Echo Blaster 64, Echo Blaster 128, LS64, LS128, ClarUs, SmartUs, MicrUs and ArtUs Series Ultrasound Systems

Echo Wave II Software

User Manual

TELEMED

Ultrasound Medical Systems

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1. Introduction

This document ("Echo Blaster 64, Echo Blaster 128, LS64, LS128, ClarUs, SmartUs, MicrUs and ArtUs Series Ultrasound Systems Echo Wave II Software User Manual") describes the TELEMED Ultrasound Systems based on Echo Blaster, LS64, LS128, ClarUs, SmartUs, MicrUs or ArtUs series of ultrasound scanners and "Echo Wave II" ultrasound scanning software.

This document describes the "Echo Wave II" software user interface, its structure, controls and how to use this software for ultrasound processing. Please note that in this manual the software screenshots shown may look slightly different from the actual software user interface because user interface can be customized and depends on the chosen options.

Before using this software, you must be trained in clinical procedures for conducting ultrasound examinations. This guide does not provide guidelines for clinical aspects of performing the examination or for interpreting medical ultrasound images.

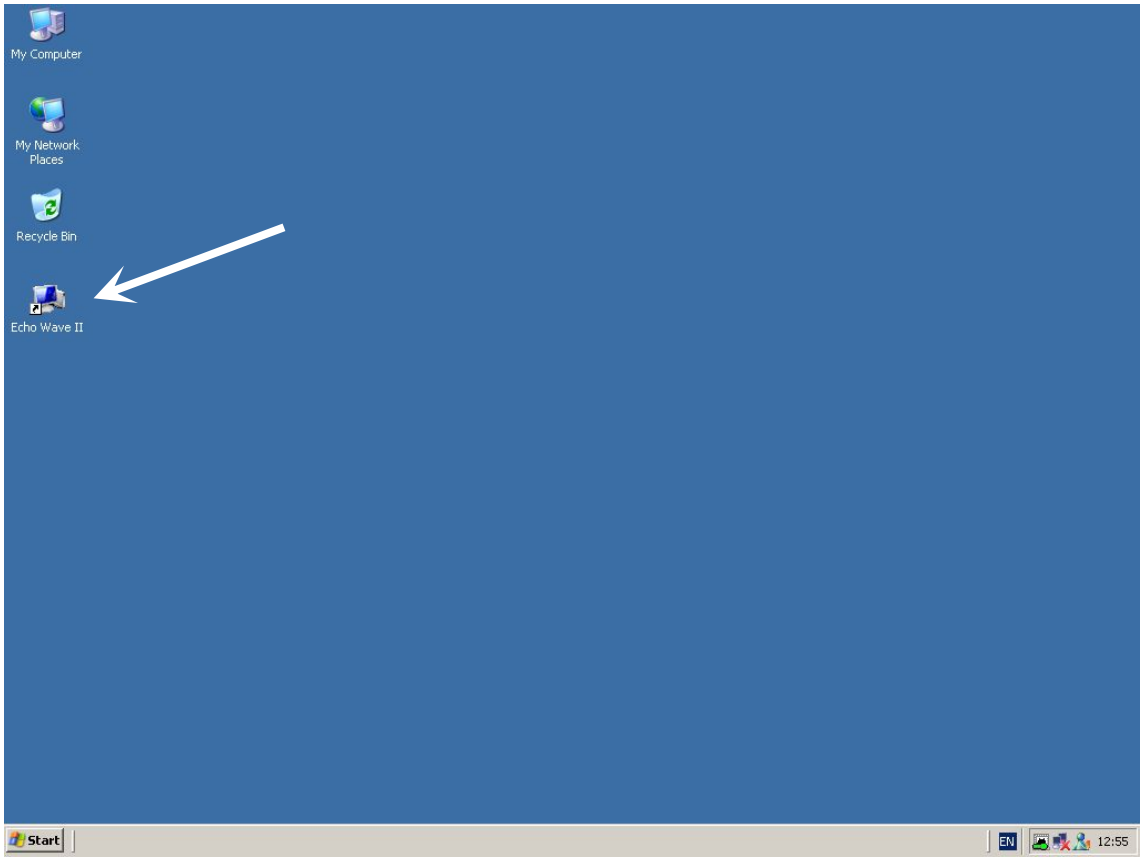
In addition, before using this software you must be familiar with the use of laptop or desktop computers and the Microsoft Windows 7 (8, 8.1, 10) operating system.

2. System Startup and Shutdown

2.1. System startup

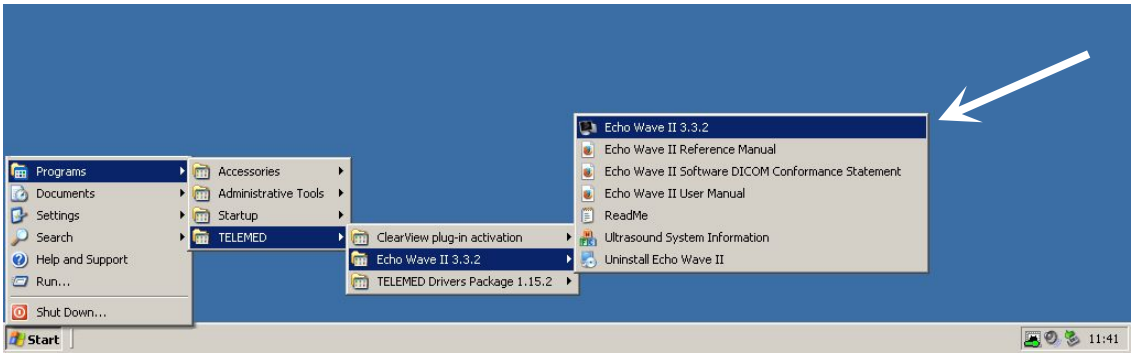
If the system was properly installed and connected, perform the following actions in order to start the system:

1. If needed, power on ultrasound scanner.
2. If needed, power on the computer, start the Windows operating system (if it does not start automatically) and log on to the operating system (if required).
3. After that you should see the Windows operating system desktop image like the image presented below. Please note that desktop image of your system may look different depending on the chosen Windows Theme and installed software.



4. If your system was not pre-configured for automatic software startup, locate the "Echo Wave II" software icon on the desktop, move your mouse cursor over this icon and double click on it using the left mouse button in order to start the "Echo Wave II" ultrasound scanning software.

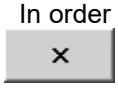
An alternative way to start the "Echo Wave II" software is to click the following Windows menu items: "Start -> Programs -> TELEMED -> Echo Wave II -> Echo Wave II".



Please note that in order to use the software you must be logged in to the user account that has operating system Administrator rights.

If you use either of the Windows 7, Windows 8 or Windows 10 operating systems and User Account Control (UAC) is turned on, then before software startup you will see a warning message that this software (EchoWave.exe) wants access to your computer. Click on the "Allow" button ("I trust this program. I know where it's from or I've used it before.") in order to start the program.

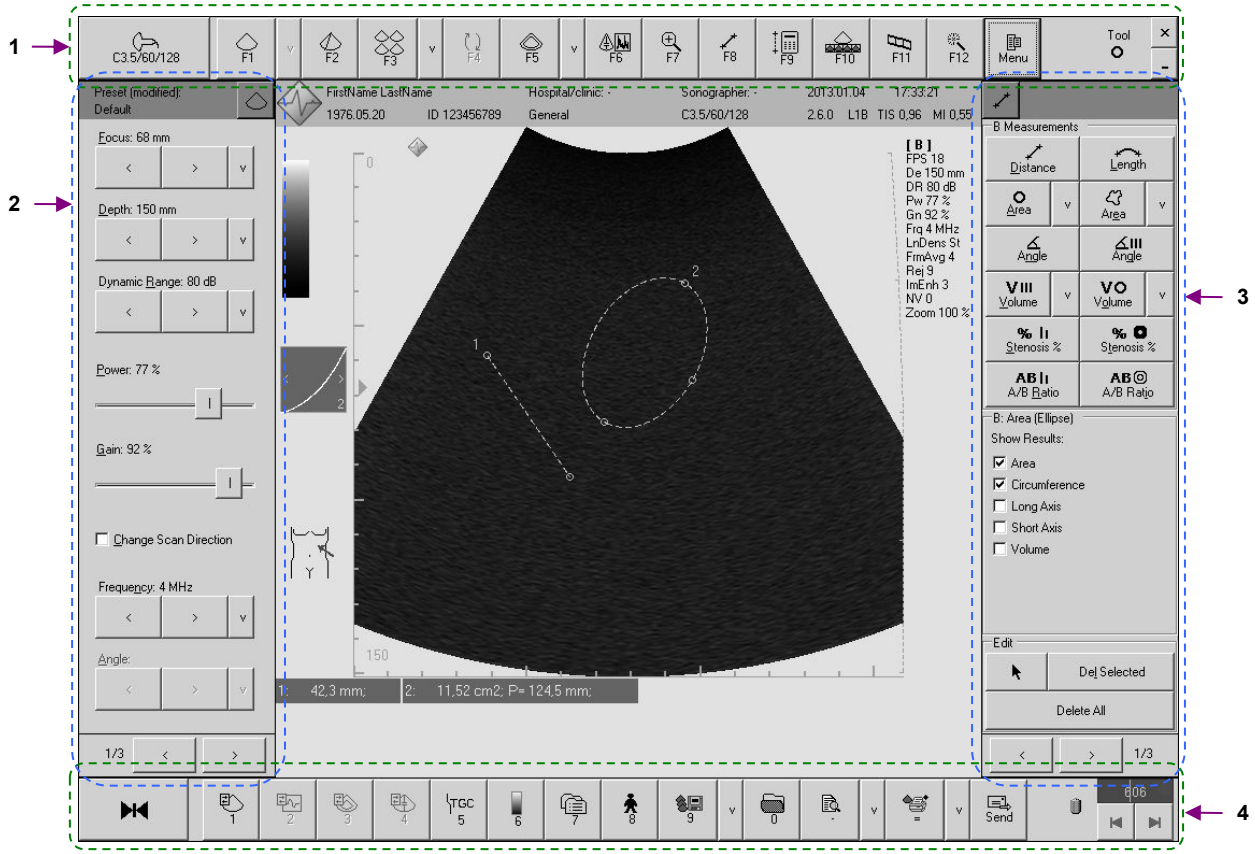
2.2. System shutdown

In order to exit the "Echo Wave II" software, simply move the mouse cursor over the software closing button  that is located at the top right corner of the software and click the left mouse button.

After that you may wish to shut down the Windows operating system by clicking the Windows menu items "Start -> Shut Down ...", turn off computer (if it does not turn off automatically) and the ultrasound scanner.

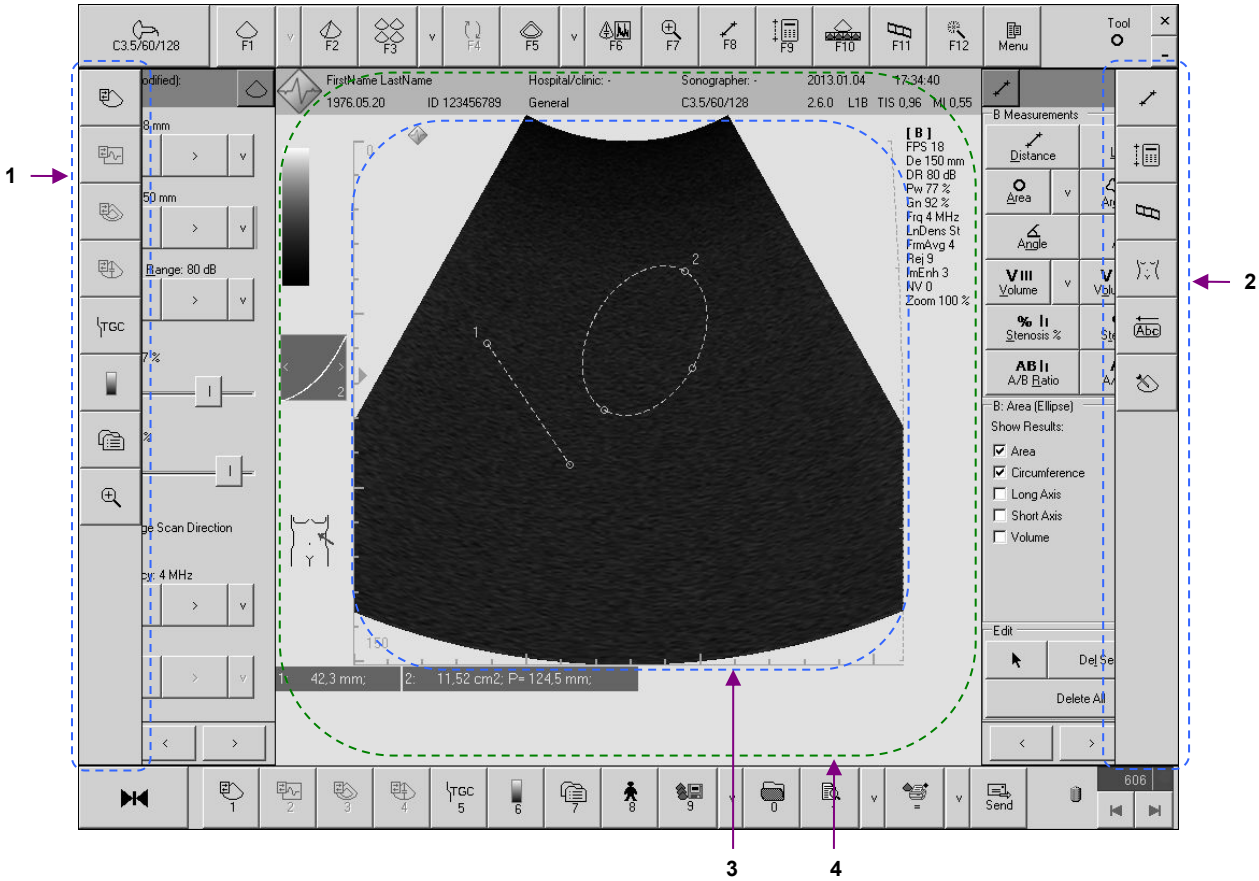
3. Software User Interface Structure

3.1. Main window



Num	Component	Description
1	Top ToolBar	The most important buttons are located on the top ToolBar and have hot keys F1, ..., Fn: • Scanning mode changing buttons (B, M, ...) • Buttons for opening measurements and calculations ControlBars • Buttons for minimizing and closing software
2	Left-side ControlBar	Left-side ControlBars contain controls for adjusting image quality, ultrasound scanning parameters: • Controls of appropriate scanning mode (B, M, ...) • TGC controls • Palettes • Presets
3	Right-side ControlBar	Right-side ControlBars contain controls that do not change scanning parameters: • General measurements of appropriate scanning mode • Exam-specific measurements and calculations • Body Marks (default hot key Ctrl+B) • Annotations (default hot key Ctrl+A) • Biopsy Guidelines (default hot key Ctrl+I)
4	Bottom ToolBar	Bottom ToolBar contains buttons for fast access to the following features: • ControlBars (panels) with controls of scanning modes • Palettes, TGC controls, Presets • Patient Information window • Image and report saving, loading, printing Buttons of bottom ToolBar have assigned keyboard hot keys 1,...0, -, =.

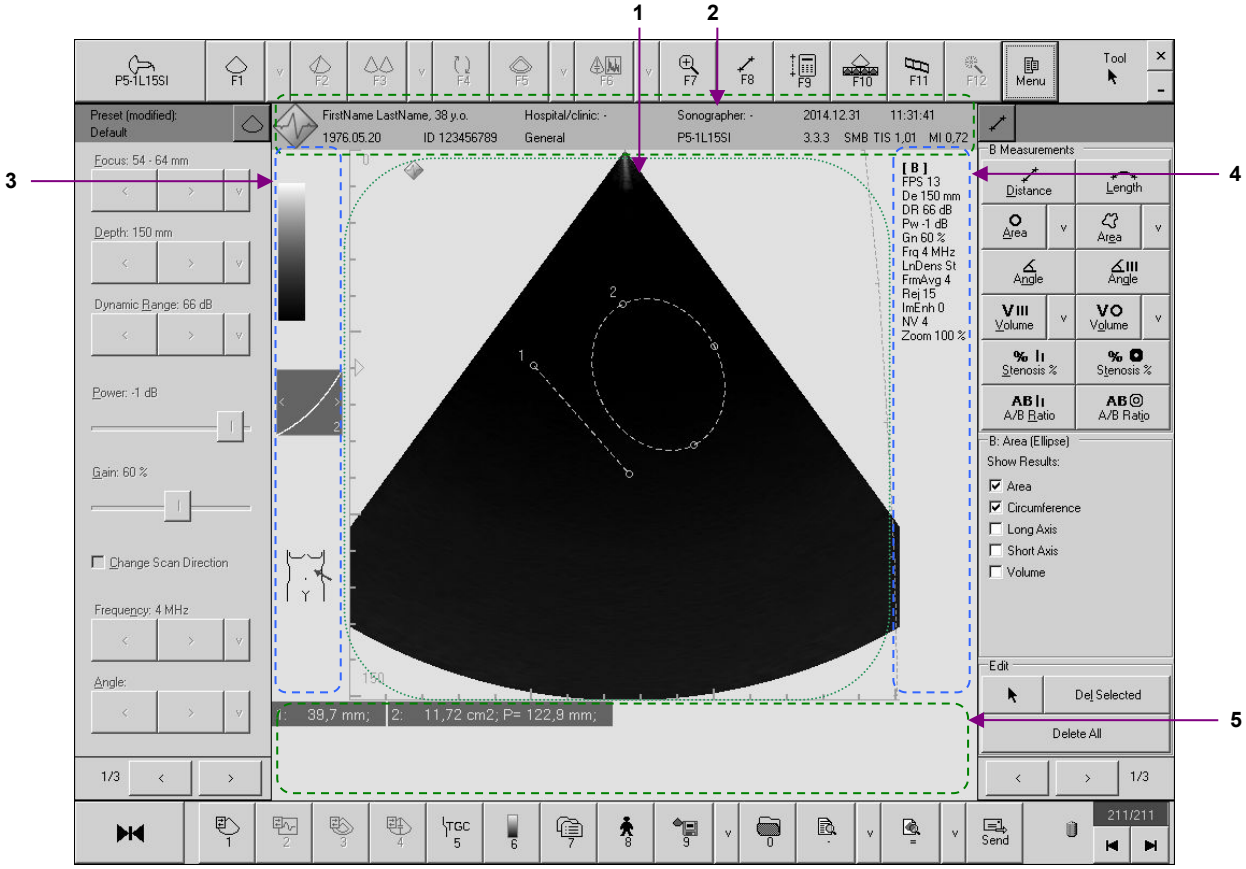
3.2. Autohide ToolBars and Ultrasound Image Area



Depending on your customization options, this software may have autohide ToolBars and ControlBars. In order to see the autohide software components, move the mouse cursor to appropriate edge of the screen (left, right, top or bottom edge) and hold the mouse cursor there for a few seconds until the autohide component is displayed. Autohide components disappear when the mouse is moved away from these components. Autohide components react to mouse movement only when the main window of this software is active.

Num	Component	Description
1	Left ToolBar	Autohide Left ToolBar contains buttons that are used for opening and activation of appropriate left-side ControlBars: • B mode controls • M mode controls • TGC controls • Palettes • Presets
2	Right ToolBar	Autohide Right ToolBar contains buttons that are used for opening and activation of appropriate right-side ControlBars: • Measurements • Calculations • Body Marks • Annotations • Biopsy Guidelines
3	Pure ultrasound image	Pure ultrasound image contains ultrasound image data and painted information (scale lines, TGC curve, measurement lines and curves) on it.
4	Ultrasound image area	Ultrasound image area contains pure ultrasound image in the centre of it and ultrasound surrounding data (image header, measurement results, palettes, and scanning parameters) that is printed or saved depending on the user request.

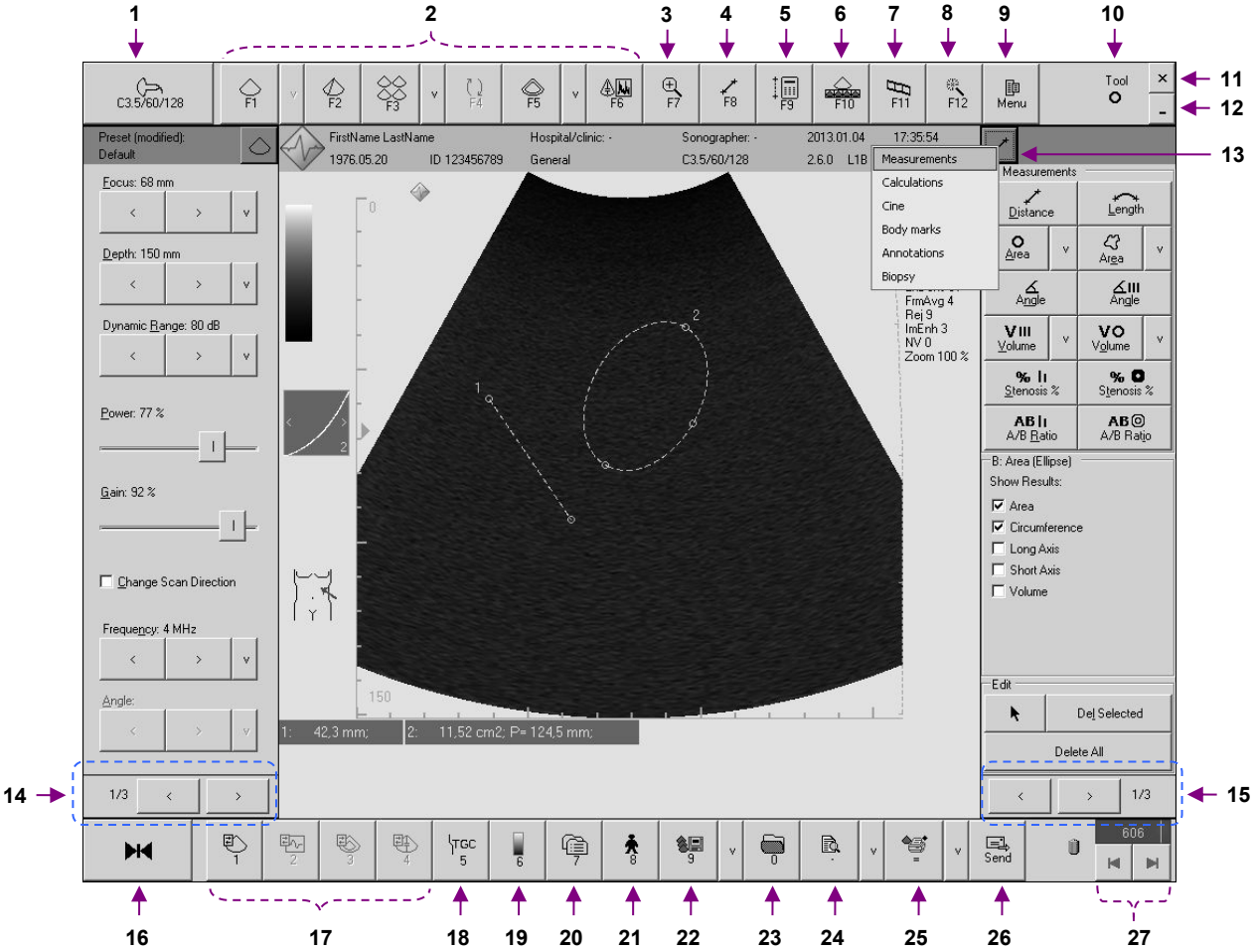
3.3. Components of the Ultrasound Image Area



Components of the ultrasound image area

Num	Component	Description
1	Pure ultrasound image	Pure ultrasound image contains ultrasound image data and painted information (scale lines, TGC curve, measurement lines and curves) on it.
2	Header of the ultrasound image	Ultrasound image header contains patient, examination, hospital/clinic and equipment information. First row contains the following information: patient name, patient age (y.o. - years old), hospital/clinic name, sonographer name, current date, current time. Second row contains the following information: patient birth date, patient ID, exam type, probe name, software version, short ultrasound scanner code, thermal index (TI), mechanical index (MI).
3	Left side of the ultrasound image	On the left side of the ultrasound image palettes and body marks (pictograms) are displayed.
4	Right side of the ultrasound image	On the right side of the ultrasound image the current values of the most important scanning parameters of the appropriate scanning modes are displayed.
5	Measurement results area	Measurement results area contains measurement results of currently visible (on the ultrasound image) measurement lines and shapes.

3.4. Main Window Controls and Control Groups

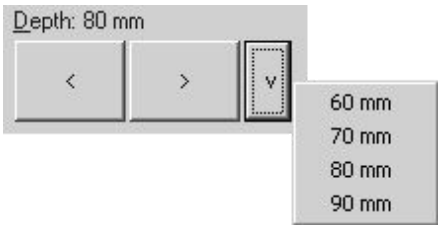


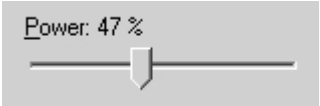
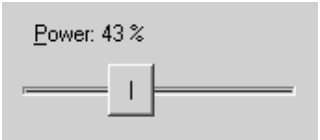
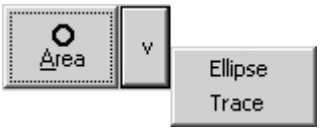
Num	Description
1	Button that shows currently selected probe. If a system has several connected probes, click this button in order to activate next probe.
2	Buttons for selecting scanning mode (B, M, B+B and others depending on the used ultrasound scanner).
3	Display (or activate) left-side ControlBar with ultrasound image zoom controls.
4	Display (or activate) right-side ControlBar of general measurements.
5	Display (or activate) right-side ControlBar of examination-specific measurements and calculations.
6	Thumbnail images panel show/hide button.
7	Display (or activate) right-side ControlBar with MovieClip (Cine) controls.
8	Perform automatic image adjustment (optimization) if this feature is available in selected scanning mode.
9	Main software menu access button.
10	Indicator of currently selected measurement (or control) tool.
11	Exit software.
12	Minimize software window.
13	Menu of ControlBar header that is opened by clicking header button. This menu allows you to open the desired right-side ControlBar (measurements, calculations, cine, body marks, annotations, biopsy). Similar button and menu is also available at headers of left-side ControlBars.
14	Select page of controls that control scanning parameters, image quality. Each ControlBar may have several pages of controls.
15	Select page of measurement controls.
16	"Freeze/Run" button that pauses / starts ultrasound scanning.
17	Buttons for activation of left-side ControlBars of B, M and other ultrasound scanning modes that

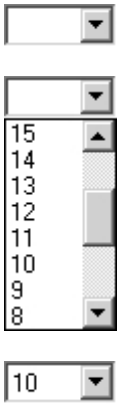
Num	Description
	contain controls for changing scanning parameters of these modes.
18	Activate left-side TGC ControlBar.
19	Activate left-side ControlBar with Palette (or color map) controls.
20	Activate left-side ultrasound scanning Presets ControlBar.
21	Open Patient Information window.
22	Save image (or video) file depending on last used function from this button menu.
23	Open image (or video) file.
24	Save / Print report with measurements and calculations or perform other report operation depending on last function used from this button menu.
25	Print currently visible image or perform other image-related operation depending on last function used from this button menu.
26	Send image or report by E-mail using system default E-mail client software (if this software is available and configured).
27	MovieClip (Cine) control buttons that in Freeze mode allow you to step through recorded cine frames.

3.5. Types of Controls

This section describes the main types of software controls that are used for the control of the scanning parameters, measurements and other operations. The software may have some controls that look slightly different from the controls presented in this section, but the main principles regarding their use are identical. Most of them are standard Microsoft Windows operating system controls or operate similar to standard operating system controls.

Control Description	Appearance
Button control In order to invoke an action that is assigned to a specific button, press that button with your mouse (move mouse cursor over button and click on the left mouse button). The same action can be invoked by pressing a keyboard key if that button has assigned a hot key that is written on button (e.g., F2). Please note that buttons (and other controls) look different when they are enabled and disabled. Disabled controls are usually gray. It is not possible to invoke button (control) action if that button (control) is disabled.	
Value change control with menu (3-buttons) Two large buttons ("<" and ">") are used for selecting values from the pre-defined value list. Control displays the name of parameter that it controls (e.g., Depth), current value (e.g., 80), measurement units (e.g., mm). Click the control button "<" in order to select previous list value. Click the control button ">" in order to select next list value. One smaller button ("v") is used for opening the menu with a list of values. In order to see the menu with a values list click the control "v" button using your mouse. From the menu displayed select the desired value and click on it using your mouse. The control current value will change to the selected one. An alternative method of selecting a desired value from an opened menu is by using the keyboard arrows "Up" and "Down" in order to navigate to the desired menu item and then by pressing the "Enter" key in order to select this item. Values also can be changed by moving your mouse cursor over this control and then by rotating the mouse wheel (if available) without pressing any mouse button. Another way to change values is by selecting (activating) this control and changing values using the keyboard Left/Right arrows. The control can be selected (activated) by pressing keyboard hot key that is displayed as an underlined letter in the control caption (e.g., "D" for Depth control). Please note that hot keys allow you to select only controls from the ControlBar last activated. For navigation inside an activated ControlBar, you can use the "Up" and "Down" keyboard arrows (if the ControlBar supports such navigation). Pages of controls inside active ControlBar can be changed using the "Page Up" and "Page Down" keyboard keys.	 

Control Description	Appearance
TrackBar (slider) control Control displays the name of the parameter that it controls (e.g., Power), the current value (e.g., 47) and measurement units (e.g., %). In order to change parameter value using this control, move the mouse cursor over the TrackBar thumb, press the left mouse button and then drag the thumb without releasing the mouse button. Release the mouse button only when the parameter value reaches the desired value. Alternatively, the value can be changed by repeatedly clicking on the left mouse button on the control track near its left or right side (if the control is horizontal). The TrackBar thumb will move to the side where the mouse cursor is placed. Another way to change values is to move the mouse cursor over this control and then rotate the mouse wheel (if available) without clicking on the mouse. In order to change values using the keyboard, at first select (activate) this control and then change values using the Left/Right keyboard arrows. The control can be selected (activated) by pressing the keyboard hot key that is shown as an underlined letter in the control caption (e.g., "P" for Power control). Please note that hot keys allow you to select only controls of last activated ControlBar. For navigation inside an activated ControlBar can be used the "Up" and "Down" keyboard arrows (if the ControlBar supports navigation). The pages of controls inside an active ControlBar can be changed using the "Page Up" and "Page Down" keyboard keys.	 
CheckBox control The CheckBox control usually indicates whether a particular option has been activated or not. The option is activated (e.g., scan direction is changed) if the corresponding CheckBox is checked ("x" = ON). Control values are changed by clicking with mouse on the CheckBox square. Values also can be changed by moving the mouse cursor over this control and then by rotating the mouse wheel (if available) forwards/backwards without clicking on the mouse. In order to change values using the keyboard, at first select (activate) this control and then change the values using the Left/Right keyboard arrows. Depending on customization options, values can be changed immediately by clicking the appropriate hot key that is displayed as an underlined letter in the control caption (e.g., C for Change Scan Direction control). Hot keys will work if the ControlBar of this control is active.	
Button with menu An action that is assigned to a large control button can be invoked by clicking on the large button using the mouse. An alternative method is to use the keyboard hot key that is displayed as an underlined letter in the control caption (e.g., A for Area control). Other actions that are assigned to this control can be invoked by clicking the button "v" using the mouse and from the appeared menu selecting desired item. Depending on the button style, an action that was selected from menu may become default action for that button and next time it can be invoked by simply clicking on the large control button (without having to select it from the menu again).	 

Control Description	Appearance
ComboBox control ComboBox controls usually contain a list of numerical or text values. In order to select any one of these values, move the mouse cursor to the small button with an up-down triangle and click on this button. From the appeared list of values you can select the desired one by clicking on it using the left mouse button. Then the list will be closed and the selected value will be visible in the left-side part of the ComboBox control. If the list contains several values, the opened list will be shown with a vertical scroller near it. Then in order to select a list value that is not currently displayed you will at first need to navigate to it by clicking on the scroller navigation buttons using the left mouse button (or by dragging the scroller thumb). Now you can select the desired value by clicking on it using the left mouse button.	

Please note that disabled software controls or hidden menu items mean that some feature is not available for the currently connected ultrasound scanner or probe, selected ultrasound scanning or software operation mode, used configuration/options of software or its modules. Some software modules are optional or need to be purchased separately.

4. Indication of Ultrasound System Status

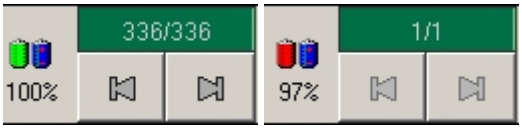
The status of the ultrasound system is indicated using different user interface elements. If the ultrasound scanning software has not been started, a green or red icon in the Windows system tray indicates the status of the ultrasound system.

A green icon means that the system is connected and powered on and you are ready to start the ultrasound scanning software. A red icon means that you should check to see if the ultrasound scanner is powered on (connected powering cable, power button is turned on) and if the USB (Universal Serial Bus) cable is connected to the computer USB port. If after proper system installation, connection and powering on this indicator still remains red, please contact technical support and send them your system information as described in the "Troubleshooting" section of this manual.

When you start to use the ultrasound scanning software, the status of the system is indicated on a button at the software top left corner.

If an ultrasound probe is connected and the system can be used for ultrasound scanning, this button displays the probe name (or "Unsupported probe" if the connected probe is not supported). If an ultrasound probe is disconnected, the beamformer power is turned off or if the USB cable has been disconnected, the text displayed in this button changes to "No Probe". This means some user actions are required in order to start scanning again such as: connecting the probe if it was disconnected, checking the beamformer power (cable, battery) and checking/replacing the USB cable.

If your computer that is used with the ultrasound system is equipped with batteries (optional), the software can display the status of the computer batteries and the status of the beamformer at the bottom right corner near the cine progress indicator.



A green or red indicator shows the status of the beamformer exactly as shown by the above mentioned green or red icons in the Windows system tray. A red indicator means that you must turn on the beamformer power supply (or connect it to the mains) in order to continue using the system. In cases of LS64 FLT-1T and ClarUs systems, a red indicator also indicates that the scanner (beamformer) batteries are discharged and you need to re-charge the batteries. A left-side icon represents the beamformer and a right-side icon represents the computer. Percentages displayed below the icons indicate the status of the beamformer and computer batteries. The presence of icons and text indication below them depends on the used hardware and software configuration.

During initialization of the ultrasound system, the software may display error message boxes that depend on the used hardware and software revisions. These message boxes are explained below.

This message box is displayed during software startup if software cannot find a valid beamformer within the system. This usually happens in the following situations:

1) Ultrasound scanner is not connected to computer USB port.

2) Ultrasound scanner is connected to the USB port, but is not powered on (or batteries are discharged) or the power supply does not use a valid voltage.

3) The ultrasound scanner driver is not installed or not properly installed in the Windows operating system.

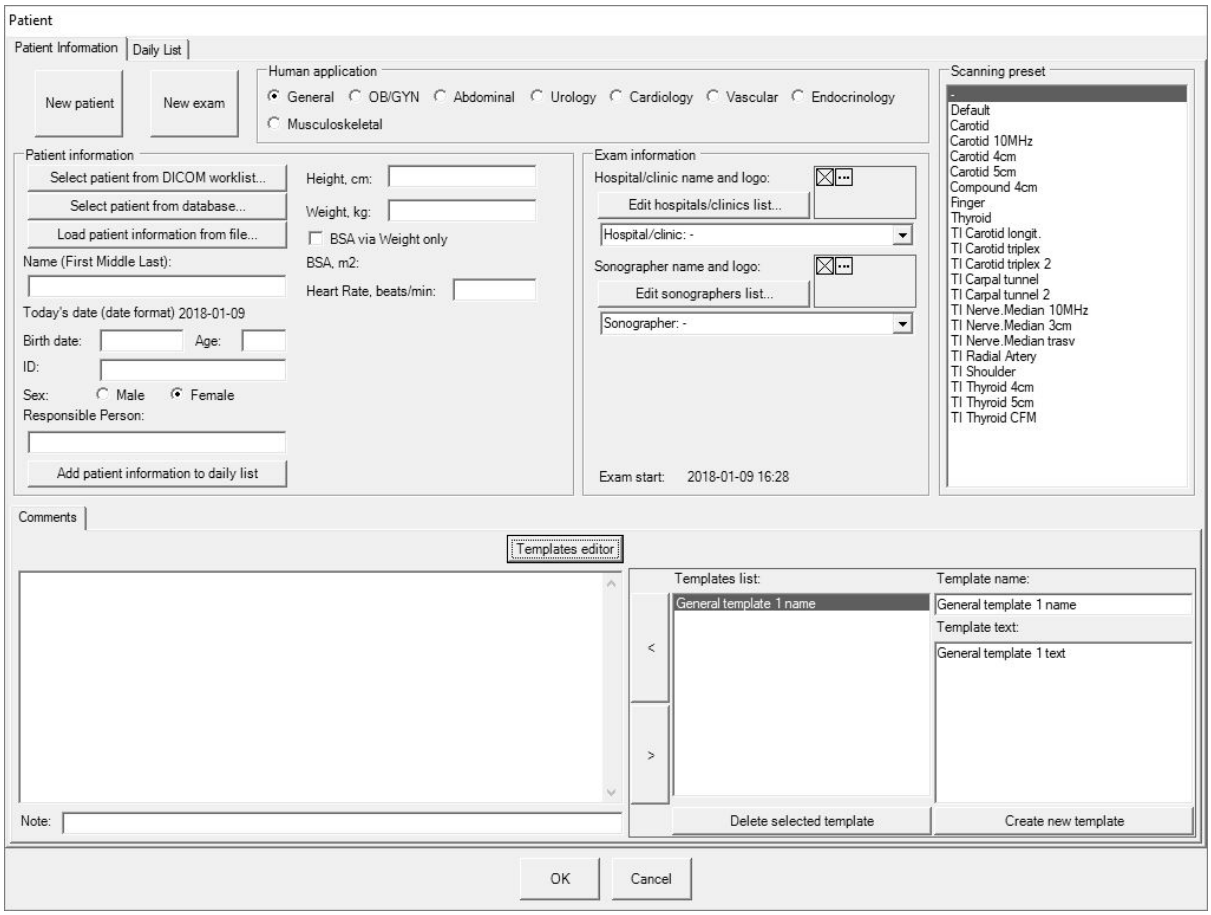
This message box is displayed if the ultrasound scanner is not powered on or if the power supply does not use a valid voltage.

This message box is displayed if the ultrasound scanner is not powered on or if an error took place during initialization.

5. Starting Examination of New Patient

In order to start the examination of new patient, please perform the following actions:

1. Click the "Patient" button that is located at the bottom ToolBar or click its keyboard hot key "8".
2. In the opened Patient Information window click on the "New patient" button. This will clear previously entered patient name and other data ("New exam" clears everything with exception of the patient name, ID and date of birth).
3. Choose the type of examination (application).
4. Enter the patient name and any other information (e.g., date of birth, ID, gender, LMP for OB exam).
5. Enter or select from the list sonographer name.
6. Optionally select desired to use ultrasound scanning preset.
7. Click on the "OK" button that closes the Patient Information window. Previously performed measurements and calculations will be discarded and the system will be prepared for the examination of the new patient.



Please note that for dates and numbers software uses formats that were selected at Windows Regional Settings. If is entered patient birth date, software calculates patient age in years (y.o. - years old) if patient age is more than one year (from start exam date) or in weeks (w.o. - weeks old) if patient age is less than one year. If birth date field is empty, then age field can be filled manually.

The comments area at the bottom of "Patient" dialog allows you to enter comments that will be visible at the bottom of saved/printed reports. "Note" field below "Comments" allows to enter short note that in DICOM will correspond to series description. In order to show/hide controls of pre-defined comments (templates) click on the "Templates" button. The controls on the right-side of the "Comments" tab allow you to select from the list and insert (button "<") pre-defined texts (comment templates) into the comments field. For creating a new template, use the "New" button and then enter the template name and template text. In order to change the arrangement of template names in the list, drag and drop list items using the mouse (press left mouse button on desired item to move this item, move mouse cursor to new desired item location and then release the mouse button). Please note that some software features are available only when is

connected ultrasound scanner and probe or opened TPD/TVD file. If you want to edit templates of comments without connected ultrasound scanner, you can do this by at first opening TPD/TVD file and then using "Patient" window.

The button "Edit sonographers list…" opens user interface that allows you to enter and save a pre-defined list of sonographer names and logos that can then be used to select from the drop-down list that is shown when clicking on the arrow button "v" on the right side of the sonographer name field (ComboBox). When you click on the "Edit sonographers list…" button and is opened list editing interface, add new sonographers by clicking "Create new item" button and entering sonographer name to "Sonographer name" field. Optionally, by clicking "…" button at "Logo image" field and selecting image file, for each sonographer in the list you can select logo image that will be printed in report with sonographer name. In order to delete sonographer from the list, select its name in the list and click "Delete selected item" button. In order to finish modification of the list and save changes, click "Save list" button. After that you can select entered or modified sonographer names from sonographer name ComboBox.

The button "Edit hospitals/clinics list…" opens user interface that allows you to enter and save a pre-defined list of hospitals/clinics names and their logo images. The list is edited using similar interface like previously described sonographer names editing interface. If for hospital/clinic is selected logo image, it will be printed in report header.

Recommended format for logo image files is PNG or BMP. The height of logo images should not be larger than ~200 pixels. When ultrasound software fits hospital/clinic logo image to report header, the image is resized to ~40 pixels height, so relatively small logo image details and texts may become invisible.

5.1. Using DICOM Modality Worklist

This software allows communication with the DICOM Modality Worklist (MWL) and the DICOM Modality Performed Procedure Step (MPPS) servers in your HIS/RIS (Hospital/Radiology Information System) and send images to DICOM PACS (Picture Archiving and Communication System).

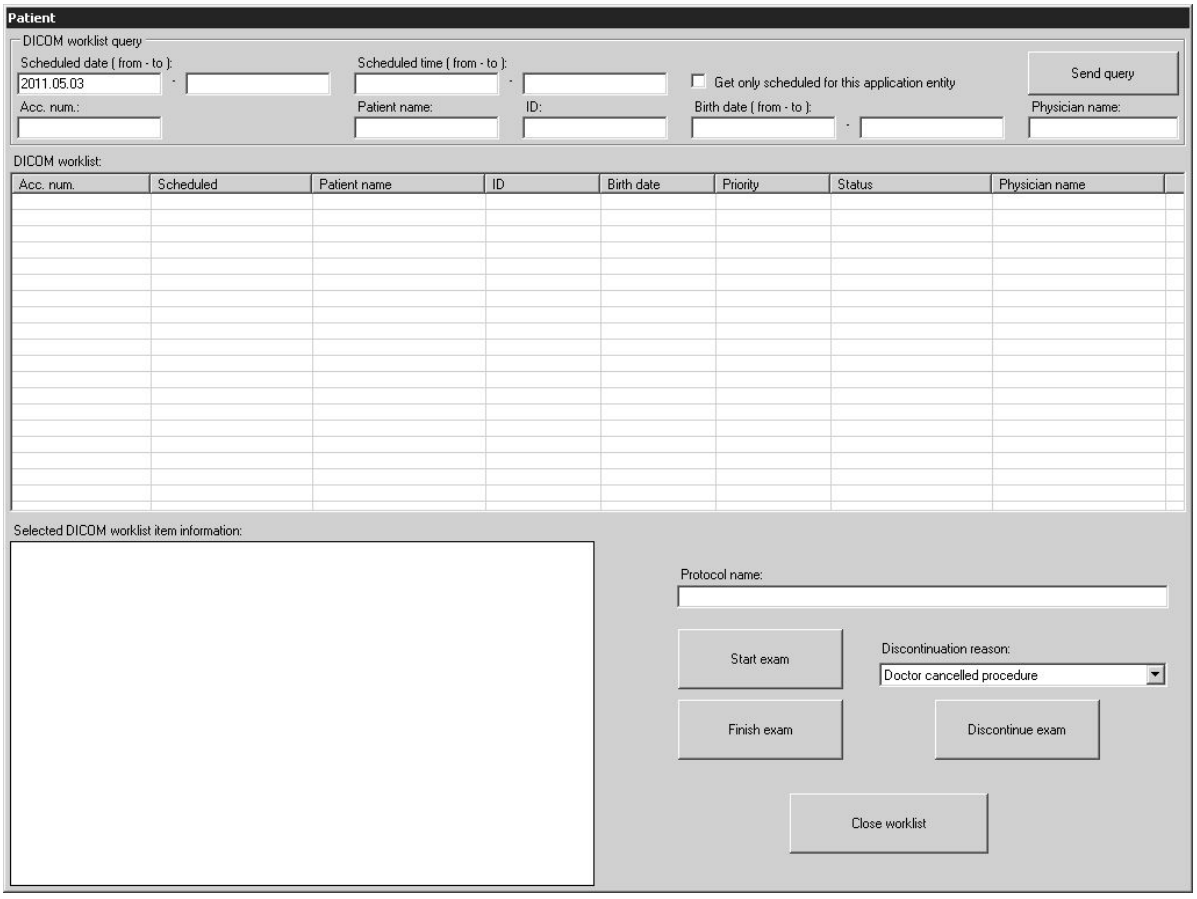
Application entity titles, IP addresses and ports of the desired to use servers must be entered using the "Echo Wave II" options ("Menu->Tools->Options->DICOM"). The title of this Application Entity must also be selected using options.

In order to find out how to configure a concrete DICOM server (another computer with third party DICOM server application that is not a part of "Echo Wave II"), please read its manual.

If your DICOM server supports different character sets, you can also specify character sets using "Echo Wave II" options ("Menu->Tools->Options->DICOM"). For the list of languages that correspond to appropriate character set please see "Echo Wave II DICOM Conformance Statement".

Before starting to use any DICOM features, we strongly recommend that you read the "Echo Wave II DICOM Conformance Statement" and Conformance Statements of the used third party servers and perform thorough compatibility testing.

If you have a DICOM Worklist server and its parameters were set in software using options, then examination patients can be selected from a DICOM Worklist that is opened by clicking on the "Select patient from DICOM worklist" button inside the "Patient" window.



