine A	Right Maternal Uterine Artery	R UterA
Lt Uterine A	Left Maternal Uterine Artery	L UterA

Rt Ovary (Doppler)

Measurement	Definition	Results Displayed on Monitor
Rt Ovarian A	Right Maternal Ovarian Artery	R OvarA

Lt Ovary (Doppler)

Measurement	Definition	Results Displayed on Monitor
Lt Ovarian A	Left Maternal Ovarian Artery	L OvarA

Generic (Doppler)

All labels and tools from Generic Package, see "Generic Measurements" on page 179

Vascular

Vascular (B-Mode)

Measurement	Definition	Results Displayed on Monitor
% ST Dist	% Stenosis Distance	Outer/Inner/%ST Distance
% ST Freehand	% Stenosis Freehand	Outer/Inner/%ST Freehand
% ST Ellipse	% Stenosis Ellipse	Outer/Inner/%ST Ellipse

Generic (B-Mode, M-Mode and Doppler)

All labels and tools from Generic Package, see "Generic Measurements" on page 179.

Cardiac

LV / LA (B-Mode)

Measurement	Definition	Results Displayed on Monitor
LV(4)	Left Ventricle (4)	IVSd / LVDd / LVPWd / LVDs / EdV / LVM / FS / EF /SV
LV(6)	Left Ventricle all	IVSd / LVDd / LVPWd / IVSs / LVDs / LVPWs / EdV / EsV / LVM / FS / SV / EF

Measurement	Definition	Results Displayed on Monitor
LV EdV SP	LV End Diastolic Volume Single Planar using Simpsons MOD	LVSPMOD EsV / LVSPMOD EdV / LVSPMOD SV / LVSPMOD EF
LV EsV SP	LV End Systolic Volume Single Planar using Simpsons MOD	LVSPMOD EsV / LVSPMOD EdV / LVSPMOD SV / LVSPMOD EF
LV EdV SP	LV End Diastolic Volume Single Planar using A/L (Modified Simpson)	LVSPA/L EsV / LVSPA/L EdV / LVSPA/L SV / LVSPA/L EF
LV EsV SP	LV End Systolic Volume Single Planar using A/L (Modified Simpson)	LVSPA/L EsV / LVSPA/L EdV / LVSPA/L SV / LVSPA/L EF
LVOT diameter s	Left Ventricular Outflow Tract Diameter, systole	LVOTDs
Cardiac Output	CO Dop Proc	LVOTDs/AV ET / LVOT VTI / HR / SV /CO Dop
LA EdV	Left Atrium End Diastolic Volume using A/L (Modified Simpson)	LA A/L EdV
LA EsV	Left Atrium End Systolic Volume using A/L (Modified Simpson)	LA A/L EsV
LA diameter s	Left Atrium Dimension- systole	LA dia s

RV / RA (B-Mode)

Measurement	Definition	Results Displayed on Monitor
RA EdV	Right Atrium End Diastolic Volume using A/L(Modified Simpson)	RA A/L EdV
RA EsV	Right Atrium End Systolic Volume using A/L(Modified Simpson)	RA A/L EsV
RVOT diameter s	Right Ventricular Outflow Tract Diameter- systole	RVOTDs
RVOT diameter d	Right Ventricular Outflow Tract Diameter, diastole	RVOTDd

Ao / IVC (B-Mode)

Measurement	Definition	Results Displayed on Monitor
IVC diameter	Inferior Vena Cava Vessel outside diameter	IVC dia
AO diameter d	Aortic Root Dimension, diastole	AO dia d
AO diameter s	Aortic Root Dimension, systole	AO dia s

LV / RV (M-Mode)

Measurement	Definition	Results Displayed on Monitor
LV (4)	LV (4)	IVSd / LVDd / LVPWd / LVDs
LV (6)	LV All	IVSd / LVDd / LVPWd / IVSs / LVDs / LVPWs
HR	Heart Rate M-Mode	HR(3)
IVS diastole	Interventricular Septum Thickness, diastole (M-mode)	IVS diastole
LVD diastole	Left Ventricular Internal Diameter, diastole (M-mode)	LVD diastole
LVPW diastole	Left Ventricular Posterior Wall Thickness, diastole (M-mode)	LVPW diastole
IVS systole	Interventricular Septal Thickness, systole (M-mode)	IVS systole
LVD systole	Left Ventricular Internal diameter, systole (M-mode)	LVD systole

Measurement	Definition	Results Displayed on Monitor
LVPW systole	Left Ventricular Posterior Wall Thickness, systole (M-mode)	LVPW systole