Controls inside "DICOM worklist query" group allow you to set the following parameters of a query that is sent to DICOM Worklist server:

- Scheduled date interval
- Scheduled time interval
- Accession number
- Patient name
- Patient ID

- Patient date of birth interval
- Performing physician name
- Select so that the worklist server only returns the items that were scheduled for this Application Entity.

If query fields are left empty, the server does not use the values of these fields for filtering. If is entered date/time, its format must correspond with the one that is currently used by the Windows operating system (software converts it to DICOM format). Inside the query fields of accession number, patient name, patient ID and physician name can be used wildcard symbols (symbol "*" means any number of any symbols). This Application Entity name is specified at software options ("Menu->Tools->Options->DICOM").

The Worklist query is sent to the server if inside active query field is clicked "Enter" keyboard key or "Send query" button. If the DICOM Worklist is opened and the user has not performed any action (item selection, clicking of buttons) within the worklist for ~5 minutes, the software automatically sends the query to the server and updates the worklist. Communication with servers and query processing may take some time.

Worklist query results received (if any) are displayed in the multicolumn "DICOM worklist" control. By default the worklist items are displayed in the order that they are returned by server. In order to change list ordering, click using the mouse on the headers of the desired to reorder columns.

In order to start a patient examination, select his name in the "DICOM worklist" control, read information about patient in the "Selected DICOM worklist item information" control, enter the protocol name using the "Protocol name" textbox, click on the "Start exam" button, close the worklist by clicking on the "Close worklist" button, select the type of examination in the "Patient" window and enter any additional patient information before closing the "Patient" window by clicking the "OK" button.

During examination perform scanning of images, measurements, calculations, saving, printing and send desired images to the PACS server.

In order to finish the examination of a patient selected from the DICOM Worklist, open the "Patient" window, open the DICOM Worklist, select the name of the patient that you wish to finish the examination for (if is selected other patient) and then click on the "Finish exam" button.

In order to discontinue an examination of a patient that was selected from the DICOM Worklist, open the "Patient" window, open the DICOM Worklist, select the patient that you wish to discontinue examination for (if is selected other patient), select a reason for this discontinuation using the "Discontinuation reason" ComboBox and then click on the "Discontinue exam" button.

After the completion/discontinuation of an examination you can select another patient from the worklist and start a new examination or you can close the worklist and in the "Patient" window start an examination of new patient not listed in the worklist.

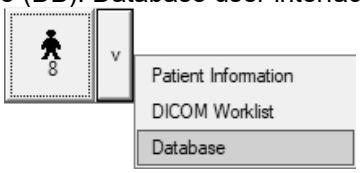
Important

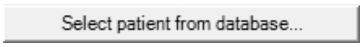
If you start an examination of a patient from the DICOM Worklist, do not edit any names or ID manually, because this will change the patient identity information and this may result in adding incorrectly formatted or duplicate data items to your database server.

In the event of the DICOM Worklist server returned an incorrect patient name, ID or any other information, you will need to perform database corrections using the database server software (which is not part of "Echo Wave II").

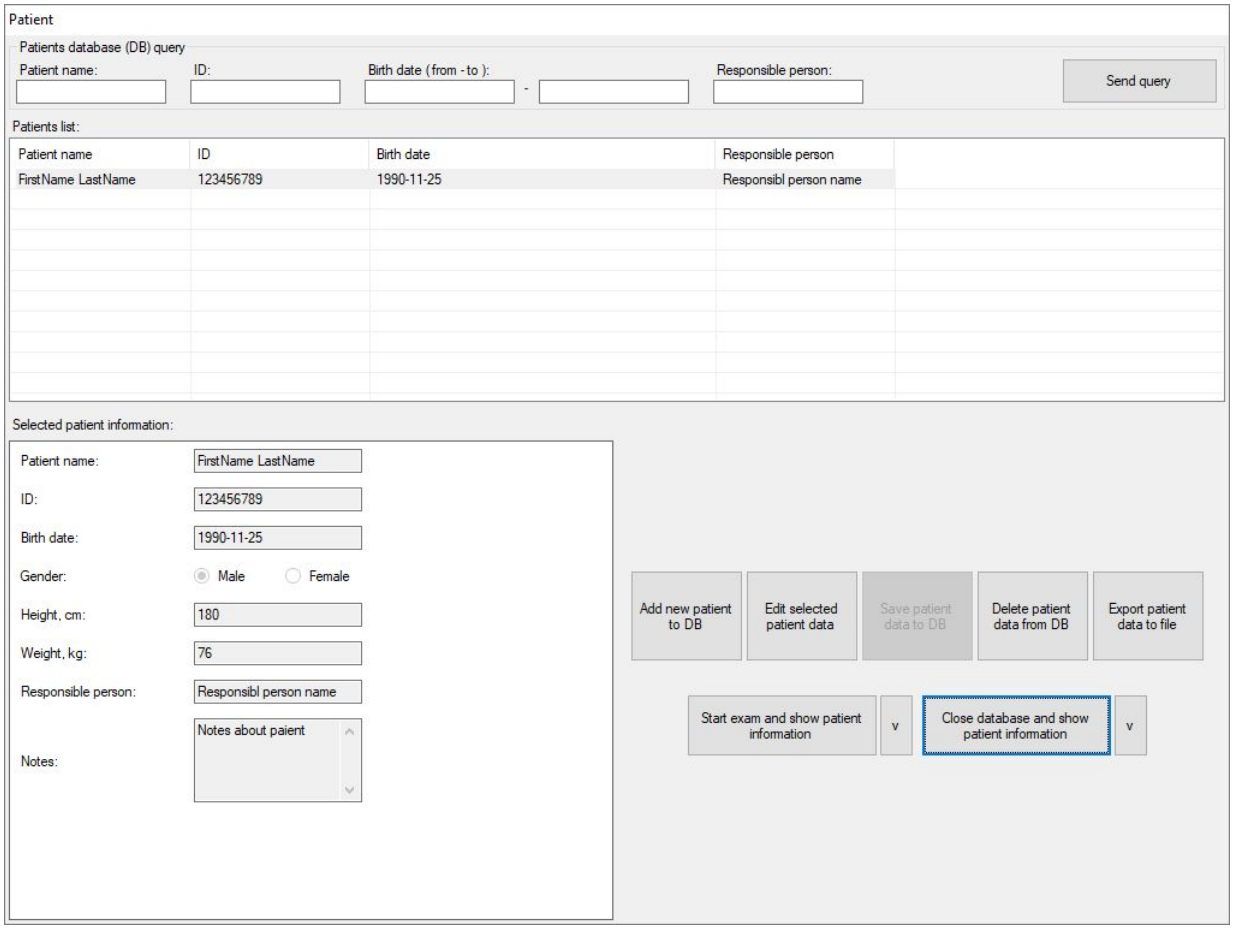
When inside a DICOM Worklist panel are clicked buttons "Start exam", "Finish exam", "Discontinue exam", software sends information about the changed examination status to the MPPS server (if configured), sends a query to the MWL server, updates the worklist and invokes the "New patient" command.

5.2. Using Patients Database

This software has built-in patients database (DB). Database user interface window can be opened by clicking “Database” menu item of “Patient” button 

at software bottom ToolBar or by clicking “Select patient from database” button 

at “Patient” window. Database file “patients.sqlite” is stored in “_PatientsDB” subfolder of quick saved images folder (by default “C:\Echo Images”), file format is SQLite (http://www.sqlite.org/), and it is assumed that the file is stored on local disk.



In order to search database, enter data to the fields at “Patients database (DB) query” GroupBox (fields must be left empty to display all database items unfiltered) and click “Send query” button or “Enter” keyboard key when input focus is in any field. Found items will be displayed in “Patients list” below. List item is selected by clicking it. Selected list item information is shown at left bottom part of the window (Selected patient information).

To add new patient to the database, click “Add new patient to DB” button, enter patient data at left bottom window part, click “Save patient data to DB” button.

To edit selected patient data, click “Edit selected patient data” button, edit data at left bottom window part, click “Save patient data to DB” button.

To delete selected patient from the database, click “Delete patient data from DB” button and in appeared dialog click “Yes”.

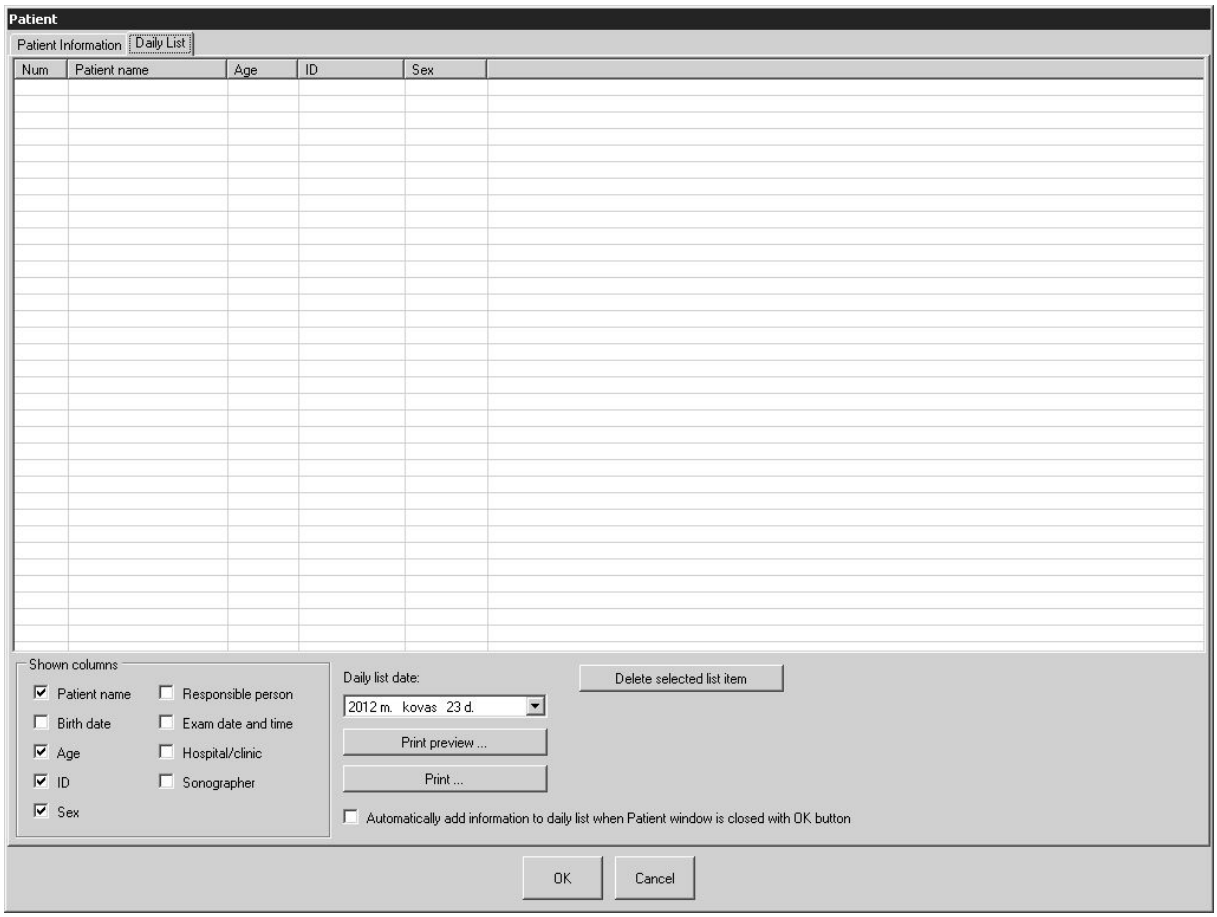
To export database record of selected patient to text file, click button “Export patient data to file”, in appeared dialog enter file name, select file location and click “Save” button.

To start exam with selected database patient and show patient information, click “Start exam and show patient information” button. Here “Start exam” means that is started examination of new patient and that patient data is transferred from database user interface to corresponding fields of usual “Patient” window user interface. Transferred fields are as follows: patient name, ID, birth date, gender, height, weight, responsible person. Database field “Notes” is used to store any notes about patient in the database, and is not transferred to any other field in “Patient” window.

To close database user interface and return to “Patient” window without selecting patient for examination, click “Close database and show patient information” button.

5.3. Using Daily List

The daily list of patients seen is usually used as a control report to ensure that the results have been dictated for every case. Patient information to daily list is added by clicking "Patient" window button "Add patient information to daily list". Daily list is opened by clicking "Daily List" tab control at the top of "Patient" window.

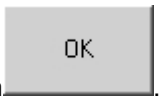


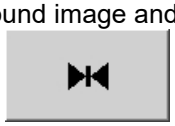
Controls in "Shown columns" group allow to select what patient information is shown in a list. "Daily list date" control allows to select the date of some previous day in order to see its daily list. "Delete selected list item" button allows to delete accidentally added or incorrect list entries. "Print preview …" button allows to see how will look printed list, "Print …" button allows to print the list to selected printer. If is checked option "Automatically add information to daily list when Patient window is closed with OK button", then software adds patient information (if it differs from previously added information) every time when "Patient" window is closed with "OK" button and there is no need to click button "Add patient information to daily list". When new information is added, software always automatically selects today's list and adds information to it no matter what date was previously selected using "Daily list date" control.

6. Typical Ultrasound Examination Workflow

In order to perform an ultrasound examination, please follow these steps:

1. Open the Patient Information window by clicking on the "Patient" button

(or corresponding keyboard hot key "8"). Click the "New Patient" button to clear the patient data. Choose the type of examination and enter the patient information manually or from another source. Close the "Patient" window by clicking on the "OK" button 

.
2. Select the desired ultrasound scanning mode by clicking on the relevant mode button (or appropriate keyboard F1-Fn hot key) using the software top ToolBar.
3. If scanning is performed in M mode, adjust the M-line position. If scanning is performed in Color Doppler mode, adjust the Doppler window size and position. If scanning is performed in PW mode, adjust the PW sample volume position and size.
4. If necessary, adjust the image quality of the selected mode using the mode controls.
5. Use proper medical protocols to perform the ultrasound examination.
6. Press the "Freeze/Run" button or the SpaceBar key to freeze the ultrasound image currently displayed.
7. Perform any measurements and calculations if required.
8. Add annotations and body marks (pictograms) if required.
9. Save and/or print out the ultrasound image and report.
10. Press the "Freeze/Run" button  or the SpaceBar key to re-start the ultrasound scanning.
11. Optionally, repeat steps 2-10 in order to perform an examination using different scanning positions and modes.

Please note that the software may stop ultrasound scanning not only upon user requests but also automatically following a period of inactivity (e.g., ~15 minutes). This automatic freeze feature is implemented in order to prolong the lifetime of the ultrasound probe. If you want to turn off this feature, open the "Options" window ("Menu->Tools->Options") then select the tabs "Scanning Control->General" and then in the "Automatic freeze" GroupBox remove check from the "Enable Auto Freeze" CheckBox and close the dialog using the "OK" button.

7. Selecting Ultrasound Scanning Mode

In order to freeze/run ultrasound scanning in any mode click the "Freeze/Run" button that is located at the software left bottom corner or click on the SpaceBar key.

Before selecting any scanning mode the ultrasound image must be unfrozen. If an ultrasound image is frozen then click on the "Freeze/Run" button or on the SpaceBar key to start ultrasound scanning.

In order to enter B (2D) mode from any other mode, click on the "B mode" button on the software top ToolBar or click the "F1" hot key.

In general, in order to enter a particular scanning mode from the current mode you need to look at the software top ToolBar and click on the buttons (or F1-F6 hot keys written on these buttons) with the pictograms of your desired mode.

Button Pictogram	Description (mode)
	B (2D) standard mode (B - Brightness)
	B mode WideView (trapezoid) scanning type (optional).
	B mode compound scanning type (optional).
	Dual mode (B+B)
	Quad mode (4B)
	B mode image with M-line
	M mode (M - Motion)
	B+M mode
	Color Doppler: CFM mode (CFM - Color Flow Mapping)
	Color Doppler: PDI mode (PDI - Power Doppler Imaging)
	Color Doppler: DPDI (Directional PDI) mode
	B mode image with PW-line
	B mode image with CW-line
	PW mode (PW - Pulsed Wave)
	CW mode (CW - Continuous Wave)
	B+PW mode (running B, PW or both (Duplex))
	B+CW mode (running B or CW)
	Color Doppler mode image with PW-line
	Color Doppler mode image with CW-line
	Color Doppler + PW mode (running Color Doppler, PW or both (Triplex))
	Color Doppler + CW mode (running Color Doppler or CW)
	Color M line
	B+Color M mode
	Color M mode

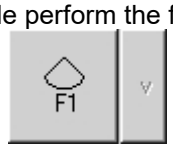
Please note that the hot key positions are fixed but the actions (scanning modes) that are invoked by these hot keys may differ depending on current scanning mode and the last used button command.

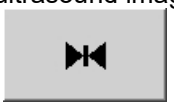
Available scanning modes depend on the ultrasound scanner type used. Disabled buttons of some scanning modes mean that these are scanning modes that are either not available for connected ultrasound

scanner or cannot be selected directly from the current scanning mode (for example, they can only be selected from B mode).

7.1. B mode (standard, WideView, compound)

In order to enter B mode perform the following actions:

1. Click on the "B mode" button 

on the software top ToolBar or click the "F1" hot key.
Depending on which beamformer and probe are connected, using the "v" button (if available) from the displayed menu you are able to select B mode standard, WideView (trapezoid) (optional) and compound (optional) scanning.
2. Optionally, adjust the B image using the B mode controls on the software left-side ControlBar.
3. Click on the "Freeze/Run" button or on the SpaceBar key to freeze the ultrasound scanning.
4. Optionally, perform measurements and add annotations.
5. Optionally, print out and/or save ultrasound images.
6. Click on the "Freeze/Run" button  or on the SpaceBar key to re-start the ultrasound scanning.
7. Optionally, repeat steps 2-6 in order to scan more B mode images.

7.2. Dual mode (B+B)

In order to enter Dual mode, perform the following actions:

1. If an ultrasound image is frozen, unfreeze it first by clicking on the "Freeze/Run" button or on the SpaceBar key.
2. If the current mode is not B mode, click on the "B mode" button or on the "F1" hot key in order to enter B mode.
3. Optionally, adjust the B image using the B mode controls on the software left-side ControlBar.
4. Click on the “Dual" button on the software top ToolBar or on the "F3" hot key to enter Dual mode and see two ultrasound images. The left-side image will be running and right-side image will be frozen.
5. In order to freeze one image while running the other image (change active image), click on the “Dual” button on the software top ToolBar or on the "F3" hot key. The selected (active) image is denoted by a small rectangle around the scanning direction marker. Perform this operation any number of times in order to get desired ultrasound images.
6. Click on the "Freeze/Run" button or on the SpaceBar key to freeze the ultrasound scanning.
7. Optionally, perform measurements and add annotations.
8. Optionally, print out and/or save ultrasound images.
9. Optionally, use the “Dual” button or the "F3" hot key to select the desired frozen image.
10. Optionally, click on the "Freeze/Run" button or on the SpaceBar key to start scanning at the selected image.
11. Optionally, repeat steps 5-10 to scan more Dual mode images.

Note. If selected at options, the selection and freezing/running of appropriate images can be performed by clicking on the right mouse button on that image.

7.3. Quad mode (4B)

In order to enter the Quad mode, perform the following actions:

1. If an ultrasound image is frozen, unfreeze it by clicking the "Freeze/Run" button or on the SpaceBar key.

2. If the current mode is not the B mode, click on the "B mode" button or on the "F1" hot key to enter B mode.
3. Optionally, adjust the B image using the B mode controls on the software left-side ControlBar.

4. Click on the “v” button on the right side of the “Dual" button and select “Quad mode” form the menu that is displayed. The appearance and operation of the “Dual” button will change to “Quad” . Software will enter Quad mode. Left top image will be running and other images will be frozen.

5. To freeze one image and run other image (change active image), click on the “Quad” button on the software top ToolBar or on the "F3" hot key. Selected (activated) images are indicated by a small rectangle around the scanning direction marker. Perform this operation any number of times in order to get desired ultrasound images.

6. Click on the "Freeze/Run" button or on the SpaceBar key to freeze ultrasound scanning.
7. Optionally, perform measurements and add annotations.
8. Optionally, print out and/or save ultrasound images.
9. Optionally, use the “Quad” button or the "F3" hot key to select the desired frozen image.

10. Optionally, click on the "Freeze/Run" button or on the SpaceBar key to start scanning on selected images.
11. Optionally, repeat steps 5-10 to scan more Quad mode images.

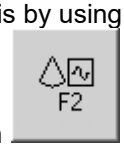
Note. If selected at options, selection and freezing/running of appropriate images can be performed by clicking on the right mouse button on that particular image.

7.4. B+M mode

In order to enter B+M mode, perform the following actions:

1. If an ultrasound image is frozen, unfreeze it by clicking on the "Freeze/Run" button or on the SpaceBar key.
2. If the current mode is not B mode, click on the "B mode" button

or on the "F1" hot key to enter B mode.
3. Optionally, adjust the B image using the B mode controls on the software left-side ControlBar.
4. Click on the "B with M-line" ("M-line") button

on the software top ToolBar or on the "F2" hot key to display the B mode image with the M line on it.
5. Click using the left mouse button on the B mode ultrasound image to select the M-line position. An alternative way of selecting M-line is by using the "Line Position" control on the left-side M mode ControlBar.
6. Click on the "B+M mode" button 

on the software top ToolBar or on the "F2" hot key to show the B+M mode image.
7. Optionally, adjust the M-line position by clicking the left mouse button on the B mode image or by using the "Line Position" control on the left-side M mode ControlBar.
8. Optionally, adjust the M image using the M mode controls on the software left-side ControlBar.
9. Click on the "Freeze/Run" button or on the SpaceBar key to freeze ultrasound scanning.
10. Optionally, perform measurements and add annotations.
11. Optionally, print out and/or save ultrasound images.
12. Click on the "Freeze/Run" button or on the SpaceBar key to re-start ultrasound scanning.
13. Optionally, repeat steps 4-12 in order to scan more B+M images.
14. Click on the "B mode" button

or on the "F1" hot key to enter B mode.

The layout of the B and M images (left-right or top-bottom) can be selected at software options (Menu->Tools->Options->Appearance->General).

7.5. M mode

In order to enter M mode, perform the following actions:

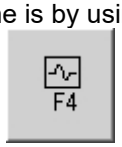
1. If an ultrasound image is frozen, unfreeze it by clicking on the "Freeze/Run" button or on the SpaceBar key.

2. If the current mode is not B mode, click on the "B mode" button

or on the "F1" hot key to enter B mode.

3. Click on the "B with M-line" ("M-line") button

on the software top ToolBar or on the "F2" hot key to display the B mode image with the M line on it.
4. Click using the left mouse button on the B mode ultrasound image to select the M-line position. An alternative way of selecting M-line is by using the "Line Position" control on the left-side M mode ControlBar.

5. Click on the "M mode" button 

on the software top ToolBar or on the "F4" hot key to show the M mode image.

6. Optionally, click on the "B with M-line" ("M-line") button

on the software top ToolBar or on the "F4" hot key to show the B mode image with the M line on it, adjust the M-line position and once again click on the "M mode" button

or on the "F4" hot key to show the M mode image.
7. Optionally, adjust M image using the M mode controls on the software left ControlBar.

8. Click on the "Freeze/Run" button or on the SpaceBar key to freeze ultrasound scanning.
9. Optionally, perform measurements and add annotations.
10. Optionally, print out and/or save ultrasound images.

11. Click on the "Freeze/Run" button or on the SpaceBar key to re-start ultrasound scanning.
12. Optionally, repeat steps 4-11 in order to scan more M mode images.

13. Click on the "B mode" button

or on the "F1" hot key to enter B mode.

7.6. Color Doppler mode (optional)

In order to enter Color Doppler mode, perform the following actions:

1. If the ultrasound image is frozen, unfreeze it by clicking on the "Freeze/Run" button or on the SpaceBar key.

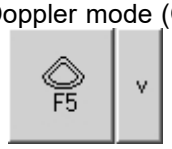
2. If the current mode is not B mode, click on the "B mode" button

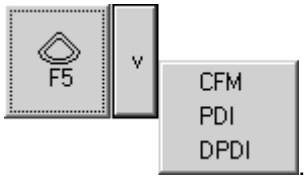
or on the "F1" hot key to enter B mode.
3. Optionally, adjust the B image using the B mode controls on the software left-side ControlBar.

4. Click on the "CFM mode" button

on the software top ToolBar or click on the "F5" hot key to enter CFM mode.

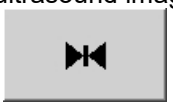
5. Optionally, click on the mode change button

on the software top ToolBar or click on the "F4" hot key to loop through the Color Doppler modes: PDI -> DPDI -> CFM.
6. Optionally, select the desired Color Doppler mode (CFM, PDI, DPDI) from the menu by clicking on the "v" button of the Color Doppler button 

followed by clicking on the desired menu item 

.
7. Adjust the Color Doppler window position and size by using the "Doppler Window" controls on the left-side Color Doppler ControlBar. An alternative way of changing the Doppler window position is to move the mouse cursor over the Doppler window and then click using the left mouse button, drag the window to the desired location and then click using the left mouse button again to finish window positioning. The size of the Doppler window also can be changed with the mouse. To change the window size, you can move the mouse cursor over the desired change border of the Doppler window and then click using the left mouse button, drag the border to desired location and finally click using the left mouse button once again to complete the resizing.
8. Optionally, adjust the Color Doppler mode parameters using the Color Doppler mode controls on the left-side of the Color Doppler ControlBar.

9. Click on the "Freeze/Run" button or on the SpaceBar key to freeze ultrasound scanning.
10. Optionally, perform measurements and add annotations.
11. Optionally, print out and/or save ultrasound images.

12. Click on the "Freeze/Run" button  or on the SpaceBar key to re-start ultrasound scanning.
13. Optionally, repeat steps 6-12 in order to scan more Color Doppler mode images.

14. Click on the "B mode" button

or on the "F1" hot key to enter B mode.

7.7. B+PW mode, Duplex (optional)

In order to enter B+PW mode, perform the following actions:

1. If an ultrasound image is frozen, unfreeze it by clicking on the "Freeze/Run" button or on the SpaceBar key.
2. If the current mode is not B mode click on the "B mode" button or on the "F1" hot key to enter B mode.
3. Optionally, adjust the B image using the B mode controls on the software left-side ControlBar.
4. Click on the "B+PW mode" button on the software top ToolBar or on the "F6" hot key to show the running B mode image with the PW line on it and the frozen PW mode image.
5. Click using the left mouse button on the B mode ultrasound image to select the PW sample volume position. An alternative way of selecting the PW-line is by using the "PW Line Position" control on the left-side PW mode ControlBar. Adjust the PW sample volume size and position using the controls on the left-side PW mode ControlBar.
6. Click on the "B+PW mode" button or on the "F6" hot key once again to freeze the B image and run the PW image.
7. Optionally, adjust the PW sample volume position and size by clicking the left mouse button on the B mode image and by using the appropriate controls on the left-side PW mode ControlBar.
8. Optionally, adjust the PW image using the PW mode controls on the software left-side ControlBar.
9. Click on the "Freeze/Run" button or on the SpaceBar key to freeze ultrasound scanning.
10. Optionally, perform measurements and add annotations.
11. Optionally, print out and/or save ultrasound images.
12. Click on the "Freeze/Run" button or on the SpaceBar key to re-start ultrasound scanning.
13. Optionally, repeat steps 4-12 in order to scan more B+PW images.
14. Click on the "B mode" button or on the "F1" hot key to enter B mode.

Depending on your selected software options, the "B+PW mode" button ("F6" hot key) may loop through the following states: B running + PW running (Duplex), B frozen + PW running.

Layout for B and PW images (left-right or top-bottom) can be selected using the software options (Menu->Tools->Options->Appearance->General).

7.8. PW mode (optional)

In order to enter PW mode, perform the following actions:

1. If an ultrasound image is frozen, unfreeze it by clicking on the "Freeze/Run" button or on the SpaceBar key.

2. If the current mode is not B mode, click on the "B mode" button

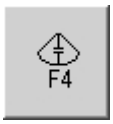
or on the "F1" hot key to enter B mode.

3. Click on the "B+PW mode" button

on the software top ToolBar or on the "F6" hot key to show the running B mode image with the PW line on it and the frozen PW mode image.
4. Click using left mouse button on the B mode ultrasound image to select the PW sample volume position. An alternative way of selecting PW-line is by using the "PW Line Position" control on the left-side PW mode ControlBar. Adjust the PW sample volume size and position using the controls on the left-side PW mode ControlBar.

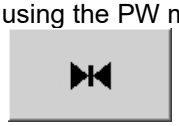
5. Click the "PW mode" button

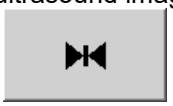
on the software top ToolBar or on the "F4" hot key to show the PW mode image.

6. Optionally, click the "B with PW-line" ("PW-line") button 

on the software top ToolBar or on the "F4" hot key to show the B mode image with the PW line displayed, adjust the PW sample volume size and position, and once again click on the "PW mode" button

or on the "F4" hot key to show the PW mode image.
7. Optionally, adjust the PW image using the PW mode controls on the software left ControlBar.

8. Click on the "Freeze/Run" button  or on the SpaceBar key to freeze ultrasound scanning.
9. Optionally, perform measurements and add annotations.
10. Optionally, print out and/or save ultrasound images.

11. Click on the "Freeze/Run" button  or on the SpaceBar key to re-start ultrasound scanning.
12. Optionally, repeat steps 4-11 in order to scan more PW mode images.

13. Click on the "B mode" button

or on the "F1" hot key to enter B mode.

7.9. Color Doppler + PW mode, Triplex (optional)

In order to enter Color Doppler + PW mode perform the following actions:

1. If an ultrasound image is frozen, unfreeze it by clicking on the "Freeze/Run" button or on the SpaceBar key.
2. If the current mode is not B mode click on the "B mode" button or on the "F1" hot key to enter B mode.
3. Optionally, adjust the B image using the B mode controls on the software left-side ControlBar.
4. Select the desired Color Doppler mode as described in the "Color Doppler mode" section, adjust the Color Doppler window size and position. Adjust the Color Doppler mode parameters using the Color Doppler mode controls on the left-side Color Doppler ControlBar.
5. Click on the "CFM+PW mode" ("PDI+PW mode", "DPDI+PW mode") button on the software top ToolBar or on the "F6" hot key to show the running Color Doppler mode image with the PW line displayed and the frozen PW mode image.
6. Click using the left mouse button on the ultrasound image to select the PW sample volume position. Adjust the PW sample volume size and position using the controls on the left-side PW mode ControlBar.
7. Click on the "CFM+PW mode" ("PDI+PW mode", "DPDI+PW mode") button or on the "F6" hot key once again to show the frozen Color Doppler mode image and the running PW mode image.
8. Optionally, adjust the PW sample volume position and size.
9. Optionally, adjust the PW image using the PW mode controls on the software left-side ControlBar.
10. Click on the "Freeze/Run" button or on the SpaceBar key to freeze ultrasound scanning.
11. Optionally, perform measurements and add annotations.
12. Optionally, print out and/or save ultrasound images.
13. Click on the "Freeze/Run" button or on the SpaceBar key to re-start ultrasound scanning.
14. Optionally, repeat steps 4-13 in order to scan more CFM+PW images.
15. Click on the "B mode" button or on the "F1" hot key to enter B mode.

Depending on your selected software options and the ultrasound scanner used, the "CFM+PW mode" button ("F6" hot key) may loop through the following states: CFM running + PW running (Triplex), CFM frozen + PW running. If the scanner does not support Triplex or this feature has been turned off at options, the following states are used: CFM running + PW frozen, CFM frozen + PW running.

7.10. Color Doppler and PW mode (optional)

The software supports switching between the Color Doppler and PW modes. In order to switch between the Color Doppler and PW modes, perform the following actions:

1. If an ultrasound image is frozen, unfreeze it by clicking on the "Freeze/Run" button or on the SpaceBar key.
2. If the current mode is not B mode click on the "B mode" button or on the "F1" hot key to enter B mode.
3. Optionally, adjust the B image using the B mode controls on the software left-side ControlBar.
4. Select the desired Color Doppler mode as described in the "Color Doppler mode" section, adjust the Color Doppler window size and position. Adjust the Color Doppler mode parameters using the Color Doppler mode controls on the left-side Color Doppler ControlBar.
5. Click on the "CFM+PW mode" ("PDI+PW mode", "DPDI+PW mode") button on the software top ToolBar or on the "F6" hot key to show the running Color Doppler mode image with the PW line displayed and the frozen PW mode image.
6. Click using the left mouse button on the ultrasound image to select the PW sample volume position. Adjust the PW sample volume size and position using the controls on the left-side PW mode ControlBar.
7. Click on the "PW mode" button on the software's top ToolBar or on the "F4" hot key to show the PW mode image.
8. Optionally, click on the "Color Doppler with PW-line" ("PW-line (CFM)", "PW-line (PDI)", "PW-line (DPDI)") button on the software top ToolBar or on the "F4" hot key to show the Color Doppler mode image with PW line on it, adjust the PW sample volume size and position and then once again click on the "PW mode" button or on the "F4" hot key to show the PW mode image.
9. Optionally, adjust the PW image using the PW mode controls on the software left ControlBar.
10. Click on the "Freeze/Run" button or on the SpaceBar key to freeze ultrasound scanning.
11. Optionally, perform measurements and add annotations.
12. Optionally, print out and/or save ultrasound images.
13. Click on the "Freeze/Run" button or on the SpaceBar key to re-start ultrasound scanning again.
14. Optionally, repeat steps 4-13 in order to scan more PW mode images.
15. Click on the "B mode" button or on the "F1" hot key to enter B mode.

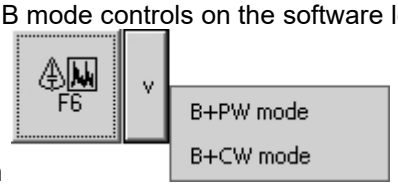
7.11. B+CW mode (optional)

In order to enter B+CW mode, perform the following actions:

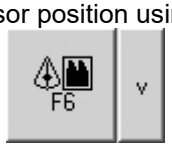
1. If an ultrasound image is frozen, unfreeze it by clicking on the "Freeze/Run" button or on the SpaceBar key.

2. If the current mode is not B mode click on the "B mode" button

or on the "F1" hot key to enter B mode.
3. Optionally, adjust the B image using the B mode controls on the software left-side ControlBar.

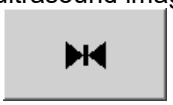
4. Open menu of the "B+PW mode" button 

on the software top ToolBar and select "B+CW mode" menu item to show the running B mode image with the CW line on it and the frozen CW mode image. If "B+CW mode" was selected before and button stored this selection, then B+CW mode can also be selected by clicking on the "F6" hot key.
5. Click using the left mouse button on the B mode ultrasound image to select the CW cursor position. An alternative way of selecting the CW-line is by using the "CW Cursor Position" control on the left-side CW mode ControlBar. Adjust the CW cursor position using the controls on the left-side CW mode ControlBar.

6. Click on the "B+CW mode" button 

or on the "F6" hot key to freeze the B image and run the CW image.
7. Optionally, adjust the CW cursor position by clicking the left mouse button on the B mode image and by using the appropriate controls on the left-side CW mode ControlBar.
8. Optionally, adjust the CW image using the CW mode controls on the software left-side ControlBar.

9. Click on the "Freeze/Run" button or on the SpaceBar key to freeze ultrasound scanning.
10. Optionally, perform measurements and add annotations.
11. Optionally, print out and/or save ultrasound images.

12. Click on the "Freeze/Run" button  or on the SpaceBar key to re-start ultrasound scanning.
13. Optionally, repeat steps 4-12 in order to scan more B+CW images.

14. Click on the "B mode" button

or on the "F1" hot key to enter B mode.

The "B+CW mode" button ("F6" hot key) loops through the following states: B running + CW frozen, B frozen + CW running.

When button with hot key "F6" loops through CW (PW) states, hot key "F2" can be used for entering PW (CW) states.

Layout for B and PW/CW images (left-right or top-bottom) can be selected using the software options (Menu->Tools->Options->Appearance->General).

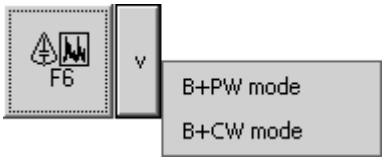
7.12. CW mode (optional)

In order to enter CW mode, perform the following actions:

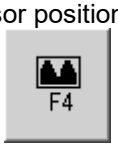
1. If an ultrasound image is frozen, unfreeze it by clicking on the "Freeze/Run" button or on the SpaceBar key.

2. If the current mode is not B mode, click on the "B mode" button

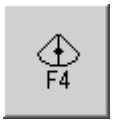
or on the "F1" hot key to enter B mode.

3. Open menu of the "B+PW mode" button 

on the software top ToolBar and select "B+CW mode" menu item to show the running B mode image with the CW line on it and the frozen CW mode image. If "B+CW mode" was selected before and button stored this selection, then B+CW mode can also be selected by clicking on the "F6" hot key.
4. Click using left mouse button on the B mode ultrasound image to select the CW cursor position. An alternative way of selecting CW-line is by using the "CW Cursor Position" control on the left-side CW mode ControlBar. Adjust the CW cursor position using the controls on the left-side CW mode ControlBar.

5. Click the "CW mode" button 

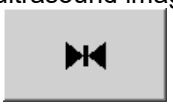
on the software top ToolBar or on the "F4" hot key to show the CW mode image.

6. Optionally, click the "B with CW-line" ("CW-line") button 

on the software top ToolBar or on the "F4" hot key to show the B mode image with the CW line displayed, adjust the CW cursor position, and once again click on the "CW mode" button

or on the "F4" hot key to show the CW mode image.
7. Optionally, adjust the CW image using the CW mode controls on the software left ControlBar.

8. Click on the "Freeze/Run" button or on the SpaceBar key to freeze ultrasound scanning.
9. Optionally, perform measurements and add annotations.
10. Optionally, print out and/or save ultrasound images.

11. Click on the "Freeze/Run" button  or on the SpaceBar key to re-start ultrasound scanning.
12. Optionally, repeat steps 4-11 in order to scan more CW mode images.

13. Click on the "B mode" button

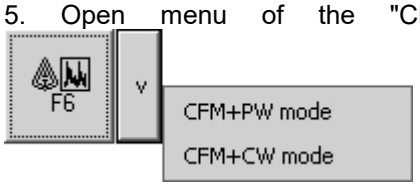
or on the "F1" hot key to enter B mode.

7.13. Color Doppler + CW mode (optional)

In order to enter Color Doppler + CW mode perform the following actions:

1. If an ultrasound image is frozen, unfreeze it by clicking on the "Freeze/Run" button or on the SpaceBar key.

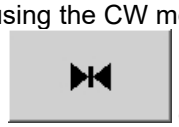
2. If the current mode is not B mode click on the "B mode" button

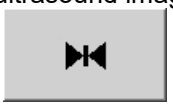
or on the "F1" hot key to enter B mode.
3. Optionally, adjust the B image using the B mode controls on the software left-side ControlBar.
4. Select the desired Color Doppler mode as described in the "Color Doppler mode" section, adjust the Color Doppler window size and position. Adjust the Color Doppler mode parameters using the Color Doppler mode controls on the left-side Color Doppler ControlBar.
5. Open menu of the "CFM+PW mode" ("PDI+PW mode", "DPDI+PW mode") button 

on the software top ToolBar and select "CFM+CW mode" menu item to show the running Color Doppler mode image with the CW line on it and the frozen CW mode image. If "CFM+CW mode" was selected before and button stored this selection, then CFM+CW mode can also be selected by clicking on the "F6" hot key.
6. Click using the left mouse button on the ultrasound image to select the CW cursor position. Adjust the CW cursor position using the controls on the left-side CW mode ControlBar.

7. Click on the "CFM+CW mode" ("PDI+CW mode", "DPDI+CW mode") button

or on the "F6" hot key once again to show the frozen Color Doppler mode image and the running CW mode image.
8. Optionally, adjust the CW cursor position.
9. Optionally, adjust the CW image using the CW mode controls on the software left-side ControlBar.

10. Click on the "Freeze/Run" button  or on the SpaceBar key to freeze ultrasound scanning.
11. Optionally, perform measurements and add annotations.
12. Optionally, print out and/or save ultrasound images.

13. Click on the "Freeze/Run" button  or on the SpaceBar key to re-start ultrasound scanning.
14. Optionally, repeat steps 4-13 in order to scan more CFM+CW images.

15. Click on the "B mode" button

or on the "F1" hot key to enter B mode.

The "CFM+CW mode" button ("F6" hot key) loops through the following states: CFM running + CW frozen, CFM frozen + CW running.

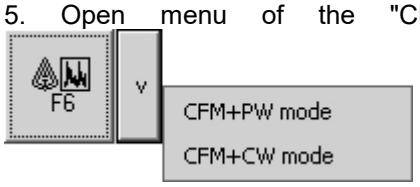
When button with hot key "F6" loops through CW (PW) states, hot key "F2" can be used for entering PW (CW) states.

7.14. Color Doppler and CW mode (optional)

The software supports switching between the Color Doppler and CW modes. In order to switch between the Color Doppler and CW modes, perform the following actions:

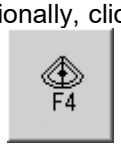
1. If an ultrasound image is frozen, unfreeze it by clicking on the "Freeze/Run" button or on the SpaceBar key.

2. If the current mode is not B mode click on the "B mode" button

or on the "F1" hot key to enter B mode.
3. Optionally, adjust the B image using the B mode controls on the software left-side ControlBar.
4. Select the desired Color Doppler mode as described in the "Color Doppler mode" section, adjust the Color Doppler window size and position. Adjust the Color Doppler mode parameters using the Color Doppler mode controls on the left-side Color Doppler ControlBar.
5. Open menu of the "CFM+PW mode" ("PDI+PW mode", "DPDI+PW mode") button 

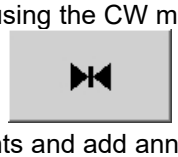
on the software top ToolBar and select "CFM+CW mode" menu item to show the running Color Doppler mode image with the CW line on it and the frozen CW mode image. If "CFM+CW mode" was selected before and button stored this selection, then CFM+CW mode can also be selected by clicking on the "F6" hot key.
6. Click using the left mouse button on the ultrasound image to select the CW cursor position. Adjust the CW cursor position using the controls on the left-side CW mode ControlBar.

7. Click on the "CW mode" button

on the software's top ToolBar or on the "F4" hot key to show the CW mode image.
8. Optionally, click on the "Color Doppler with CW-line" ("CW-line (CFM)", "CW-line (PDI)", "CW-line (DPDI)") button 

on the software top ToolBar or on the "F4" hot key to show the Color Doppler mode image with CW line on it, adjust the CW cursor position and then once again click on the "CW mode" button

or on the "F4" hot key to show the CW mode image.
9. Optionally, adjust the CW image using the CW mode controls on the software left ControlBar.

10. Click on the "Freeze/Run" button  or on the SpaceBar key to freeze ultrasound scanning.
11. Optionally, perform measurements and add annotations.
12. Optionally, print out and/or save ultrasound images.

13. Click on the "Freeze/Run" button or on the SpaceBar key to re-start ultrasound scanning again.
14. Optionally, repeat steps 4-13 in order to scan more CW mode images.

15. Click on the "B mode" button

or on the "F1" hot key to enter B mode.

7.15. B+Color M mode (optional)

In order to enter B+Color M mode, perform the following actions:

1. If an ultrasound image is frozen, unfreeze it by clicking on the "Freeze/Run" button or on the SpaceBar key.

2. If the current mode is not B mode, click on the "B mode" button

or on the "F1" hot key to enter B mode.
3. Optionally, adjust the B image using the B mode controls on the software left-side ControlBar.
4. Select CFM mode as described in the "Color Doppler mode" section, adjust the Color Doppler window size and position. Adjust the Color Doppler mode parameters using the Color Doppler mode controls on the left-side Color Doppler ControlBar.

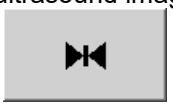
5. Click on the "Color M line" button

on the software top ToolBar or on the "F2" hot key to display the CFM mode image with the M line on it.
6. Click using the left mouse button on the CFM mode ultrasound image to select the M-line position. Software will center CFM window at mouse click position or M-line position. An alternative way of selecting M-line is by using the "Line Position" control on the left-side M mode ControlBar.

7. Click on the "B+Color M mode" button

on the software top ToolBar or on the "F2" hot key to show the B+Color M mode image.
8. Optionally, adjust the M-line position by clicking the left mouse button on the B mode image. Line position and Doppler window size can be adjusted using Doppler Window controls at left-side CFM mode ControlBar. Doppler window size also can be changed by clicking with mouse on the line that indicates Doppler window border (on B or on M image), moving it and then clicking again to finish movement.
9. Optionally, adjust the Color Doppler mode and M mode scanning parameters using left-side Color Doppler and left-side M ControlBars.

10. Click on the "Freeze/Run" button or on the SpaceBar key to freeze ultrasound scanning.
11. Optionally, perform measurements and add annotations.
12. Optionally, print out and/or save ultrasound images.

13. Click on the "Freeze/Run" button  or on the SpaceBar key to re-start ultrasound scanning.
14. Optionally, repeat steps 4-13 in order to scan more B+Color M images.

15. Click on the "B mode" button

or on the "F1" hot key to enter B mode.

The layout of the B and M images (left-right or top-bottom) can be selected at software options (Menu->Tools->Options->Appearance->General).

7.16. Color Doppler and Color M mode (optional)

The software supports switching between the Color Doppler and Color M modes, and this can be done in the following way:

1. If an ultrasound image is frozen, unfreeze it by clicking on the "Freeze/Run" button or on the SpaceBar key.

2. If the current mode is not B mode, click on the "B mode" button

or on the "F1" hot key to enter B mode.
3. Optionally, adjust the B image using the B mode controls on the software left-side ControlBar.
4. Select CFM mode as described in the "Color Doppler mode" section, adjust the Color Doppler window size and position. Adjust the Color Doppler mode parameters using the Color Doppler mode controls on the left-side Color Doppler ControlBar.

5. Click on the "Color M line" button

on the software top ToolBar or on the "F2" hot key to display the CFM mode image with the M line on it.
6. Click using the left mouse button on the CFM mode ultrasound image to select the M-line position. Software will center CFM window at mouse click position or M-line position. An alternative way of selecting M-line is by using the "Line Position" control on the left-side M mode ControlBar.

7. Click on the "Color M mode" button

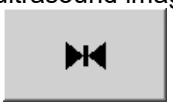
on the software top ToolBar or on the "F4" hot key to show the Color M mode image.

8. Optionally, click on the "Color M line" button

on the software top ToolBar or on the "F4" hot key to show the CFM mode image with the M line on it, adjust the M-line position and once again click on the "Color M mode" button

or on the "F4" hot key to show the Color M mode image.
9. Optionally, adjust the Color Doppler mode and M mode scanning parameters using left-side Color Doppler and left-side M ControlBars.

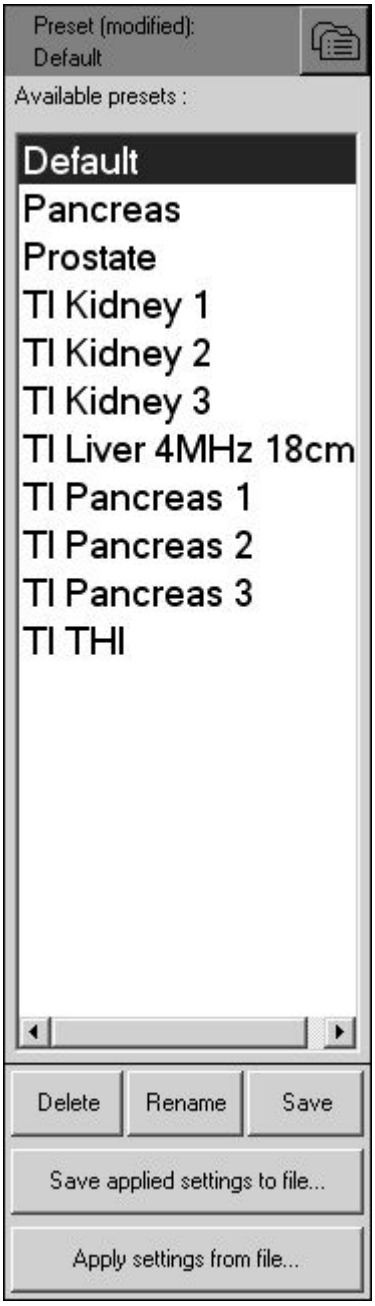
10. Click on the "Freeze/Run" button or on the SpaceBar key to freeze ultrasound scanning.
11. Optionally, perform measurements and add annotations.
12. Optionally, print out and/or save ultrasound images.

13. Click on the "Freeze/Run" button  or on the SpaceBar key to re-start ultrasound scanning.
14. Optionally, repeat steps 4-13 in order to scan more Color M mode images.

15. Click on the "B mode" button

or on the "F1" hot key to enter B mode.

8. Using Ultrasound Scanning Presets



In order to apply ultrasound scanning preset, perform the following actions:

1. Open the left-side Presets ControlBar (if not already open) by clicking on the "Presets" button on the software bottom ToolBar.
2. Move the mouse cursor over the name of the preset you want to use from the list of available presets.
3. Click using the left mouse button in order to activate this preset.
4. Optionally, repeat steps 2-3 to use another preset.

When you activate presets, the software at first enters the appropriate scanning mode that was used during the preset saving and then sets the scanning parameters for the controls of that particular mode.

The name of used preset is shown at the top of left-side ControlBars. If after preset invocation were modified any scanning parameters, this is indicated by text "(modified)".

In order to apply an ultrasound scanning preset using the keyboard, please perform the following actions:

1. Open (activate) the left-side Presets ControlBar by clicking on the "7" key (hot key of "Presets" button).
2. Use the keyboard "Up" and "Down" arrow keys to select the desired preset.
3. Click on the "Enter" key to activate the selected preset.
4. Optionally, repeat steps 2-3 in order to apply another preset.

In order to save the current ultrasound scanning parameters as a preset for future use please perform the following actions:

1. Open the left-side Presets ControlBar (if not already open) by clicking on the "Presets" button on the software bottom ToolBar.

2. Click on the "Save" button

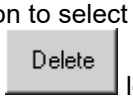
that is located at the bottom of the Presets ControlBar. After this a window will be displayed for entering the preset name.

3. Inside the open window enter the desired preset name (must be different from the other preset names) that will be displayed in the list of presets and click on the "OK" button. The window will then be closed and the preset will then appear in the preset list.

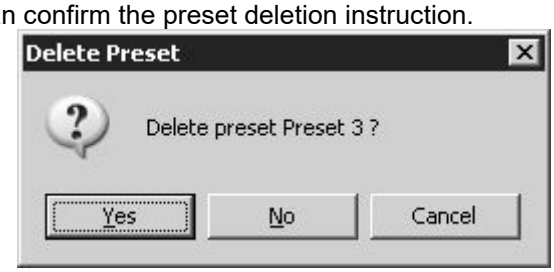
Please note that preset stores and loads all ultrasound scanning parameters for all modes regardless of which mode was used during the preset creation. That means that even if a preset is created in B mode it will also store and load parameters for all available modes (B, M, CFM, PDI, DPDI, PW, CW).

Presets are stored for currently selected beamformer + probe. If you want to perform a presets backup you need to use the presets import/export tool at software options ("Menu->Tools->Options->Scanning Control->Presets->Import and Export") or backup/restore tool ("Menu->Tools->Backup/Restore"). More information about backup is presented in the section "Frequently Asked Questions".

In order to delete an ultrasound scanning preset please perform the following actions:

1. Open the left-side Presets ControlBar (if not already open) by clicking on the "Presets" button on the software bottom ToolBar.
2. Move the mouse cursor over the name of the desired to delete preset from the list of available presets.
3. Click on the left mouse button to select a preset. This will apply the selected preset.
4. Click on the "Delete" button 

located at the bottom of the Presets ControlBar. After that a window will be displayed where you can confirm the preset deletion instruction.



5. To delete a preset click the "Yes" button inside the window displayed. In order to cancel preset deletion operation, click on the "No" button or on the "Cancel" button.
6. Optionally, repeat steps 2-5 to delete other presets.

If Presets ControlBar is active, a preset also can be selected using the "Up" and "Down" arrow keys and deleted by clicking on the "Delete" button.

To save current ultrasound scanning parameters as a settings file for future use or for copying to another ultrasound scanner, please perform the following actions:

1. Open the left-side Presets ControlBar (if not already open) by clicking on the "Presets" button on the software bottom ToolBar.

2. Click on the "Save applied settings to file" button

located at the bottom of the Presets ControlBar. Then a file saving window for entering the file name will appear.
3. Inside the opened "Save file as" window enter the file name and click on the "Save" button.

To load ultrasound scanning parameters from a settings file (e.g., one that was copied from another ultrasound scanner) or previously saved TPD/TVD image file, please perform the following actions:

1. Open the left-side Presets ControlBar (if not already open) by clicking on the "Presets" button on the software bottom ToolBar.

2. Click on the "Apply settings from file" button

located at the bottom of the Presets ControlBar. Then a file opening window will be displayed.
3. Inside the opened "Open" window select the file name for the desired to apply settings and click on the "Open" button.

9. Using Cine

By default the software automatically records the most recent scanned ultrasound image frames to cine memory (buffer). Cine memory status is displayed on the software bottom-right corner using the progress indicator

. The progress bar filling graphically indicates how much cine memory has been used for recorded frames in comparison with the total cine memory size. The number in the center of the progress bar indicates the number of frames recorded (the number of frames that are currently stored in cine memory). When the cine memory is full, new scanned frames replace the oldest frames and this is indicated by a moving vertical graphical line. It is important to note that cine memory is organized in a specific manner so that the user will always see the most recently scanned/recorded frames. Generally speaking, you do not need to bother whether the cine buffer is full or not since the cine will always store the most recently scanned frames. A red circle inside the progress bar indicates that live scanning is currently in progress and recording to cine memory. If during scanning you want to clear previously scanned ultrasound frames from cine buffer, this can be done by clicking Alt+C hot key or by doing freeze/unfreeze.

Cine is usually used in the following way:

1. Select the desired scanning mode and scan the anatomy of interest.

2. Click on the "Freeze/Run" button or on the SpaceBar key to freeze ultrasound scanning.

3. Select the desired ultrasound frame using the cine stepping buttons (Previous Frame, Next Frame) on the software bottom-right corner:

.

Buttons can be clicked using the mouse (hold button down for a short period to perform fast stepping). You can also move the mouse over these buttons and select cine previous/next frames by rotating the mouse wheel (if present) without clicking. An alternative way of selecting frames is to use the keyboard keys "<" and ">" located near the SpaceBar key or use the multimedia keys (if present). If the "Previous Frame" or "Next Frame" buttons are activated (focused), for cine stepping can be used the Left/Right arrow keys, Home/End keys, and for playing/pausing can be used the Up/Down arrow keys.

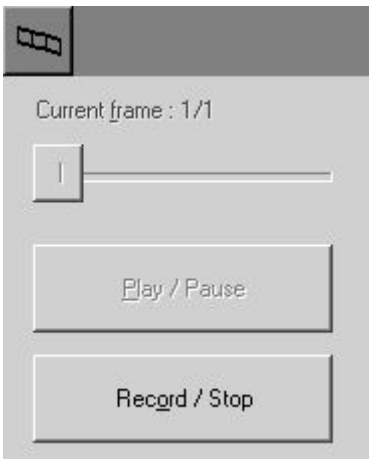
The cine preview (playback) indicator

shows how many frames have been recorded in the cine memory and what frame (frame with what number) we are currently viewing. For example, "10/50" means that we are viewing the 10th frame of 50 frames. The current frame position is also indicated using a vertical graphical line. The last frame (e.g., 50/50) is the frame that we saw when the freeze was performed.

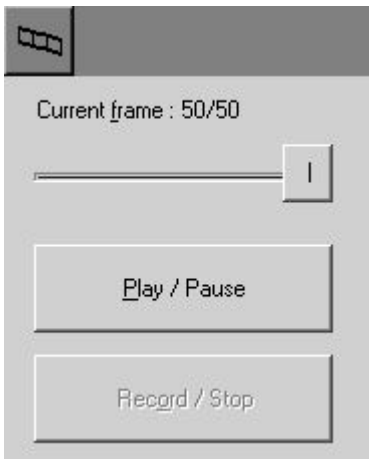
4. Optionally, perform post-processing of selected frames (image enhancement, gamma correction, brightness and contrast adjustment).
5. Optionally, perform measurements and calculations.
6. Optionally, print out or save current images.
7. Click on the "Freeze/Run" button or on the SpaceBar key to re-start ultrasound scanning. This will clear the cine buffer and will start recording new scanned frames.
8. Optionally, perform steps 1-7 in order to scan more images.

An alternative way of controlling cine (frame selection, playback) is by using the right-side "Cine" ControlBar that can be opened by clicking on the "Cine" button

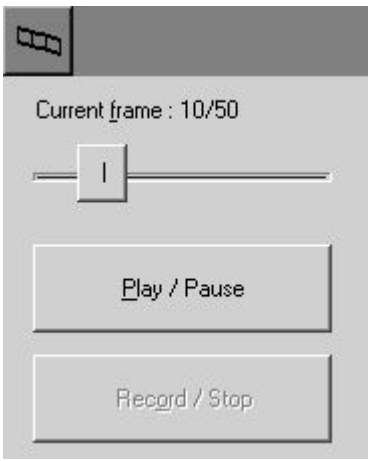
on the software top ToolBar or “F11” hot key.



"Cine" ControlBar during live scanning



After freeze



After 10th frame selection

During live scanning the only function available is using the "Record/Stop" button that allows you to manually select when recording of ultrasound frames is started or finished. The first click on this button clears the cine buffer and starts recording. A second click of the "Record/Stop" button freezes the ultrasound scanning and the recording. In order to start ultrasound scanning again, click on the "Freeze/Run" button or on the SpaceBar key.

When ultrasound images are frozen, we can use the frame selection TrackBar "Current frame" in the "Cine" ControlBar to select desired frames. Frames can be selected by dragging the TrackBar thumb using the mouse or by moving the mouse cursor over the TrackBar and rotating the mouse wheel (if present). If the "Current frame" TrackBar is active the desired frame can be selected using the Left / Right arrow keys and the first frame can be fast selected by clicking on the "Home" key and the last frame (visible when we performed the freeze) can be fast selected by clicking on the "End" key.

To play recorded frames or to pause playing, click on the "Play/Pause" button. An alternative way of playing cine or pausing play is by using the multimedia keyboard keys (if available). When the final frame is reached, the playback automatically returns to the first frame.

Cine size (capacity) can be adjusted at software options (Menu->Tools->Options->Scanning Control->Cine). After changing cine size close the options dialog by clicking on the "OK" button and then restart the software.

10. Adjusting Ultrasound Image Quality

To change scanning mode click on the desired mode (B, M, CFM) button displayed at the top ToolBar using your mouse or change the scanning mode using the appropriate mode "F1"-"F7" hot keys.

To adjust the desired parameter of the selected mode, please perform the following actions:

1. Open (activate) the left-side ControlBar of the desired mode by clicking on the appropriate button on the software bottom ToolBar (or corresponding hot key "1"-"7").

Here 1 - B mode, 2 - M mode, 3 - Color Doppler mode (optional), 4 - Pulsed Wave Doppler mode (optional), 5 - TGC controls, 6 - Palettes and Color Maps, 7 - Presets.

Alternatively, you can move the mouse cursor to the left-side of the screen, wait for a short period and then inside the autohide left-side ToolBar displayed click on the button of the desired scanning mode to adjust.

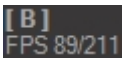
2. Each ControlBar may have several pages of controls. Optionally, inside the open ControlBar select the page of controls where the desired controls are found for the appropriate parameter by clicking on the "<" and ">" buttons at the bottom of the selected ControlBar. If the ControlBar is active, the pages can be changed by clicking on the "Page Up" and "Page Down" keys.

3. Move the mouse cursor over the appropriate control and perform adjustments by rotating the mouse wheel (if your mouse has a wheel) or by clicking using the left mouse button at appropriate control location depending on control type. ControlBars for each mode also support keyboard navigation. This means that if a ControlBar is active then the active controls can be selected by clicking on the "Up" and "Down" arrow keys and the values of active controls can be changed by clicking on the "Left" and "Right" arrow keys. Optionally, active controls can be indicated by different caption colors or by colored rectangles displayed on the left and right sides of the control.

4. Optionally, repeat steps 1-3 in order to adjust all necessary parameters.

Parameters for each mode that can be adjusted are described in the following sections.

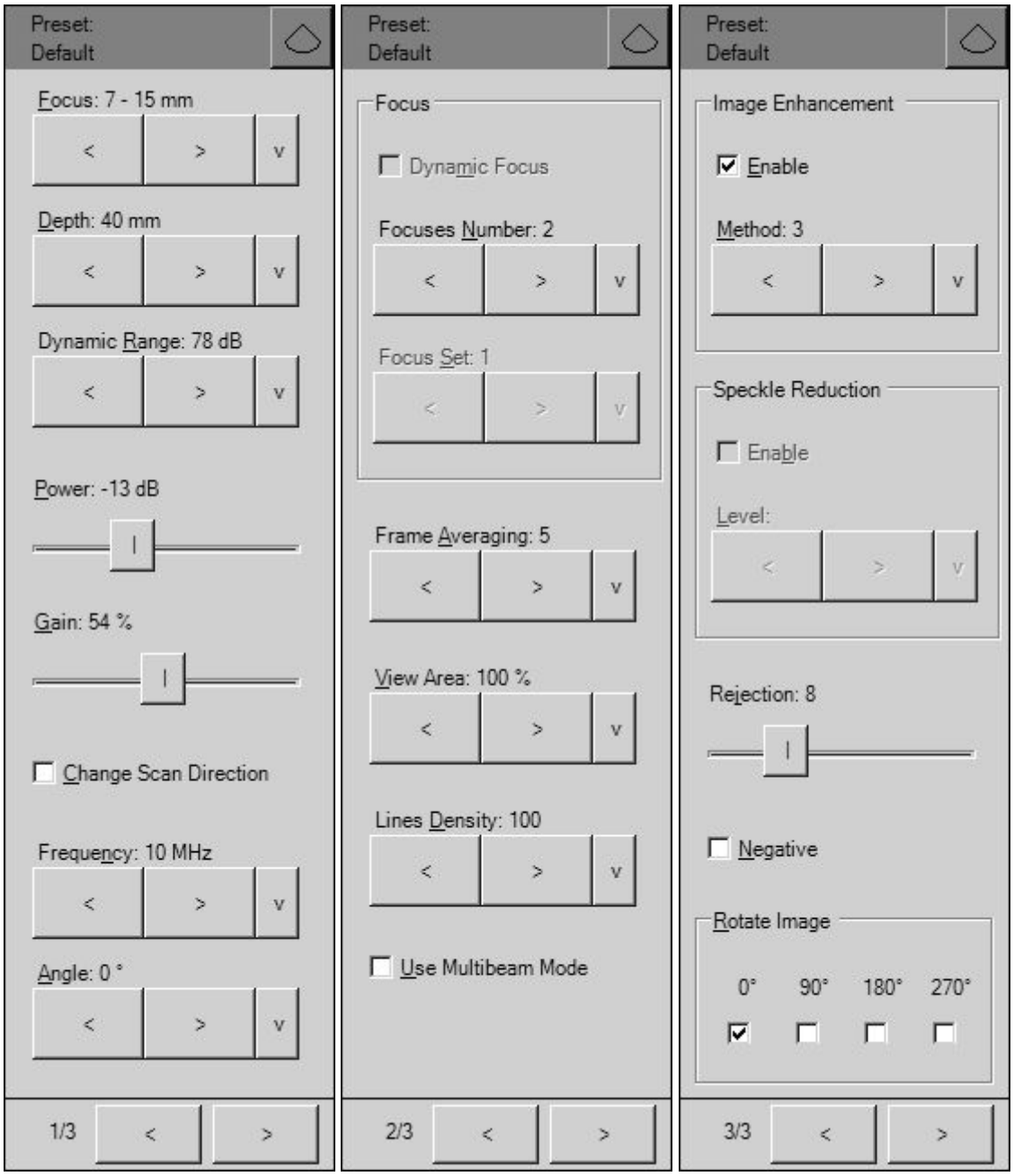
Adjustments are only allowed for the currently selected scanning mode that means that some buttons and controls may be disabled.

When scanning, the software shows frame rate in format “FPS x/y” 

, where x - output to computer monitor frame rate (FPS), y - ultrasound scanning/cine recording frame rate (FPS), FPS means Frames per Second. Here mentioned x and y values may differ, because, depending on selected scanning parameters, the scanner may be able to scan at higher FPS than computer is able to display.

10.1. Adjusting B Mode Controls

To adjust the B mode controls open the left-side B controls ControlBar by clicking on the "B controls" button on the software bottom ToolBar or on the "1" hot key. Inside this ControlBar the B mode controls are divided into the following 3 pages:



10.1.1. Focus

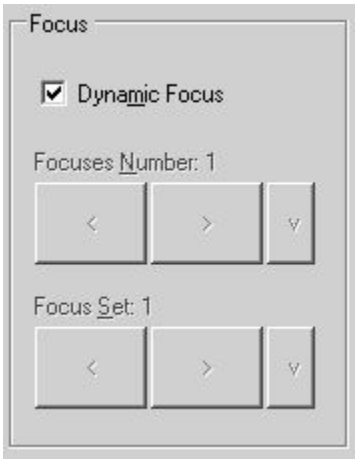
Description

Focus optimizes the ultrasound image by increasing the resolution of specific areas. The hardware supports both dynamic (optional) and static focusing modes. In the dynamic focusing mode an ultrasonic beam is focused full length. In the static focusing mode the ultrasonic beam is only focused at selected areas or focusing zones. In the static focusing mode it is possible to select a number of focusing areas (called the focus number). Please note that selecting a larger number of focuses (or active focusing zones) reduces the frame rate. You must select a focusing depth (see the triangular focusing markers near the depth scale) in both the static and dynamic focusing modes. In the static focusing mode you may need to select the set of focuses that also determine which depths are used for the focusing zones before you adjust the focusing depth. Always try to adjust focuses so that focusing markers are at the center of the anatomical structure which is of most interest.

Values

The available list of focusing depth values depends on the beamformer and probe used. Focusing depth measurement units used - millimeters (mm).

Adjustment



To use the dynamic focusing mode (optional) tick the "Dynamic Focus" CheckBox and then adjust the focusing depth using the "Focus" control

.

To use the static focusing mode, untick the "Dynamic Focus" CheckBox. Then select the focusing set depending on the desired focusing depth. Focusing sets with small identifiers are located at small depths while sets with large identifiers are located at greater depths. Alternatively, select the number of focuses (active focusing zones). Then adjust the focusing depth using the "Focus" control.

Hints

In order to achieve a higher frame rates use static focusing (untick the "Dynamic Focus" CheckBox) with a small number of focuses (set the "Focuses Number" as 1).

Relations to other controls

After adjusting Depth you may need to adjust the Focus controls.

The behavior of the focuses in the different scanning modes (B, CFM, PW) can be adjusted under the software options ("Menu->Tools->Options->Scanning Control" sub-tabs "B mode", "Color Doppler mode", "PW Doppler mode").

Bioeffects

Focus adjustments may change the TI (Thermal Index) and MI (Mechanical Index) values.

10.1.2. Depth

Description

Depth adjusts the field of view. Increase the depth to look at larger or deeper structures. Decrease depth in order to look at structures near the skin surface. Additionally, you may wish to decrease the depth if there is a large part of unnecessary ultrasound image below the displayed anatomical structures of interest. You may also need to change the depth in order to see anatomical structures of interest in the center of the screen.

Values

The list of available depth values depends on the type of probe used. Measurement units used - millimeters (mm). The painted depth scale on the ultrasound image displays tick marks at 10 mm intervals.

Adjustment

Use the Depth control to change the values.

Relations to other controls

After adjusting the Depth you may need to adjust the Gain, TGC (Time Gain Compensation) and the Focus controls.

Smaller scanning depths usually allow you to achieve higher frame rates.

Bioeffects

Depth adjustment may change the TI and MI values.

10.1.3. Dynamic Range

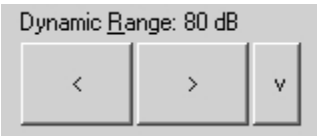
Description

Dynamic range is a measure of the ultrasonic device's ability to display both very weak and very strong signals at the same time while ensuring their levels can still be visually distinguished. The greater the dynamic range the better the above-mentioned ability. As a rule, every observation should be started using the maximum possible dynamic range since it provides you with the most complete diagnostic information. Narrowing or reducing the dynamic range leads to the echo image displaying more contrast. Dynamic Range is useful for optimizing tissue texture for different anatomical structures.

Values

The values available depend on the type of probe used. Measurement units used - decibels (dB).

Adjustment



To change the values use the Dynamic Range control.

Hints

In order to perform automatic B mode Gain, TGC and Dynamic Range adjustment, use the "Automatic adjustment" button on the software top ToolBar (“F12” hot key). During image optimization hold the probe on an anatomical structure of interest and do not move it. Please note that availability of the automatic image optimization depends on the ultrasound scanner used.

Adjust the Dynamic Range so that the highest amplitude edges appear as white while the lowest levels (such as for blood) are only just visible.

10.1.4. Power

Description

Power adjustment increases or decreases the acoustic power of the transmitted ultrasound signal. Larger power values allow you to increase the penetration depth and can help to achieve better image quality when observing tissues at greater depths.

Values

Available power values usually are in the interval 10-100%. Measurement units used - percentages (%). For SmartUs scanners, power values are in the interval [-20;0] dB (decibels).

Adjustment

To change the values use the Power control.

Relations to other controls

After adjusting the Power level you may need to adjust the Gain. If you decrease the power level you may need to increase the gain. If you increase the power level you may need to decrease the gain.

Hints

Always optimize gain before increasing power levels.

Bioeffects

Power adjustments may change the TI and MI values.

Caution

Always use the lowest possible power value in order to reduce any possible negative effects on the patient. This is especially important when observing pregnant women and children.

10.1.5. Gain

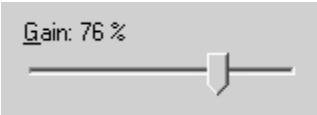
Description

B mode Gain adjustment increases or decreases the amplification of the returning ultrasound echo signal. Use this control to increase or decrease the amount of echo information displayed in the ultrasound image. Gain adjustment allows you to balance echo contrast so that cystic structures appear echo-free and reflecting tissues are filled in. Gain adjustment may brighten or darken the ultrasound image if sufficient echo information is generated.

Values

Gain values available are usually found in the interval 10-100%. Measurement units used - percentages (%).

Adjustment



Use the Gain control to change the value.

Relations to other controls

After adjusting the Gain you may need to adjust the Power level. If you increase the gain then you may need to decrease the power level. If you increase the power level you may need to decrease the gain. Please note that adjustments of the Gain control do not change the shape of the TGC (Time Gain Compensation) curve. Gain control adjusts overall gain while TGC controls adjust the gain at appropriate depths.

Hints

To perform automatic B mode Gain, TGC and Dynamic Range adjustment use the "Automatic adjustment" button on the software top ToolBar (“F12” hot key). During image optimization hold the probe on an anatomical structure of interest and do not move it. Please note that availability of automatic image optimization depends on the ultrasound scanner used.

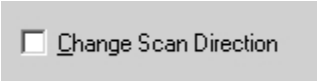
Always optimize gain before increasing the power level.

10.1.6. Change Scan Direction

Description

The Change Scan Direction (Reverse) control allows you to change the ultrasound scanning direction without rotating the probe. Use this feature when you wish to scan an anatomically correct ultrasound image without rotating the probe.

Adjustment



To change the scan direction place tick the "Change Scan Direction" CheckBox control.

Relations to other controls

In some cases (e.g., for gynecological examinations) you may also want to rotate the ultrasound image using the "Rotate Image" control.

Caution

When scanning, please observe the scan direction marker on the ultrasound image in order to avoid any possible confusion.

10.1.7. Frequency and Tissue Harmonic Imaging (THI)

Description

Frequency is a characteristic that defines the resolution of ultrasonic signal. Higher frequencies increase resolution of the incoming ultrasonic signal but reduce the visibility of examined tissues at greater

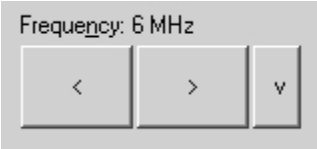
depths. In order to examine tissues found at small depths use larger frequencies and when examining tissues at greater depths it is better to use small frequencies.

Tissue Harmonic Imaging (THI) is a B mode imaging technique that reduces ultrasound image noise and clutter by improving the signal to noise ratio and the resolution. THI uses two different frequencies for transmitting and receiving the ultrasound signal. The receiving frequency is twice the size of the transmitting frequency. The THI feature is optional. ITHI - THI Pulse Inversion.

Values

The frequency values available depend on the type of probe and beamformer used. Measurement units used - megahertz (MHz).

Adjustment



Use the Frequency control to change the values. If the THI feature is available it can be turned on by selecting the appropriate frequency with THI label.

If at software "Menu->Tools->Options->Scanning Control->B mode" is turned on option "Use separate B frequency in Color Doppler, Duplex, Triplex modes", the software stores separate B Frequency values for B, Color Doppler, Duplex and Triplex modes. Otherwise is used the same B Frequency in all modes.

Bioeffects

Frequency adjustments may change the TI and MI values.

10.1.8. Angle (optional)

Description

Angle control (if available) allows you to change the ultrasound beam steering angle if a linear probe and a B mode standard scanning type is used and also to change the WideView (trapezoid) angle if a B mode WideView (trapezoid) scanning type is used.

Values

The angle values available depend on the B mode scanning type used, the probe and on the beamformer. Measurement units used - degrees (^{0}).

Adjustment

Use the Angle control to change the values.

10.1.9. Frame Averaging

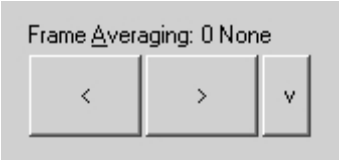
Description

Frame averaging is an image processing technique that allows you to obtain smoother, softer images and reduces ultrasound image noise by averaging several sequential ultrasound image frames together. Use higher frame averaging values to obtain smoother images.

Values

The values available may differ depending on the type of probe but the following values are usually available: 0, 2, 3, ..., 8. These values mean the number of averaged frames. The value designated as 0 means that frame averaging is not used.

Adjustment



Use the Frame Averaging control to change the frame averaging level.

Caution

Please note that higher frame averaging values not only make ultrasound images smoother but may also hide small image details. Frame averaging may slightly decrease the frame rate.

10.1.10. View Area

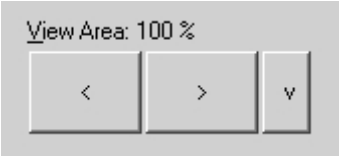
Description

The View Area control adjusts the width of the field of view (scanning angle). Increase the view area to look at larger objects. You may reduce view area in order to obtain higher frame rates when observing fast moving tissues such as the heart.

Values

The range of values normally available is 50-100%. Measurement units used - percentages (%).

Adjustment



Use the View Area control to change the view area.

Bioeffects

View Area adjustments may change the TI and MI values.

10.1.11. Rejection

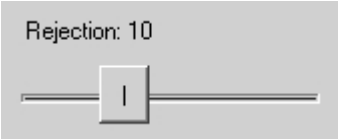
Description

Ultrasonic signal rejection is a processing that changes a range of the values of the ultrasonic signal received. Generally speaking, this processing is used to reduce visibility of noises on ultrasonic images.

Values

The range of values usually available is 0-32. The value means at what level the gray scale values are rejected. A value of 0 means that no rejection is performed. Higher values mean that more data is rejected.

Adjustment



Use the Rejection control to change rejection values..

10.1.12. Image Enhancement

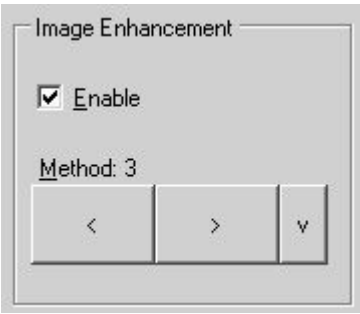
Description

Ultrasound images can be enhanced by using smoothing filters that remove noise or by using sharpening filters that enhance the tissue boundary visibility (e.g., for vessels).

Values

The software displays indexes of the image enhancement methods available.

Adjustment



In order to enable image enhancement, place a tick on the "Enable" CheckBox. Then select the desired enhancement method using the "Method" control.

Relations to other controls

Enabled image enhancement may reduce frame rate. If your want higher frame rates you may need to disable the image enhancement.

10.1.13. Speckle Reduction: PureView, ClearView (optional) plug-in

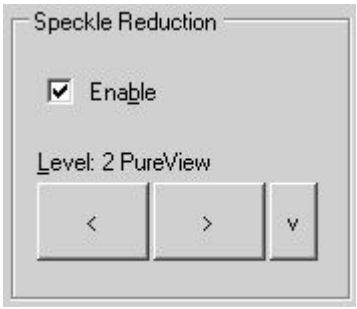
Description

PureView, ClearView (optional) and other methods are image enhancement techniques that can be used in order to reduce speckle noise and view smoother ultrasound images.

Values

Available values depend on the software/hardware configuration used and on the ultrasound probes. Displayed values mean speckle filtration level.

Adjustment



In order to enable Speckle Reduction image enhancement, place a tick on the "Enable" CheckBox. Then select the desired filtering level and method using the "Level" control.

The ClearView feature is optional (requiring an additional plug-in module).

Relations to other controls

Enabled speckle reduction may greatly reduce frame rate and slow down software operation (adjustment of scanning parameters, change of scanning modes). If you want greater frame rates you may need to disable speckle reduction (remove tick from the "Enable" CheckBox).

Caution

Please note that speckle reduction filters not only make ultrasound images smoother but they may also hide small image details.

10.1.14. Lines Density (optional)

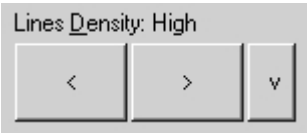
Description

Lines density adjusts the number of ultrasonic beams used in order to scan ultrasound images. Use a higher density when you are viewing small objects. A lower density allows you to increase the frame rate and can be used when viewing fast moving objects (for example the heart).

Values

Available lines density values depend on the used ultrasound scanner and probe and may be as follows: Low, Medium, Medium S, Standard, Standard S, High. “Low” means lower number of lines, “High” means higher number of lines, letter “S” means higher scanning speed.

Adjustment



Use the Lines Density control to change lines density.

Bioeffects

Lines density adjustments may change the TI and MI values.

10.1.15. Multibeam Mode (optional)

Description

The Use Multibeam Mode control allows you to increase the Frame Rate using parallel beamforming, which allows to receive multiple ultrasound beams from single transmitted pulse. Use this feature when you wish to increase the Frame Rate. This technique results in a trade-off in image quality.

Adjustment

To turn on Multibeam Mode put check on the "Use Multibeam Mode" CheckBox.

Bioeffects

Use Multibeam Mode adjustment may change the TI and MI values.

10.1.16. Negative

Description

In order to invert the palette of the ultrasound image (change the dark gray scale values to light and vice versa) you can use the Negative control.

Adjustment

To invert the palette place a tick on the "Negative" CheckBox.

Relations to other controls

Changing the Negative value affects how the palette is displayed on the other controls (e.g., Palette control).

10.1.17. Rotate Image

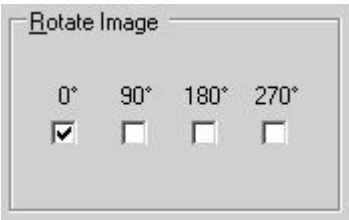
Description

For some types of examinations (e.g., gynecological examinations) you may wish to see ultrasound image rotated by, for example, 180 degrees. This can be done using the image rotation control.

Values

The rotation angles available are 0^0, 90^0, 180^0, 270^0. Measurement units used - degrees (^{0}).

Adjustment



In order to rotate an ultrasound image counter-clockwise by a particular angle, place a tick on the appropriate Rotate Image CheckBox. If the ultrasound image is not to be rotated, tick the "0^0" CheckBox.

Relations to other controls

In some cases after using the rotation angle adjustment you may wish to adjust the ultrasound scanning direction using the "Change Scan Direction" control.

Caution

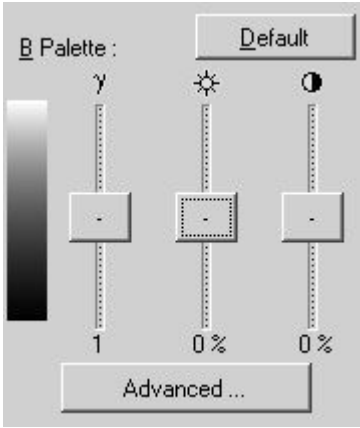
When scanning please observe the scan direction marker on the ultrasound image in order to avoid possible confusion.

10.1.18. Palette

Description

The software allows you to adjust the ultrasound image palette using gamma, brightness and contrast controls. Gamma adjustment changes the gray scale values of the ultrasound image in a non-linear manner by raising the normalized values to the power of the chosen gamma value. To make the entire ultrasound image appear lighter you can increase the brightness value. By increasing the contrast value you can increase the difference between the image gray scale values and make the ultrasound image appear sharper.

Adjustment



In order to adjust the palette of the B mode image, open the left-side Palettes ControlBar by clicking on the "Palette controls" button on the software bottom ToolBar or on the "6" hot key. Inside the opened left-side ControlBar you will find the palette control. Using this control you can adjust image gamma γ, brightness ☼, contrast ◑ or click on the "Default" button to use the default palette. Gamma correction is not used if the level 1 is selected, brightness correction is not used if the level 0 is selected and contrast correction is not used if the level 0 is selected.

The "Advanced…" button opens a dialog window that allows you to create and activate the desired gamma curves. To continue working the "Advanced" dialog window must be closed.

Hints

Before adjusting the ultrasound image Gamma, Brightness or Contrast, it is recommended that you perform the correct ultrasound image adjustment using the Gain, TGC, Power, and Dynamic Range controls.

10.1.19. Compound Angle

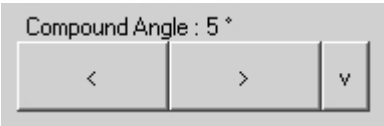
Description

The Compound Angle control adjusts the width of the field of view when is used compound scanning type.

Values

The compound angles available are 5^0, 10^0, 15^0, 20^0. Measurement units used - degrees (^{0}).

Adjustment



Use the Compound Angle control to change the values. This control is available under the software options (Menu->Tools->Options->Scanning Control->B mode).

10.1.20. Compound Frames Number

Description

The Compound Frames Number control adjusts how many ultrasound frames are used to form compound image.

Values

The values available may differ depending on the type of probe and beamformer. Available values may be 2, 3, 4, 5 frames.

Adjustment

Use the Compound Frames Number control to change the values. This control is available under the software options (Menu->Tools->Options->Scanning Control->B mode).

10.1.21. Speckle Reduction for Compound mode

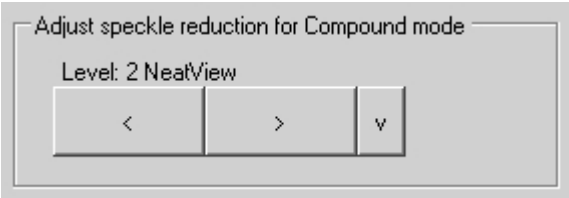
Description

The Speckle Reduction for Compound mode control adjusts what Speckle Reduction level is set when is selected Compound scanning type. When Compound scanning type is turned off, software restores previously used Speckle Reduction level.

Values

Available values depend on the software/hardware configuration used and on the ultrasound probes. Displayed values mean speckle filtration level.

Adjustment

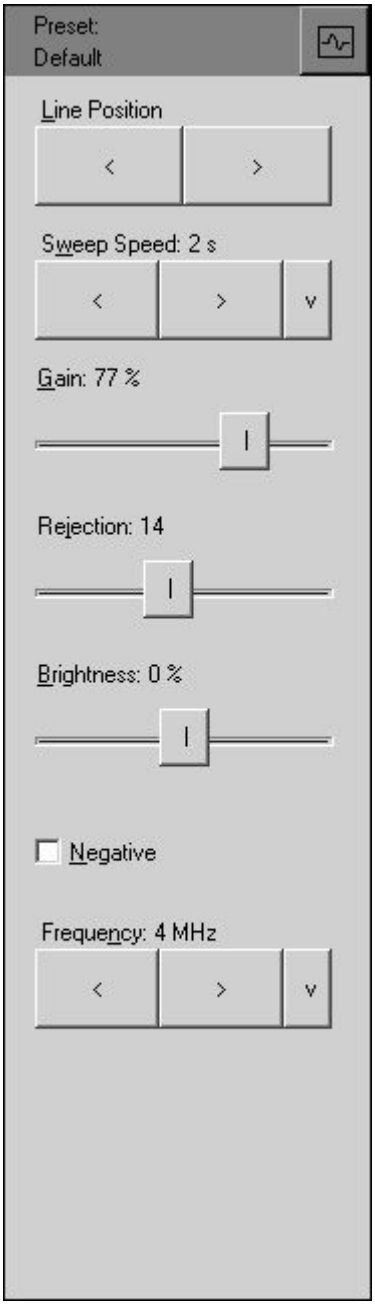


Use the Speckle Reduction for Compound mode control to change the values. This control is available under the software options (Menu->Tools->Options->Scanning Control->B mode).

10.2. Adjusting M Mode Controls

To adjust the M mode controls open the left-side M controls ControlBar by clicking on the "M controls" button

on the software bottom ToolBar or on the "2" hot key.

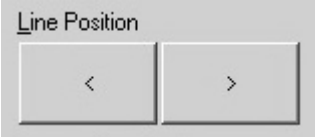


10.2.1. M-line Position

Description

The M-line (M-cursor) position determines which scan line is used for M mode information obtained.

Adjustment



To adjust the M-line position use the "Line Position" control or click using the left mouse button on the ultrasound image when the M-line is active.

Hints

The active tool is visible at the top right corner of the top ToolBar.
If the M-line tool has not been selected (for example, because the Zoom or other tool was used), you can select the M-line tool by clicking on the "M controls" button

on the software bottom ToolBar or on the "2" hot key.

10.2.2. Sweep Speed

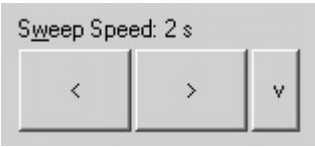
Description

Sweep speed determines how fast the M mode image (timeline) sweeps and changes the frequency of acquisition of the M mode beams. Smaller time values mean that the M image will be filled at a faster rate while greater time values mean that the M image will be filled at a slower rate.

Values

Values depend on the scanner and software options used. Measurement units used - seconds (s).

Adjustment



To change sweep speed values use the "Sweep Speed" control. Smaller values mean faster updating of M image.

Relations to other controls

When the Sweep Speed value is changed, the cine memory is cleared.

Bioeffects

Sweep speed adjustments may change the TI and MI values.

10.2.3. Gain

Adjusts B mode Gain. See description of the B mode Gain control.

10.2.4. Rejection

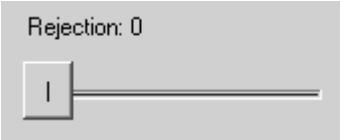
Description

Ultrasonic signal rejection is a type of processing that changes a range of values of the ultrasonic signal received. Generally speaking, this processing is used to reduce the visibility of ultrasonic image noise.

Values

The range of values normally available is 0-32. The level 0 means that rejection is not used.

Adjustment



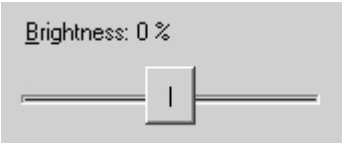
To change the rejection values use the Rejection control.

10.2.5. Brightness

Description

To make the M mode ultrasound image appear lighter you can increase the brightness value.

Adjustment



To adjust brightness use the Brightness control. Brightness correction is not used if the value is set at 0%.

Relations to other controls

Brightness also can be adjusted using the Palette controls.

10.2.6. Negative

Description

To invert the palette of the M mode ultrasound image you can use the Negative control.

Adjustment

To invert the palette place a tick on the "Negative" CheckBox.

Relations to other controls

Changes to the Negative value affect how the palette is displayed on the other controls (e.g., Palette control).

10.2.7. Frequency

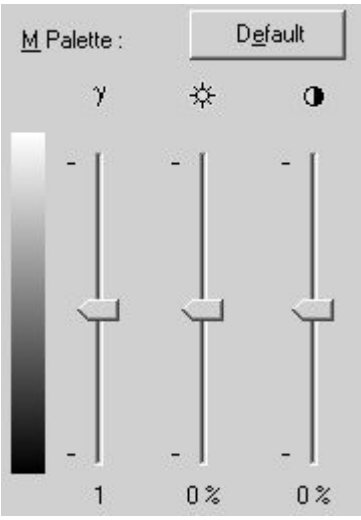
The Frequency control adjusts the B mode Frequency. See description of the B mode Frequency control.

10.2.8. Palette

Description

The software allows you to adjust the ultrasound image palette using the gamma, brightness and contrast controls. Gamma adjustments change the gray scale values of the ultrasound image in a non-linear manner by raising the normalized values to the power of the chosen gamma value. To make the entire ultrasound image appear lighter you can increase the brightness value. By increasing the contrast value you can increase the difference between the image gray scale values and make the ultrasound image appear sharper.

Adjustment



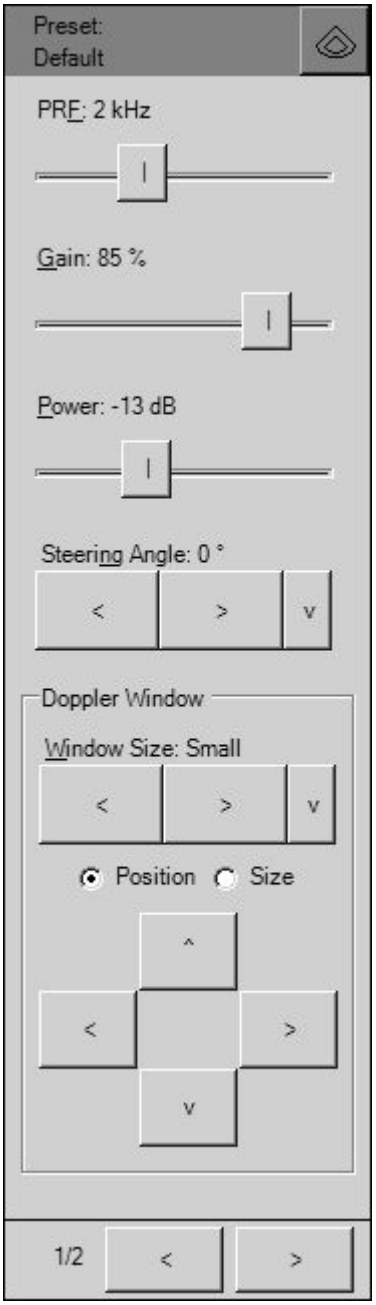
To adjust the palette of the M mode image open the left-side Palettes ControlBar by clicking on the "Palette controls" button

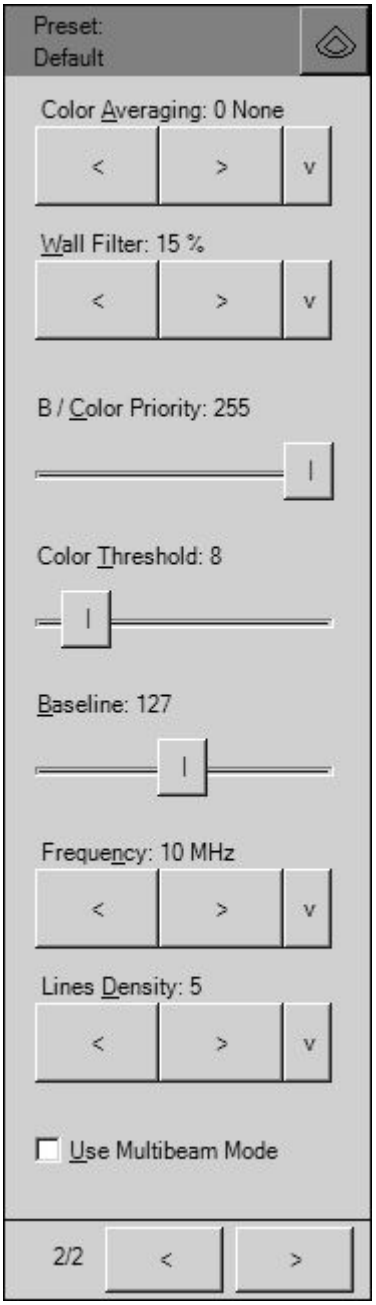
on the software bottom ToolBar or on the "6" hot key. Inside the opened left-side ControlBar you will find a palette control. Using this control you can adjust the image gamma γ, brightness ☼, contrast ◑ or click on the "Default" button to use the default palette. Gamma correction is not used if the level 1 is selected, the brightness correction is not used if the level 0 is used and the contrast correction is not used if the level 0 is used.