LA /AO / IVC M-Mode

Measurement	Definition	Results Displayed on Monitor
AO diameter d	Aortic Root Dimension, diastole	AO dia d
LA diameter s	Left Atrium Medial-Lateral Diameter, systole	LA dia s
LAs/AOd	LADs/AOd Ratio	LAs/AOd
HR	Heart Rate (M-Mode)	HR(x)

FATE (M-Mode)

Measurement	Definition	Results Displayed on Monitor
LV (4)	LV (4)	IVSd / LVDd / LVPWd / LVDs
LV (6)	LV All	IVSd / LVDd / LVPWd / IVSs / LVDs / LVPWs
MSS	Mitral Septal Separation	MSS
MAPSE	Mitral Annular Plane Systolic Excursion	MAPSE
TAPSE	Tricuspid Annular Plane Systolic Excursion	TAPSE
HR	Heart Rate (M-Mode)	HR(x)

Valves (M-Mode)

Measurement	Definition	Results Displayed on Monitor
MSS	Mitral Septal Separation	MSS
MAPSE	Mitral Annular Plane Systolic Excursion	MAPSE
TAPSE	Tricuspid Annular Plane Systolic Excursion	TAPSE
HR	Heart Rate (M-Mode)	HR(x)

LV / RV (Doppler)

Measurement	Definition	Results Displayed on Monitor
LVOT VTI	Velocity Time Integral Left Ventricle Outflow Tract	AV ET / LVOT VTI
LVOT PEAK	Left Ventricle Outflow Tract Peak Flow Velocity	LVOT PFV
Cardiac Output	CO Doppler	AV ET / LVOT VT I/ HR(x)
HR	Heart Rate	HR(x)
RVSP	Right Ventricle Systolic Pressure	RVSP RAp TR PkV

AV / MV (Doppler)

Measurement	Definition	Results Displayed on Monitor
LVOT VTI	Velocity Time Integral Left Ventricle Outflow Tract	AV ET / LVOT VTI
AV ET	Ejection Time Aortic Valve	AV ET
AV peak	Peak Flow Velocity Aortic Valve (Point)	AV PFV / PG
MV peak	Peak Flow Velocity Mital Valve (Point)	MV PFV / PG
HR	Heart Rate	HR(x)

PV / TV (Doppler)

Measurement	Definition	Results Displayed on Monitor
PV peak	Peak Flow Velocity Pulmonic Valve (Point)	PV PFV / PG
RVSP	Right Ventricle Systolic Pressure	RVSP RAp TR PkV
TV peak	Peak Flow Velocity Tricuspid Valve (Point)	TV PFV / PG
HR	Heart Rate	HR(x)

Generic Doppler

All labels and tools from Generic Package, see "Generic Measurements" on page 179.

Abbreviated Results

Abbreviated Result on Monitor	Abbreviated Result Definition
IVSd	Interventricular Septum diastole
LVDd	Left Ventricle Diameter diastole
LVPWd	Left Ventricle Posterior Wall diastole
IVSs	Interventricular Septum systole
LVDs	Left Ventricle Diameter systole
LVPWs	Left Ventricle Posterior Wall systole
EdV	End diastolic Volume
EsV	End systolic Volume
LVM	Left Ventricular Mass
FS	Fractional Shortening
EF	Ejection Fraction
SV	Stroke Volume
SI	Stroke Index
BSA	Body Surface Area
LVLd	Left Ventricle Length diastole
LVAd	Left Ventricle Area diastole
LVLs	Left Ventricle Length systole
LVAs	Left Ventricle Area systole
RVSP	Right Ventricle Systolic Pressure
RAp	Right Atrium Peak
TR	Tricuspid Regurg
PkV	Peak Velocity
CO Dop	Cardiac Output Doppler

LVSPMOD	Left Ventricle Single Plane Method of Disc
LVSPA/L	Left Ventricle Single Plane Area/Length

Abbreviated Result on Monitor	Abbreviated Result Definition
LA A/L EdV	Left Atrium Area/Length End diastole Volume
LV4CMOD	Left Ventricle Four Chamber Method of Disc
LV2CMOD	Left Ventricle Two Chamber Method of Disc
LVBPMOD	Left Ventricle Biplane Method of Disc
LV4CA/L	Left Ventricle Four Chamber Area/Length
LV2CA/L	Left Ventricle Two Chamber Area/Length
LVBPA/L	Left Ventricle Biplane Area/Length