10.3. Adjusting Color Doppler Mode Controls

To adjust the Color Doppler mode controls open the left-side Color Doppler controls ControlBar by clicking on the "Color Doppler controls" button

on the software bottom ToolBar or on the "3" hot key. This button can also be used for selection of the Color Doppler window positioning tool (the active tool is shown at top ToolBar's top right corner). Inside the Color Doppler ControlBar the controls are divided into the following 2 pages:





Please note that the Color Doppler mode is optional and may therefore not be available.

10.3.1. PRF (Pulse Repetition Frequency)

Description

The Pulse Repetition Frequency (PRF) adjustment changes the displayed velocity range. The velocity range is shown in kHz. The PRF should be set high enough in order to prevent aliasing. If the blood is moving faster than the pulse repetition rate, the Doppler display will alias in CFM or Directional Power Doppler mode. Aliasing does not occur if the Power Doppler mode is used. If the PRF is set too high, low velocity flow may not be visible. Changing the PRF may affect the frame rate and the wall filter.

Values

PRF values are available in the interval 0.5-10 kHz. Measurement units used - kilohertz (kHz).

Adjustment

Use the PRF control to change the values.

Relations to other controls

Changing the PRF may affect the frame rate and the wall filter.
When the PRF value is changed, the cine memory is cleared.

Hints

Always optimize the acoustical Power Output after increasing PRF.

Bioeffects

Changing the PRF range may change the TI and/or MI. Observe the output display for possible effects.

10.3.2. Gain

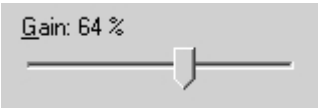
Description

The Color Gain adjustment increases or decreases the amplification of the returning ultrasound echo signal in the Color Doppler mode. Color Gain adjustment allows you to control the amount of color within a vessel. The Gain should be set high enough to achieve good filling of color within a vessel but not too high either in order to avoid noise in Doppler image.

Values

Gain values available are usually in the interval 10-100%. Measurement units used - percentages (%).

Adjustment



Use the Gain control to change the values.

Relations to other controls

After adjusting the Gain you may need to adjust the Power. If you increase the gain, the output level can usually be reduced to produce an equivalent image quality.

To perform automatic Color Doppler Gain adjustment use the "Automatic adjustment" button on the software top ToolBar (“F12” hot key). During image optimization hold the probe still on a vessel and do not move it.

Hints

Always optimize Gain before increasing the Power.

If the adjusted Color Doppler Gain value does not produce the desired color sensitivity, you may want to increase the Color Doppler Packet Size value under the software options (Menu->Tools->Options->Scanning Control->Color Doppler mode).

Bioeffects

Gain has no affect on the acoustical power output. Once you have increased the Gain, the output power level can usually be reduced to produce an equivalent image quality.

10.3.3. Power

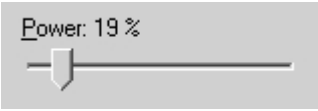
Description

Power adjustment increases or decreases the acoustic power of the ultrasound signal.

Values

Power values available are usually in the interval 10-100%. Measurement units used - percentages (%). For SmartUs scanners, power values are in the interval [-20;0] dB (decibels).

Adjustment



Use the Power control to change the values.

Relations to other controls

After adjusting Power you may need to adjust the Gain. If you decrease power you may need to increase the gain. If you increase power, however, you may need to decrease the gain.

Hints

Always optimize the Gain before increasing the Power.

Bioeffects

Changing the Power may change the TI and/or MI. Observe the output display for possible effects.

10.3.4. Scale

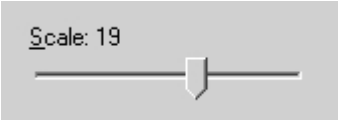
Description

Scale adjustments increase or decrease the level of power visualized in the Power Doppler (PDI) and the Directional Power Doppler (DPDI) modes.

Values

Scale values available are usually in the interval 1-10. This value is non-dimensional.

Adjustment



Use the Scale control to change the values. This control is available under the software options (Menu->Tools->Options->Scanning Control->Color Doppler mode).

Relations to other controls

After adjusting the Scale you may need to adjust the Gain. If you decrease the Scale you may need to increase the gain. If you increase the Scale, however, you may need to decrease the gain.

10.3.5. Lines Density

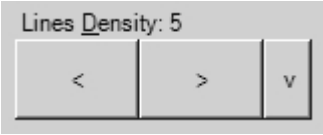
Description

Lines density adjustments optimize the Color Doppler frame rate or the spatial resolution for the best possible color image. Higher density values produce images with better spatial resolution and lower lines density values produce images with higher frame rates.

Values

The lines density values usually available are in the interval 1-7. This value is non-dimensional.

Adjustment



To change the values use the Lines Density control.

Relations to other controls

Lines Density changes the frame rate.

Bioeffects

Adjusting the Lines Density may change the TI and/or MI. Observe the output display for possible effects.

10.3.6. Multibeam Mode (optional)

Description

The Use Multibeam Mode control allows you to increase the Color Doppler Frame Rate using parallel beamforming, which allows to receive multiple ultrasound beams from single transmitted pulse. Use this feature when you wish to increase the Frame Rate. This technique results in a trade-off in image quality.

Adjustment

To turn on Multibeam Mode put check on the "Use Multibeam Mode" CheckBox.

Bioeffects

Use Multibeam Mode adjustment may change the TI and MI values.

10.3.7. Color Doppler Window Size and Position

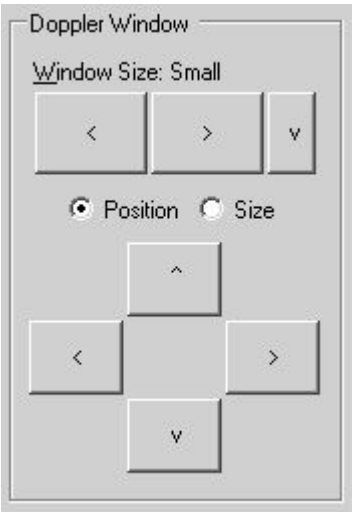
Description

When using the Color Doppler mode you need to adjust the Color Doppler window size and position in order to place it at position where is located the anatomical structure of interest. Please note that smaller window sizes allow you to achieve higher frame rates.

Values

For SmartUs and ArtUs ultrasound scanners minimal allowed Color Doppler window width is 8 mm for linear probes, 20 mm for convex probes, 15 mm for microconvex and phased array probes.

Adjustment



To select a pre-defined size of Color Doppler window use the "Window Size" control. It will select window size depending on the current B mode image size.

To adjust the window position place a tick on to the "Position" control (if not already ticked) and use the buttons that are located below this control.

To adjust the window size place a tick on the "Size" control (if not already ticked) and use the buttons that are located below this control.

An alternative way of changing the position of the active Doppler window is to select the Color Doppler window tool ("3" hot key), move the mouse cursor over the Doppler window, click using the left mouse button, drag the window to the desired location and click using the left mouse button again to finish window positioning. If during window positioning is rotated mouse wheel, it changes Doppler window size. The size of the Doppler window also can be changed using mouse cursor. To change the window size move the mouse cursor over the desired border of the Doppler window, click using the left mouse button, drag the border to the desired location and click using the left mouse button again in order to finish resizing.

Pre-defined Color Doppler window sizes can be added or changed under the software options (Menu->Tools->Options->Scanning Control->Color Doppler mode) where the Color Doppler window size is defined as a percentage of the B mode image dimensions.

Relations to other controls

Changing the Color Doppler window size affects the frame rate.
When the Color Doppler window size or position is changed, the cine memory is cleared.

Bioeffects

Doppler window size adjustments may change the TI and MI values.

10.3.8. Color Averaging

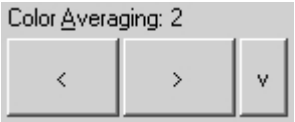
Description

Color Averaging adjustments increase or decrease the time of color displayed in the Color Doppler image. Higher averaging levels mean that color is displayed longer while lower averaging levels provide greater color changes.

Values

Color Averaging values available are usually in the interval 0-7. This value is non-dimensional.

Adjustment



Use the Color Averaging control to change the values.

Hints

Make a trade-off between color quality and color changing rate in the Color Doppler Image.

10.3.9. Dynamic Range

Description

Dynamic Range adjustments increase or decrease the range of power visualized in the Power Doppler and Directional Power Doppler modes.

Values

Dynamic Range values available are usually in the interval 2-40 dB. Measurement units used - decibels (dB).

Adjustment

Use the Dynamic Range control to change the values. This control is available under the software options (Menu->Tools->Options->Scanning Control->Color Doppler mode).

Relations to other controls

After adjusting the Dynamic Range you may need to adjust the Gain or the Scale. If you increase the Dynamic Range you may need to decrease the Gain or Scale in the case of noisy Doppler images.

10.3.10. Wall Filter

Description

Wall Filter adjustments increase or decrease the cut-off frequency of the Wall Filter (High Pass Frequency Filter) which eliminates the unwanted low-frequency, high-intensity signals from tissues or wall motion. Increasing the wall filter reduces the display of low velocity tissue motion. Lowering the wall filter displays more information but more wall tissue motion will also be displayed however.

Values

The Wall Filter values available are usually in the interval 5-15% of PRF. Measurement units used - percentages (%) of PRF.

Adjustment

Use the Wall Filter control to change the values.

Hints

Use a wall filter level that is high enough to remove clutter but low enough to display the required Color Doppler information.

10.3.11. Steering Angle

Description

Steering Angle adjustment for linear probes steers the Doppler cursor left/right 10 degrees. This control can be used to achieve the desired angle between the Color Doppler beam and the flow.

Values

Steering Angle values available are 0, ±10 degrees. Measurement units used - degrees (^{0}).

Adjustment

Use the Steering Angle control to change the values.

Bioeffects

Adjusting the Steering Angle may change the TI and/or MI. Observe the output display for possible effects.

10.3.12. B / Color Priority

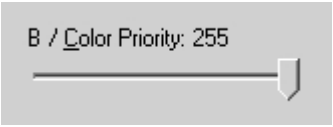
Description

B/Color Priority adjustments increase or decrease the level of the B-mode image at which color information overwrites the B-Mode information. If you want to see more color flow in an area of significant B-mode brightness, increase the B/Color Priority. If you want improved containment of the display of flow within the vessels decrease the B/Color Priority.

Values

The B/Color Priority values available are usually in the interval 0-255. This value is non-dimensional.

Adjustment



Use the B/Color Priority control to change the values.

10.3.13. Color Threshold

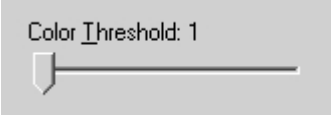
Description

Color Threshold adjustments increase or decrease the color data level below which color information is not shown. Using low values displays more color while using high values displays more B-Mode data.

Values

The Color Threshold values available are usually in the interval 1-64. This value is non-dimensional.

Adjustment



Use the Color Threshold control to change the values.

10.3.14. Baseline

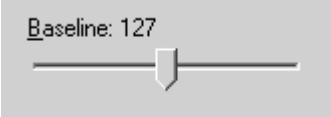
Description

Baseline adjustments increase or decrease the part of the Color Doppler data that is displayed as corresponding to positive (forward flow) or negative (reverse flow) velocity. By changing the Baseline it is possible to minimize aliasing by displaying a greater range of forward flow with respect to reverse flow, or vice versa.

Values

Baseline values available are usually in the interval 0-255. This value is non-dimensional.

Adjustment



Use the Baseline control to change the values.

Hints

An alternative way of adjusting CFM baseline is by clicking on its image using the right mouse button.

10.3.15. Frequency

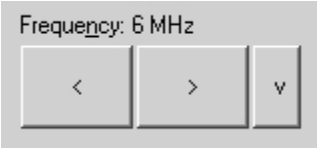
Description

Frequency is a characteristic that defines a resolution of ultrasonic signal. Higher frequencies increase the resolution of the incoming ultrasonic signal but reduce the visibility of examined tissues at greater depths. In order to examine tissues at smaller depths use larger frequencies and to examine tissues at greater depths use smaller frequencies.

Values

The frequency values available depend on the type of probe and beamformer used. Measurement units used - megahertz (MHz).

Adjustment



Use the Frequency control to change the values.

Bioeffects

Frequency adjustments may change TI and MI values.

10.3.16. Packet Size (Color Quality)

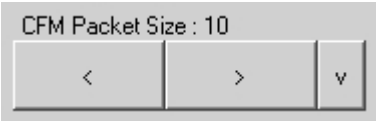
Description

Packet Size controls allow you to change the intensity of the colors in the Color Doppler mode. Larger values increase Color Doppler sensitivity but the frame rate is reduced. After changing this parameter you may need to adjust the Color Doppler Gain.

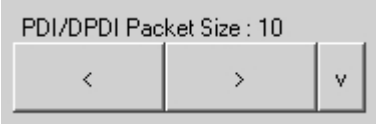
Values

Packet Size values available depend on the type of beamformer used and are in the interval 8-16. This value is non-dimensional.

Adjustment



Packet size can be selected under the software options (Menu->Tools->Options->Scanning Control->Color Doppler mode).



Relations to other controls

Packet Size adjustment affects the frame rate.

10.3.17. Spatial Filtering

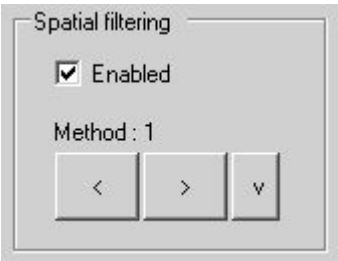
Description

Spatial filtering allows you to obtain smoother Color Doppler images. Higher values of this parameter make the Color Doppler image smoother but the resolution of the Color Doppler image is decreased.

Values

The number of spatial filters available depends on the beamformer and probe.

Adjustment



Spatial filtering can be enabled/disabled and the filtering method can be selected under the software options (Menu->Tools->Options->Scanning Control->Color Doppler mode).

10.3.18. Pulse Length

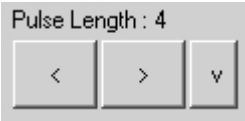
Description

The Pulse length control allows you to adjust the resolution of the Color Doppler image. The increase of the pulse length increases both the sensitivity and the image quality but also increases the TI and MI. The Increase of the pulse length may involve an automatic power reduction.

Values

The pulse length values available depend on the beamformer and probe used. Pulse length values are usually found in the range 2-8.

Adjustment



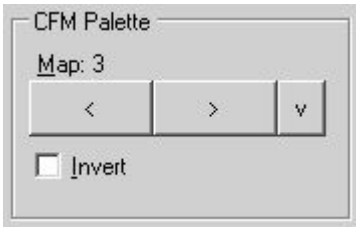
The Pulse length can be adjusted under the software options (Menu->Tools->Options->Scanning Control->Color Doppler mode).

10.3.19. CFM, PDI, DPDI Color Maps

Description

These controls allow you to select a specific color map. In the CFM and Directional Power Doppler modes the flow is shown as blue traveling away from the probe and red traveling towards the probe. In the CFM mode the range of displayed velocities is shown on the Color Map. In Power Doppler the map indicates the power values independently of the flow direction. In Directional Power Doppler the map indicates the power values and also indicates the flow direction - the red part of the map corresponds to the flow towards the probe and the blue part corresponds to the flow away from the probe. In the Power Doppler and Directional Power Doppler modes the minimum velocity corresponding to the Wall Filter cut-off frequency is displayed.

Adjustment



To adjust the color map of current scanning mode (CFM, PDI, DPDI), open the left-side Palettes ControlBar by clicking on the "Palette controls" button on the software bottom ToolBar or on the "6" hot key. Inside the opened left-side ControlBar you will find the color map control for the appropriate mode (CFM, PDI, DPDI).

To invert the CFM or DPDI color map tick on the "Invert" CheckBox.

Hints

An alternative way of inverting the CFM or DPDI color map is by clicking on the CFM or DPDI palette using the left mouse button.

10.3.20. CFM, PDI, DPDI Color Transparency

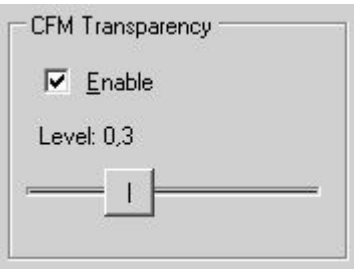
Description

The Color Transparency control allows you to adjust the transparency of the displayed Color Doppler information.

Values

Color transparency values are usually in the range [0;0.9]. Larger values mean that the color information is more transparent.

Adjustment



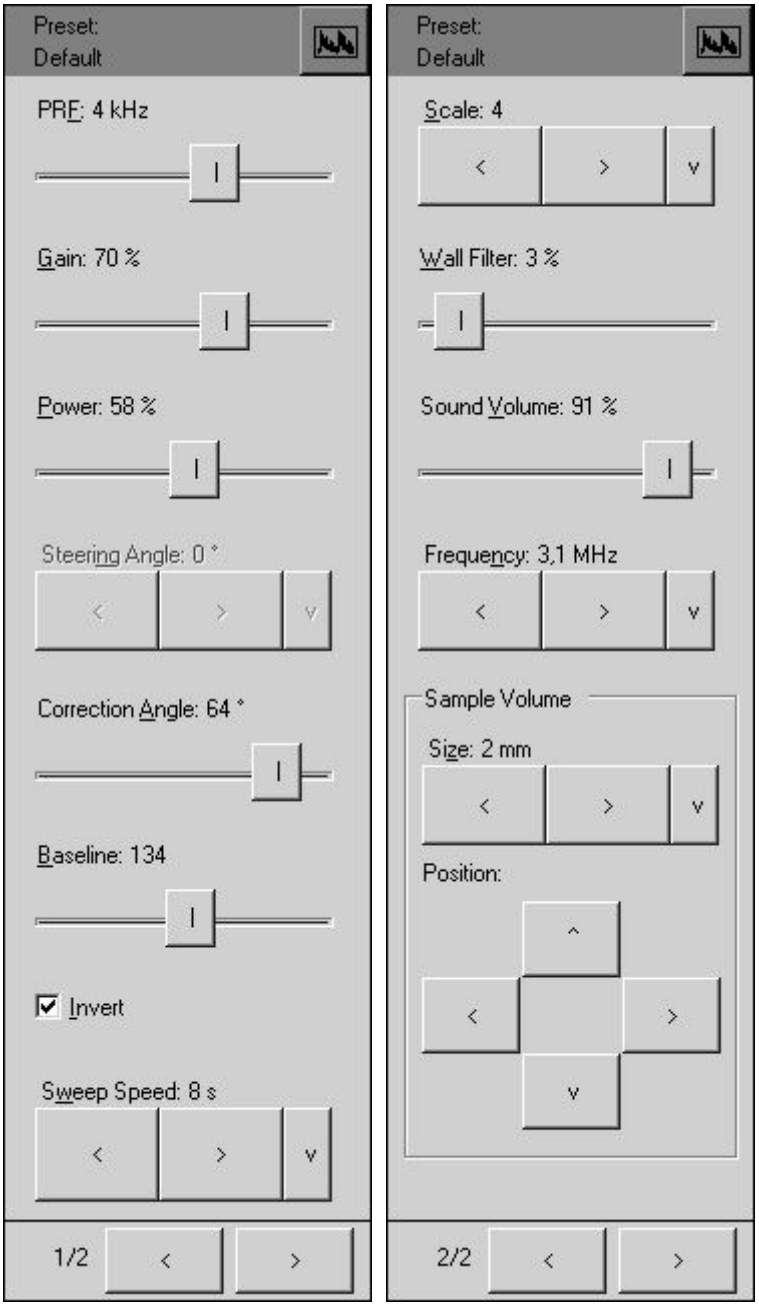
To adjust the color transparency of current scanning mode (CFM, PDI, DPDI), open the left-side Palettes ControlBar by clicking on the "Palette controls" button

on the software bottom ToolBar or on the "6" hot key. Inside the opened left-side ControlBar you will find the controls for enabling color transparency and selecting the transparency level for the appropriate scanning mode (CFM, PDI, DPDI).

10.4. Adjusting Pulsed Wave (PW) or Continuous Wave (CW) Doppler Mode Controls

To adjust the Pulsed Wave (PW) or Continuous Wave (CW) Doppler mode controls open the left-side PW/CW mode controls ControlBar by clicking on the "PW Doppler controls" ("CW Doppler controls") button

on the software bottom ToolBar or on the "4" hot key. This button also selects the PW-line (CW-line) tool for changing the PW/CW line position. Inside the PW/CW Doppler mode ControlBar the controls are divided into the following 2 pages:



Please note that the PW and CW Doppler modes are optional and may be not available. Most controls of PW and CW modes are common. If some controls are different, this is described in this text below.

10.4.1. PW Sample Volume position and size

Description

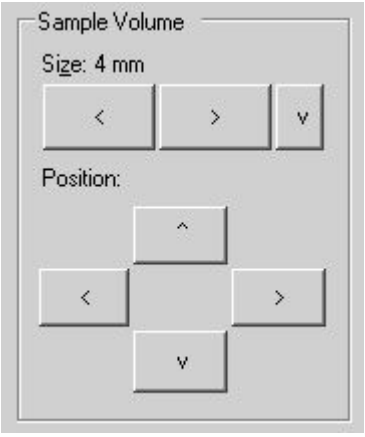
The sample volume position and size controls allow you to adjust the location and size of the PW Doppler region being examined so that you can place it at position where the anatomical structure of interest is located. The sample volume is displayed along the scan line as two parallel lines. Smaller sample volume gates produce accurate sampling results because it is more sensitive. You can also enlarge the gate to hear the Doppler audio better or for sampling large vessels or areas.

Values

Sample volume size values are usually in the interval 1-10 mm but this may vary depending on the beamformer and probe used. Sample volume size measurement units used - millimeters (mm).

For SmartUs and ArtUs ultrasound scanners maximal allowed PW sample volume size is 5 mm for high frequenciy probes and 10 mm for low frequency probes.

Adjustment



To set the position of the PW sample volume, select the PW-line tool by clicking on the "4" hot key or on the appropriate button on the bottom ToolBar, click using the left mouse button on B or Color Doppler image when the PW line is visible and the PW sample volume (PW line) adjustment tool is active.

An alternative method of adjusting the position and size of the PW sample volume is to use the Sample Volume Size and Position controls.

Relations to other controls

Changes to the PW sample volume size and position may automatically change the Power value and the available PRF values.

When a sample volume position or size is changed the cine memory is cleared.

Bioeffects

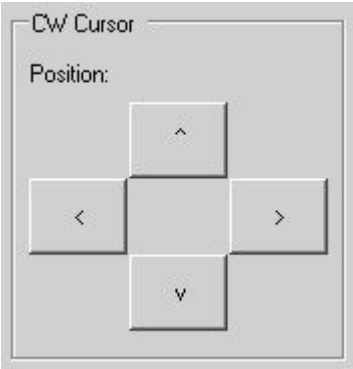
Changing the sample volume gate size and position may change the TI and/or MI.

10.4.2. CW Cursor position

Description

The cursor position control allows you to adjust the location of the CW Doppler region being examined so that you can place it at position where the anatomical structure of interest is located. The CW focusing point is displayed along the scan line as small circle.

Adjustment



To set the position of the CW cursor, select the CW-line tool by clicking on the "4" hot key or on the appropriate button on the bottom ToolBar, click using the left mouse button on B or Color Doppler image when the CW line is visible and the CW line adjustment tool is active.

An alternative method of adjusting the position of the CW line is to use the CW Cursor Position controls.

Relations to other controls

Changes to the CW cursor position may automatically change the Power value.
When a CW cursor position is changed the cine memory is cleared.

Bioeffects

Changing the CW cursor position may change the TI and/or MI.

10.4.3. PRF (Pulse Repetition Frequency)

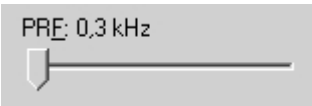
Description

Pulse Repetition Frequency (PRF) adjustments change the displayed velocity range. The velocity range is shown in kHz. The PRF should be set high enough to prevent aliasing. If the blood is moving faster than the pulse repetition rate the Doppler display will alias, or wraparound the baseline. If the PRF is set too high, low velocity flows may not be visible. It may be necessary to vary the PRF during an examination depending on the speed of the blood flow.

Values

PRF values available are in the interval 1-10 kHz. The values available depend on the scanning mode and depth. Measurement units used - kilohertz (kHz).

Adjustment



Use the PRF control to change the values.

Relations to other controls

Changing the PRF may affect the frame rate, the Power and the Wall Filter. When the PRF is changed, the cine memory is cleared.

To perform automatic PW/CW PRF and Baseline adjustment use the "Automatic adjustment" button on the software top ToolBar (“F12” hot key). During image optimization hold the probe still on a vessel and do not move it.

Hints

Always optimize acoustical Power output after increasing the PRF.

Bioeffects

Changing the PRF range may change the TI and/or MI. Observe the output display for possible effects.

10.4.4. HPRF (High Pulse Repetition Frequency)

Description

The High Pulse Repetition Frequency (HPRF) adjustment changes the displayed velocity range. The velocity range is shown in kHz. The pulse repetition frequency should be set high enough to prevent aliasing. If the blood is moving faster than the pulse repetition rate, the Doppler display will alias, or wraparound the baseline. If the pulse repetition frequency is set too high, low velocity flows may not be displayed. It may be necessary to vary the pulse repetition frequency during an examination depending on the speed of the blood flow.

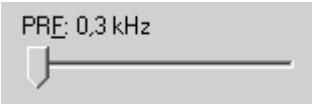
The HPRF pulse repetition frequency can be chosen manually using the PRF control or it can be activated when you are operating in PW Doppler Mode and conditions activate HPRF (when the velocity scale factor or sample volume gate depth exceeds certain limits). When HPRF is active, multiple sample volume gates appear along the Doppler mode cursor. Doppler information can be received from any of the several sample volume gates. The Doppler signals from all of the gates are added together and displayed in one spectrum.

When HPRF is activated and the second PW sample volume (phantom volume) is displayed, in order to get a clearer PW signal it is recommended that you perform ultrasound scanning in such a way so as to ensure that the phantom volume contains no moving tissues.

Values

If the HPRF feature is available, the PRF values are in the interval 1-15 kHz. Values available depend on the scanning mode and depth used. Measurement units used - kilohertz (kHz).

Adjustment



Use the PRF control to change the PRF and HPRF values.

Relations to other controls

Changes to pulse repetition frequency may affect the frame rate, the Power and the Wall Filter. When the pulse repetition frequency is changed, the cine memory is cleared.

To perform automatic PW/CW PRF and Baseline adjustments use the "Automatic adjustment" button on the software top ToolBar (“F12” hot key).

Hints

Always optimize the acoustical Power output after increasing pulse repetition frequency.

Bioeffects

The change to the pulse repetition frequency range may change the TI and/or MI. Observe the output display for possible effects.

10.4.5. Gain

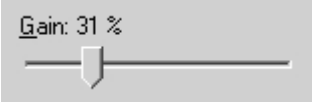
Description

Gain adjustments increase or decrease the amplification of the returning ultrasound echo signal. The Gain should be set high enough in order to achieve a sufficiently bright spectral waveform but not too high in order to avoid Doppler image noise.

Values

Gain values available are usually in the interval 10-100%. Measurement units used - percentages (%).

Adjustment



Use the Gain control to change the values.

Relations to other controls

After adjusting the Gain you may need to adjust the Power. If you increase the gain, the power level can usually be reduced to produce equivalent image quality.

Hints

Always optimize gain before increasing the power.

Bioeffects

Gain has no effect on acoustical Power Output. Increasing Gain usually allows you to reduce the output level to produce an equivalent image quality.

10.4.6. Power

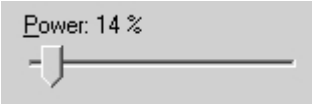
Description

Power adjustments increase or decrease the acoustic power of the ultrasound signal.

Values

Power values available are usually in the interval 10-100%. Measurement units used - percentages (%). For SmartUs scanners, power values are in the interval [-20;0] dB (decibels).

Adjustment



Use the Power control to change the values.

Relations to other controls

After adjusting the Power you may need to adjust the Gain. If you decrease the power you may need to increase the gain. If you increase the power you may need to decrease the gain.

Hints

Always optimize the gain before increasing the power. Use Power values that are as low as possible.

Bioeffects

Changing the Power may change the TI and/or MI. Observe the output display for possible effects.

10.4.7. Correction Angle

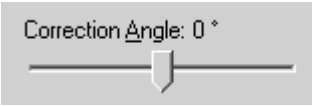
Description

The Correction Angle adjusts the accuracy of the displayed flow velocity values. The direction of the correction angle marker must correspond with the blood flow direction. Before performing any PW/CW measurements you must at first set the correct Correction Angle value.

Values

Values are in the interval [-85, 85]. Measurement units used - degrees (^{0}).

Adjustment



Values can be changed using the Correction Angle control.

Relations to other controls

Changes to the Correction Angle values also change the velocity scale line of the PW/CW image. The Correction Angle must be adjusted before performing any PW/CW measurements.

Hints

It is recommended that you use probe positions that require that you use absolute correction angle values less than 60 degrees in order to get more accurate measurement and calculation results.

10.4.8. Steering Angle

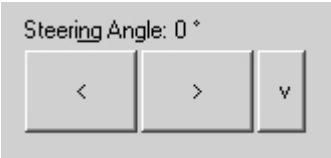
Description

Steering Angle adjustment for linear probe steers the Doppler cursor 10 degrees to the left/right. This steering may be used to achieve the desired angle between the Doppler beam and the flow.

Values

Steering Angle values available are 0, ±10 degrees. Measurement units used - degrees (^{0}).

Adjustment



Use the Steering Angle control to change the values.

Bioeffects

Adjusting the Steering Angle may change the TI and/or MI. Observe the output display for possible effects.

10.4.9. Invert

Description

Invert performs vertical inversion of the spectral waveform. After inversion positive velocities will be displayed below the baseline and negative velocities will be displayed above the baseline.

Adjustment

Use the Invert control to change the values.

10.4.10. Baseline

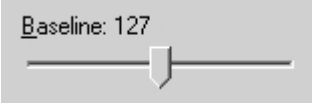
Description

Baseline adjustments increase or decrease the part of the PW/CW Doppler data displayed as corresponding to positive (forward flow) or negative (reverse flow) velocity. The change to the Baseline allows you to minimize aliasing by displaying a greater range of forward flow with respect to reverse flow, or vice versa. The default baseline is at the midpoint of the spectrum. Baseline is displayed as a horizontal line along the PW/CW waveform.

Values

Baseline values available are usually in the interval 0-255. This value is non-dimensional.

Adjustment



Use the Baseline control to change the values.

Relations to other controls

To perform automatic PW/CW PRF and Baseline adjustment use the "Automatic adjustment" button on the software top ToolBar (“F12” hot key).

10.4.11. Dynamic Range

Description

Dynamic Range controls how echo intensities are converted into various shades of gray.

Values

Available Dynamic Range values are usually in the interval 10-80 dB. Measurement units used - decibels (dB).

Adjustment

To change values use the Dynamic Range control. This control is available under the software options (Menu->Tools->Options->Scanning Control->PW/CW Doppler mode).

Relations to other controls

After adjusting the Dynamic Range you may need to adjust the Gain or the Scale. If you increase the Dynamic Range you may need to decrease the Gain or the Scale in the case of noisy Doppler images.

10.4.12. Wall Filter

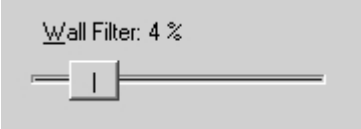
Description

Wall Filter adjustments increase or decrease the cut-off frequency of the Wall Filter (High Pass Frequency Filter) which eliminates the unwanted low-frequency, high-intensity signals from tissues or wall motion. Increasing the wall filter reduces the display of low velocity tissue motion. Lowering the wall filter displays more information but more wall tissue motion will however be displayed.

Values

Wall Filter available values are usually in the interval 2-20% of PRF. Measurement units used - percentages (%) of PRF.

Adjustment



Use the Wall Filter control to change the values.

Hints

Use a wall filter level that is high enough to remove clutter but low enough to display sufficient Doppler information.

10.4.13. Sweep Speed

Description

Sweep speed determines how fast the PW/CW mode image (timeline) is swept and changes the frequency of acquisition of PW/CW mode beams. Smaller time values mean that the PW/CW image will be filled at a faster rate and larger time values mean that the PW/CW image will be filled at a slower rate. Fast speeds display fewer waveforms over time but waves with more detail.

Values

Values depend on the scanner and software options used. Measurement units used - seconds (s).

Adjustment

In order to change sweep speed values use the "Sweep Speed" control. Smaller values mean faster updating of PW/CW image.

Relations to other controls

When the Sweep Speed value is changed, the cine memory is cleared.

Bioeffects

Sweep speed adjustments may change the TI and MI values.

10.4.14. PW Scale

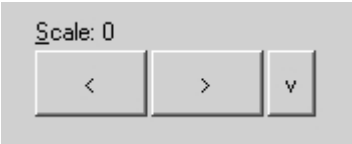
Description

PW Scale adjustments increase or decrease the level of power that is visualized.

Values

Scale values available are usually in the interval 0-4. This value is non-dimensional.

Adjustment



Use the Scale control to change the values.

Relations to other controls

After adjusting the Scale you may need to adjust the Gain. If you reduce the scale you may need to increase the gain. If you increase scale you may need to reduce the gain.

10.4.15. Sound

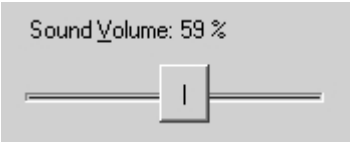
Description

The sound control allows you to adjust the level of audio output. In order to hear sound you must have computer speakers and these must be turned on.

Values

The Sound Volume values available are in the interval 10-100%. Measurement units used - percentages (%).

Adjustment



Use the Sound Volume control to adjust the audio output level.

10.4.16. Frequency

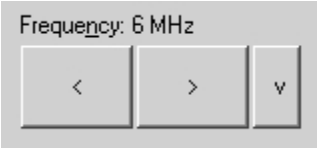
Description

Frequency is a characteristic that defines the resolution of an ultrasonic signal. Higher frequencies increase the resolution of the incoming ultrasonic signal but reduce visibility of examined tissues at greater depths. To examine tissues at smaller depths use greater frequencies and to examine tissues which are at greater depths use smaller frequencies.

Values

Available frequency values depend on the type of probe and beamformer used. Measurement units used - megahertz (MHz).

Adjustment



Use the Frequency control to change the values.

Bioeffects

Frequency adjustments may change the TI and MI values.

10.4.17. Smoothing

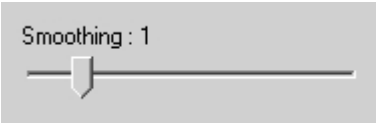
Description

Smoothing allows you to obtain smoother Doppler images. Larger values mean smoother images.

Values

The values available depend on the beamformer and probe used. This value is non-dimensional.

Adjustment



To adjust the smoothing level use the Smoothing control under the software options (Menu->Tools->Options->Scanning Control->PW Doppler mode).

10.4.18. Spectral Averaging

Description

Spectral averaging allows to obtain smoother Doppler images.

Adjustment

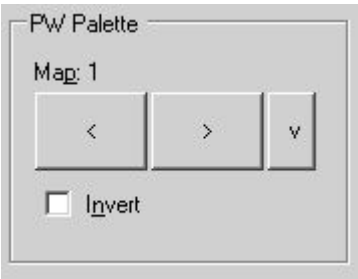
In order to turn on/off spectral averaging, at “Menu->Tools->Options->Scanning Control->PW Doppler mode” check/uncheck “Use spectral averaging” CheckBox.

10.4.19. Color Map

Description

Allows you to select a specific PW/CW color map.

Adjustment

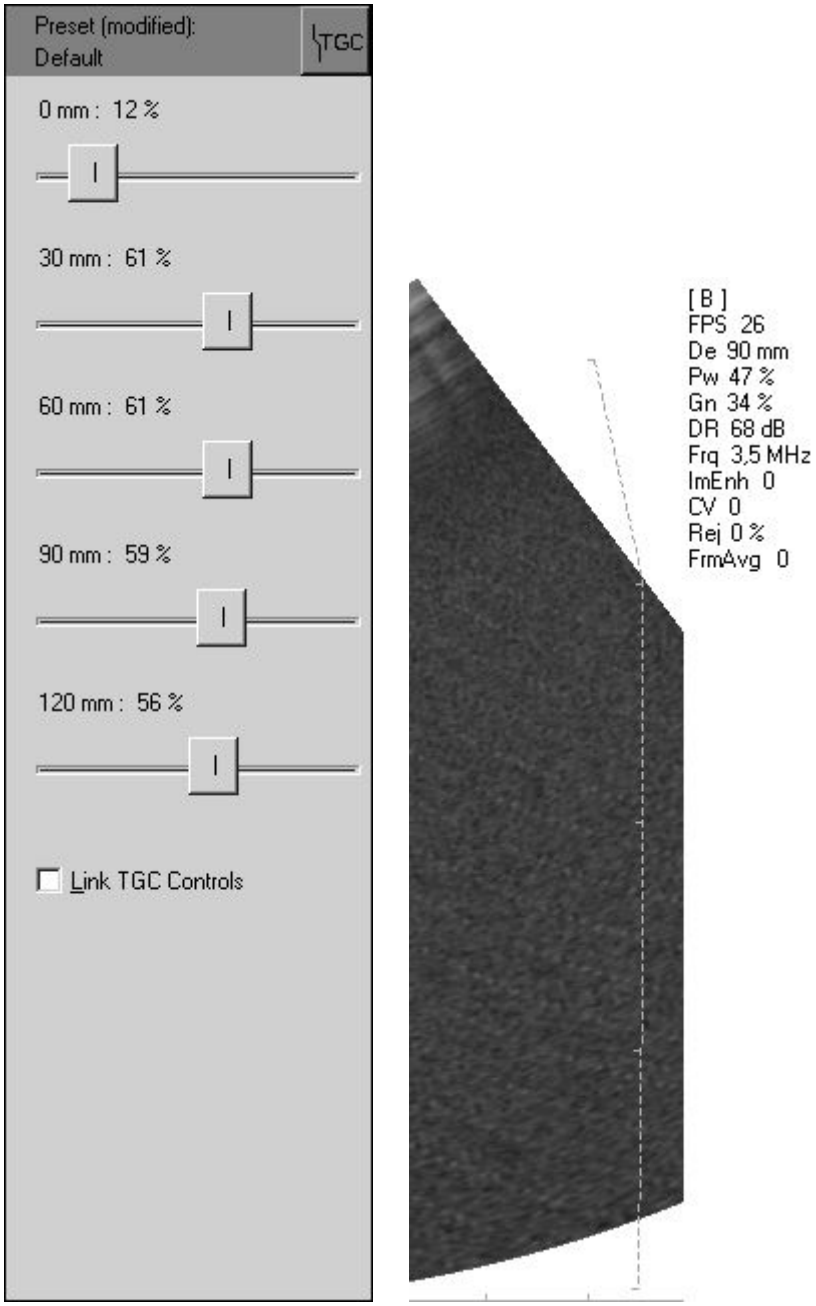


To adjust the PW/CW color map open the left-side Palettes ControlBar by clicking on the "Palette controls" button

on the software bottom ToolBar or on the "6" hot key. Inside the opened left-side ControlBar you will find the color map control.

To invert colors of a current color map use the Invert control.

10.5. Adjusting TGC (Time Gain Compensation) Controls



The Time Gain Compensation (TGC) controls adjust how returning signals are amplified in order to correct the attenuation that varies depending on the scanning depth and the tissue being observed. Using the TGC controls you can equalize amplification of the returning echo signal so that the density of echoes at different depths is similar. TGC allows you to control the gain level in several depth zones independently. TGC TrackBar controls are spaced proportionally to the current scanning depth. Current TGC values at appropriate depths are displayed on the TGC controls. The vertical TGC curve is shown on the right side of the ultrasound image. Small markers on this curve correspond to the depths of the TGC controls.

Values

TGC values available are usually in the interval 0-100%. Measurement units used - percentages (%).

Adjustment

To change the TGC values open the software left-side TGC ControlBar by clicking on the "TGC controls" button

on the software bottom ToolBar or on the "5" hot key. Then adjust the TGC using the TrackBar controls located on this ControlBar.

If the "Link TGC Controls" has been selected, movement of one of the TGC controls causes movement of all the other TGC controls. During adjustment of the linked TGC controls the software tries to keep the shape of TGC curve unchanged.

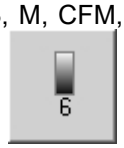
Hints

To perform automatic B mode Gain, TGC and Dynamic Range adjustments use the "Automatic adjustment" button on the software top ToolBar (“F12” hot key). During image optimization hold the probe on the anatomy of interest and do not move it. Please note that availability of the automatic image optimization depends on the ultrasound scanner used.

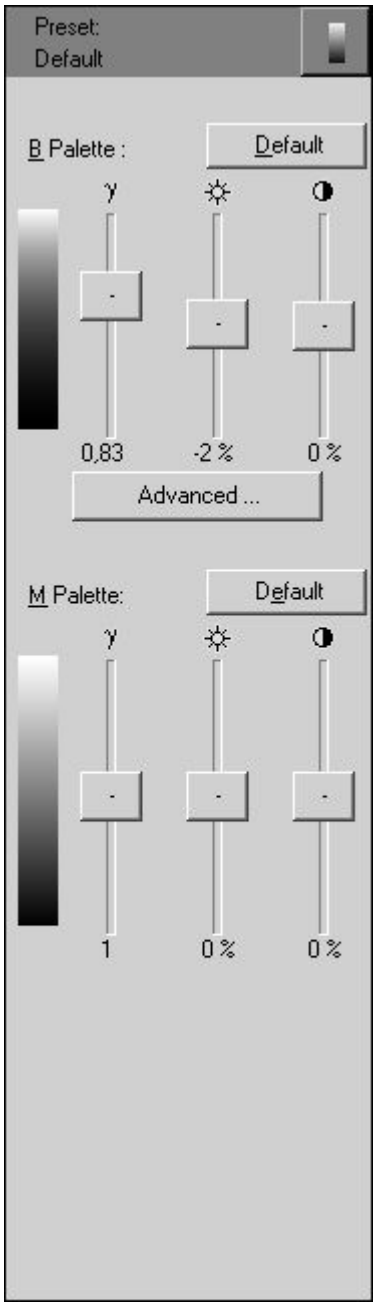
Relations to other controls

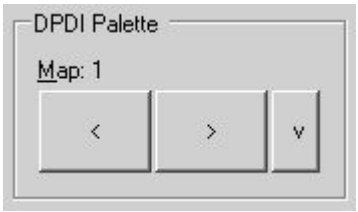
To adjust the overall gain use the B mode Gain control. After adjusting the Depth you may need to adjust the TGC.

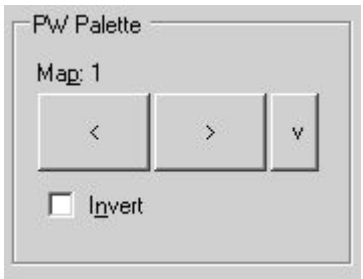
10.6. Adjusting Palette and Color Map Controls

To adjust the palette or color map of a current scanning mode (B, M, CFM, PDI, DPDI, PW), open the left-side Palette ControlBar by clicking on the "Palette controls" button 

on the software bottom ToolBar or on the "6" hot key. Inside the opened left-side ControlBar use the palette (gamma γ, brightness ☼, contrast ◑) or color map controls of the appropriate mode and perform the adjustments.



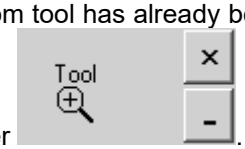




10.7. Using B (Color Doppler) Mode Zoom

To perform a zoom of the ultrasound image (B or Color Doppler mode) carry out the following actions:

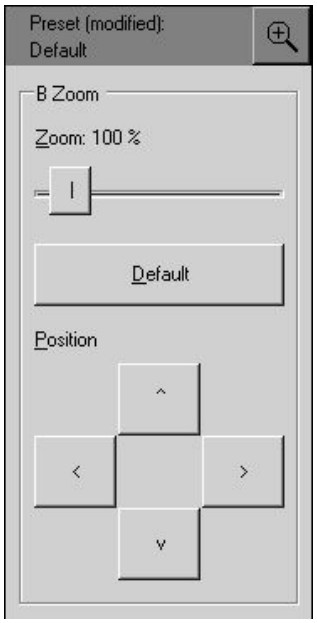
1. Select the zoom tool by clicking on the "Zoom" button

on the software top ToolBar or on the “F7” hot key. You can omit this step if the zoom tool has already been selected. A pictogram of the selected tool is displayed on the software right top corner 

.
2. Select a rectangular region of interest that needs to be zoomed. In order to do this, move the mouse cursor to a position on the ultrasound image where you wish to place the first corner of the rectangle that will contain the anatomy of interest. Press on the left mouse button and keeping it pressed move the mouse to position of the second corner of the rectangle. While the mouse is moved the rectangle containing the anatomy of interest for zooming will be drawn . Finally, release the mouse button and the software will zoom the selected rectangular area (if a valid area on the ultrasound image was selected).
3. When the ultrasound image is zoomed (or shifted), the zoom tool starts to work as an image shifting tool. You can center a zoomed ultrasound image. To perform an image shift, press the left mouse button on the ultrasound image at a point that needs to be shifted. Keep the mouse button pressed and move the mouse cursor to the position where it needs to be shifted. During the mouse movement an arrow of shift direction and position is drawn . Finally, release the mouse button, and the software will perform the image shift.
4. In order to reset ultrasound image to its default position and scale, click on the left mouse button on the ultrasound image (ensure that the zoom tool is selected).
5. Optionally, repeat steps 1-4 in order to zoom other areas of the ultrasound image.