Cardiac Advanced

LV / LA (B-Mode)

Measurement	Definition	Results Displayed on Monitor
LV(4)	Left Ventricle (4)	IVSd / LVDd / LVPWd / LVDs /EdV/LVM/FS/EF/SV
LV(6)	Left Ventricle all	IVSd / LVDd / LVPWd / IVSs / LVDs / LVPWs / EdV / EsV / LVM / FS / SV / EF
LVOT diameter s	Left Ventricular Outflow Tract Diameter, systole	LVOTDs
Cardiac Output	CO Dop Proc	LVOTDs/ AV ET / LVOT VTI /HR/SV/CO Dop
LV 4C EdV	Left Ventricular 4 Chamber End Diastolic Volume using Simpsons MOD	LV4CMOD EdV/ LV4CMOD EsV/ LV4CMOD SV/ LV4CMOD EF/ LV2CMOD EdV/ LVBPMOD EdV/ LV2CMOD EsV/ LVBPMOD EsV/ LV2CMOD SV/ LV2CMOD EF/ LVBPMOD SV/ LVBPMOD EF
LV 4C EsV	Left Ventricular 4 Chamber End Systolic Volume using Simpsons MOD	LV4CMOD EdV/ LV4CMOD EsV/ LV4CMOD SV/ LV4CMOD EF/ LV2CMOD EdV/ LVBPMOD EdV/ LV2CMOD EsV/ LVBPMOD EsV/ LV2CMOD SV/ LV2CMOD EF/ LVBPMOD SV/ LVBPMOD EF
LV 2C EdV	Left Ventricular 2 Chamber End Diastolic Volume using Simpsons MOD	LV4CMOD EdV/ LV4CMOD EsV/ LV4CMOD SV/ LV4CMOD EF/ LV2CMOD EdV/ LVBPMOD EdV/ LV2CMOD EsV/ LVBPMOD EsV / LV2CMOD SV/ LV2CMOD EF/ LVBPMOD SV/ LVBPMOD EF
LV 2C EsV	Left Ventricular 2 Chamber End Systolic volume using Simpsons MOD	LV4CMOD EdV/ LV4CMOD EsV/ LV4CMOD SV/ LV4CMOD EF/ LV2CMOD EdV/ LVBPMOD EdV/ LV2CMOD EsV/ LVBPMOD EsV/ LV2CMOD SV/ LV2CMOD EF/ LVBPMOD SV/ LVBPMOD EF
LV 4C EdV	Left Ventricular 4 Chamber End Diastolic Volume using A/L Modified Simpsons	LV4CA/L EdV/ LV4CA/L EsV/ LV4CA/L SV/ LV4CA/L EF/ LV2CA/L EdV/ LVBPA/L EdV/ LV2CA/L EsV/ LVBPA/L EsV/ LV2CA/L SV /LV2CA/L EF/ LVBPA/L SV/ LVBPA/L EF

Measurement	Definition	Results Displayed on Monitor
LV 4C EsV	Left Ventricular 4 Chamber End Systolic Volume using A/L Modified Simpsons	LV4CA/L EdV/ LV4CA/L EsV/ LV4CA/L SV/ LV4CA/L EF/ LV2CA/L EdV/ LVBPA/L EdV/ LV2CA/L EsV/ LVBPA/L EsV/ LV2CA/L SV/ LV2CA/L EF/ LVBPA/L SV/ LVBPA/L EF
LV 2C EdV	Left Ventricular 2 Chamber End Diastolic Volume using A/L Modified Simpsons	LV4CA/L EdV/ LV4CA/L EsV/ LV4CA/L SV/ LV4CA/L EF/ LV2CA/L EdV/ LVBPA/L EdV/ LV2CA/L EsV/LVBPA/ L EsV/LV2CA/L SV/ LV2CA/L EF /LVBPA/L SV /LVBPA/L EF
LV 2C EsV	Left Ventricular 2 Chamber End systolic Volume using A/L Modified Simpsons	LV4CA/L EdV/ LV4CA/L EsV/ LV4CA/L SV/ LV4CA/L EF/ LV2CA/L EdV/ LVBPA/L EdV/ LV2CA/L EsV/ LVBPA/L EsV/ LV2CA/L SV/ LV2CA/L EF /LVBPA/L SV/ LVBPA/L EF
LA EdV	Left Atrium End Diastolic Volume using Simpsons MOD	LA MOD EdV
LA EsV	Left Atrium End Systolic Volume using Simpsons MOD	LA MOD EsV
LA EdV	Left Atrium End Diastolic Volume using A/L(Modified Simpson)	LA A/L EdV
LA EsV	Left Atrium End Systolic Volume using A/L(Modified Simpson)	LA A/L EsV
LA diameter s	Left Atrium Dimension- systole	LA dia s