If your computer keyboard has a numerical pad (keys with numbers on them located on the right side of main keyboard), then you can perform zoom in and zoom out operations using the "+" and "-" keys on this numerical pad.

In order to perform measurements or other operations (such as Doppler Window positioning) on a zoomed ultrasound image, select the desired measurement or control tool and perform the measurement or other operations as described in the appropriate sections of this manual. In order to control zoom again, select the zoom tool.



When the "Zoom" button on the software top ToolBar is clicked, this not only selects the zoom tool but also opens the "Zoom" controls on the software left-side ControlBar.

Using these controls you can zoom in (up to ~600%) or zoom out (up to ~60%) the ultrasound images (the default zoom is 100%).

You can reset the zoom level and image shifting to the default values by clicking on the "Default" button.

The positioning controls allow you to shift the ultrasound image and move the anatomical structure of interest to the center of the ultrasound image area.

10.8. Using M Mode Zoom

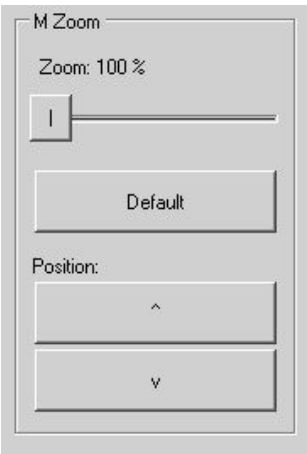
To perform zooming of the M mode ultrasound image (when scanning is performed in B+M or M mode) carry out the following actions:

1. Select the zoom tool by clicking on the "Zoom" button

on the software top ToolBar or on the “F7” hot key. Omit this step if the zoom tool is already selected. A pictogram of the selected tool is displayed on the software right top corner

.
2. Select a depths interval on the M mode image that needs to be zoomed. To do this move the mouse cursor to the position on the ultrasound image where you want to start the zoom stripe. Press on the left mouse button and keeping it pressed move the mouse to the position where you want the zoom stripe to end. During the movement of the mouse two horizontal lines will be drawn that should contain the desired to zoom M mode data. Finally, release the mouse button, and the software will zoom a selected depths interval.
3. When an ultrasound image is zoomed (or shifted), the zoom tool starts working as an image shifting tool. This lets you perform centering of zoomed M mode ultrasound images. To perform image shifting, press the left mouse button on the ultrasound image at a point that you want to be shifted. Keep the mouse button pressed and move the mouse cursor to the position where must be shifted selected point. During the mouse movement an arrow of shift direction and position are drawn . Finally, release the mouse button, and the software will perform an image shift. Using the zoom tool the M mode image is shifted vertically. To perform horizontal shifts of M mode data please use the Cine controls.
4. To reset an ultrasound image to its default position and scale, click on the left mouse button on the M mode ultrasound image (ensure that the zoom tool is selected).
5. Optionally, repeat steps 1-4 in order to zoom other areas of the ultrasound image.

To perform measurements or other operations on a zoomed M mode image, select the desired measurement or control tool and perform the measurement or operation as described in the appropriate sections of this manual. To control zoom once again, select the zoom tool.



When clicking the "Zoom" button on the software top ToolBar you not only select the zoom tool but you also open the "Zoom" controls on the software left-side ControlBar.

Using the M mode zoom controls you can zoom an ultrasound image up to ~600% (the default zoom is 100%).

You can reset the zoom factor and image shifting to the default values by clicking on the "Default" button.

The positioning controls allow you to shift the M mode ultrasound image up and down and move M mode data of interest to the center of the ultrasound image area.

10.9. Using Full Screen Mode

The software allows you to hide the ultrasound scanning controls and display the ultrasound image using a full screen.

To hide the controls and, if selected in options, enter the full screen mode, double click using the mouse on the company logo image on the left side of the ultrasound image header. Alternative way to turn full screen mode on/off is to use hot key (default hot key is Ctrl+L).

To exit the full screen mode, click on the "Esc" key.

If you not only want to hide the scanning controls but also show the ultrasound image using the full screen, go to "Menu->Tools->Options->Appearance->General" and turn on option "When logo is double clicked show full-screen ultrasound".

If during full screen mode you want to adjust a scanning parameter, open the desired left-side ControlBar using the appropriate button on autohide left or bottom ToolBar or using the appropriate hot key. To hide the opened left-side or right-side ControlBar, click using the right mouse button on the header of this ControlBar or click the "Tab" key.

IMPORTANT. If drawings or measurements on time-based ultrasound images (M, PW) are used in full screen mode, these images with the drawings/measurements must be printed or saved (to JPG, PNG, BMP) also in full screen mode because after exiting from full screen mode some of these drawings/measurements may become invisible due to the reduced horizontal space for time-based ultrasound data.

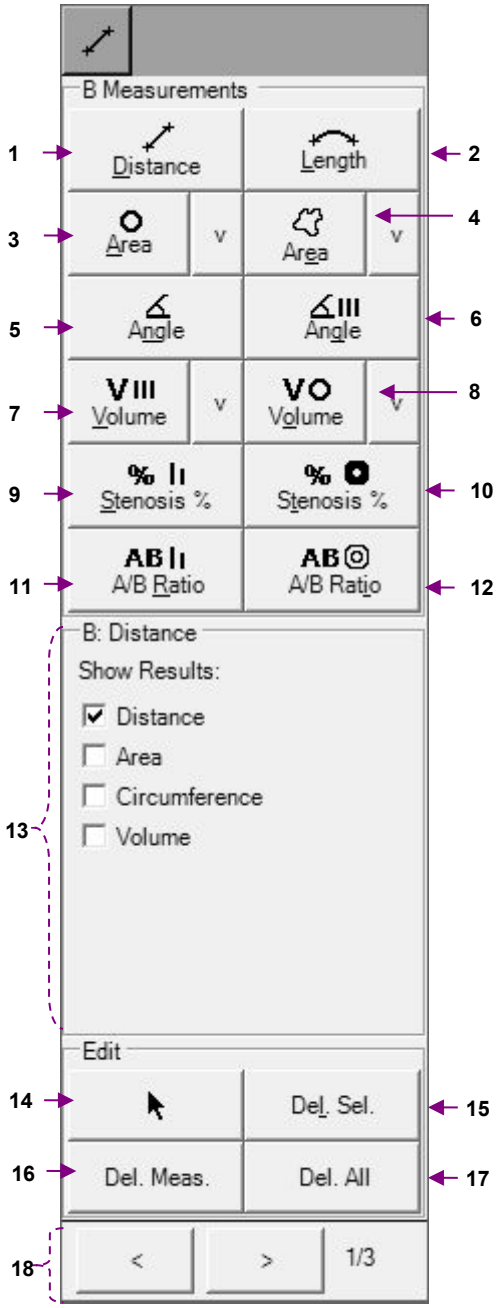
11. Measurements and Calculations

This section describes the user interface for measurements and calculations. For equations and references please see the "Echo Wave II Software Reference Manual". Depending on software options, measurements and calculations may only be available when the ultrasound scanning is frozen. Measurements and calculations also can be performed on opened TPD (Telemed Picture Data) and TVD (Telemed Video Data) files.

11.1. General B, B+B, 4B Mode Measurements

In order to perform B, B+B, 4B mode measurements, carry out the following actions:

1. Scan the desired B (B+B, 4B) mode image(s) and Freeze it by clicking on the "Freeze/Run" button or on the SpaceBar key.
2. Click on the "Measurements" button to open (activate) the right-side measurements ControlBar.
3. If the opened measurements ControlBar is not identical to the "B Measurements", use the controls for changing General Measurements pages (buttons "<" and ">") to open the "B Measurements" page. Pages also can be changed by clicking on the "Page Up" and "Page Down" keys.
4. Inside this ControlBar select the desired measurement tool, choose options for this tool and perform the desired number of measurements using this tool.
5. If needed, choose another measurement tool, choose the desired options and once again perform the desired number of measurements using the selected tool.

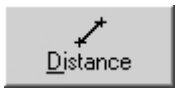


General B mode measurements ControlBar

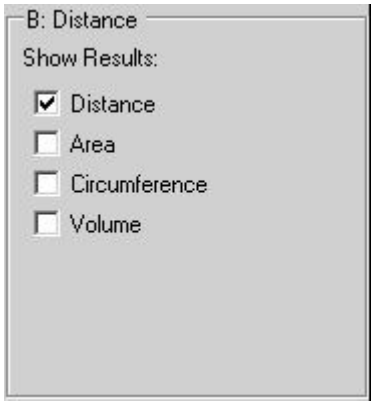
Num	Description
1	Distance measurement tool button.
2	Length measurement tool button.
3	Area, circumference measurement ellipse tool button.
4	Area, circumference measurement trace tool button.
5	Angle measurement using two distances tool button.
6	Angle measurement using three distances tool button.
7	Volume measurement using three distances tool button.
8	Volume measurement using one ellipse tool button.
9	Stenosis (%) measurement using two distances tool button.
10	Stenosis (%) measurement using two areas tool button.
11	A/B ratio of two distances measurement tool button.
12	A/B ratio of two areas (or circumferences) measurement tool button.
13	Options of selected tool.
14	Neutral tool button. Neutral tool is used in order to select, edit, and delete measurement objects.
15	Button for deletion of selected measurement and drawing objects.
16	Button for deletion of all measurements.
17	Button for deletion of all measurements and drawings.
18	Controls for changing pages of General Measurements.

11.1.1. Distance

To measure distances, perform the following actions:

1. Select the distance measurement tool by clicking on the "Distance" button 

inside the B Measurements ControlBar.
If the measurement tool button has a hot key shown as an underlined letter (e.g., an underlined D for Distance) and the measurements ControlBar is active, then the tool can be selected by pressing this hot key on the keyboard.
2. Ensure that the CheckBox "Distance" is ticked.
3. Optionally, if you wish to measure the area or circumference of a circle with measured diameter or volume of a sphere, tick the appropriate CheckBoxes. Please note that you can tick several CheckBoxes.
4. Move the mouse cursor to a position on the ultrasound image from where you wish to start measuring and click using the left mouse button to start the measurement process.
5. Move the mouse cursor to the position on the ultrasound image where you wish to finish the measurement and click using the left mouse button in order to finish the measurement process.
6. Optionally, perform another measurement of the same type by repeating steps 4-5.



Measurement object :

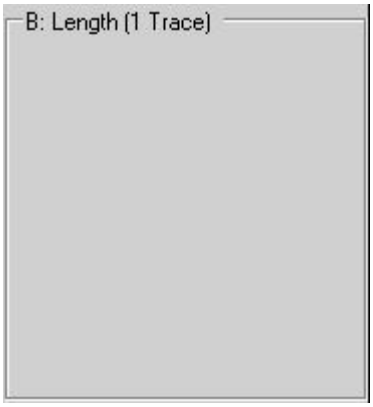
Result (distance):
1: 13,5 mm;

11.1.2. Length

To measure the length of a curvilinear object, perform the following actions:

1. Select the length measurement tool by clicking on the "Length" button

inside the B Measurements ControlBar.
If the measurement tool button has a hot key shown as an underlined letter (e.g., an underlined L for Length) and the measurements ControlBar is active, the tool can be selected by pressing this hot key on the keyboard.
2. Move the mouse cursor to the position on the ultrasound image where you wish to start the measurement and click using the left mouse button in order to start the measurement process.
3. Move the mouse cursor along the contour of the object you want to measure on the ultrasound image.
4. Click using the left mouse button in order to finish the measurement process.
5. Optionally, perform another measurement of the same type by repeating steps 2-4.



Measurement object :

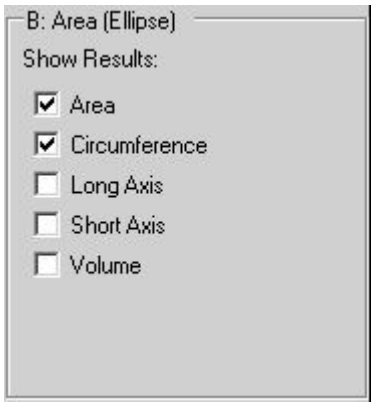
Result (length):
1: 36,2 mm;

11.1.3. Area and Circumference using Ellipse Tool

In order to measure area and/or circumference using ellipse tool, perform the following actions:

1. Select measurement tool by clicking appropriate "Area" button

inside B Measurements ControlBar.
2. If you wish to measure area, ensure that "Area" CheckBox inside tool options is checked.
3. If you wish to measure circumference, ensure that "Circumference" CheckBox is checked.
4. Optionally, if you wish to measure long axis, short axis of an ellipse, or ellipsoid volume, place checks on appropriate options.
5. Move mouse cursor to position on the ultrasound image, where should be placed first point of an ellipse long axis, and click left mouse button in order to start measurement.
6. Move mouse cursor to position on the ultrasound image, where should be placed second point of an ellipse long axis, and click left mouse button.
7. Move mouse cursor to position on the ultrasound image, where should be placed first point of an ellipse short axis, and click left mouse button in order to finish measurement.
8. Optionally, perform another measurement of the same type by repeating steps 5-7.



Measurement object (ellipse) :

Result (area, circumference) :
1: 2,3 cm2; P= 56,9 mm;

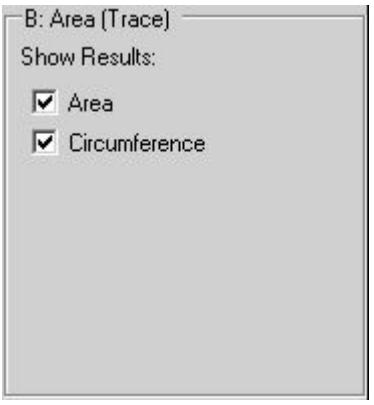
Please note that both ends of ellipse long axis (first axis) are marked with small circles (key points), while short axis (second axis) has marked one endpoint.

11.1.4. Area and Circumference using Trace Tool

In order to measure area and/or circumference using trace tool, perform the following actions:

1. Select measurement tool by clicking appropriate "Area" button

inside B Measurements ControlBar.
2. If you wish to measure area, ensure that "Area" CheckBox inside tool options is checked.
3. If you wish to measure circumference, ensure that "Circumference" CheckBox is checked.
4. Move mouse cursor to position on the ultrasound image, where the trace should be started, and click left mouse button in order to start measurement.
5. Move mouse cursor along desired contour in order to form closed curve.
6. In order to finish measurement, click left mouse button again. Last curve's point will be connected with the first curve's point, and the measurement will be finished.
7. Optionally, perform another measurement of the same, type by repeating steps 4-6.



Measurement object :

Result (area, circumference) :
1: 0,6 cm2; P= 31,6 mm;

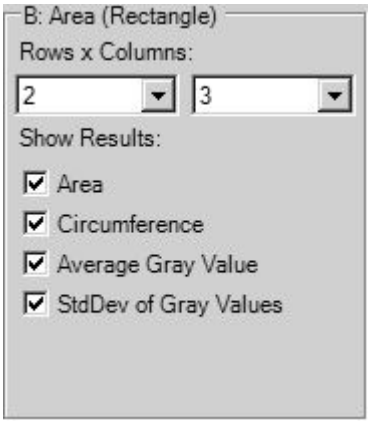
It is important to note that painted closed trace must not have intersections. If during painting software detects that mouse cursor is moved over already painted trace part, the trace is automatically truncated to mouse cursor position. Also during painting software displays the line that connects last mouse cursor position with first trace point showing what trace we would get if we would click left mouse button for finishing trace painting. Before finishing trace painting, please make sure that the line that connects its last and first points does not intersect any other trace points, because otherwise the trace will be truncated and closed at intersection point. Intersection point (if present) is indicated with red marker.

11.1.5. Area and Circumference using Rectangle Tool

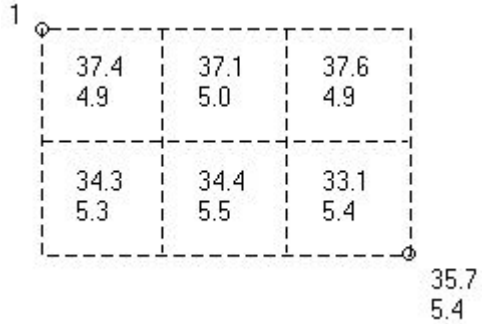
In order to measure area and/or circumference using rectangle tool, perform the following actions:

1. Select measurement tool by clicking "Rectangle" button

inside B Measurements ControlBar or by selecting “Rectangle” menu item from “Area” button.
2. If you wish to measure area, ensure that "Area" CheckBox inside tool options is checked.
3. If you wish to measure circumference, ensure that "Circumference" CheckBox is checked.
4. Optionally, if you wish to calculate average gray value or standard deviation of gray values, place checks on appropriate options. From ComboBoxes select desired number of rows and columns if rectangle should be divided to subrectangles.
5. Move mouse cursor to position on the ultrasound image, where should be placed first corner point of rectangle, and click left mouse button in order to start measurement.
6. Move mouse cursor to position on the ultrasound image, where should be placed second corner point of rectangle, and click left mouse button.
7. Optionally, perform another measurement of the same type by repeating steps 5-6.



Measurement object (rectangle) :



At first corner point (in this case at left top) is shown measurement object number (“1”) that is also shown at result line. The numbers at first rows correspond to average gray value. The numbers at second rows correspond to standard deviation of gray values. These values are calculated for each subrectangle. Average gray value and standard deviation of gray values of full rectangle is shown at right bottom corner (in this case 35.7 and 5.4).

Result (area, circumference, average gray value, standard deviation of gray values of full rectangle):

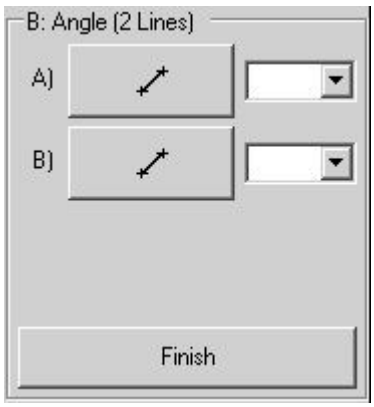
1: S= 7.63 cm2; P= 113.8 mm; Avg= 35.7; StdDev= 5.4;

11.1.6. Angle using Two Lines

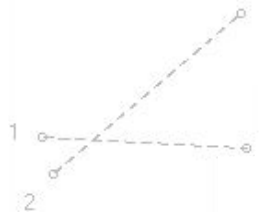
In order to measure angle between two lines (vectors), perform the following actions:

1. Select measurement tool by clicking appropriate "Angle" button

inside B Measurements ControlBar.
2. Move mouse cursor to position on the ultrasound image, where first vector should start, and click left mouse button in order to start measurement.
3. Move mouse cursor to position where first vector should end, and click left mouse button.
4. Move mouse cursor to position where second vector should start, and click left mouse button.
5. Move mouse cursor to position where second vector should end, and click left mouse button in order to finish angle measurement.
6. Optionally, perform another measurement of the same type by repeating steps 2-5.
Please note that at line's (vector's) starting point is painted its number (the number of measurement object).



Measurement objects (two vectors) :



Results (lengths of vectors and angle between vectors):
1: 18 mm; **2:** 21,7 mm; **#** <AB(1,2)= 43,6°;

In order to calculate angle between two previously measured distances, perform the following actions:

1. Select measurement tool by clicking appropriate "Angle" button

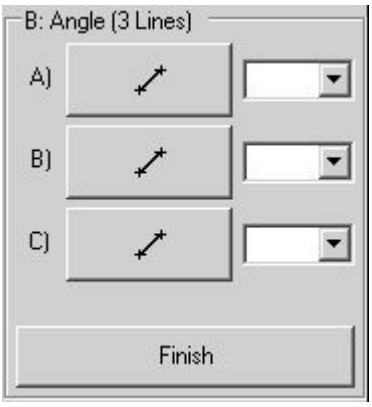
inside B Measurements ControlBar.
2. From the first ComboBox inside angle tool options, select the number of measurement object that will correspond to the first vector for angle calculation.
3. From the second ComboBox inside angle tool options, select the number of measurement object that will correspond to the second vector for angle calculation.
4. Click "Finish" button inside angle tool options in order to calculate angle.
5. Optionally, calculate more angles by repeating steps 2-4.

11.1.7. Angles using Three Lines

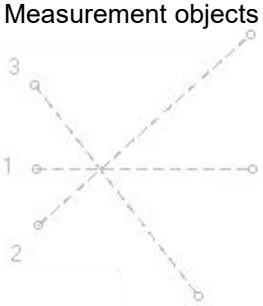
In order to measure angles between three lines (vectors), perform the following actions:

1. Select measurement tool by clicking appropriate "Angle" button

inside B Measurements ControlBar.
2. Move mouse cursor to position on the ultrasound image, where first vector should start, and click left mouse button in order to start measurement.
3. Move mouse cursor to position where first vector should end, and click left mouse button.
4. Move mouse cursor to position where second vector should start, and click left mouse button.
5. Move mouse cursor to position where second vector should end, and click left mouse button.
6. Move mouse cursor to position where third vector should start, and click left mouse button.
7. Move mouse cursor to position where third vector should end, and click left mouse button in order to finish angle measurement.
8. Optionally, perform another measurement of the same type by repeating steps 2-7.
Angles will be measured between first and second, and between first and third vectors.
Please note that at line's (vector's) starting point is painted its number (the number of measurement object).

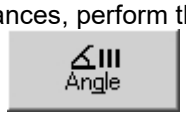


Measurement objects (three vectors) :



Results (lengths of vectors and angles between vectors):
1: 18,8 mm; **2:** 24,8 mm; **3:** 23,2 mm; **#** <AB(1,2)= 41,8°; <AC(1,3)= 52,1°;

In order to calculate angles between three previously measured distances, perform the following actions:

1. Select measurement tool by clicking appropriate "Angle" button 

inside B Measurements ControlBar.
2. From the first ComboBox inside angle tool options, select the number of measurement object that will correspond to the first vector for angle calculation.
3. From the second ComboBox inside angle tool options, select the number of measurement object that will correspond to the second vector for angle calculation.
4. From the third ComboBox inside angle tool options, select the number of measurement object that will correspond to the second vector for angle calculation.
5. Click "Finish" button inside angle tool options in order to calculate angles between first and second, and between first and third vectors.
6. Optionally, calculate more angles by repeating steps 2-5.

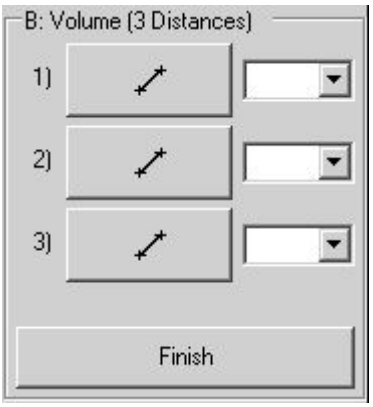
Note. This tool can be used for measuring hip angles.

11.1.8. Volume using Three Distances

In order to measure volume using three distances (three axes of an ellipsoid), perform the following actions:

1. Select measurement tool by clicking appropriate "Volume" button

inside B Measurements ControlBar.
2. Move mouse cursor to position on the ultrasound image, where first distance should start, and click left mouse button in order to start measurement.
3. Move mouse cursor to position where first distance should end, and click left mouse button.
4. Move mouse cursor to position where second distance should start, and click left mouse button.
5. Move mouse cursor to position where second distance should end, and click left mouse button.
6. Move mouse cursor to position where third distance should start, and click left mouse button.
7. Move mouse cursor to position where third distance should end, and click left mouse button in order to finish volume measurement.
8. Optionally, perform another measurement of the same type by repeating steps 2-7.



In order to calculate volume using three previously measured distances, perform the following actions:

1. Select measurement tool by clicking appropriate "Volume" button

inside B Measurements ControlBar.
2. From the first ComboBox inside volume tool options, select the number of measurement object that will correspond to the first axis of an ellipsoid.
3. From the second ComboBox inside volume tool options, select the number of measurement object that will correspond to the second axis of an ellipsoid.
4. From the third ComboBox inside volume tool options, select the number of measurement object that will correspond to the third axis of an ellipsoid.
5. Click "Finish" button inside volume tool options in order to calculate volume of an ellipsoid with selected three axes.
6. Optionally, calculate more volumes by repeating steps 2-5.

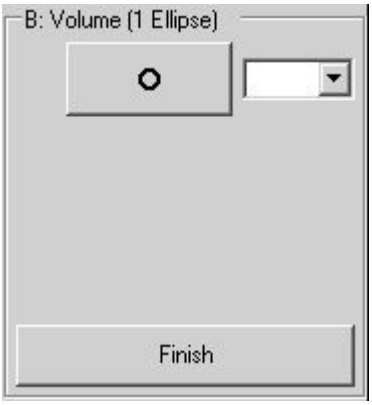
Note.
In some cases in order to measure volume you may need at first to scan the anatomy of interest at several different planes and only then perform volume measurement. For this purpose you must use Dual (B+B) or Quad (4B) mode.

11.1.9. Volume using One Ellipse

In order to measure volume of an ellipsoid using ellipse tool, perform the following actions:

1. Select measurement tool by clicking appropriate "Volume" button

inside B Measurements ControlBar.
2. Move mouse cursor to position on the ultrasound image, where should be placed first point of an ellipse long axis, and click left mouse button in order to start measurement.
3. Move mouse cursor to position on the ultrasound image, where should be placed second point of an ellipse long axis, and click left mouse button.
4. Move mouse cursor to position on the ultrasound image, where should be placed first point of an ellipse short axis, and click left mouse button in order to finish measurement.
5. Optionally, perform another measurement of the same type by repeating steps 2-4.
Please note that for calculations it is assumed that third axis of an ellipsoid is equal to the second (short) axis.



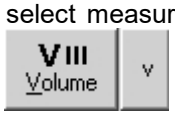
In order to calculate volume using previously measured ellipse, perform the following actions:

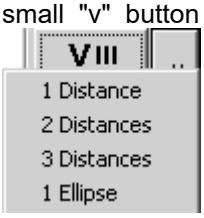
1. Select measurement tool by clicking appropriate "Volume" button

inside B Measurements ControlBar.
2. From the ComboBox inside volume tool options, select the number of measurement object (ellipse) that will be used for volume calculation.
3. Click "Finish" button inside volume tool options in order to calculate volume of an ellipsoid.
4. Optionally, calculate more volumes by repeating steps 2-3.

11.1.10. Volume using One Distance

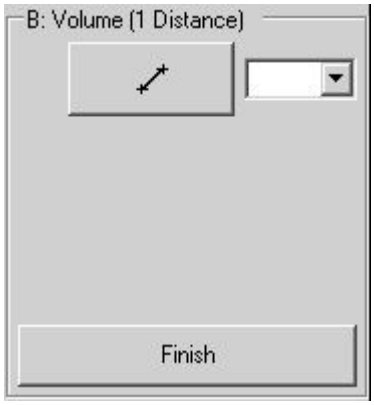
In order to measure volume of a sphere using one distance (sphere diameter), perform the following actions:

1. Inside B Measurements ControlBar select measurement tool by clicking small "v" button of "Volume" control 

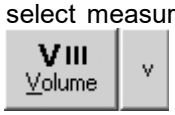
that will open menu 

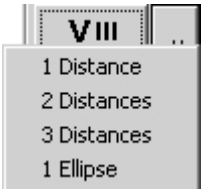
, and inside opened menu click "1 Distance". Then menu will be closed and "Volume" control's mode will be changed to volume calculation using one distance

.
2. Move mouse cursor to position on the ultrasound image, where should be placed first point of a sphere axis, and click left mouse button in order to start measurement.
3. Move mouse cursor to position on the ultrasound image, where should be placed second point of a sphere axis, and click left mouse button in order to finish volume measurement.
4. Optionally, perform another measurement of the same type by repeating steps 2-3.



In order to calculate volume using previously measured distance, perform the following actions:

1. Inside B Measurements ControlBar select measurement tool by clicking small "v" button of "Volume" control 

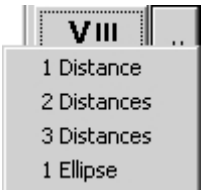
that will open menu 

, and inside opened menu click "1 Distance". Then menu will be closed and "Volume" control's mode will be changed to volume calculation using one distance

.
2. From the ComboBox inside volume tool options, select the number of measurement object that will be used for volume calculation.
3. Click "Finish" button inside volume tool options in order to calculate volume of a sphere.
4. Optionally, calculate more volumes by repeating steps 2-3.

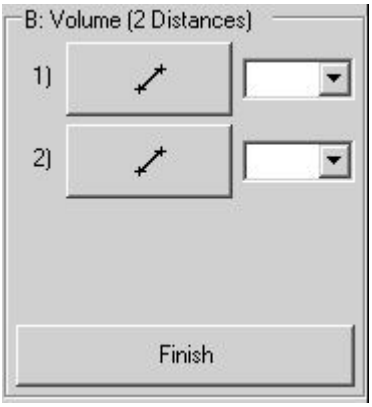
11.1.11. Volume using Two Distances

In order to measure volume of an ellipsoid using two distances, perform the following actions:
1. Inside B Measurements ControlBar select measurement tool by clicking small "v" button of "Volume" control

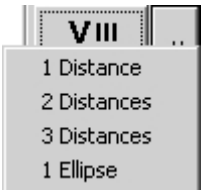
that will open menu 

, and inside opened menu click "2 Distances". Then menu will be closed and "Volume" control's mode will be changed to volume calculation using two distances

.
2. Move mouse cursor to position on the ultrasound image, where should be placed first point of an ellipsoid long axis, and click left mouse button in order to start measurement.
3. Move mouse cursor to position on the ultrasound image, where should be placed second point of an ellipsoid long axis, and click left mouse button.
4. Move mouse cursor to position, where should be placed first point of an ellipsoid short axis, and click left mouse button.
5. Move mouse cursor to position, where should be placed second point of an ellipsoid short axis, and click left mouse button in order to finish volume measurement.
6. Optionally, perform another measurement of the same type by repeating steps 2-5.
Please note that for calculations it is assumed that third ellipsoid axis is equal to the second axis.



In order to calculate volume using two previously measured distances, perform the following actions:
1. Inside B Measurements ControlBar select measurement tool by clicking small "v" button of "Volume" control

that will open menu 

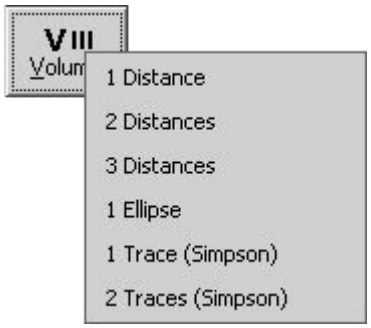
, and inside opened menu click "2 Distances". Then menu will be closed and "Volume" control's mode will be changed to volume calculation using two distances

.
2. From the first ComboBox inside volume tool options, select the number of measurement object that will correspond to an ellipsoid's long axis.
3. From the second ComboBox inside volume tool options, select the number of measurement object that will correspond to an ellipsoid's short axis.
4. Click "Finish" button inside volume tool options in order to calculate volume of an ellipsoid.
5. Optionally, calculate more volumes by repeating steps 2-4.

11.1.12. Volume using One Trace (Simpson's Single Plane Method)

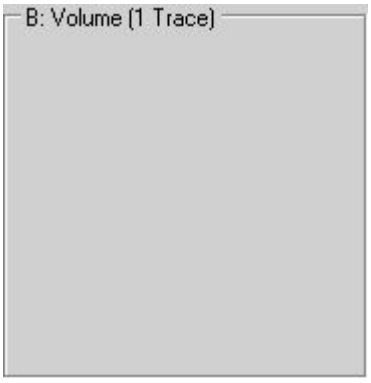
In order to measure volume using one trace, perform the following actions:

1. Inside B Measurements ControlBar select measurement tool by clicking small "v" button of "Volume" control

that will open menu 

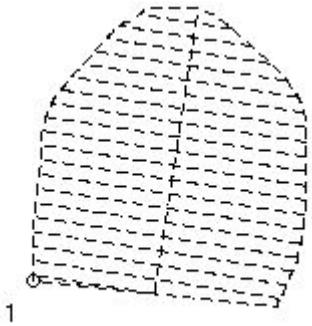
, and inside opened menu click "1 Trace (Simpson)". Then menu will be closed and "Volume" control's mode will be changed to volume calculation using one trace

.



2. Move mouse cursor to position on the ultrasound image, where should be placed first point of a trace, and click left mouse button in order to start measurement.
3. Move mouse cursor in order to paint trace of desired to measure volume.
4. Click left mouse button in order to finish trace painting.
5. Move mouse cursor in order to set direction of long axis. During this movement on the screen will be visible how the trace will be divided into disks (perpendicular to long axis).
6. Click left mouse button in order to finish volume measurement.
7. Optionally, perform another measurement of the same type by repeating steps 2-6.

Measurement object and results (trace area, long axis length and calculated volume):

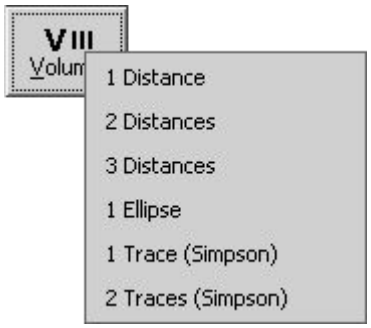


1: 6,13 cm2; L= 27,7 mm; V= 11,169 cm3;

The number of used disks for Simpson's method can be changed at "Menu->Tools->Options->Measurements and Calculations->Common Settings".

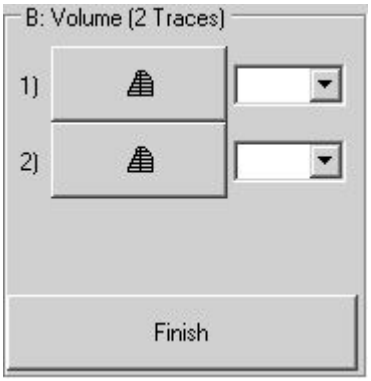
11.1.13. Volume using Two Traces (Simpson's Biplane Method)

In order to measure volume using two traces, perform the following actions (usually in B+B or 4B mode with perpendicular scans of measured object):
1. Inside B Measurements ControlBar select measurement tool by clicking small "v" button of "Volume" control

that will open menu 

, and inside opened menu click "2 Traces (Simpson)". Then menu will be closed and "Volume" control's mode will be changed to volume calculation using two traces

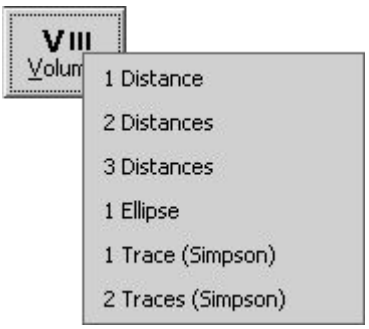
.



2. Move mouse cursor to position on the ultrasound image (first plane), where should be placed first point of a first trace, and click left mouse button in order to start measurement.
3. Move mouse cursor in order to paint trace of desired to measure volume.
4. Click left mouse button in order to finish trace painting.
5. Move mouse cursor in order to set direction of long axis. During this movement on the screen will be visible how the trace will be divided into disks (perpendicular to long axis).
6. Click left mouse button in order to finish adjustment of long axis.
7. Move mouse cursor to position on the ultrasound image (second plane), where should be placed first point of a second trace, and click left mouse button in order to start measurement.
8. Move mouse cursor in order to paint trace of desired to measure volume.
9. Click left mouse button in order to finish trace painting.
10. Move mouse cursor in order to set direction of long axis. During this movement on the screen will be visible how the trace will be divided into disks (perpendicular to long axis).
11. Click left mouse button in order to finish volume measurement using two traces.
12. Optionally, perform another measurement of the same type by repeating steps 2-11.

In order to calculate volume using two previously measured traces (please note that here are used special traces divided to disks), perform the following actions:
1. Inside B Measurements ControlBar select measurement tool by clicking small "v" button of "Volume" control

that will open menu



, and inside opened menu click "2 Traces (Simpson)". Then menu will be closed and "Volume" control's mode will be changed to volume calculation using two traces

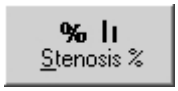
.

2. From the first ComboBox inside volume tool options select the number of measurement object that will correspond to a trace on first plane.
3. From the second ComboBox inside volume tool options select the number of measurement object that will correspond to a trace on second plane.
4. Click "Finish" button inside volume tool options in order to calculate volume using two selected traces.
5. Optionally, calculate more volumes by repeating steps 2-4.

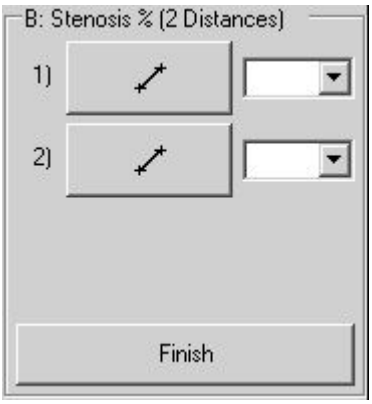
Please note that for volume calculation are used special traces (divided to disks), and it is not possible to do this calculation using any other traces.

11.1.14. Stenosis (%) using Two Distances

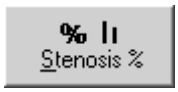
In order to measure stenosis (%) using two distances, perform the following actions:

1. Select measurement tool by clicking appropriate "Stenosis %" button 

inside B Measurements ControlBar.
2. Move mouse cursor to position on the ultrasound image, where should be started first distance, and click left mouse button in order to start measurement.
3. Move mouse cursor to position on the ultrasound image, where should be ended first distance, and click left mouse button.
4. Move mouse cursor to position, where should be started second distance, and click left mouse button.
5. Move mouse cursor to position, where should be ended second distance, and click left mouse button in order to finish stenosis measurement.
6. Optionally, perform another measurement of the same type by repeating steps 2-5.



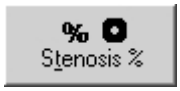
In order to calculate stenosis (%) using two previously measured distances, perform the following actions:

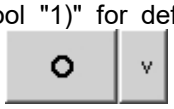
1. Select measurement tool by clicking appropriate "Stenosis %" button 

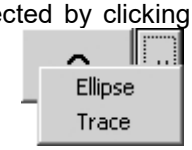
inside B Measurements ControlBar.
2. From the first ComboBox inside stenosis tool options, select the number of measurement object that will correspond to the first distance.
3. From the second ComboBox inside stenosis tool options, select the number of measurement object that will correspond to the second distance.
4. Click "Finish" button inside stenosis tool options in order to calculate stenosis using two distances.
5. Optionally, perform more calculations of the same type by repeating steps 2-4.

11.1.15. Stenosis (%) using Two Areas

In order to measure stenosis (%) using two areas, perform the following actions:

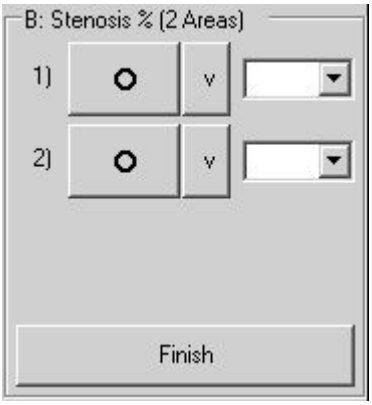
1. Select measurement tool by clicking appropriate "Stenosis %" button 

inside B Measurements ControlBar.
2. Optionally, from stenosis tool options select tool "1)" for defining first area. Tool is selected by clicking menu button "v" 

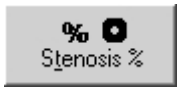
and from appeared menu 

selecting desired tool (e.g., trace

).
3. Draw on the ultrasound image first area using selected tool. For detailed instructions on using selected tool, see sections about area measurement using ellipse and trace tools. If in previous step the tool was not changed, then by default is used ellipse tool.
4. Optionally, from stenosis tool options select tool "2)" for defining second area.
5. Draw on the ultrasound image second area using selected tool. For detailed instructions on using selected tool, see sections about area measurement using ellipse and trace tools. If in previous step the tool was not changed, then by default is used ellipse tool. Stenosis will be calculated automatically.
6. Optionally, perform another measurement of the same type by repeating steps 2-5.



In order to calculate stenosis (%) using two previously measured areas, perform the following actions:

1. Select measurement tool by clicking appropriate "Stenosis %" button 

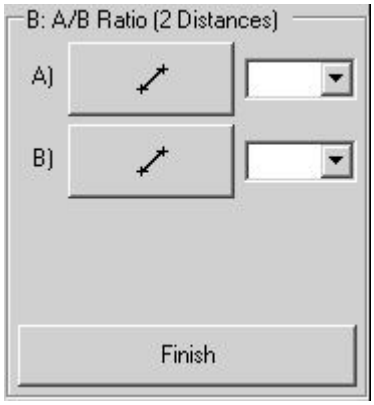
inside B Measurements ControlBar.
2. From the first ComboBox inside stenosis tool options, select the number of measurement object that defines first area.
3. From the second ComboBox inside stenosis tool options, select the number of measurement object that defines second area.
4. Click "Finish" button inside stenosis tool options in order to calculate stenosis using two areas.
5. Optionally, perform more calculations of the same type by repeating steps 2-4.

11.1.16. A/B Ratio using Two Distances

In order to measure the ratio of two distances, perform the following actions:

1. Select measurement tool by clicking appropriate "A/B Ratio" button

inside B Measurements ControlBar.
2. Move mouse cursor to position on the ultrasound image, where should be started first distance (numerator A), and click left mouse button in order to start measurement.
3. Move mouse cursor to position on the ultrasound image, where should be ended first distance, and click left mouse button.
4. Move mouse cursor to position, where should be started second distance (denominator B), and click left mouse button.
5. Move mouse cursor to position, where should be ended second distance, and click left mouse button in order to finish ratio measurement.
6. Optionally, perform another measurement of the same type by repeating steps 2-5.



In order to calculate ratio using two previously measured distances, perform the following actions:

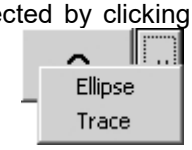
1. Select measurement tool by clicking appropriate "A/B Ratio" button

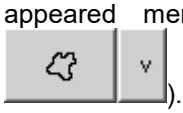
inside B Measurements ControlBar.
2. From the first "A)" ComboBox inside ratio tool options, select the number of measurement object that will correspond to the first distance (numerator A).
3. From the second "B)" ComboBox inside ratio tool options, select the number of measurement object that will correspond to the second distance (denominator B).
4. Click "Finish" button inside ratio tool options in order to calculate ratio using two distances.
5. Optionally, perform more calculations of the same type by repeating steps 2-4.

11.1.17. A/B Ratio using Two Areas or Circumferences

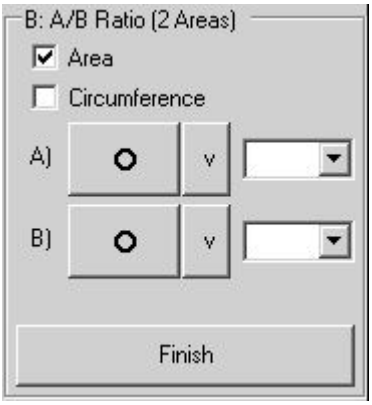
In order to measure A/B Ratio using two areas or circumferences, perform the following actions:
1. Select measurement tool by clicking appropriate "A/B Ratio" button

inside B Measurements ControlBar.
2. If you wish to measure ratio between two areas, ensure that "Area" CheckBox inside ratio tool options is checked. If it is not checked, then check it.
3. Optionally, if you wish to measure ratio between two circumferences, check "Circumference" CheckBox inside ratio tool options.
4. Optionally, from the ratio tool options select tool "A)" for defining first area. Tool is selected by clicking menu button "v"

and from appeared menu 

selecting desired tool (e.g., trace 

).
5. Draw on the ultrasound image first area (numerator A) using selected tool. For detailed instructions on using selected tool, see sections about area measurement using ellipse and trace tools. If in previous step the tool was not changed, then by default is used ellipse tool.
6. Optionally, from the ratio tool options select tool "B)" for defining second area.
7. Draw on the ultrasound image second area (denominator B) using selected tool. For detailed instructions on using selected tool, see sections about area measurement using ellipse and trace tools. If in previous step the tool was not changed, then by default is used ellipse tool. A/B ratio will be calculated automatically.
8. Optionally, perform another measurement of the same type by repeating steps 4-7.



In order to calculate ratio using two previously measured areas, perform the following actions:
1. Select measurement tool by clicking appropriate "A/B Ratio" button

inside B Measurements ControlBar.
2. If you wish to measure ratio between two areas, ensure that "Area" CheckBox inside ratio tool options is checked. If it is not checked, then check it.
3. Optionally, if you wish to measure ratio between two circumferences, check "Circumference" CheckBox inside ratio tool options.
4. From the first "A)" ComboBox inside ratio tool options, select the number of measurement object that defines first area (numerator A).
5. From the second "B)" ComboBox inside ratio tool options, select the number of measurement object that defines second area (denominator B).
6. Click "Finish" button inside ratio tool options in order to calculate ratio using two areas.
7. Optionally, perform more calculations of the same type by repeating steps 4-6.

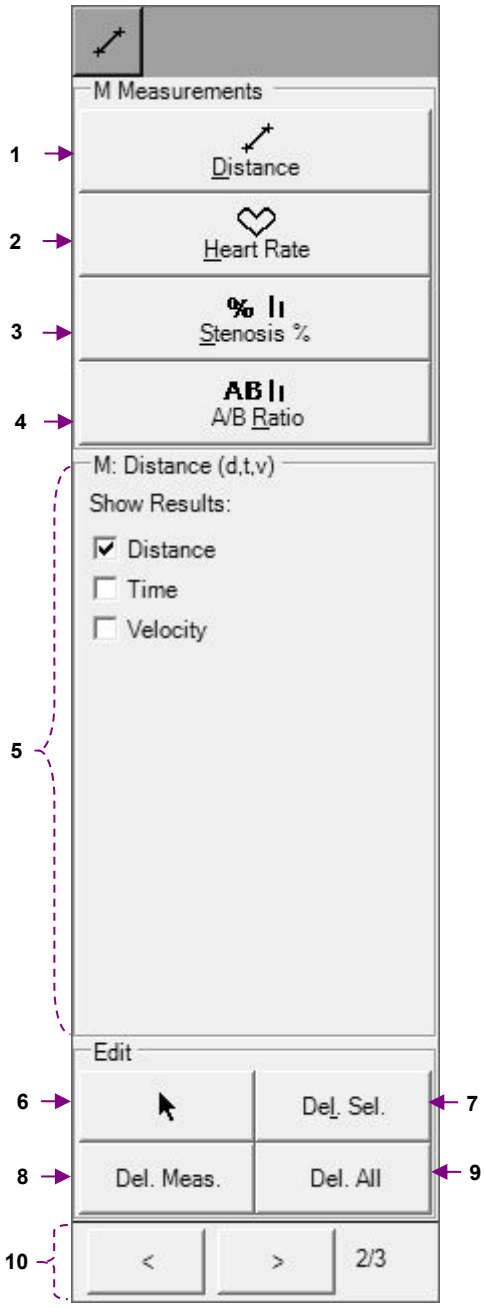
11.2. General M Mode Measurements

In order to perform M mode measurements, perform the following actions:

1. Scan desired M mode image and Freeze it.

2. Click "Measurements" button

in order to open right-side measurements ControlBar.
3. If opened measurements ControlBar is other than "M Measurements", use controls for changing General Measurements pages in order to open "M Measurements" page.
4. Inside this ControlBar select desired measurement tool, choose options of this tool, and perform desired number of measurements using this tool.
5. If needed, choose another measurement tool, choose its options, and again perform desired number of measurements using selected tool.

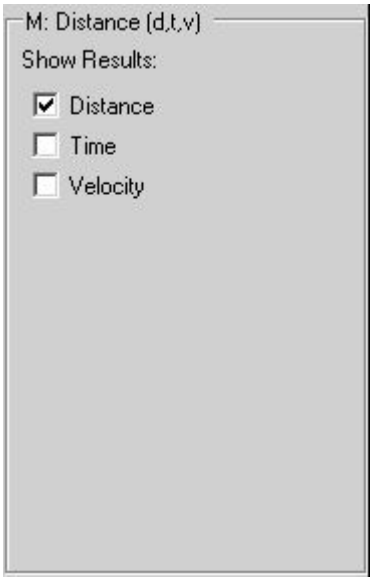


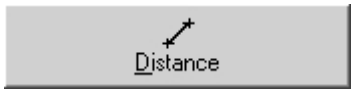
General M mode measurements ControlBar

Num	Description
1	Distance, time, velocity measurement tool button.
2	Heart Rate measurement tool button.
3	Stenosis (%) measurement using two distances tool button.
4	A/B ratio of two distances measurement tool button.
5	Options of selected tool.
6	Neutral tool button. Neutral tool is used in order to select, edit, and delete measurement objects.
7	Button for deletion of selected measurement and drawing objects.
8	Button for deletion of all measurement objects.
9	Button for deletion of all measurement and drawing objects.
10	Controls for changing pages of General Measurements.

11.2.1. Distance, Time, Velocity

In order to measure distance, time, or velocity, perform the following actions:

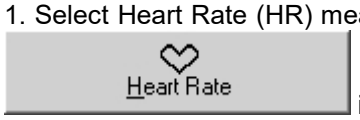


1. Select distance measurement tool by clicking "Distance" button 

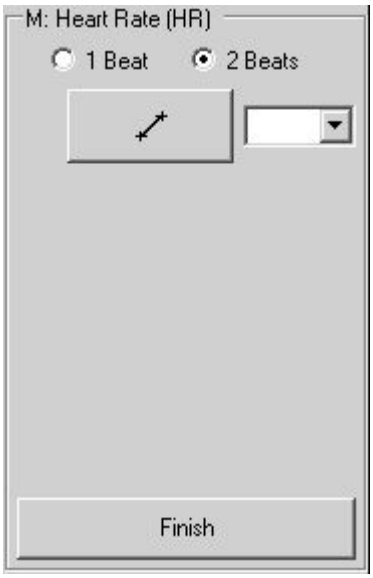
inside M Measurements ControlBar.
2. If you wish to measure distance, ensure that CheckBox "Distance" inside distance tool options is checked. If it is not checked, then check it.
3. Optionally, if you wish to measure time or velocity, then check appropriate CheckBoxes ("Time", "Velocity") inside distance tool options. Please note that you can check several CheckBoxes.
4. Move mouse cursor to position on the ultrasound image, where you wish to start measurement, and click left mouse button in order to start measurement.
5. Move mouse cursor to position on the ultrasound image, where you wish to finish measurement, and click left mouse button in order to finish measurement.
6. Optionally, perform another measurement of the same type by repeating steps 4-5.

11.2.2. Heart Rate (HR)

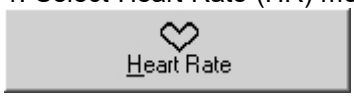
In order to measure Heart Rate (HR), perform the following actions:

1. Select Heart Rate (HR) measurement tool by clicking "Heart Rate" button 

inside M Measurements ControlBar.
2. If you wish to measure heart rate using two heart beats interval, ensure that RadioButton "2 Beats" inside heart rate tool options is checked. If it is not checked, then check it.
3. If you wish to measure heart rate using one heart beat interval, ensure that RadioButton "1 Beat" inside heart rate tool options is checked. If it is not checked, then check it.
4. Move mouse cursor to position on the ultrasound image, where you wish to start measurement, and click left mouse button in order to start measurement.
5. Move mouse cursor to position on the ultrasound image, where you wish to finish measurement, and click left mouse button in order to finish measurement.
6. Optionally, perform another measurement of the same type by repeating steps 4-5.



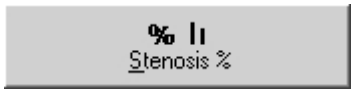
In order to calculate Heart Rate (HR) using previously measured time interval, perform the following actions:

1. Select Heart Rate (HR) measurement tool by clicking "Heart Rate" button 

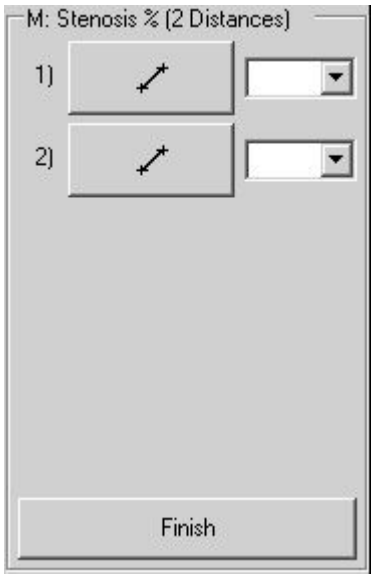
inside M Measurements ControlBar.
2. If you wish to calculate heart rate using two heart beats interval, ensure that RadioButton "2 Beats" inside heart rate tool options is checked. If it is not checked, then check it.
3. If you wish to calculate heart rate using one heart beat interval, ensure that RadioButton "1 Beat" inside heart rate tool options is checked. If it is not checked, then check it.
4. From the ComboBox inside heart rate tool options, select the number of measurement object that will be used for calculating heart rate.
5. Click "Finish" button inside heart rate tool options in order to calculate heart rate.
6. Optionally, perform more calculations of the same type by repeating steps 2-5.

11.2.3. Stenosis (%) using Two Distances

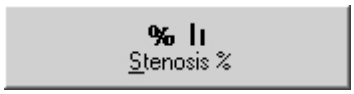
In order to measure stenosis (%) using two distances, perform the following actions:

1. Select measurement tool by clicking "Stenosis %" button 

inside M Measurements ControlBar.
2. Move mouse cursor to position on the M mode ultrasound image, where should be started first distance, and click left mouse button in order to start measurement.
3. Move mouse cursor to position on the M mode ultrasound image, where should be ended first distance, and click left mouse button.
4. Move mouse cursor to position, where should be started second distance, and click left mouse button.
5. Move mouse cursor to position where should be ended second distance and click left mouse button in order to finish stenosis measurement.
6. Optionally, perform another measurement of the same type by repeating steps 2-5.



In order to calculate stenosis (%) using two previously measured distances, perform the following actions:

1. Select measurement tool by clicking "Stenosis %" button 

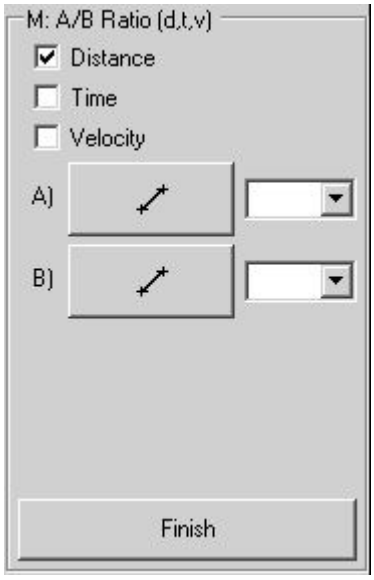
inside M Measurements ControlBar.
2. From the first ComboBox inside stenosis tool options, select the number of measurement object that will correspond to the first distance.
3. From the second ComboBox inside stenosis tool options, select the number of measurement object that will correspond to the second distance.
4. Click "Finish" button inside stenosis tool options in order to calculate stenosis using two distances.
5. Optionally, perform more calculations of the same type by repeating steps 2-4.

11.2.4. A/B Ratio using Two Distances, Times or Velocities

In order to measure the ratio of two distances, times, or velocities, perform the following actions:

1. Select measurement tool by clicking "A/B Ratio" button

inside M Measurements ControlBar.
2. If you wish to calculate ratio between two distances, ensure that "Distance" CheckBox inside ratio tool options is checked. If it is not checked, then check it.
3. Optionally, if you wish to calculate ratio between two time intervals, check "Time" CheckBox inside ratio tool options.
4. Optionally, if you wish to calculate ratio between two velocities, check "Velocity" CheckBox inside ratio tool options.
5. Move mouse cursor to position on the M mode ultrasound image, where should be started first distance (numerator A), and click left mouse button in order to start measurement.
6. Move mouse cursor to position on the M mode ultrasound image, where should be ended first distance, and click left mouse button.
7. Move mouse cursor to position, where should be started second distance (denominator B), and click left mouse button.
8. Move mouse cursor to position, where should be ended second distance, and click left mouse button in order to finish ratio measurement.
9. Optionally, perform another measurement of the same type by repeating steps 5-8.



In order to calculate ratio using two previously measured distances, perform the following actions:

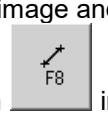
1. Select measurement tool by clicking appropriate "A/B Ratio" button

inside M Measurements ControlBar.
2. If you wish to calculate ratio between two distances, ensure that "Distance" CheckBox inside ratio tool options is checked. If it is not checked, then check it.
3. Optionally, if you wish to calculate ratio between two time intervals, check "Time" CheckBox inside ratio tool options.
4. Optionally, if you wish to calculate ratio between two velocities, check "Velocity" CheckBox inside ratio tool options.
5. From the first "A)" ComboBox inside ratio tool options, select the number of measurement object that will correspond to the first distance (numerator A).
6. From the second "B)" ComboBox inside ratio tool options, select the number of measurement object that will correspond to the second distance (denominator B).
7. Click "Finish" button inside ratio tool options in order to calculate ratio using two distances.
8. Optionally, perform more calculations of the same type by repeating steps 2-7.

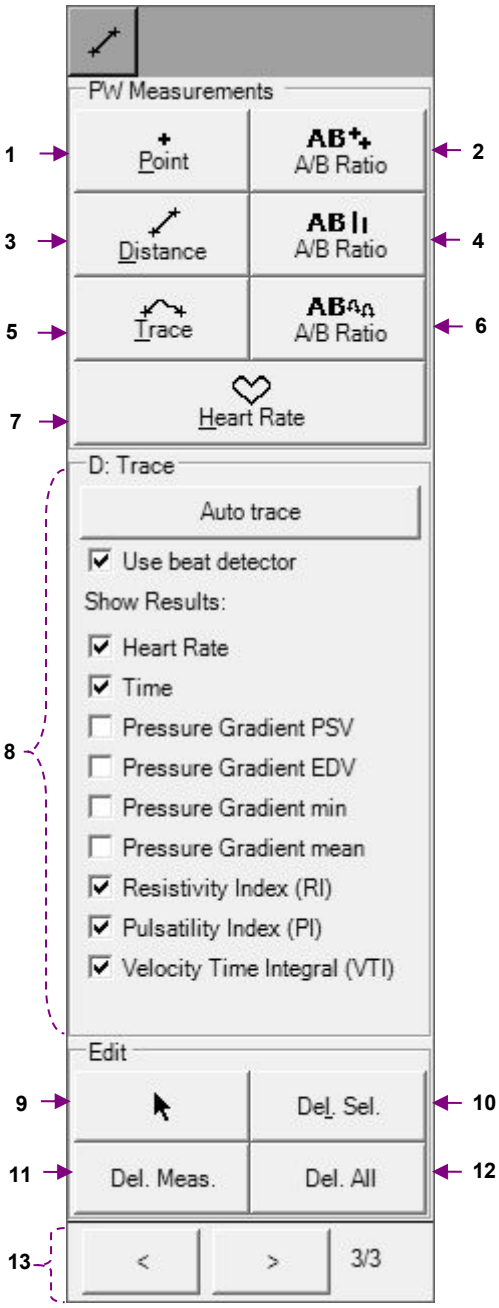
11.3. General PW/CW Mode Measurements

In order to perform PW/CW mode measurements, perform the following actions:

1. Scan desired PW/CW mode image and Freeze it.

2. Click "Measurements" button 

in order to open right-side measurements ControlBar.
3. If opened measurements ControlBar is other than "PW/CW Measurements", use controls for changing General Measurements pages in order to open "PW/CW Measurements" page.
4. Inside this ControlBar select desired measurement tool, choose options of this tool, and perform desired number of measurements using this tool.
5. If needed, choose another measurement tool, choose its options, and again perform desired number of measurements using selected tool.

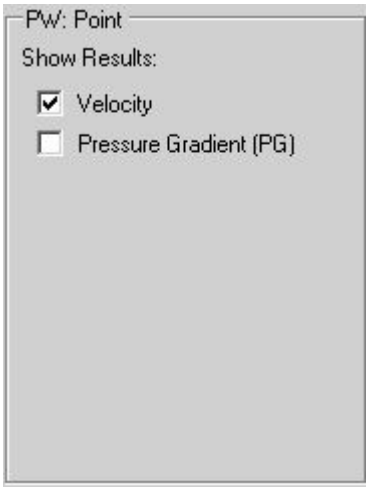


General PW/CW mode measurements ControlBar

Num	Description
1	Point-based Velocity, Pressure Gradient measurement tool button.
2	A/B ratio of two point-based measurements tool button.
3	Distance (two points) -based Velocities difference, Pressure Gradients (PG) difference, Times difference, Acceleration and Resistivity Index (RI) measurement tool button.
4	A/B ratio of two distance-based measurements tool button.
5	Trace-based Velocity min/max/mean, Pressure Gradient (PG) min/max/mean, Velocity Time Integral (VTI), Resistivity Index (RI), Pulsatility Index (PI) measurements tool button.
6	A/B ratio of two trace-based measurements tool button.
7	Heart Rate measurement tool button.
8	Options of selected tool.
9	Neutral tool button. Neutral tool is used in order to select, edit, and delete measurement objects.
10	Button for deletion of selected measurement and drawing objects.
11	Button for deletion of all measurement objects.
12	Button for deletion of all measurement and drawing objects.
13	Controls for changing pages of General Measurements.

11.3.1. Velocity and Pressure Gradient (PG) using One Point

In order to measure Velocity or Pressure Gradient (PG) perform the following actions:



1. Select point-based measurement tool by clicking "Point" button

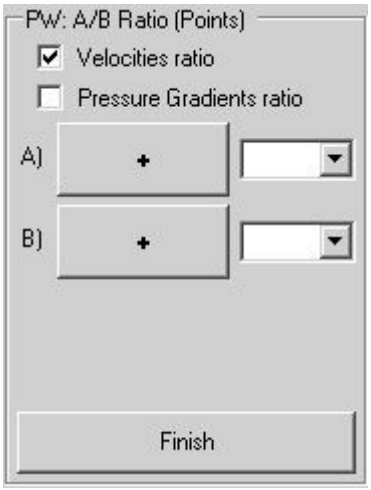
inside PW/CW Measurements ControlBar.
2. If you wish to measure Velocity, ensure that CheckBox "Velocity" inside point-based measurement tool options is checked. If it is not checked, then check it.
3. Optionally, if you wish to measure Pressure Gradient (PG), then check appropriate CheckBox ("Pressure Gradient (PG)") inside point-based measurement tool options. Please note that you can check several CheckBoxes.
4. Move mouse cursor to position on the ultrasound image, where you wish to perform measurement and click left mouse button in order to perform measurement.
5. Optionally, perform another measurement of the same type by repeating step 4.

11.3.2. A/B Ratio of Point-based measurements (Velocities, Pressure Gradients)

In order to measure the ratio of two point-based measurements, perform the following actions:

1. Select measurement tool by clicking "A/B Ratio" button

inside PW/CW Measurements ControlBar.
2. If you wish to calculate ratio between two Velocities, ensure that "Velocities ratio" CheckBox inside ratio tool options is checked. If it is not checked, then check it.
3. Optionally, if you wish to calculate the ratio of two Pressure Gradients (PG), check "Pressure Gradients ratio" CheckBox inside ratio tool options.
4. Move mouse cursor to position on the PW mode ultrasound image, where should be performed first measurement (numerator A), and click left mouse button in order to perform measurement.
5. Move mouse cursor to position, where should be performed second measurement (denominator B), and click left mouse button in order to perform measurement and calculate ratio.
6. Optionally, perform another measurement of the same type by repeating steps 4-5.



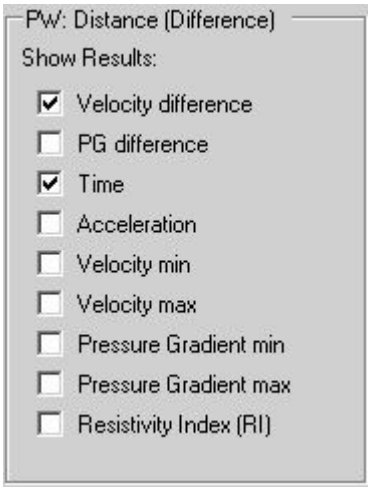
In order to calculate ratio using two previously measured point-based measurements, perform the following actions:

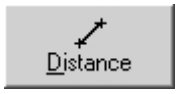
1. Select measurement tool by clicking appropriate "A/B Ratio" button

inside PW/CW Measurements ControlBar.
2. If you wish to calculate ratio between two Velocities, ensure that "Velocities ratio" CheckBox inside ratio tool options is checked. If it is not checked, then check it.
3. Optionally, if you wish to calculate the ratio of two Pressure Gradients (PG), check "Pressure Gradients ratio" CheckBox inside ratio tool options.
4. From the first "A)" ComboBox inside ratio tool options, select the number of measurement object that will correspond to the first measurement (numerator A).
5. From the second "B)" ComboBox inside ratio tool options, select the number of measurement object that will correspond to the second measurement (denominator B).
6. Click "Finish" button inside ratio tool options in order to calculate ratio of two measurements.
7. Optionally, perform more calculations of the same type by repeating steps 2-6.

11.3.3. Velocities difference, Pressure Gradients (PG) difference, Times difference, Acceleration, and Resistivity Index (RI) using One Distance (Two Points)

In order to measure Velocities difference, Pressure Gradients (PG) difference, Times difference, Acceleration, or Resistivity Index (RI), perform the following actions:



1. Select distance measurement tool by clicking "Distance" button 

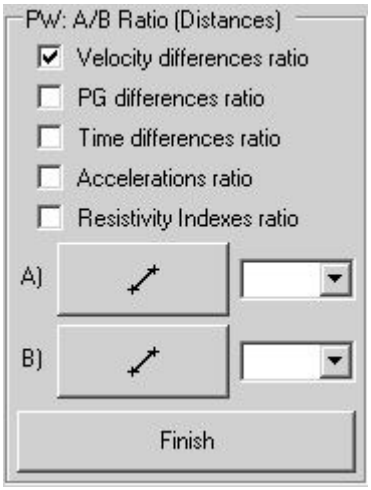
inside PW/CW Measurements ControlBar.
2. If you wish to measure Velocities difference, ensure that CheckBox "Velocity difference" inside distance tool options is checked. If it is not checked, then check it.
3. Optionally, if you wish to measure other parameters, then check appropriate CheckBoxes inside distance tool options. Please note that you can check several CheckBoxes.
4. Move mouse cursor to position on the ultrasound image, where you wish to start measurement, and click left mouse button in order to start measurement.
5. Move mouse cursor to position on the ultrasound image, where you wish to finish measurement, and click left mouse button in order to finish measurement.
6. Optionally, perform another measurement of the same type by repeating steps 4-5.

11.3.4. A/B Ratio of Distance (Two Points) -based measurements

In order to measure the ratio of two distance (two points) -based measurements, perform the following actions:

1. Select measurement tool by clicking "A/B Ratio" button

inside PW/CW Measurements ControlBar.
2. If you wish to calculate ratio between two Velocity differences, ensure that "Velocity differences ratio" CheckBox inside ratio tool options is checked. If it is not checked, then check it.
3. Optionally, if you wish to calculate ratio between other parameters, check appropriate CheckBoxes inside ratio tool options.
4. Move mouse cursor to position on the PW/CW mode ultrasound image, where should be started first distance-based measurement (numerator A), and click left mouse button in order to start measurement.
5. Move mouse cursor to position on the PW/CW mode ultrasound image, where should be ended first distance-based measurement, and click left mouse button.
6. Move mouse cursor to position, where should be started second distance-based measurement (denominator B), and click left mouse button.
7. Move mouse cursor to position, where should be ended second distance-based measurement, and click left mouse button in order to finish ratio measurement.
8. Optionally, perform another measurement of the same type by repeating steps 4-7.



In order to calculate ratio using two previously measured distance-based measurements, perform the following actions:

1. Select measurement tool by clicking appropriate "A/B Ratio" button

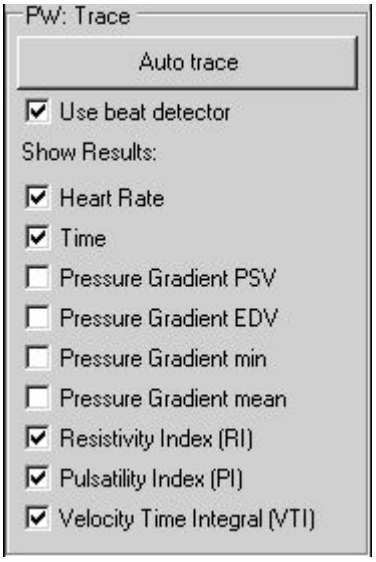
inside PW/CW Measurements ControlBar.
2. If you wish to calculate ratio between two Velocity differences, ensure that "Velocity differences ratio" CheckBox inside ratio tool options is checked. If it is not checked, then check it.
3. Optionally, if you wish to calculate ratio between other parameters, check appropriate CheckBoxes inside ratio tool options.
4. From the first "A)" ComboBox inside ratio tool options, select the number of measurement object that will correspond to the first distance-based measurement (numerator A).
5. From the second "B)" ComboBox inside ratio tool options, select the number of measurement object that will correspond to the second distance-based measurement (denominator B).
6. Click "Finish" button inside ratio tool options in order to calculate ratio of selected measurements.
7. Optionally, perform more calculations of the same type by repeating steps 2-6.

11.3.5. Velocity min/max/mean, Pressure Gradient (PG) min/max/mean, Velocity Time Integral (VTI), Resistivity Index (RI) and Pulsatility Index (PI) using Trace measurement

The PW/CW Trace measurement mode (automatic or manual) is selected under the software options ("Menu->Tools->Options->Measurements and Calculations->Common Settings" option "Use automatic PW/CW trace detection").
To perform a PW/CW trace-based measurement perform the following actions:

1. Select the Trace measurement tool by clicking on the "Trace" button

in the PW/CW Measurements ControlBar.
2. Tick with mouse the CheckBoxes of the parameters that you want to measure (e.g., Heart Rate, Time, Resistivity Index, Pulsatility Index, Velocity Time Integral) and untick the CheckBoxes of the parameters that you do not want to measure.
3. Move the mouse cursor to a position on the ultrasound image where you wish to start the trace measurement and click using the left mouse button to start the measurement.
4. Move the mouse to the position where you want to end the trace measurement and click using the left mouse button to finish the measurement. If you are using the automatic PW/CW trace detection, the software will automatically detect trace contour and will perform the selected measurements. If automatic detection is not being used, you will need to draw the trace curve by moving the mouse on the ultrasound image along the contour of the PW/CW trace you want to measure.
5. Optionally, perform another measurement of the same type by repeating steps 2-4.

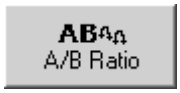


IMPORTANT
Some parameters (Heart Rate, Resistivity Index (RI), Pressure Gradient EDV) are only calculated if is the option "Use beat detector" is used and the software is able to detect heart beat interval. After detection it is drawn using a different color than the rest of the trace.
If the option "Use beat detector" is used, all parameters (with the exception of the Time and Velocity Time Integral) are calculated for detected heart beat part (drawn using a different color).
Time and Velocity Time Integral are calculated not for one detected beat, but for a full drawn trace between the dashed endpoint lines.
If software detects that PW/CW data is aliased, PW/CW trace is painted using red color and calculations are not performed.

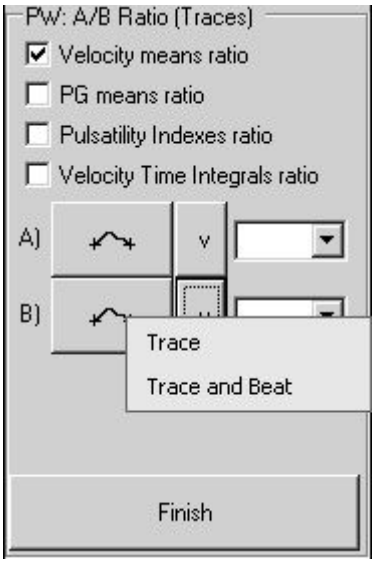
Here PSV - Peak Systole Velocity, EDV - End Diastole Velocity.

11.3.6. A/B Ratio of Trace -based measurements

To measure the ratio of two trace-based measurements perform the following actions:

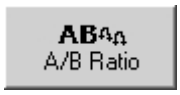
1. Select the measurement tool by clicking on the "A/B Ratio" button 

in the PW/CW Measurements ControlBar.
2. If you wish to calculate the ratio between two Velocity means, ensure that "Velocity means ratio" CheckBox is ticked in the ratio tool options. Tick this CheckBox if not already ticked.
3. Optionally, if you wish to calculate the ratio between other parameters, tick the appropriate CheckBoxes in the ratio tool options.
4. Optionally, using the menu ("v") of the "A)" button select whether you want to measure a standard trace or a trace with automatically detected heart beat.
5. Perform the measurement of the first trace (numerator A).
6. Optionally, using the menu ("v") of the "B)" button select whether you want to measure a standard trace or a trace with automatically detected heart beat.
7. Perform the measurement of the second trace (denominator B). The software will calculate the selected ratios.
8. Optionally, perform another measurement of the same type by repeating steps 2-7.



IMPORTANT.
If a trace with heart beat detection ("Trace and Beat") is used, then Velocity mean, PG mean and Pulsatility Index are all calculated for detected beat interval (drawn using different color).
The Velocity Time Integral is always calculated for a full trace between dashed vertical endpoint markers regardless of whether a heart beat is detected or not.

To calculate a ratio using two previously measured traces perform the following actions:

1. Select the measurement tool by clicking on the appropriate "A/B Ratio" button 

in the PW/CW Measurements ControlBar.
2. If you wish to calculate the ratio between two Velocity means, ensure that the "Velocity means ratio" CheckBox in the ratio tool options is ticked. Tick this CheckBox if not already ticked.
3. Optionally, if you wish to calculate the ratio between other parameters, tick the appropriate CheckBoxes inside the ratio tool options.
4. From the first "A)" ComboBox in ratio tool options select the number of first trace measurement object (numerator A).
The ComboBox only shows the numbers of objects that correspond with the type of object selected using the menu "v" of "A)" button ("Trace" or "Trace and Beat"). If you want to change the type of objects, do this by selecting the appropriate menu item (using menu button "v").
5. From the second "B)" ComboBox in the ratio tool options select the number of second trace measurement object (denominator B).
6. Click on the "Finish" button in ratio tool options to calculate the selected ratios.
7. Optionally, perform more calculations of the same type by repeating steps 2-6.

11.3.7. Resistivity Index (RI)

The Resistivity Index (RI) can be measured manually using the PW/CW distance tool or automatically using the PW/CW trace tool and by selecting the appropriate options for these tools. For more information see the descriptions of these tools.

11.3.8. Pulsatility Index (PI)

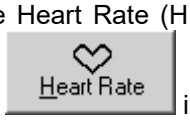
The Pulsatility Index (PI) is measured using the PW/CW trace tool and by selecting the appropriate option of this tool. For more information see the description of this tool.

11.3.9. Velocity Time Integral (VTI)

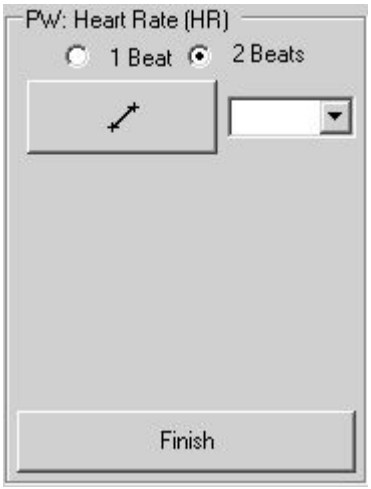
The Velocity Time Integral (VTI) is measured using the PW/CW trace tool and by selecting the appropriate option of this tool. For more information see the description of this tool.

11.3.10. Heart Rate (HR) using Distance-based measurement

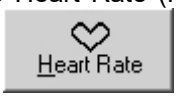
To measure the Heart Rate (HR) perform the following actions:

1. Select the Heart Rate (HR) measurement tool by clicking on the "Heart Rate" button 

in the PW/CW Measurements ControlBar.
2. If you wish to measure the heart rate using a two heart beats interval, ensure that RadioButton "2 Beats" in the heart rate tool options is ticked. Tick this if not already ticked.
3. If you wish to measure heart rate using a one heart beat interval, ensure that RadioButton "1 Beat" in heart rate tool options is ticked. Tick this if not already ticked.
4. Move the mouse cursor to the position on the ultrasound image where you wish to start the measurement and click using the left mouse button to start measurement.
5. Move the mouse cursor to the position on the ultrasound image where you want to finish the measurement and click using the left mouse button to finish measurement.
6. Optionally, perform another measurement of the same type by repeating steps 4-5.



To calculate the Heart Rate (HR) using a previously measured time interval perform the following actions:

1. Select the Heart Rate (HR) measurement tool by clicking on the "Heart Rate" button 

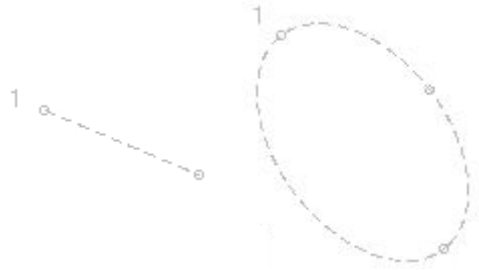
in the PW/CW Measurements ControlBar.
2. If you wish to calculate the heart rate using a two heart beats interval, ensure that RadioButton "2 Beats" in the heart rate tool options is ticked. Tick this if not already ticked.
3. If you wish to calculate the heart rate using a one heart beat interval, ensure that RadioButton "1 Beat" in the heart rate tool options is ticked. Tick this if not already ticked.
4. From the ComboBox in the heart rate tool options select the number of measurement object that will be used for calculating the heart rate.
5. Click on the "Finish" button in heart rate tool options to calculate the heart rate.
6. Optionally, perform more calculations of the same type by repeating steps 2-5.

A Heart Rate also can be entered in the Patient Information window.

Another way of measuring a heart rate is by using the PW/CW trace with selected beat detection and Heart Rate options. For more information see the trace tool description.

11.4. Modifying and Deleting Performed Measurements

Each measurement object has defined key points that can be used for modifying this measurement object. These key points are usually marked with small circles and are located at points which are the start and/or end of the measurement object and at some other points.



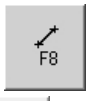
To modify the measurement or drawing after finishing measurement perform the following actions:

1. If no measurement tool is selected or if a tool such as the M-line is selected, click on the "Measurements" button to open the right-side measurements ControlBar and click on the "Neutral tool" button .
2. Move the mouse cursor over the key point of the measurement object you want to modify.
3. Click using the right mouse button to start the key point modification.

   Please note that some computers may not have an external mouse but have a built-in touch pad or touch screen. To find out how to perform right mouse button click on such computer please read the user manual for this particular computer or for its pointing device. In the case of the ClarUs system with touch pads, clicks using the right mouse button can be performed by *very gently touching* the touch pad with *two fingers at once*.
4. Move the mouse cursor to the new desired key point location.
5. Click using the right mouse button to finish key point modification.
6. Optionally, repeat steps 2-5 for all measurement objects and their key points that you want to modify.

Please note that if a particular measurement object was connected with an examination-specific measurement field, the modification of the measurement object also affects the value that resides in the connected examination-specific measurement field.

To delete a measurement or a drawing object after finishing measurement, perform the following actions:

1. If no measurement tool is selected or if a tool such as the M-line is selected, click on the "Measurements" button  to open the right-side measurements ControlBar and click on the "Neutral tool" button .
2. Move the mouse cursor over the key point of the measurement object you want to delete.
3. Click using the right mouse button to start the key point modification.
4. Click on the "Delete" ("Del") key to delete the measurement object.
5. Optionally, repeat steps 2-4 for all measurement objects that you wish to delete.

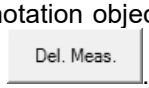
Please note that the deletion of a measurement object does not affect the values contained in the examination-specific measurement fields.

To delete all measurements and drawings (annotations) perform the following actions:

1. If the right-side measurement ControlBar is not opened, click on the "Measurements" button

to open the right-side Measurements ControlBar.

2. Click on the "Delete All" button

at the bottom of the Measurements ControlBar to delete all measurement and annotation objects. To delete only all measurements, but leave annotations, click “Delete Measurements” button 

.

Please note that deletion of measurement objects does not affect the values contained in the examination-specific measurement fields.

To delete several measurements or drawings (annotations) at once, please perform the following actions:

1. If the right-side Measurement ControlBar is not open, click on the "Measurements" button

to open the right-side Measurement ControlBar.

2. Click on the "Neutral tool" button .
3. Move the mouse cursor over the key point of the measurement object you want to delete.
4. Click using the left mouse button to select the measurement object.
5. In case of a selection error, click the key point of the same measurement object to cancel selection.
6. Perform steps 3-5 to select all the objects that you wish to delete.
7. Optionally, in order to select multiple measurement objects at the same time using a rectangular selection region, press the left mouse button at the point where the selection region should start and keep this mouse button pressed while moving the mouse cursor to the point where rectangular region should end and then release this mouse button. All measurement objects with key points inside this selection rectangle will be selected.

8. Click on the "Delete Selected" button

at the bottom of the measurement ControlBar to delete the selected measurement objects. Alternatively click on the "Delete" ("Del") key.
9. Optionally, repeat steps 3-8 in order to delete other measurements or drawings.

Please note that the deletion of measurement objects does not affect the values contained in the examination-specific measurement fields.

To move previously created measurement/drawing/annotation graphical object to another location perform the following actions:

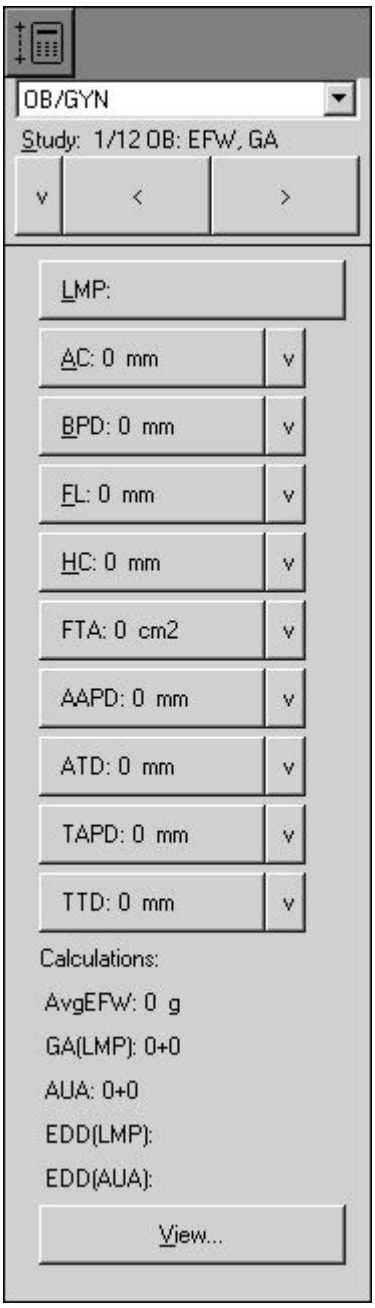
1. If the right-side measurements ControlBar is not opened click on the "Measurements" button

to open the right-side measurements ControlBar.

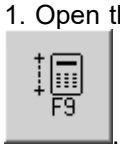
2. Click on the "Neutral tool" button .
3. Move the mouse cursor over the endpoint or contour of the object you want to move.
4. Press the left mouse button and move the mouse cursor without releasing the left mouse button. Please note that this movement operation affects all selected objects if you previously selected multiple objects.
5. Release the left mouse button to finish the movement operation.

11.5. Human Obstetrics / Gynecology (OB / GYN) Examination Measurements and Calculations

To perform examination-specific measurements and calculations, freeze the ultrasound image (or open the thumbnail image) and at software top ToolBar click on the "Calculations" button . If OB/GYN exam type was selected in the Patient Information window (that is opened by clicking on the "Patient" button), the OB/GYN measurements and calculations right-side ControlBar will be opened.



To enter the LMP (Last Menstrual Period) date perform the following actions:

1. Open the OB/GYN calculations ControlBar (if not already opened) by clicking on the "Calculations" button 

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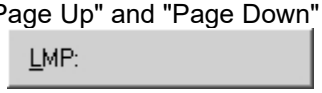
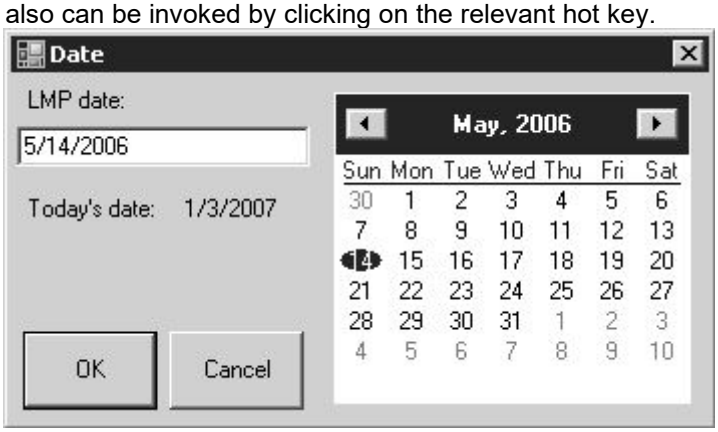
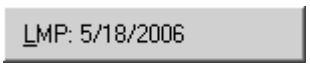
2. Use the "Study" control

from the OB/GYN calculations ControlBar to open the study page that contains the LMP button if the current study page does not have a LMP button. Study can be changed by clicking on the "<" and ">" buttons from the "Study" control or by clicking on the "v" button and from the opened menu selecting the desired study. If the calculations ControlBar is active, the "Study" control can be activated by clicking on the appropriate hot key that is indicated as an underlined letter in the control caption (underlined "S" for Study). If the calculations ControlBar is active, the studies also can be changed by clicking on the "Page Up" and "Page Down" keys.

3. Click on the "LMP" button 

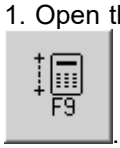
to open the LMP input window. If a button has a hot key that is indicated with an underlined letter (e.g., underlined for LMP button) and the button ControlBar is active, the button action also can be invoked by clicking on the relevant hot key.



4. Inside the opened window select the LMP date (year, month and day) using the calendar or enter the date manually using the "LMP date" field. The date format should correspond with the format shown by the "Today's date" label.
5. Click on the "OK" button to confirm the entered date or on the "Cancel" button to cancel a date input operation. This will close the date input window.
6. Ensure that the LMP date on the LMP button 

is the one you wish to enter.
7. Optionally, repeat steps 3-6 to modify/correct the LMP date.

To measure an OB/GYN parameter, perform the following actions:

1. Open the OB/GYN calculations ControlBar (if not already opened) by clicking on the "Calculations" button 

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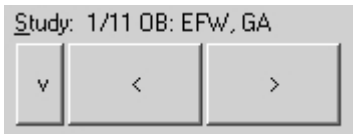
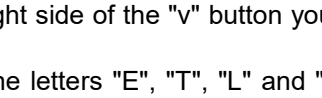
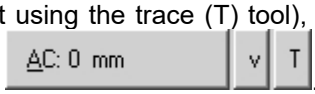
2. Use the "Study" control 

of the OB/GYN calculations ControlBar to open the study page containing the control (measurement field) with the name of the desired to measure parameter (e.g., AC) if the current study page does not already contain it. The study can be changed by clicking on the "<" and ">" buttons from the "Study" control or by clicking on the "v" button and from the opened menu selecting the desired study. Measurement abbreviations (e.g., AC meaning Abdominal Circumference) and for calculations used formulas can be found in the software reference manual.

3. Click on the button of the desired to measure parameter, e.g., AC

. If the field contains any measurement data, this data will be deleted and at the right side of the "v" button you will see a third button displayed ("E", "T", "L", "B") 

. The letters "E", "T", "L" and "B" indicate what measurement tool is used for measuring the selected parameter: E - ellipse tool, T - trace, L - line, B - trace with heart beat detection. The software selects this tool automatically and waits while the measurement is performed. If a measurement field has a hot key indicated as an underlined letter (e.g., an underlined A for AC) and the calculations ControlBar is active, then the desired to measure parameter can be selected by clicking on the relevant hot key. Also the field you want to measure can be selected from the activated ControlBar using the "Up" and "Down" arrow keys and then clicking on the "Enter" key.
4. Optionally, if you wish to change the measurement tool for the selected field (e.g., measure AC not using ellipse (E) but using the trace (T) tool), click on this third button and another available tool will be selected, e.g., trace (T) 

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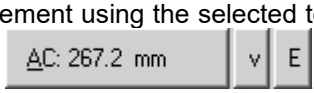
5. Move the mouse cursor over the ultrasound image and measure the desired parameter by performing the mouse clicks required in order to perform the measurement using the selected tool. Measurement results will be transferred automatically to the measurement field 

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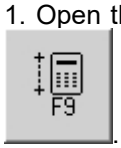
6. Optionally, measure other desired parameters by repeating steps 3-5.

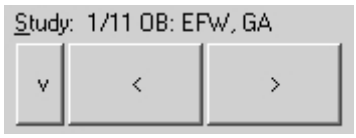
Please note that after the measurement of the selected parameter, its field is linked to the measurement object (painted ellipse, trace or line). If you modify the size or shape of this measurement object, the updated results will be automatically transferred to the linked measurement field. For example, modification of an elliptical object will change the "AC" field data if that ellipse was used for measuring AC.

To modify the field data you should modify the corresponding measurement object. This modification is usually performed by moving the key points for that particular object. For detailed instructions please see the corresponding section about modification of performed measurements.

Please note also that deletion of measurement object breaks the link between the measurement field and this object, but the field data is not erased.

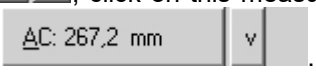
If a circumference or an area field is measured using the line tool ("L"), it is assumed that this line corresponds to the diameter of a circle, and the result of the field is calculated based on the circumference or area of this circle.

To clear data of a measured OB/GYN parameter (clear measurement field) perform the following actions:
1. Open the OB/GYN calculation ControlBar (if not already opened) by clicking on the "Calculations" button 

.
2. Use the "Study" control 

from the OB/GYN calculations ControlBar to open the study page containing the control (measurement field) with the name of the parameter that you want to clear (e.g., AC) if it is not included in the current study page.

3. If the measurement field which you want to clear is selected (is visible third button)

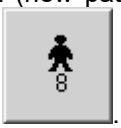
, click on this measurement field (e.g., "AC" button) to deselect it (the third button will then disappear) 

.
4. Click on the measurement field button you want cleared (e.g., AC)

. The field data will be cleared and this field will be selected for measurement

.
5. Optionally, repeat steps 3-4 in order to clear data from other fields.

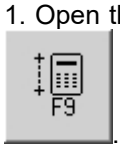
Please note that this measurement parameter (measurement field) clearing operation does not delete measurement object (ellipse, trace or line) that was painted when measuring this parameter.

To clear data from all the measurement fields and delete all the measurement (drawing) objects at once, start a new examination (new patient) by using the Patient Information window that is opened after clicking on the "Patient" button 

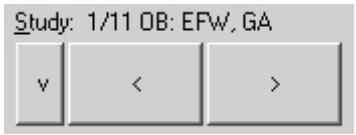
.

In some cases you may want to perform general measurements and then decide to transfer the results from these general measurements (measurement objects) to different fields of OB/GYN parameters.

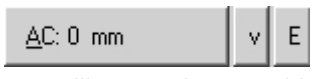
To transfer measurement result from some measurement object (ellipse, trace or line) to an OB/GYN field, perform the following actions:

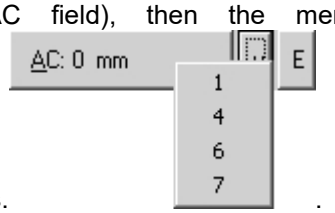
1. Open the OB/GYN calculations ControlBar (if not already opened) by clicking on the "Calculations" button 

.

2. Use the "Study" control 

from the OB/GYN calculations ControlBar to open the study page containing the control (measurement field) with the name of the parameter you wish to enter (e.g., AC) if it is not included in the current study page.

3. Click on the button "v" of the desired to fill measurement field control 

. If the ultrasound image contains measurement objects of the appropriate type (e.g., ellipse and trace objects for the AC field), then the menu will be opened with the numbers of that measurement objects. 

.