RV / RA (B-Mode)

Measurement	Definition	Results Displayed on Monitor
RA EdV	Right Atrium End Diastolic Volume using A/L(Modified Simpson)	RA A/L EdV
RA EsV	Right Atrium End Systolic Volume using A/L(Modified Simpson)	RA A/L EsV
RVOT diameter s	Right Ventricular Outflow Tract Diameter- systole	RVOTDs
RVOT diameter d	Right Ventricular Outflow Tract Diameter, diastole	RVOTDd

Ao / IVC (B-Mode)

Measurement	Definition	Results Displayed on Monitor
IVC diameter	Inferior Vena Cava Vessel outside diameter	IVC dia
AO diameter d	Aortic Root Dimension, diastole	AO dia d
AO diameter s	Aortic Root Dimension, systole	AO dia s

LV / RV (M-Mode)

Measurement	Definition	Results Displayed on Monitor
LV (4)	LV (4)	IVSd / LVDd / LVPWd / LVDs
LV (6)	LV All	IVSd / LVDd / LVPWd / IVSs / LVDs / LVPWs
HR	Heart Rate M-Mode	HR(3)
IVS diastole	Intrventricular Septum Thickness, diastole (M-mode)	IVS diastole
LVD diastole	Left Ventricular Internal Diameter, diastole (M-mode)	LVD diastole
LVPW diastole	Left Venticular Posterior Wall Thickness, diastole (M-mode)	LVPW diastole
IVS systole	Interventiricular Septal Thickness, systole (M-mode)	IVS systole
LVD systole	Left Venticular Internal diameter, systole (M-mode)	LVD systole

Measurement	Definition	Results Displayed on Monitor
LVPW systole	Left Venticular Posterior Wall Thickness, systole (M-mode)	LVPW systole

Measurement	Definition	Results Displayed on Monitor
AO diameter d	Aortic Root Dimension, diastole	AO dia d
LA diameter s	Left Atrium Medial-Lateral Diameter, systole	LA dia s
LAs/AOd	LADs/AOd Ratio	LAs/ADd
HR	Heart Rate (M-Mode)	HR(x)

FATE (M-Mode)

Measurement	Definition	Results Displayed on Monitor
LV (4)	LV (4)	IVSd / LVDd / LVPWd / LVDs
LV (6)	LV All	IVSd / LVDd / LVPWd / IVSs / LVDs / LVPWs
MSS	Mitral Septal Separation	MSS
MAPSE	Mitral Annular Plane Systolic Excursion	MAPSE
TAPSE	Tricuspid Annular Plane Systolic Excursion	TAPSE
HR	Heart Rate (M-Mode)	HR(x)

Valves (M-Mode)

Measurement	Definition	Results Displayed on Monitor
MSS	Mitral Septal Separation	MSS
MAPSE	Mitral Annular Plane Systolic Excursion	MAPSE
TAPSE	Tricuspid Annular Plane Systolic Excursion	TAPSE
HR	Heart Rate (M-Mode)	HR(x)

LV / RV (Doppler

Measurement	Definition	Results Displayed on Monitor
LVOT VTI	Velocity Time Integral Left Ventricle Outflow Tract	AV ET / LVOT VTI
LVOT PEAK	Left Ventricle Outflow Tract Peak Flow Velocity	LVOT PFV
Cardiac Output	CO Doppler	AV ET / LVOT VTI / HR(x)
HR	Heart Rate	HR(x)
RVSP	Right Ventricle Systolic Pressure	RVSP RAp TR PkV

AV / MV (Doppler)

Measurement	Definition	Results Displayed on Monitor
LVOT VTI	Velocity Time Integral Left Ventricle Outflow Tract	AV ET / LVOT VTI
AV ET	Ejection Time Aortic Valve	AV ET
AV peak	Peak Flow Velocity Aortic Valve (Point)	AV PFV / PG
AV PFV(Trace)	Peak Flow Veloity Aortic Valve	AV PFV AV MPG AV PG
AV VTI	Velocity Time Integral Aortic Valve	AV ET/AV PFV/AV MPG/AV PG/AV VTI
MV peak	Peak Flow Velocity Mital Valve (Point)	MV PFV / PG
MV PFV (Trace)	Peak Flow Velocity Mital Valve (Trace)	MV PFV/MPG/PG
MV VTI	Velocity Time Integral, Mitral Valve	MV ET / PFV/ MPG/PG/VTI
HR	Heart Rate	HR(x)