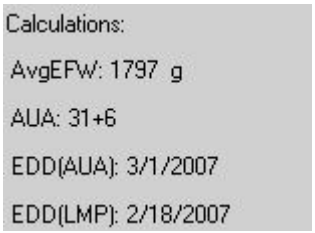
4. If a menu with the numbers of the measurement object was opened, select the number of object whose data you want transferred to the selected measurement field. The field data will be updated and this field will be linked together with the chosen measurement object

.

5. Optionally, repeat steps 3-4 in order to fill other fields with data.

All OB calculations are performed automatically when you perform OB measurements. Some of the most important calculation results are displayed directly in the OB calculations ControlBar:

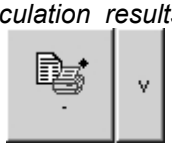
Average Estimated Fetal Weight (AvgEFW)
Average Ultrasound Age (AUA)
Estimated Delivery Date that was calculated using AUA
Estimated Delivery Date that was calculated using LMP



To see more results of OB calculations or to select what calculation results should be used for averaging, perform the following actions:

1. Click on the "View" button

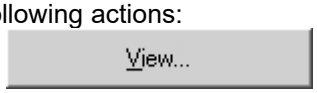
to open the OB Results window.
2. In the opened window use "Calculations" tab to view the results of the Estimated Fetal Weight and Gestational Age calculations using different methods.
3. If needed, mark the desired methods with ticks indicating which results should be used for averaging.
4. Click on the "OK" button to close this dialog.

Please note that *in order to see all calculation results* you should save/print the report of the performed examination using the "Report" button 

(or one of its menu items) located on the software bottom ToolBar.

Report usually contains examination-specific measurements and calculations for currently selected examination type and the change of the type of examination clears all examination-specific measurements and calculations. If you want to have measurements and calculations of several different examination types in one single report, go to the "Menu->Tools->Options->Measurements and Calculations->Common Settings", enable the option designated as "Merge data of different exam types into single report" and close the options dialog with the "OK" button. In such case on the right-side calculations ControlBar you will be able to change both the study type and also select the examination type that will change the calculations package.

To analyze fetal growth using Growth Curves and measurement results of current and previous examinations, perform the following actions:

1. Click on the "View" button 

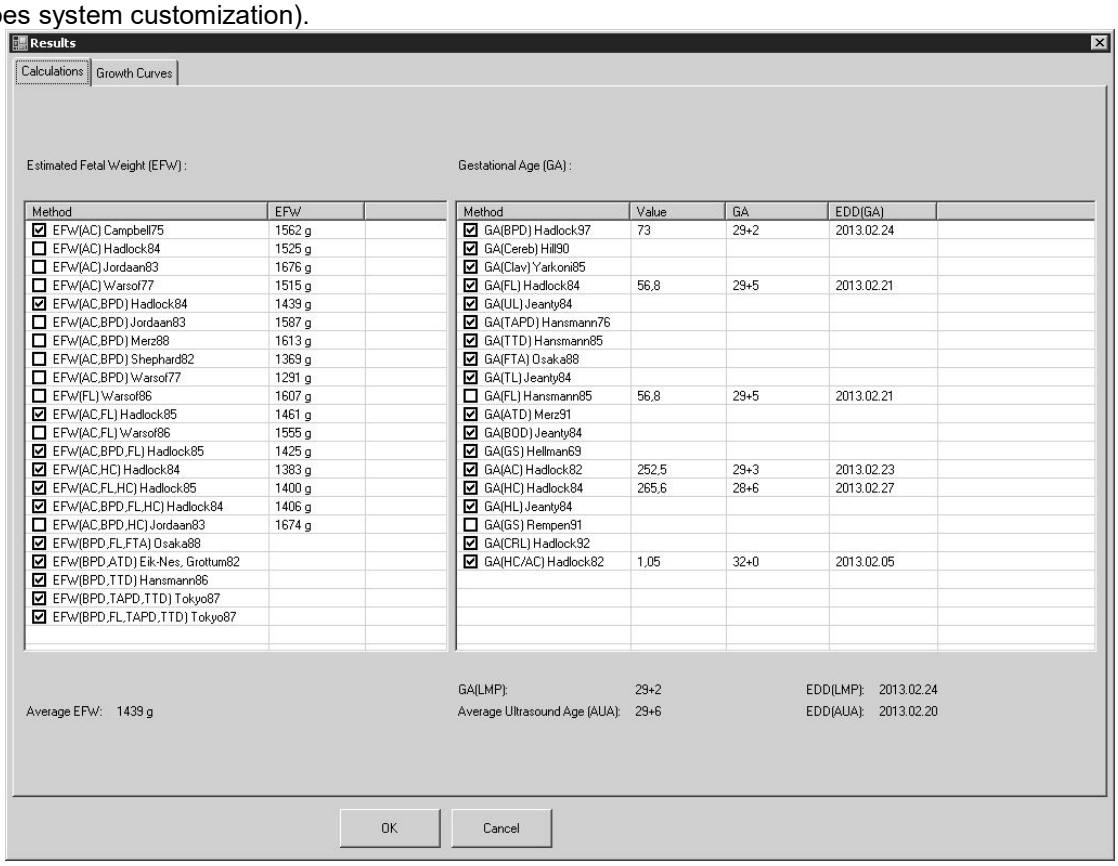
to open the OB Results window.
2. In the opened window click using the with left mouse button on the "Growth Curves" tab.
3. Using the "View" ComboBox set the number of simultaneously visible charts to 1 (if the current value is not 1).
4. Using the "Table" ComboBox select the parameter and the table that will be used for analysis.
5. Optionally, in the "Previous exams data" field enter the dates of the previous examinations and measured values of the selected parameter using the following format:

date1; result1;
date2; result2;
...

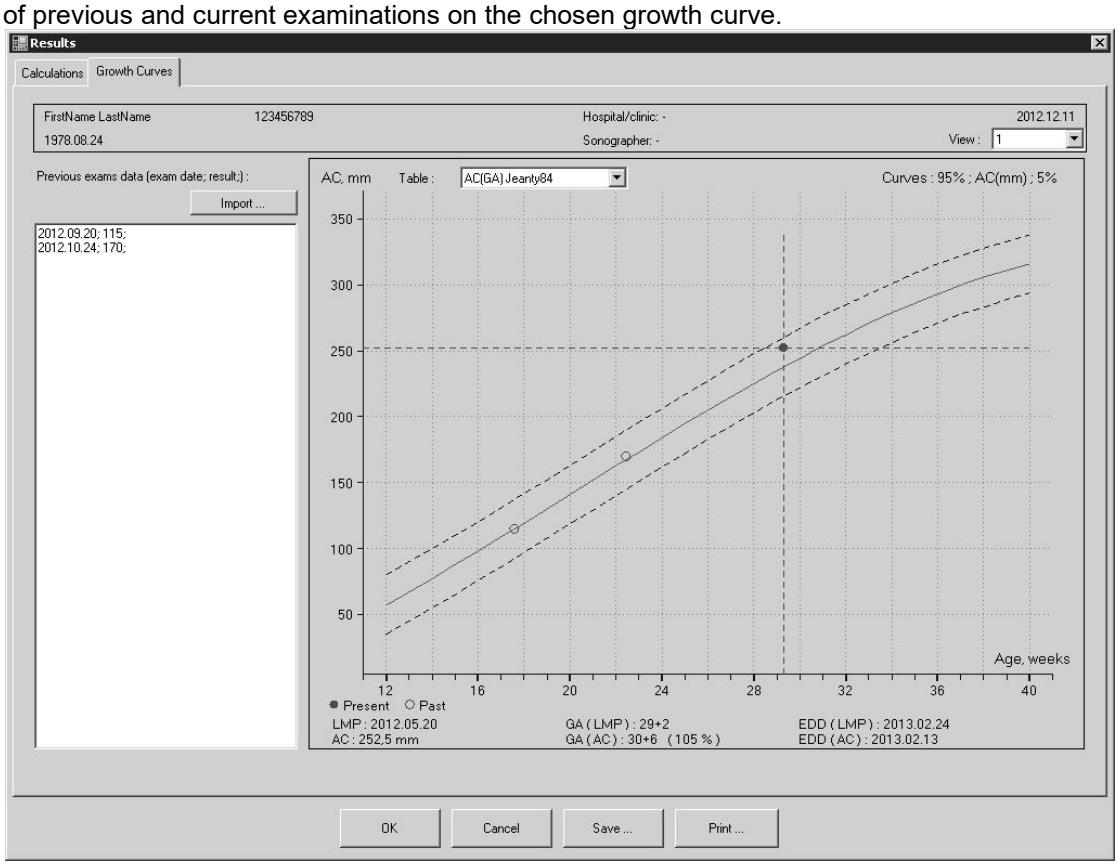
Please use the same date format that is used for displaying the current examination date.
Another way to add previous exams data is to use "Import ..." button that allows to import previously stored trending data and measurement results from TPD/TVD files. Software imports data that corresponds to all used OB parameters (AC, BPD, ...), no matter what growth curve is currently visible. That is, you need to import file only once, and then can view curve(s) of desired measurement(s). In order to view what trending data after import is available for some measurement, select growth table that corresponds to this measurement. Please note that during import is performed checking and sorting of dates and removal of duplicate and incorrect entries (if present).
6. Optionally, perform steps 4-5 for other desired to analyze parameters.
7. Optionally, using the "View" ComboBox select the number of simultaneously visible charts (1, 2, 3 or 4) and then, using the "Table" ComboBox for each chart, select the parameters and tables that will be used for analysis.
8. Optionally, save or print out the images of the desired curves.
9. Click on the "OK" button to close this dialog.

Please note that fetal growth analysis requires the entry of the LMP date (LMP - Last Menstrual Period). The LMP can be entered by clicking on the "LMP" button on the OB/GYN measurements ControlBar and selecting LMP from the calendar (or entering manually). The LMP can also be entered in the Patient Information window that is opened by clicking on the "Patient" button
that is located on the software bottom ToolBar.

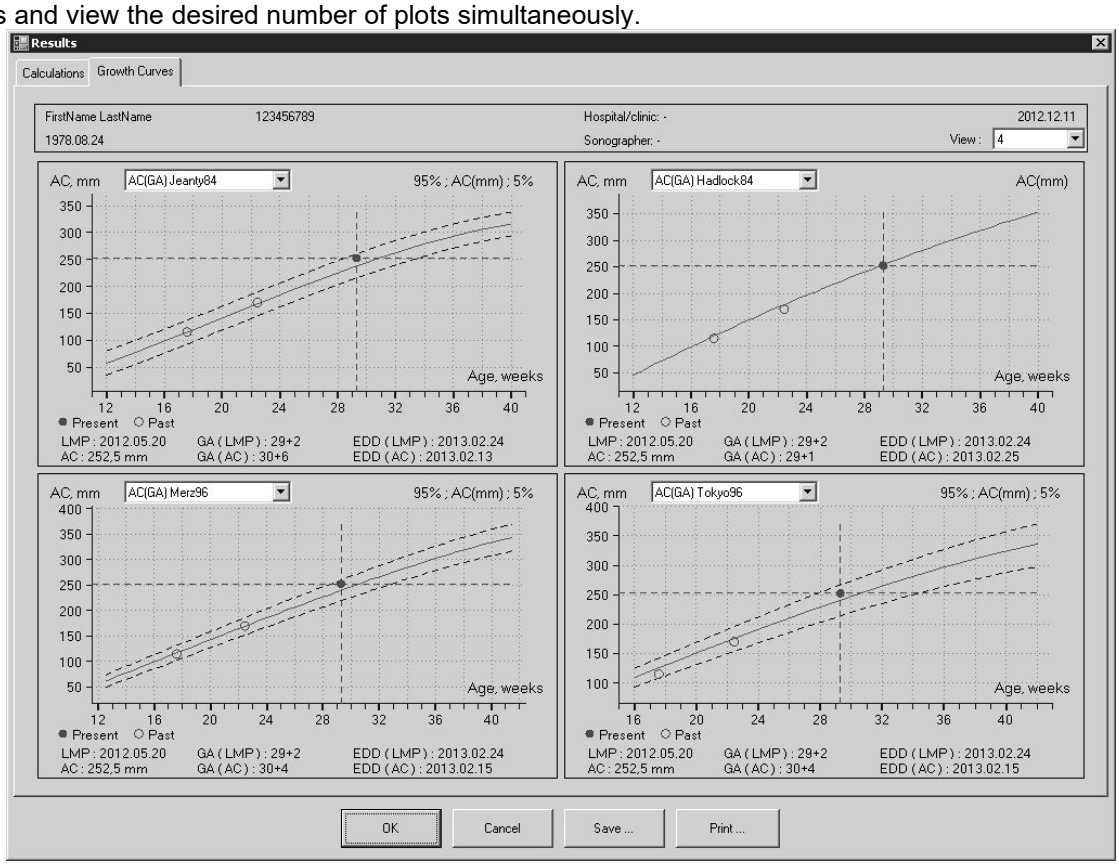
The software OB/GYN package allows you to use multiple EFW and GA calculation methods and select what methods are to be used for the calculation of the averaged results. Tables that are immediately available for calculations can be selected in the software options window (for details, see the section that describes system customization).



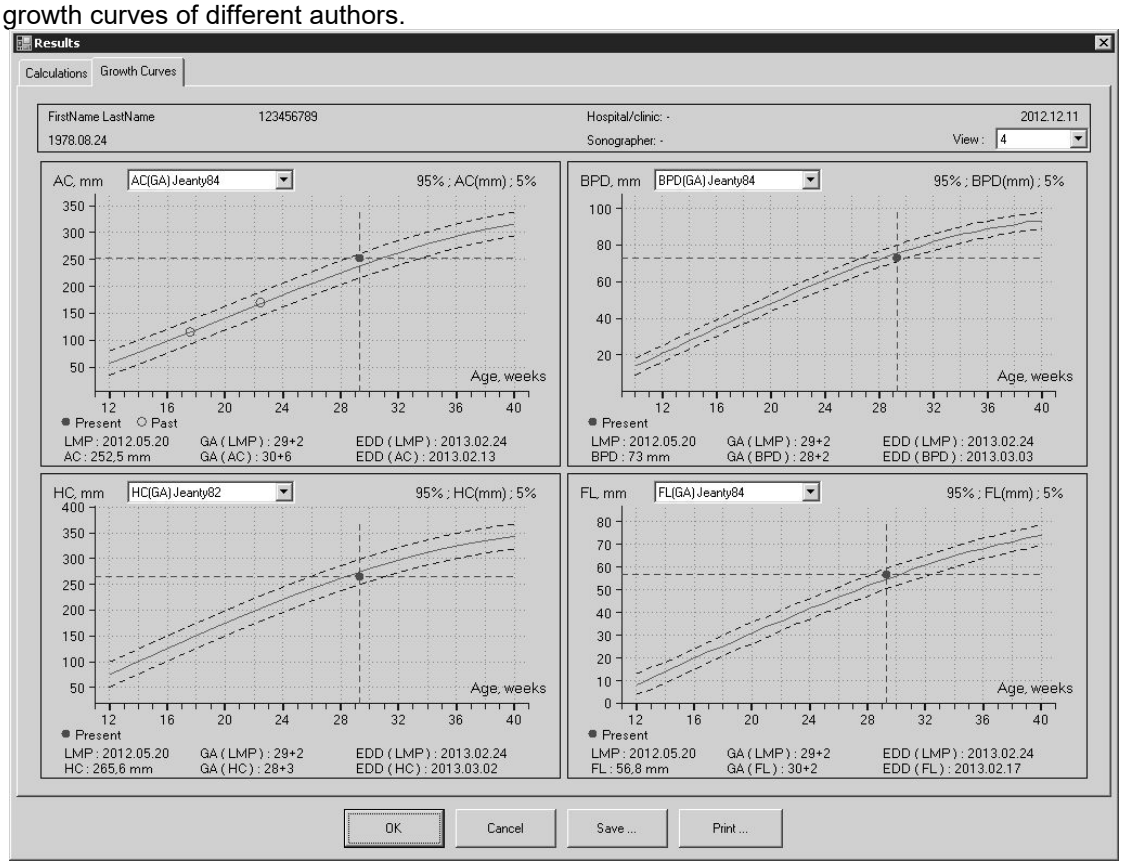
The software allows you to enter the measurement results of previous examinations and to view the results of previous and current examinations on the chosen growth curve.



The software allows you to plot the same measured parameter on the growth curves of different authors and view the desired number of plots simultaneously.

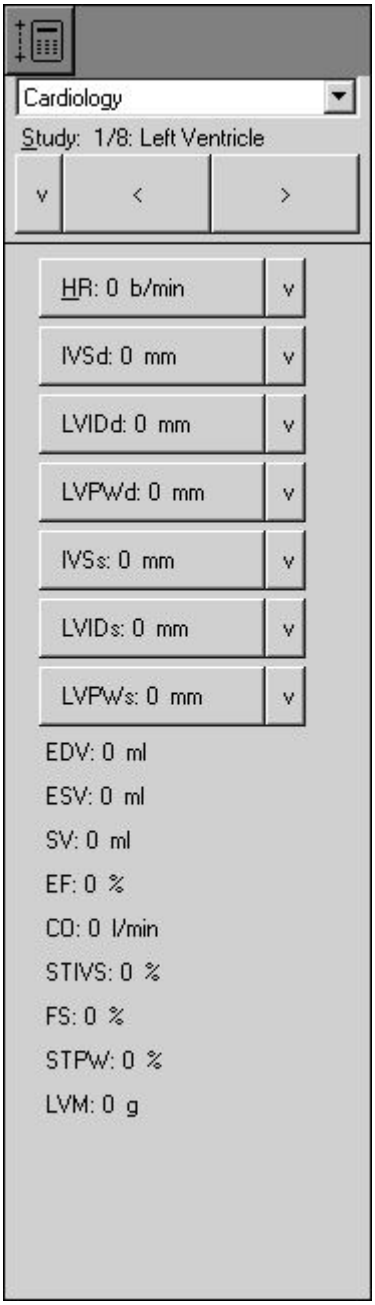


The software also allows you to plot different measured parameters (AC, BPD, HC, FL and others) on the growth curves of different authors.



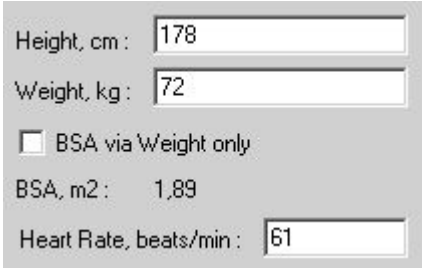
11.6. Human Cardiology Examination Measurements and Calculations

To perform examination-specific measurements and calculations, freeze the ultrasound image (or open the thumbnail image) and on the software top ToolBar click on the "Calculations" button . If a Cardiology examination was selected in the Patient Information window (that can be opened by clicking on the "Patient" button), this will open the right-side ControlBar of Cardiology measurements and calculations.



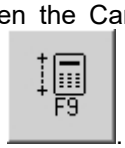
To enter the patient height, weight and heart rate (HR), perform the following actions:

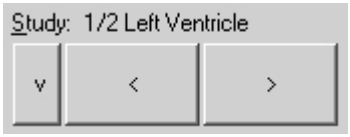
1. Open the Patient Information window by clicking on the "Patient" button .
2. If a Cardiology examination is not already selected, select it if you wish to perform Cardiology examination.
3. Enter the patient height (optional), weight and heart rate (optional if it is going to be measured on the ultrasound image).
4. If the patient Body Surface Area (BSA) is to be calculated using only his weight, tick the "BSA via Weight only" CheckBox.



5. Close the Patient Information window by clicking on the "OK" button .

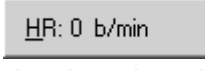
To measure a Cardiology parameter, perform the following actions:

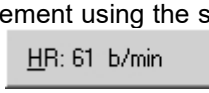
1. Open the Cardiology calculations ControlBar (if not already opened) by clicking on the "Calculations" button  .

2. Use the "Study" control 

from the Cardiology calculations ControlBar to open the study page that contains the control (measurement field) with the name of the parameter to be measured (e.g., HR) if not already included in the current study page. The study can be changed by clicking on the "<" and ">" buttons of the "Study" control or by clicking on the "v" button and from the opened menu then selecting the desired study. Abbreviations of measurements (e.g., HR meaning Heart Rate) and for calculations used formulas can be found in the software reference manual.

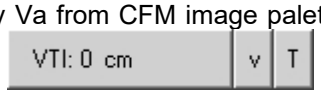
3. Click on the button of the desired to measure parameter, e.g., HR

. If the field contains measurement data, this data will be deleted and on the right side of the "v" button you will see a third button displayed ("E", "T", "L" or "B") 

. The letters "E", "T", "L" and "B" indicate what measurement tool is used for measuring the selected parameter: E - ellipse tool, T - trace, L - line, B - trace with heart beat detection. The software selects this tool automatically and waits while the measurement is being performed. If a measurement field has a hot key indicated as an underlined letter (e.g., H representing HR) and the calculations ControlBar is active, the desired to measure parameter can be selected by clicking on the relevant hot key. In addition, the desired to measure field on the active ControlBar can be selected using the "Up" and "Down" arrow keys and then clicking on the "Enter" key.
4. Optionally, if you wish to change the measurement tool for a selected field and if the selected parameter can be measured using different tools, click on this third button and another available tool (if available) will be selected.
5. Move the mouse cursor over the ultrasound image and measure the desired parameter by performing the required mouse clicks in order to perform the measurement using the selected tool. Measurement results will be automatically transferred to the measurement field 

.
6. Optionally, scan another image using the desired mode and freeze it.
7. Optionally, measure other desired parameters by repeating steps 3-6.

If in Cardiology calculations package is selected mitral, aortic, tricuspid or pulmonary regurgitation study using Proximal Isovelocity Surface Area (PISA) method (available only for scanners with Continuous Wave (CW) Doppler mode), for calculations is required appropriate sequence of operations. At first must be scanned CFM image and adjusted CFM baseline. Then must be activated (clicked) radius R measurement field

and on CFM image measured PISA radius. When is measured radius, software will automatically get aliasing velocity Va from CFM image palette. After that must be scanned CW mode image, activated VTI measurement field 

and measured trace on CW image. Software will perform PISA-related calculations (RFlow, EROA, RVol).

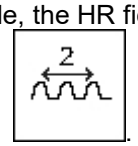
Please note that after measurement of the selected parameter, its field becomes linked to the measurement object (painted ellipse, trace or line). If you modify the size or shape of this measurement object, the updated results will be automatically transferred to the linked measurement field. For example, modification of a line object will change the "HR" field data if that line was used for measuring the HR.

To modify field data you should modify the corresponding measurement object. This modification is usually performed by moving the key points of that object. For detailed instructions please see the corresponding section about modification of performed measurements.

Please note also that deletion of measurement object breaks the link between the measurement field and the object but field data is not erased.

If the circumference or area fields are measured using the line tool ("L"), it is assumed that this line corresponds to the diameter of the circle and the result of calculation is based on the circumference or area of this circle.

For some fields of Cardiology calculations package are defined hint images. Hint image (if defined) appears when a field is activated. Hint image appears on the left side of the ultrasound image area. For example, the HR field has the following hint image:



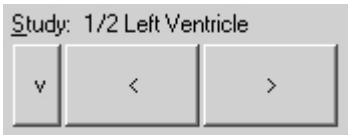
.

This means that in order to calculate the heart rate a 2 beats interval must be measured. For more detailed images and explanations of field meaning please read the appropriate sections of the *reference manual*. To hide the hint image, move the mouse cursor over it and click on it.

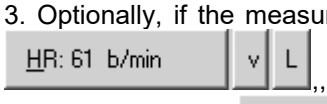
To clear data for a particular Cardiology parameter measured (clear measurement field), perform the following actions:

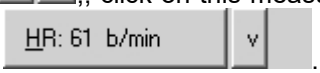
1. Open the Cardiology calculations ControlBar (if not already opened) by clicking on the "Calculations" button

.

2. Use the "Study" control 

of the Cardiology calculations ControlBar to open the study page that contains the control (measurement field) with the name of the parameter that needs to be cleared (e.g., HR) if it is not included in the current study page.

3. Optionally, if the measurement field that needs to be cleared is already selected (is visible third button) 

,, click on this measurement field (e.g., "HR" button) to deselect it (the third button will now disappear) 

.

4. Click on the desired to clear measurement field button (e.g., HR)

. Field data will be cleared and this field will be selected for measurement

.

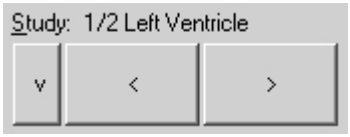
5. Optionally, repeat steps 3-4 in order to clear data from other fields.

Please note that the measurement parameter (measurement field) clearing operation does not delete measurement object (ellipse, trace or line) that was painted when measuring this parameter.

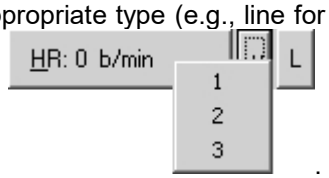
To clear data from all measurement fields and delete all measurement objects (drawings) at the same time, start a new examination (new patient) by using the Patient Information window that is opened by clicking on the "Patient" button .

In some cases you may want to perform general measurements and then decide to transfer the results of these general measurements (measurement objects) to different fields of the Cardiology parameters.

To transfer measurement result from a measurement object (ellipse, trace or line) to some Cardiology field, perform the following:

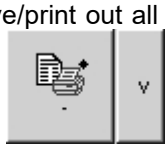
1. Open the Cardiology calculations ControlBar (if not already opened) by clicking on the "Calculations" button .
2. Use the "Study" control 

of the Cardiology calculations ControlBar to open the study page containing the control (measurement field) with the name of the parameter (e.g.,HR) to be measured if not already included on the current study page.
3. Click the button "v" of the desired to fill measurement field control

. If the ultrasound image includes the measurement objects of appropriate type (e.g., line for HR field), a menu with the numbers of those measurement objects will be opened 

.
4. If the menu with the numbers of the measurement object was opened, select the number of the object whose data needs to be transferred to the selected measurement field. Field data will be updated and this field will be linked with the chosen measurement object

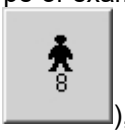
.
5. Optionally, repeat steps 3-4 in order to fill other fields with data.

To see/save/print out all examination-specific results of measurements and calculations, please use the "Report" button 

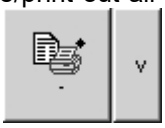
(or one of its menu items) located on the software bottom ToolBar.

Report usually contains examination-specific measurements and calculations for the currently selected type of examination, and changing the type of examination clears all examination-specific measurements and calculations. If you want to have measurements and calculations of different types of examinations included in a single report, go to the "Menu->Tools->Options->Measurements and Calculations->Common Settings" and enable the option designated as "Merge data of different exam types into single report" and then close the options dialog using the "OK" button. In such case the right-side calculation ControlBar will enable you to change not only the type of study but also select the type of examination that will change the calculations package.

11.7. Measurements and Calculations of Other Examination Types

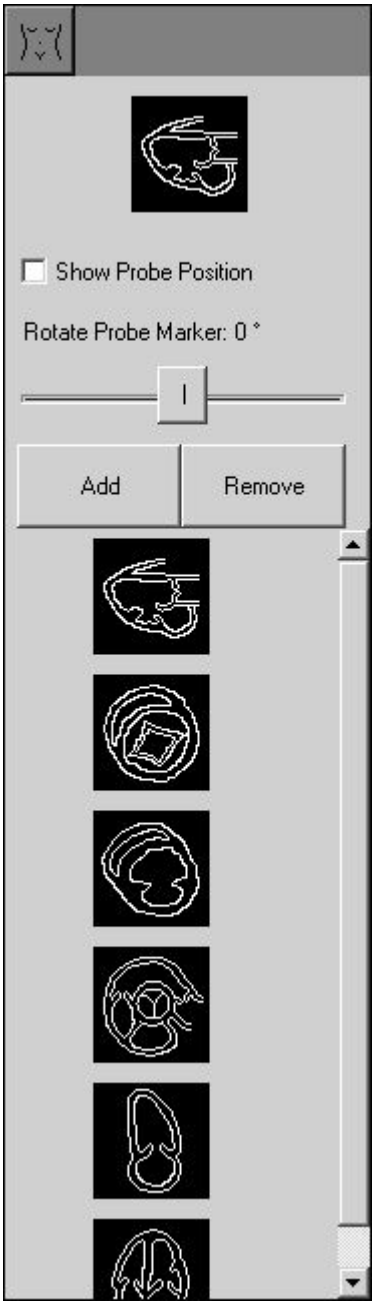
To perform examination-specific measurements and calculations of any other type of examinations, freeze the ultrasound image (or open the thumbnail image) and on the software top ToolBar click on the "Calculations" button . If the appropriate type of examination was selected in the Patient Information window (opened by clicking on the "Patient" button ), the right-side measurements and calculations ControlBar will be displayed for that particular type of examination.

The same mechanism for controlling measurements and calculations is used for all types of examinations and for a detailed description on how to perform examination-specific measurements and calculations the users should refer to the sections that describe examination-specific OB/GYN and Cardiology measurements. The equations used for the various types of examinations can be found in the software measurements and calculations *reference manual*.

To see/save/print out all examination-specific results of measurements and calculations, please use the "Report" button  (or one of its menu items) located on the software bottom ToolBar.

A report usually contains examination-specific measurements and calculations for the currently selected type of examination and changing the type of examination clears all examination-specific measurements and calculations. If you want to have measurements and calculations of different types of examinations in a single report, go to the "Menu->Tools->Options->Measurements and Calculations->Common Settings" and enable the option designated as "Merge data of different exam types into single report" and then close the options dialog using the "OK" button. In such case the right-side calculations ControlBar will enable you to change not only the type of study but also select the type of examination that will change the calculations package.

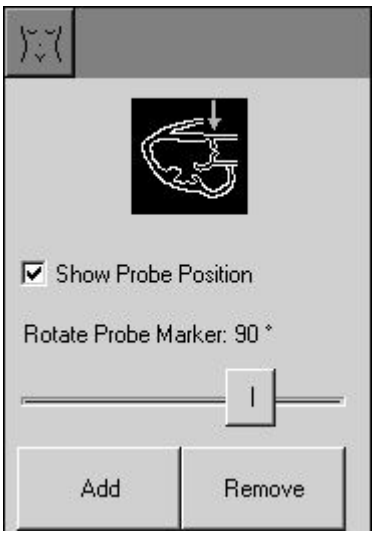
12. Body Marks



To add a body mark, freeze the ultrasound image and perform the following:

1. Move the mouse cursor to the far right side of the screen and wait for the right-side autohide ToolBar to appear.

2. In the right-side ToolBar click on the "Body Marks" button . This opens the right-side Body Marks ControlBar.
3. Choose the desired body mark from the appeared list, move the mouse cursor over it and then click using the left mouse button. The clicked body mark will appear on the body mark adjustment area at the top of the Body Marks ControlBar where you can then select the position of the probe marker.



4. Optionally, to select the position of the probe marker, move the mouse cursor over the body mark at the body mark adjustment area and click using the left mouse button at the point where probe marker should be drawn.
5. Optionally, to adjust the orientation of the probe marker, move the mouse cursor over the body mark adjustment area and rotate the mouse wheel (if present) or adjust the probe marker orientation by using the "Rotate Probe Marker" TrackBar.
6. Optionally, repeat steps 4-5 to perform more accurate positioning of the probe marker.
7. Optionally, remove the tick in the "Show Probe Position" CheckBox to hide the probe marker.
8. Click on the "Add" button on the Body Marks ControlBar to add the selected body mark to the ultrasound image.

To remove a body mark, perform the following:

1. Move the mouse cursor to the far right side of the screen and wait for the right-side autohide ToolBar to appear.
2. In the right-side ToolBar click on the "Body Marks" button . This opens the right-side Body Marks ControlBar.
3. Click on the "Remove" button on the Body Marks ControlBar to remove the body mark from the ultrasound image.

To remember and restore the last body marks used when the type of examination is changed, at the "Menu->Tools->Options->Measurements and Calculations->Common Settings" select the option "For each exam type remember last used body mark". If this option is turned on and a new patient is selected, new examination is selected or is changed the type of examination, the software will add to the active ultrasound image the body mark that was last used with that particular type of examination.

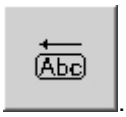
Body mark images are located on the software "…\Config\BodyMarks\" folder (subfolders by examination type) and can be added or modified depending on user requirements. The default installation folder (containing "Config" and other subfolders) for the ultrasound scanning software is usually "C:\Program Files\TELEMED\Echo Wave II".

To add a new body mark, copy a desired body mark image file to a new file with a different name, open the new file with the image editor that supports the PNG file format, draw the body mark image and save it. When next time you will open the ultrasound scanning software, for the selected type of examination it will load all images (including newly created images) located in the appropriate exam folder.

13. Annotations

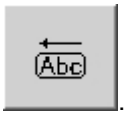
To use annotations, freeze the ultrasound image and open the right-side Annotations ControlBar by performing the following:

1. Move the mouse cursor to the far right side of the screen and wait for the right-side autohide ToolBar to appear.

2. In the right-side ToolBar click on the "Annotations" button  . This opens the right-side Annotations ControlBar.

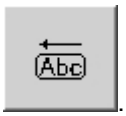
13.1. Using Text Annotations

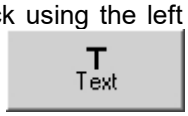
To add a text annotation, freeze the ultrasound image and perform the following:

1. Move the mouse cursor to the far right side of the screen and wait for the right-side autohide ToolBar to appear.
2. In the right-side ToolBar click on the "Annotations" button  . This opens the right-side Annotations ControlBar.
3. In the Annotations ControlBar select the text annotation tool by clicking on the "Text" button . The text annotation tool is selected and in the Annotations ControlBar you will see the following tool options:

4. Optionally, select the font and the font size using the appropriate ComboBoxes and select the font style (bold, italic, underlined) by clicking on the appropriate buttons.
5. Move the mouse cursor over the ultrasound image to where you wish to add the text annotation.
6. Click using the left mouse button to add the text annotation field.
7. Use the keyboard to type in the desired annotation text inside the added field.
8. Optionally, change the position of the annotation text (move text field). To change the position of the text field, move the mouse cursor to the edge of the text field. When the mouse cursor appearance changes to a "Move" cursor , press using the left mouse button and keep it pressed down. Move the mouse cursor to the desired position without releasing the mouse button and this will move the annotation text field. Now release the mouse button.
9. Click using the left mouse button on the ultrasound image outside the text field or click on the "Text" button to finish editing the annotation text.
10. Optionally, repeat steps 5-9 in order to add more texts.

To modify/delete the text of the text annotation, perform the following:

1. If the Annotations ControlBar is not visible, move the mouse cursor to the far right side of the screen and wait for the right-side autohide ToolBar to appear. In this ToolBar click on the "Annotations" button  . This opens the right-side Annotations ControlBar.
2. If the text annotations tool is not selected, select it by clicking the "Text" button .
3. Move the mouse cursor over the desired to edit text label on the ultrasound image.
4. Click using the right mouse button in order to start editing the text field.
5. Use the arrow keys for navigation inside the text field and use the "Delete" key to delete some part of the text or all of the text and then type in the desired text.
6. Optionally, change the position of the annotation text (move text field). To change the position of text field, move the mouse cursor to the edge of the text field. When the mouse cursor appearance changes to a "Move" cursor , press the left mouse button and keep it pressed down. Move the mouse cursor to the desired position without releasing the mouse button and this will move the annotation text field. Now release the mouse button.

7. Click using the left mouse button on the ultrasound image outside of the text field or click on the "Text" button 

to finish editing the annotation text.
8. Optionally, repeat steps 3-7 in order to modify/delete other text fields.

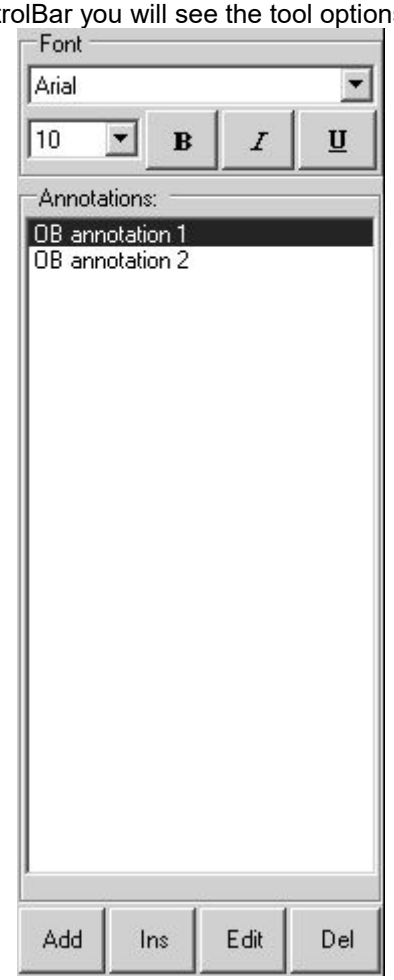
13.2. Using Pre-Defined Text Labels

To add a pre-defined text annotation, freeze the ultrasound image and perform the following:

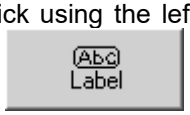
1. Move the mouse cursor to the far right side of the screen and wait for the right-side autohide ToolBar to appear.

2. In the right-side ToolBar click on the "Annotations" button . This opens the right-side Annotations ControlBar.

3. In the Annotations ControlBar select the "Label" button . This selects the pre-defined text label tool and in the Annotations ControlBar you will see the tool options displayed.

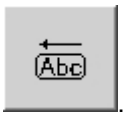


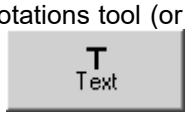
4. Optionally, select the font and font size using the appropriate ComboBoxes and then select the font style (bold, italic or underlined) by clicking the appropriate buttons.
5. From the list of pre-defined annotation labels select the one you want to use by moving the mouse cursor over it and clicking using the left mouse button on it.
6. Move the mouse cursor over the ultrasound image to the place where you wish to add the text annotation.
7. Click using the left mouse button to add the text annotation field.
8. Optionally, use the keyboard and edit the annotation text inside the added field. Use arrows for navigation inside the text field and the "Delete" key to delete some part of the text or all of the text.
9. Optionally, change the position of the annotation text (move text field). To change the position of text field, move the mouse cursor to the edge of the text field. When the mouse cursor appearance changes to a "Move" cursor , press the left mouse button and keep it pressed down. Move the mouse cursor to the desired position without releasing the mouse button and this will move the annotation text field. Now release the mouse button.

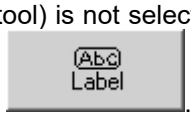
10. Click using the left mouse button on the ultrasound image outside the text field or click on the "Label" button 

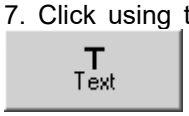
to finish editing the annotation text.
11. Optionally, repeat steps 5-10 in order to add more texts.

To modify/delete the text of the text annotation, perform the following:

1. If the Annotations ControlBar is not visible, move the mouse cursor to the far right side of the screen and wait for the right-side autohide ToolBar to appear. In this ToolBar click on the "Annotations" button 

. This opens the right-side Annotations ControlBar.
2. If the text annotations tool (or pre-defined text tool) is not selected, select any of these tools by clicking on the "Text" button 

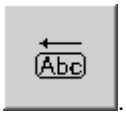
or "Label" button 

.
3. Move the mouse cursor over text label on the ultrasound image you want to edit.
4. Click using the right mouse button to start editing the text field.
5. Use the keyboard arrows for navigation inside the text field and the "Delete" key to delete some part of the text or all of the text and type in the desired text.
6. Optionally, change the position of the annotation text (move text field). To change the position of the text field, move the mouse cursor to the edge of the text field. When the mouse cursor appearance changes to a "Move" cursor , press the left mouse button and keep it pressed down. Move the mouse cursor to the desired position without releasing the mouse button and this will move the annotation text field. Now release the mouse button.
7. Click using the left mouse button on the ultrasound image outside the text field or click on the "Text" 

or "Label" button

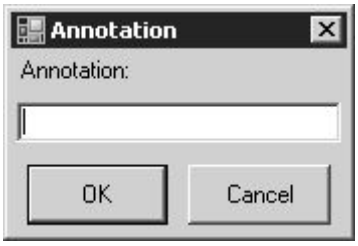
to finish the editing of the annotation text.
8. Optionally, repeat steps 3-7 in order to modify/delete other text fields.

To add annotation text to the list of pre-defined annotations, perform the following:

1. If the Annotations ControlBar is not visible, move the mouse cursor to the far right side of the screen and wait for the right-side autohide ToolBar to appear. In this ToolBar click on the "Annotations" button 

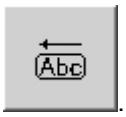
. This opens the right-side Annotations ControlBar.
2. If the pre-defined text label tool is not selected (its options are not visible), select this tool by clicking on the "Label" button

. The pre-defined text label tool will appear and in the Annotations ControlBar you will see the options for this tool displayed.
3. Click on the "Add" button at the bottom of the Annotations ControlBar. This opens a window for entering the annotation text.

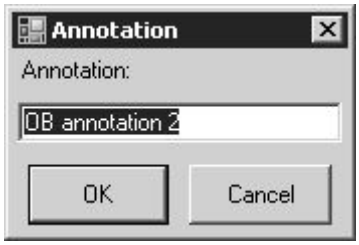


4. Enter the annotation text and click on the "OK" button or on the "Enter" key. The annotation text will now be added to the end of the list.
5. Optionally, repeat steps 3-4 to add more pre-defined annotation texts.

To modify an annotation text in the list of pre-defined annotations, perform the following:

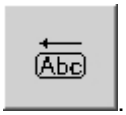
1. If the Annotations ControlBar is not visible, move the mouse cursor to the far right side of the screen and wait for the right-side autohide ToolBar to appear. In this ToolBar click on the "Annotations" button  . This opens the right-side Annotations ControlBar.
2. If the pre-defined text label tool is not selected (its options are not visible), select this tool by clicking on the "Label" button

. The pre-defined text label tool is selected and in the Annotations ControlBar the options for this tool are displayed.
3. In the list of pre-defined annotation texts select the text that you wish to edit by moving the mouse cursor over this text and clicking using the left mouse button.
4. Click on the "Edit" button at the bottom of the Annotations ControlBar. This opens a window for editing the annotation text.



5. Use the arrow keys, the "Delete" key and type the modified annotation text.
6. Click on the "OK" button or on the "Enter" key in order to finish editing.
7. Optionally, repeat steps 3-6 in order to modify other annotation texts.

To delete an annotation text from the list of pre-defined annotations, perform the following:

1. If the Annotations ControlBar is not visible, move the mouse cursor to the far right side of the screen and wait for the right-side autohide ToolBar to appear. In this ToolBar click on the "Annotations" button  . This opens the right-side Annotations ControlBar.
2. If the pre-defined text label tool is not selected (its options are not visible), select this tool by clicking on the "Label" button

. The pre-defined text label tool is now selected and in the Annotations ControlBar you will see the options for this tool.
3. In the list of pre-defined annotation texts select the text that you wish to delete by moving the mouse cursor over this text and clicking using the left mouse button.
4. Click on the "Del" button at the bottom of Annotations ControlBar. This deletes the selected annotation from the list.
5. Optionally, repeat steps 3-4 in order to delete other annotation texts from the list of pre-defined annotation texts.

To change the arrangement of the pre-defined annotations in the list, drag and drop them with the mouse (press the left mouse button on the item to be moved, then move the mouse cursor to new desired location and then release the mouse button).

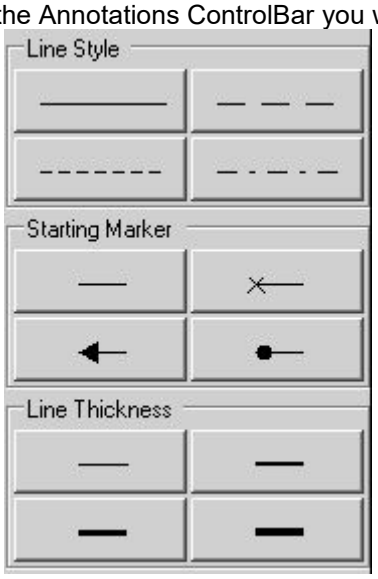
13.3. Drawing Arrows

To draw an arrow on the ultrasound image, freeze the ultrasound image and perform the following:

1. Move the mouse cursor to the far right side of the screen and wait for the right-side autohide ToolBar to appear.

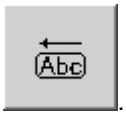
2. In the right-side ToolBar click on the "Annotations" button . This opens the right-side Annotations ControlBar.

3. In the Annotations ControlBar select the arrow tool by clicking on the "Arrow" button . The arrow tool will now be selected and in the Annotations ControlBar you will see the options for this tool.



4. Optionally, select a line style, a starting marker and line thickness by clicking on the appropriate buttons.
5. Move the mouse cursor over the ultrasound image to the location where you wish to start the arrow and to see starting marker.
6. Click using the left mouse button to start drawing an arrow.
7. Move the mouse cursor over the ultrasound image to the location where you wish to finish the arrow.
6. Click using the left mouse button to finish the arrow drawing process.
7. Optionally, repeat steps 4-6 in order to draw more arrows.

To edit/delete arrow drawings, perform the following:

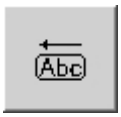
1. If the Annotations ControlBar is not visible, move the mouse cursor to the far right side of the screen and wait for the right-side autohide ToolBar to appear. In this ToolBar click on the "Annotations" button  . This opens the right-side Annotations ControlBar.

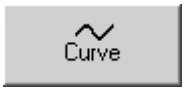
2. If the arrow tool is not yet selected, select this tool by clicking on the "Arrow" button .
3. Move the mouse cursor over endpoint of the arrow on the ultrasound image that you wish to edit.
4. Click using the right mouse button to start editing the arrow drawing.
5. Move the mouse cursor (and arrow endpoint) to the desired location.
6. Click using the right mouse button to finish the editing or click on the "Delete" button to delete arrow object.
7. Optionally, repeat steps 3-6 in order to edit/delete other arrows.