PV / TV (Doppler)

Measurement	Definition	Results Displayed on Monitor
PV peak	Peak Flow Velocity Pulmonic Valve (Point)	PV PFV / PG
PV PFV (Trace)	Peak Flow Velocity Pulmonary Valve	PV PFV/ MPG/PG
PV VTI	Velocity Time Integral Pulmonic Valve	PV ET/ PFV/ MPG/PG/VTI
RVSP	Right Ventricle Systolic Pressure	RVSP RAp TR PkV

TV peak	Peak Flow Velocity Tricuspid Valve (Point)	TV PFV / PG
TV PFV (Trace)	Peak Flow Velocity Tricuspid Valve	TV PFV/MPG/PG
HR	Heart Rate	HR(x)

Generic (Doppler)

All labels and tools from Generic Package, see "Generic Measurements" on page 179.

Renal

Right Kidney (B-Mode)

Measurement	Definition	Results Displayed on Monitor
Rt Kidney L	Rt Kidney Length	Rt Kidney L
Rt Kidney H	Rt Kidney Height	Rt Kidney H
Rt Kidney W	Rt Kidney Width	Rt Kidney W
Rt Kidney V	Rt Kidney Volume	Rt Kidney V
Dist	Distance	Dist

Left Kidney (B-Mode)

Measurement	Definition	Results Displayed on Monitor
Lt Kidney L	Lt Kidney Length	Lt Kidney L
Lt Kidney H	Lt Kidney Height	Lt Kidney H

Measurement	Definition	Results Displayed on Monitor
Lt Kidney W	Lt Kidney Width	Lt Kidney W
Lt Kidney V	Lt Kidney Volume	Lt Kidney V
Dist	Distance	Dist

Aorta/IVC (B-Mode)

Measurement	Definition	Results Displayed on Monitor
Ao Prox AP	Aorta Prox (AP)	Ao Prox AP
Ao Mid AP	Aorta Mid (AP)	Ao Mid AP
Ao Dist AP	Aorta Distal (AP)	Ao Dist AP
Rt Iliac A AP	Rt Iliac A (AP)	RIliacA AP
Lt Iliac A AP	Lt Iliac A (AP)	LIliacA AP
Ao Prox W	Aorta Prox W	Ao Prox W
Ao Mid W	Aorta Mid W	Ao Mid W
Ao Dist W	Aorta Distal W	Ao Dist W
Rt Iliac A W	Rt Iliac A W	RIliacA W
Lt Iliac A W	Lt Iliac A W	LIliacA W
IVC Dia	Inferior Vena Cava Vessel outside diameter	IVC Dia

Bladder (B-Mode)

Measurement	Definition	Results Displayed on Monitor
Pre Void Bl V	Pre Void Bladder Volume	Pre Void Bl L/Pre Void Bl H/Pre Void Bl W/Pre Void Bl V
Post Void Bl V	Post Void Bladder Volume	PostVoidBl L/PostVoidBl H/PostVoidBl W/PostVoidBl V
Dist	Distance	Dist

Generic B Mode

All Labels and Tools from Generic Package, see "Generic Measurements" on page 179.

Generic M-Mode

All Labels and Tools from Generic Package, see "Generic Measurements" on page 179.

Right Renal (Doppler)

Measurement	Definition	Results Displayed on Monitor
Prox RRA	Right Kidney Prox RRA	ProxRRA
Mid RRA	Right Kidney Mid RRA	MidRRA
Dist RRA	Right Kidney Dist RRA	DistRRA

Left Renal (Doppler)

Measurement	Definition	Results Displayed on Monitor
Prox LRA	Left Kidney Prox RRA	ProxLRA
Mid LRA	Left Kidney Mid RRA	MidLRA
Dist LRA	Left Kidney Dist RRA	DistLRA

Aorta/IVC (Doppler)

Measurement	Definition	Results Displayed on Monitor
Ao Prox	Aorta Prox	Ao Prox
Ao Mid	Aorta Mid	Ao Mid
Ao Dist	Aorta Distal	Ao Dist
Rt Iliac A	Rt Iliac Artery	RIliacA
Lt Iliac A	Lt Iliac Artery	LIliacA

Generic Doppler

All Labels and Tools from Generic Package, see "Generic Measurements" on page 179.

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