13.4. Drawing Curves

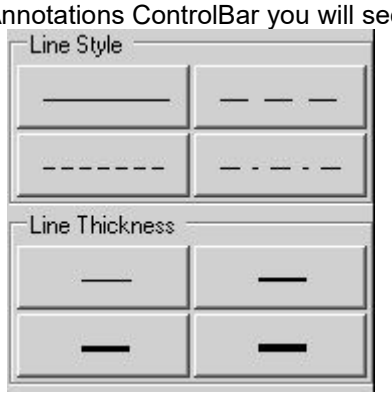
To draw a curve on the ultrasound image, freeze the ultrasound image and perform the following:

1. Move the mouse cursor to the far right side of the screen and wait for the appearance of the right-side autohide ToolBar.

2. In the right-side ToolBar click on the "Annotations" button  . This will open the right-side Annotations ControlBar.

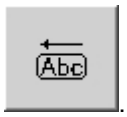
3. In Annotations ControlBar select the curve tool by clicking on the "Curve" button 

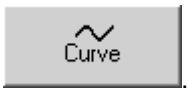
. The curve tool will be selected and in the Annotations ControlBar you will see the options for this tool.



4. Optionally, select the line style and line thickness by clicking the appropriate buttons.
5. Move the mouse cursor over ultrasound image to where you wish to start curve drawing.
6. Click using the left mouse button in order to start the curve drawing.
7. Move the mouse cursor and draw the desired shape of the curve.
6. Click using the left mouse button to finish curve drawing.
7. Optionally, repeat steps 4-6 in order to draw more curves.

To delete a curve, perform the following:

1. If the Annotations ControlBar is not visible, move the mouse cursor to the far right side of the screen and wait for the appearance of the right-side autohide ToolBar. In this ToolBar click on the "Annotations" button  . This opens the right-side Annotations ControlBar.

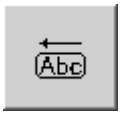
2. If the curve tool is not already selected, select this tool by clicking on the "Curve" button 

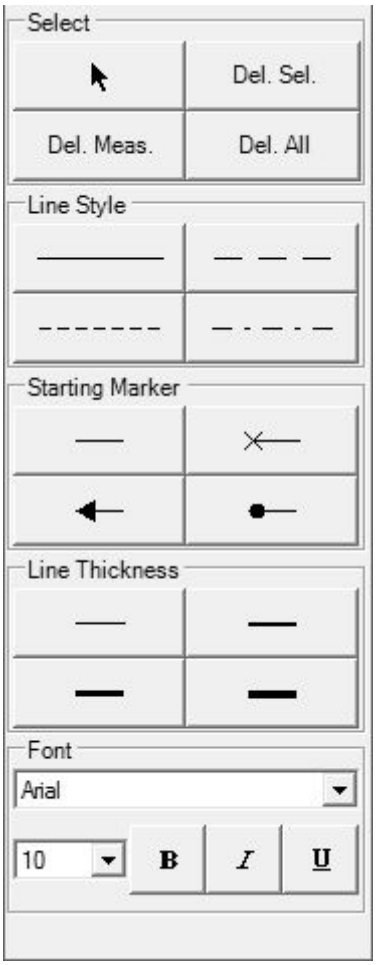
.
3. Move the mouse cursor over the endpoint of curve object you want to delete on the ultrasound image.
4. Click using the right mouse button in order to start the deletion of the curve.
5. Click on the "Delete" button to delete the curve or click using the right mouse button in order to cancel the deletion.
6. Optionally, repeat steps 3-5 in order to delete other curves.

13.5. Modifying and Deleting Annotations and Drawings

To delete several annotations or drawings at once, perform the following:

1. Move the mouse cursor to the far right side of the screen and wait for the appearance of the right-side autohide ToolBar.

2. In the right-side ToolBar click on the "Annotations" button  . This will open the right-side Annotations ControlBar.
3. In the Annotations ControlBar select the selection (neutral) tool by clicking on the "Select" button . The selection (neutral) tool will be selected and in the Annotations ControlBar you will see the options for this tool.

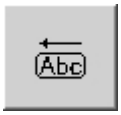


4. Move the mouse cursor over the endpoint (key point) of drawing you want to delete.
5. Click using the left mouse button to select the drawing.
6. In the event of a selection error, click the endpoint (key point) of the same object in order to deselect it.
7. Perform steps 4-6 in order to select all the objects that you wish to delete.
8. Optionally, to select multiple measurement objects all at once using a rectangular selection region, press the left mouse button at a point where selection region should be started, keep the mouse button pressed down, move the mouse cursor to the point where the rectangular region should end and then release the mouse button. All measurement objects whose key points were inside this selection rectangle will now be selected (or deselected).
9. Click on the "Delete Selected" button to delete the selected measurement objects. Alternatively click on the "Delete" ("Del") keyboard button.

10. Optionally, repeat steps 4-9 in order to delete other measurements or drawings.

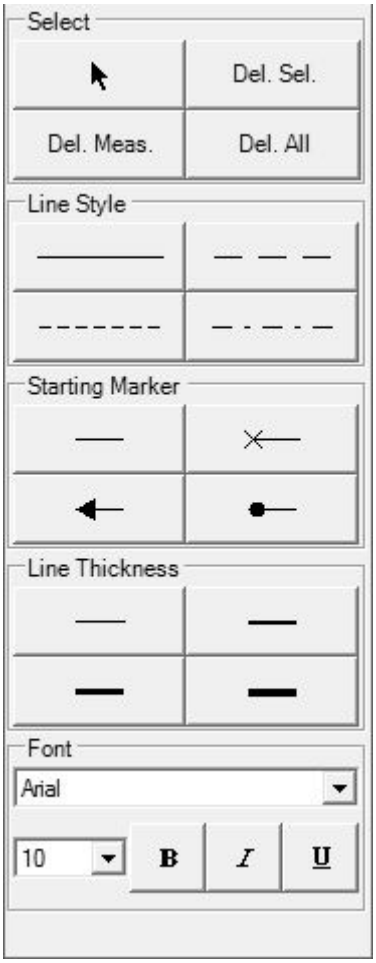
To modify a font or line style of an annotation or drawing, perform the following:

1. Move the mouse cursor to the far right side of the screen and wait for the appearance of the right-side autohide ToolBar.

2. In the right-side ToolBar click on the "Annotations" button 

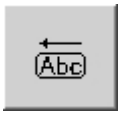
. This will open the right-side Annotations ControlBar.
3. In the Annotations ControlBar select the selection (neutral) tool by clicking on the "Select" button

. The selection (neutral) tool will be selected and in the Annotations ControlBar you will see the options for this tool.

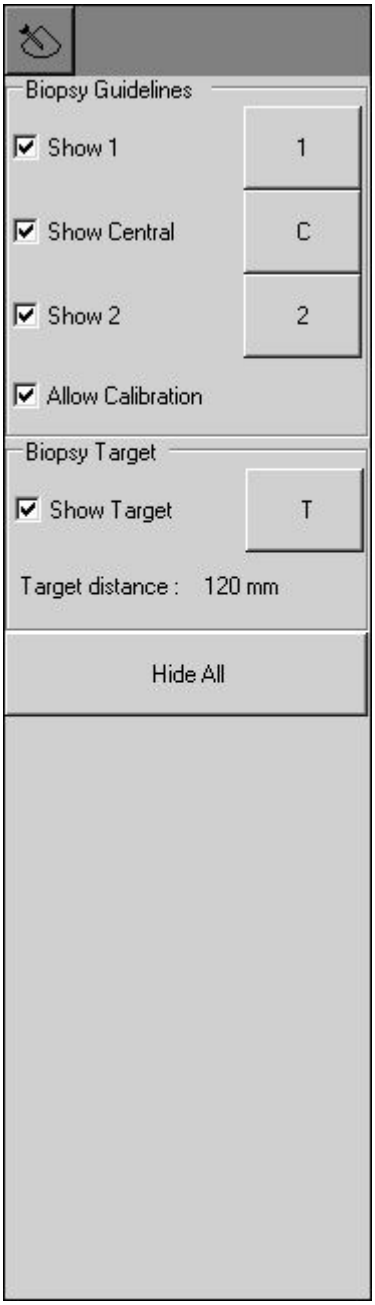


4. Move the mouse cursor over the endpoint (key point) of the desired to modify drawing.
5. Click using the left mouse button to select drawing object.
6. In the event of a selection error, click on the endpoint (key point) of the same object in order to deselect it.
7. In the Annotations ControlBar select the desired font or line style for the selected object (if the object support font or line style changes) by using the appropriate ComboBoxes and Buttons.
8. Move the mouse cursor over the ultrasound image to a position where there are no painted objects (drawings, measurements).
9. Click using the left mouse button to deselect all of the selected objects.
10. Optionally, repeat steps 4-9 in order to change the style of other drawings.

To move a previously created drawing/annotation or graphical object to another location, perform the following:

1. Move the mouse cursor to the far right side of the screen and wait for the appearance of the right-side autohide ToolBar.
2. In the right-side ToolBar click on the "Annotations" button  . This will open the right-side Annotations ControlBar.
3. In the Annotations ControlBar select the selection (neutral) tool by clicking on the "Select" button . The selection (neutral) tool will be selected and in the Annotations ControlBar you will see the options for this tool.
4. Move the mouse cursor over the endpoint or contour of the object that is to be moved.
5. Press using the left mouse button and move the mouse cursor without releasing the left mouse button. Please note that movement operations affect all selected objects if you previously selected several graphical objects.
6. Release the left mouse button to finish the movement operation.

14. Biopsy Guidelines



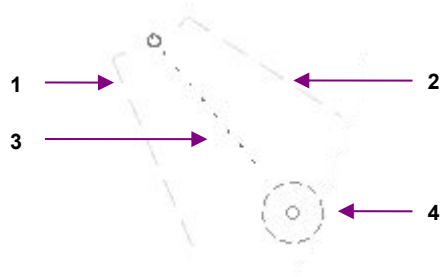
To show the biopsy guidelines and biopsy target, perform the following:

1. Move the mouse cursor to the far right side of the screen and wait for the appearance of the right-side autohide ToolBar.

2. In the right-side ToolBar click on the "Biopsy" button . This opens the right-side Biopsy ControlBar.
3. If you are using a biopsy needle tick the "Show 1" CheckBox (if not already ticked) in order to show the 1st and 2nd side biopsy guidelines and remove the tick from the "Show Central" CheckBox (if it is ticked) to hide the central guideline. If guidelines were previously calibrated, they will now be displayed on the ultrasound image.

4. Optionally, if you are using the biopsy gun, tick the "Show Central" CheckBox (if it is not ticked) to show the central biopsy guideline, and remove the tick from the "Show 1" CheckBox (if it is ticked) to hide the 1st and 2nd guidelines. If the guideline has already been calibrated it will be displayed on the ultrasound image.
5. Optionally, to show a biopsy target marker tick the "Show Target" CheckBox (if it is not ticked), or to hide a biopsy target marker remove the tick from the "Show Target" CheckBox.
6. Optionally, to hide all biopsy guidelines and biopsy target markers click the "Hide All" button.
7. Optionally, repeat steps 3-6 in order to show/hide the appropriate biopsy guidelines.

If biopsy guidelines and target marker have been defined and are visible, the maximum distance from the starting point(s) of the visible guideline(s) to the target marker ("Target distance") will be displayed. This distance can help you determine the minimum needle length required in order to reach the target. Please note that this distance depends on the accuracy of the guideline calibration. Also please note that calculations and defined biopsy guidelines do not take into account mechanical needle bending when the needle passes through the body.



Biopsy guidelines

Num	Description
1	1st side biopsy guideline.
2	2nd side biopsy guideline.
3	Central biopsy guideline.
4	Biopsy target marker.

To calibrate biopsy guidelines, perform the following:

1. Attach the biopsy adapter to the probe, immerse the probe in the bath of water, use the maximum needle length and scan and freeze the image of the biopsy needle.
2. Move the mouse cursor to the far right side of the screen and wait for the appearance of the right-side autohide ToolBar.
3. In the right-side ToolBar click on the "Biopsy" button . This will open the right-side Biopsy ControlBar.
4. Tick the "Allow Calibration" CheckBox (if it is not already ticked).
5. Tick the "Show 1" and "Show Central" CheckBoxes (if they are not already ticked) to show the guidelines.
6. To calibrate the 1st side biopsy guideline, click the "1" button inside the Biopsy ControlBar. If the 1st guideline was defined previously it will now be cleared.
7. Move the mouse cursor to a position on the ultrasound image where you want to position the starting point of the 1st side guideline.
8. Click using the left mouse button to start the calibration of the 1st guideline.
9. Move the mouse cursor to a position where you want to position the endpoint of the 1st side guideline.
10. Click using the left mouse button to finish calibration of the 1st side guideline.
11. To calibrate the 2nd side biopsy guideline, click the "2" button in the Biopsy ControlBar. If the 2nd guideline was defined previously it will now be cleared. Click using the mouse on the ultrasound image where you want to position the starting and ending points of the 2nd guideline.
12. Optionally, to calibrate the central biopsy guideline, click on the "C" button in the Biopsy ControlBar. If the central guideline was defined previously, then it will now be cleared. Click using the mouse on the ultrasound image where you want to position the starting and ending points of the central guideline.
13. Optionally, to edit any defined guideline, move the mouse cursor over its endpoint and click using the right mouse button to start editing. Move the mouse cursor to the desired new endpoint position and click using the left mouse button to finish the guideline editing.

14. Remove the tick from the "Allow Calibration" box to disable the calibration and accidental clearing of biopsy guidelines.

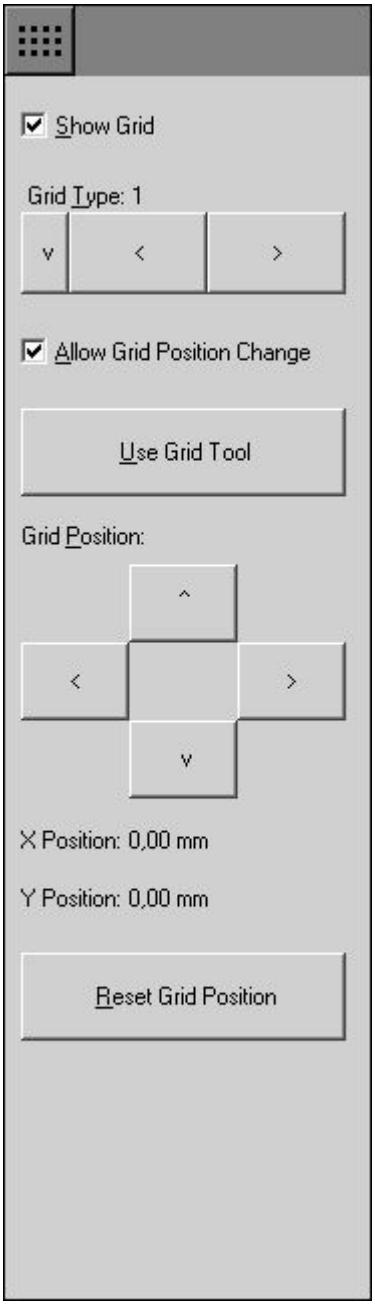
Do not use the same needle for calibration and biopsy procedures. Sterile needles must always be used.

To define a biopsy target marker, perform the following:

1. Move the mouse cursor to the far right side of the screen and wait for the appearance of the right-side autohide ToolBar.

2. In the right-side ToolBar click on the "Biopsy" button . This will open the right-side Biopsy ControlBar.
3. Tick the "Show Target" CheckBox (if it is not already ticked) to show the biopsy target marker.
4. To define a biopsy target marker, click the "T" button in the Biopsy ControlBar. If the biopsy target marker was defined previously, then it will now be cleared.
5. Move the mouse cursor to a position on the ultrasound image where you want to position the biopsy target marker.
6. Click using the left mouse button to set the target position.
7. Optionally, repeat step 6 to define the target more exactly.
8. Optionally, to change the position of a biopsy target marker, move the mouse cursor over the center of the marker and click using the right mouse button to start editing. Move the mouse cursor to the desired new position of the center of the marker and click using the left mouse button to finish marker editing.

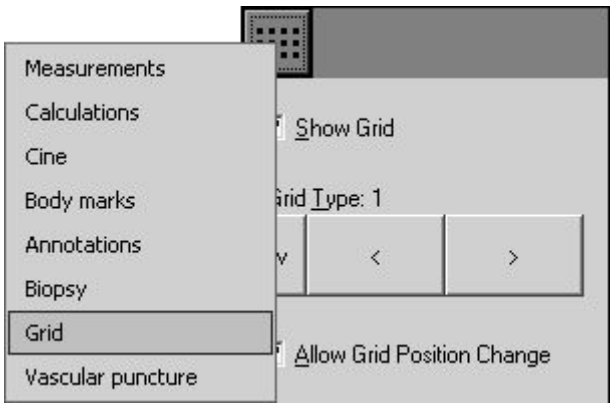
15. Brachytherapy/Biopsy Grid



To show brachytherapy/biopsy grid on the ultrasound image, perform the following:

1. Move the mouse cursor to the far right side of the screen and wait for the appearance of the right-side autohide ToolBar.

2. In the right-side ToolBar click on the "Grid" button . This opens the right-side Grid ControlBar. Alternative way to open ControlBar is to click button in ControlBar header and select “Grid” from appeared menu.



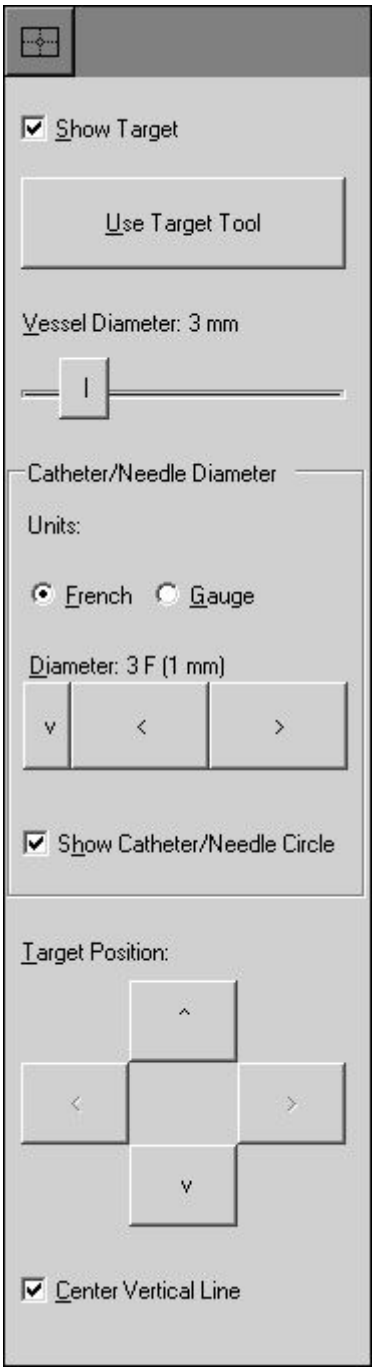
3. Click “Show Grid” CheckBox to show/hide the grid on the ultrasound image.

“Grid Type” control allows to select used grid type. Usually grids have points with 5 mm spacing and differ in letters/numbers notation.

Before using the grid, you may need to adjust grid position. In order to do this, put check on “Allow Grid Position Change” and then use “Grid Position” control. Alternative way to change grid position is to select grid tool (if now is selected some other tool) by clicking “Use Grid Tool” button, move mouse cursor over ultrasound image where must be positioned grid point (for example, point (D,1)) that corresponds to the center of probe coordinate system (0,0) and click left mouse button. Grid position is stored for beamformer, probe and grid type. Grid position (shift) is shown after “X Position” and “Y Position” labels. Grid position can be reset to zero shifts by clicking “Reset Grid Position” button.

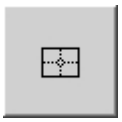
In order to protect grid positioning result from accidental change, remove check from “Allow Grid Position Change” control.

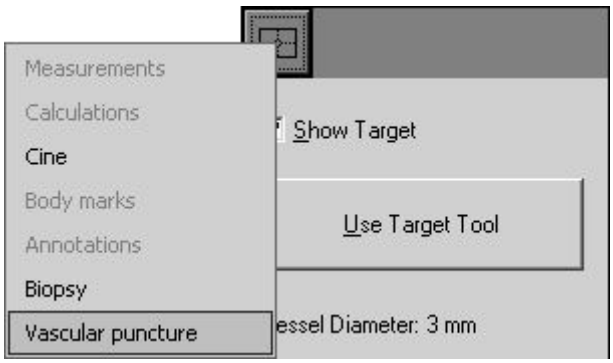
16. Vascular Puncture



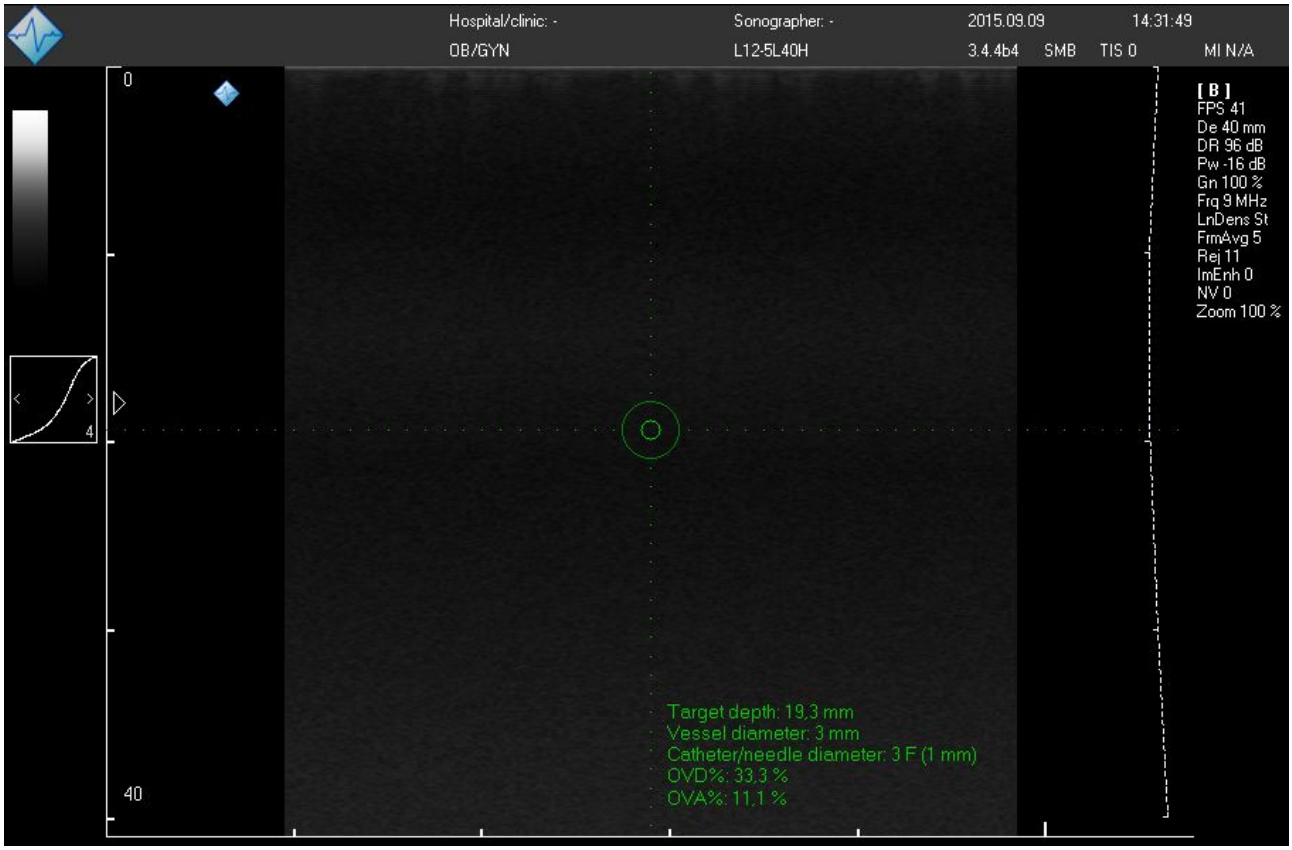
To define vascular puncture target, perform the following:

1. Move the mouse cursor to the far right side of the screen and wait for the appearance of the right-side autohide ToolBar.

2. In the right-side ToolBar click on the "Vascular puncture" button  . This opens the right-side Vascular Puncture ControlBar. Alternative way to open ControlBar is to click button in ControlBar header and select “Vascular puncture” from appeared menu.



3. Click “Use Target Tool” button, move mouse over ultrasound image where should be positioned the centre of vascular puncture target and click left mouse button. Target position can be changed by clicking left mouse button on the ultrasound image or by clicking “Target Position” buttons. If required, vascular puncture target can be hidden/shown using “Show Target” CheckBox. Also you can check “Center Vertical Line” CheckBox if you will scan ultrasound image to show vessel in image center. If you will need to use some other tool like Zoom and after that return to vascular puncture adjustment, click “Use Target Tool” button.
4. Using “Vessel Diameter” slider select vessel diameter. During adjustment observe diameter circle on the ultrasound image.
5. Select catheter/needle measurement units by clicking “French” or “Gauge” RadioButton. Then select desired catheter/needle diameter using “Diameter” control in “Catheter/Needle Diameter” group. “Show Catheter/Needle Circle” control allows to hide or show catheter/needle circle that is painted on ultrasound image.
The lists of diameters in French or Gauge units can be changed at software “Options” (“Menu->Tools->Options->Measurements and Calculations->Vascular Puncture”).
6. Observe software output on the ultrasound image in order to find out the distance from 0 mm depth to target centre along vertical dotted line. Dotted line has dots every 1 mm. Dots inside target circle are not painted. Also software displays calculated percentage values that define how much space inside vessel will be occupied by catheter/needle of selected size. Here OVD% - Occupied Vessel Diameter, OVA% - Occupied Vessel Area. For AVD% and OVA% equations please see the software reference manual.



17. Using Thumbnail Images

When an ultrasound image is fully frozen by clicking on the "Freeze" button or the appropriate keyboard key, the software stores a single frame of the last visible ultrasound data. A panel with thumbnail images of the stored data can be shown/hidden by clicking on the "Thumbnail Images" button

on the software top ToolBar or on the “F10” hot key.

The thumbnail images panel looks like this:

New images are added on the left side of panel. *In order to load ultrasound data from thumbnail image, click on it using the mouse.* The most recently opened (visible) image is indicated by green markers at the image corners. On the opened image you can perform measurements or image processing tasks and then save the image to the file (for permanent storage or to include it into report) or print it out.

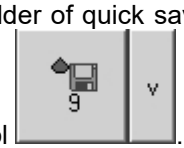
The "<" and ">" buttons are used for scrolling through images. The options button "..." opens “Thumbnails Options” window with buttons for printing/saving/deleting thumbnail images. The "X" button closes the panel of thumbnail images.

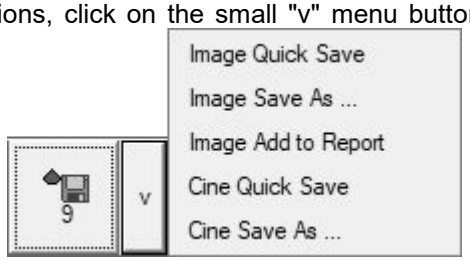
Thumbnail images are deleted when a probe is changed or when a new patient is selected.

Please note that thumbnails store and load all ultrasound scanning parameters for all modes (like during preset saving), regardless of what mode was used during the thumbnail creation. For example, even if a thumbnail is created in B mode, it will also store and load parameters for all the available modes (B, M, CFM, PDI, DPDI, PW, CW).

To resize the thumbnails panel, press using the left mouse button on the edge of the panel, drag it and then release it. To move the panel, press using the left mouse button inside the panel where there are no thumbnail placeholders or buttons, drag the panel and release the mouse button. Please note that the software will not allow you to move or resize thumbnails panel if the borders become hidden by other panels.

18. Saving and Loading Images and Cines

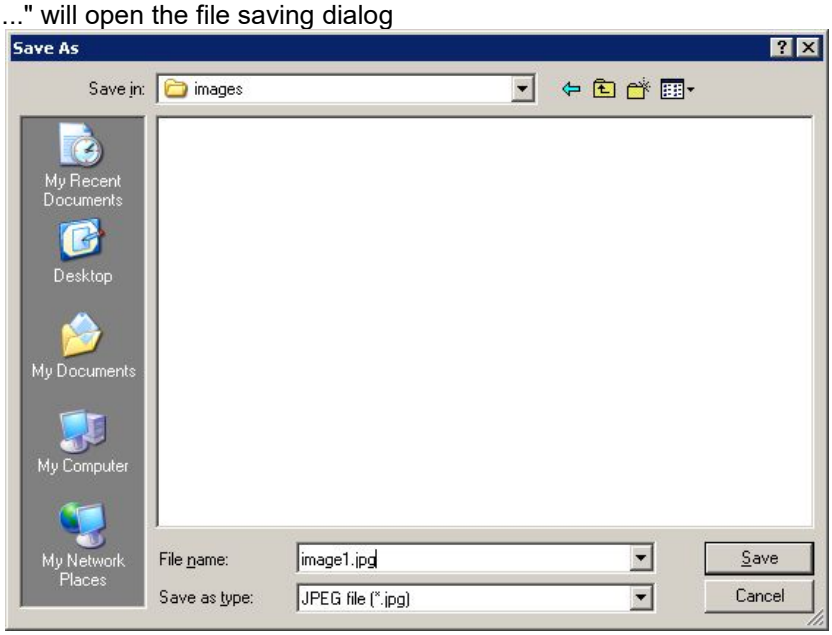
To save a currently visible ultrasound image to a pre-defined folder of quick saved images, click on the "Image Quick Save" button on the image/cine saving control  .

To use the other image/cine saving options, click on the small "v" menu button on the image/cine saving control, and from the menu displayed 

select the desired saving option:

1. "Image Quick Save" will save the currently visible ultrasound image to the folder of quick saved images defined in software options. The image file name will be generated automatically and depends on the software customization options.

2. "Image Save As ..." will open the file saving dialog



In the "Save As" dialog select the folder where you wish to save the ultrasound image, enter the file name, select the file type and click the "Save" button to save image. Alternatively click on the "Cancel" button to cancel the saving operation.

3. "Image Add to Report" will add currently visible scanned image to report. The image is not saved to file.

4. "Cine Quick Save" will save current cine to the folder of quick saved images defined in the software options. The file name will be generated automatically and depends on the software customization options.

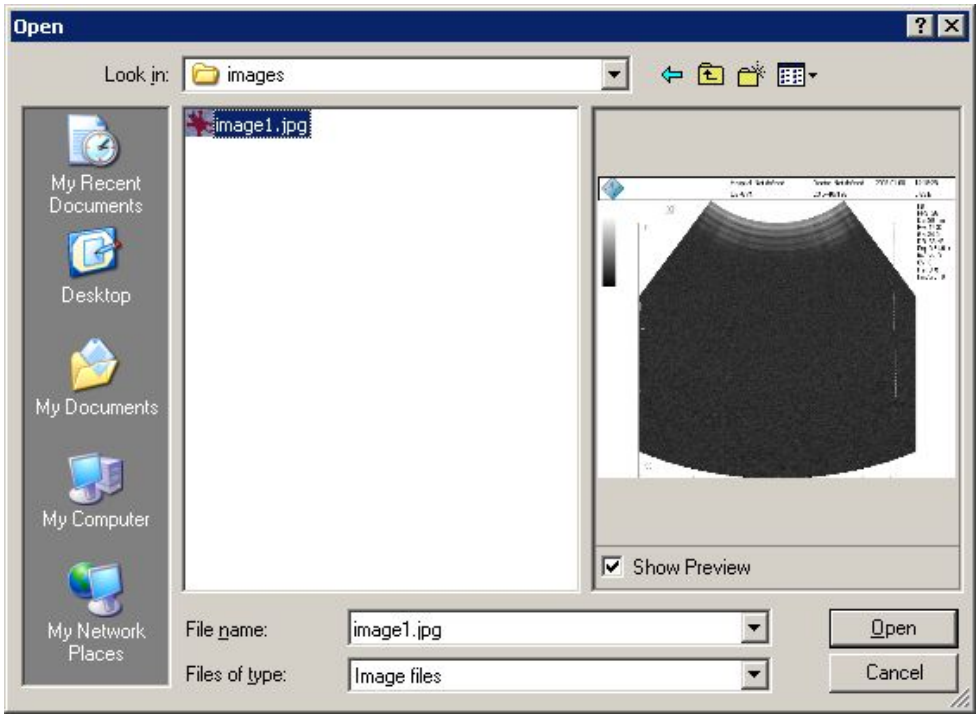
5. "Cine Save As ..." will open the file saving dialog in a similar manner to "Image Save As ..." but with file types that can store cines. In the cine saving dialog you can also enter the desired to save cine frames interval. Please note that if you are using the M or PW/CW mode and the entered frames interval is shorter than the width of the ultrasound output rectangle, at the start of the interval the software will automatically save additional ultrasound data.

After the selection of a menu item using the image saving control, the last selected item will be stored and the large button icon will change accordingly. Next time you can invoke the same image saving action by simply clicking on this large button.

The quick saving folder (by default "C:\Echo Images\"), file/folder name generation rules, file saving format can be changed using the software options (Menu->Tools->Options->Saving and Printing).

To open a saved image or video file, perform the following actions:

1. On the software bottom ToolBar click on the "Open" button . This will activate the file opening window.



2. Inside the "Open" window select a folder and a file that you wish to open. If the "Show Preview" CheckBox is ticked, you will see a preview image of selected file.
3. Click on the "Open" button to open the selected file or click on the "Cancel" button to cancel the opening operation. **When the file is opened the "Probe" button displays the text "FILE" instead of the probe name.**
4. Optionally, perform steps 1-3 in order to open other images.
5. To close an opened image and to continue ultrasound scanning, click on the "Freeze/Run" button or on the SpaceBar key.

The software supports BMP, JPG, PNG, TIF, DCM, TPD image file formats and AVI, MP4, TVD, DCM video file formats. Also software can save cine as a series of images (multiple images (multislice) format). Saving options can be adjusted at "Menu->Tools->Options->Saving and Printing".

For information about data fields and formats stored by "Echo Wave II" in the DICOM (DCM) file, please read the "Echo Wave II DICOM Conformance Statement".

If you need to be able to open saved images/videos and perform measurements and calculations using these, save them using the TPD (Telemed Picture Data) or TVD (Telemed Video Data) file formats.

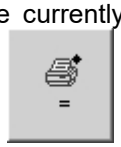
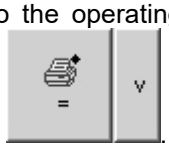
For permanent, long time data storage and exchange we strongly recommend that you do not use TPD/TVD but use another file formats because the results visible after opening TPD/TVD depend on the current software configuration (installed processing filters, ultrasound area resolution, installed OB tables, etc.).

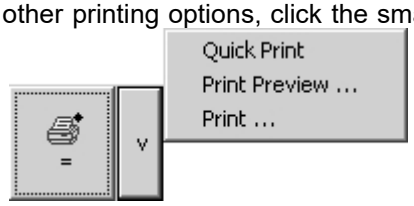
Please note that seeking of opened MP4 file may be not frame-accurate.

To remove a dark background from saved and printed images, at the "Menu->Tools->Options->Saving and Printing" turn on the option designated as "Remove dark background from saved and printed images".

IMPORTANT. When working with opened TPD (Telemed Picture Data) or TVD (Telemed Video Data) files (performing measurements, calculations, etc), you must always remember that closing the file will discard the performed measurements/calculations and any information that was entered when this file was opened. So after modification please save your current changes to another TPD/TVD file before closing the current TPD/TVD file. The file is closed when you open any other file or when you start live scanning using any method ("Freeze" button, spacebar keyboard key, "Probe" button, scanning mode button or the corresponding hot key or appropriate buttons on external ultrasound keyboards).

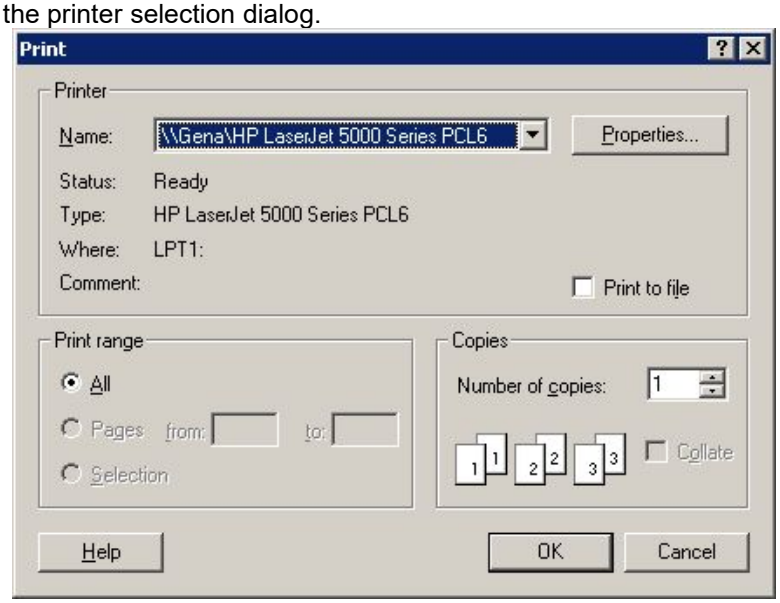
19. Printing Images

To print the currently visible ultrasound image to the operating system's default printer, click the "Quick Print" button  on the image printing control  .

To use other printing options, click the small "v" button form the image printing control, and from the displayed menu 

select the desired printing option.

1. "Quick Print" will immediately print the current image to the operating system default printer.
2. "Print Preview..." will open the print preview window. Inside this window you can print previewed images or close the window without printing.
3. "Print ..." will open the printer selection dialog.



To print an image, select the desired printer and click the "OK" button from the "Print" dialog. Or click on the "Cancel" button in order to cancel printing. You may also wish to adjust printer-specific options using the "Properties…" dialog.

After the selection of any menu item using image printing control, it will remember the last selected item and will change the icon of its large button to Quick Print , Print Preview , or Print . Next time you can invoke the same printing action by simply clicking on this large button.

Before printing to the system default printer, ensure that it is properly installed and turned on.

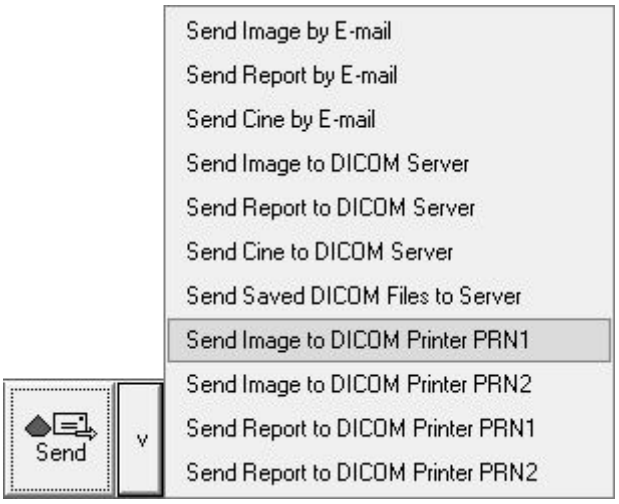
Printing margins and the page layout (portrait/landscape) can be adjusted at "Menu->File->Page Setup".

To remove a dark background from saved and printed images, at "Menu->Tools->Options->Saving and Printing" turn on the option designated as "Remove dark background from saved and printed images".

When printing images or reports, the software automatically fits (if required) images to page *width* and resizes images proportionally. In some cases, in order to reduce the height of printed image you may need to increase the horizontal printing margins on the software main menu ("Menu->File->Page Setup"). If,

due to page width reduction, the software needs to reduce horizontal width of the image, then the image height will also be reduced accordingly.

If you have a network printer that supports DICOM format, images for this printer can be sent by clicking the menu button of the "Send" button on the bottom ToolBar and selecting the menu item "Send Image to DICOM Printer" with the name of the appropriate printer.



To see DICOM printers in this menu, at first you need to configure printers at "Menu->Tools->Options->DICOM" group "DICOM Printers".

Before starting to use DICOM printing, we strongly recommend that you read the "Echo Wave II DICOM Conformance Statement" and Conformance Statements and the manuals of the used DICOM printers and perform thorough compatibility testing.

20. Working with Reports

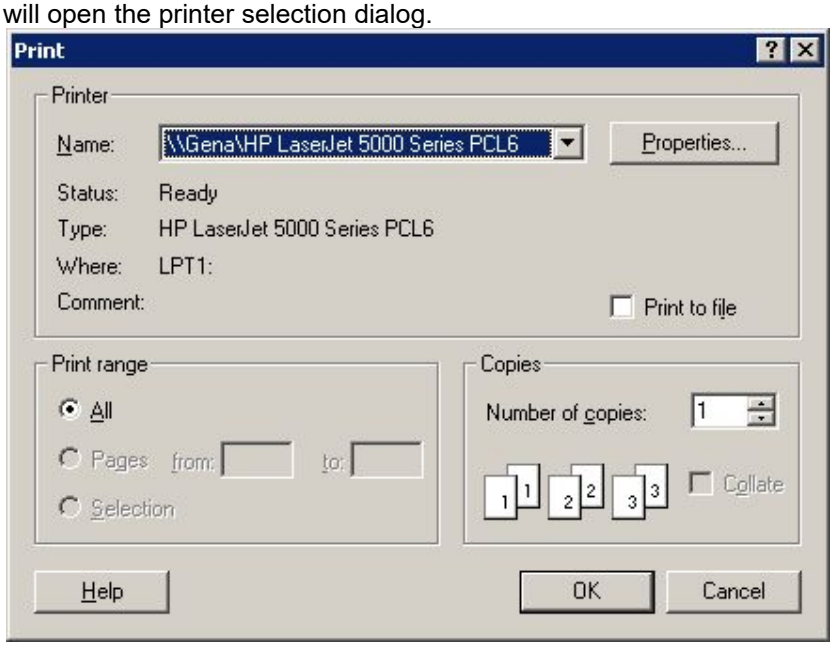
To save or print a Report (results of performed calculations, comments) use the "Report" button

on the software bottom ToolBar and select the desired item from menu ("v") of this button:

1. "Report Quick Print" will immediately print the report using the operating system default printer.

2. "Report Print Preview ..." will open the print preview window. Inside this window you can print previewed report image or close the window without printing.

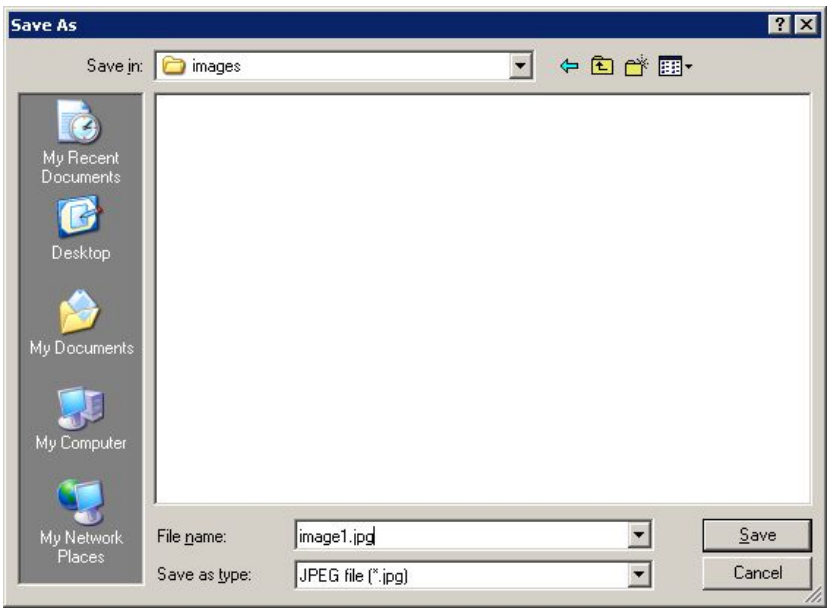
3. "Report Print ..." will open the printer selection dialog.



To print an image, select the desired printer and click the "OK" button of the "Print" dialog. Or click the "Cancel" button to cancel printing.

4. "Report Quick Save" will save the report image to the folder of quick saved images as defined in the software options. The image file name will be generated automatically and depends on the software customization options.

5. "Report Save As ..." will open the file saving dialog.



In the "Save As" dialog, select the folder where you wish to save the report image, enter a file name, select the file type and press the "Save" button to save report image. Or press the "Cancel" button to cancel the report saving operation.

6. "Import Ultrasound Data ..." shows the file opening dialog and allows you to load from TPD/TVD file only ultrasound data without overriding the existing patient data and calculations. This feature is used for the creation of reports from multiple previously saved TPD/TVD files and is described in section "Using Reports with Multiple Images".

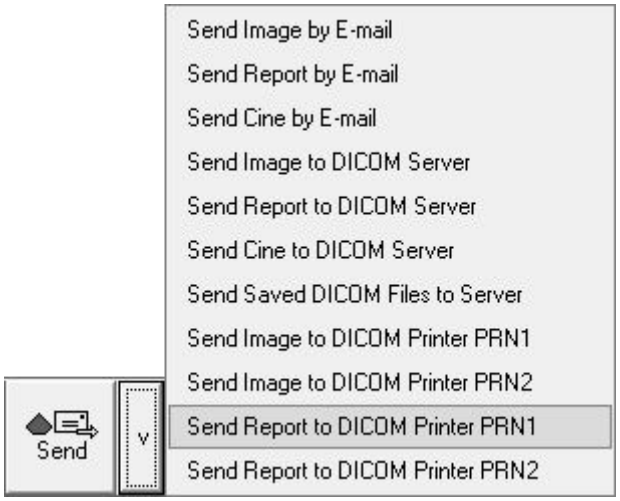
7. "Report ..." will open the advanced report creation window that is described in the section "Using Reports with Multiple Images".

Reports usually contain examination-specific measurements and calculations of currently selected exam type and the change of examination type will erase all examination-specific measurements and calculations.

If you want to have measurements and calculations using different examination types all in a single report, go to the "Menu->Tools->Options->Measurements and Calculations->Common Settings", enable the option designated as "Merge data of different exam types into single report" and close the options dialog with the "OK" button. In such case using the right-side calculations ControlBar you will be able to change not only the study type but also select an examination type that will change the calculations package.

IMPORTANT. When starting the examination of new patient always go to Patient Information window, click on the "New Patient" button in order to clear the data from the previous exam, select the desired exam type, enter the patient's data and close the window with the "OK" button.

If you have a network printer that supports DICOM format, reports to such printer can be sent by clicking the menu button of the "Send" button on the bottom ToolBar and selecting the menu item "Send Report to DICOM Printer" with the name of the appropriate printer.

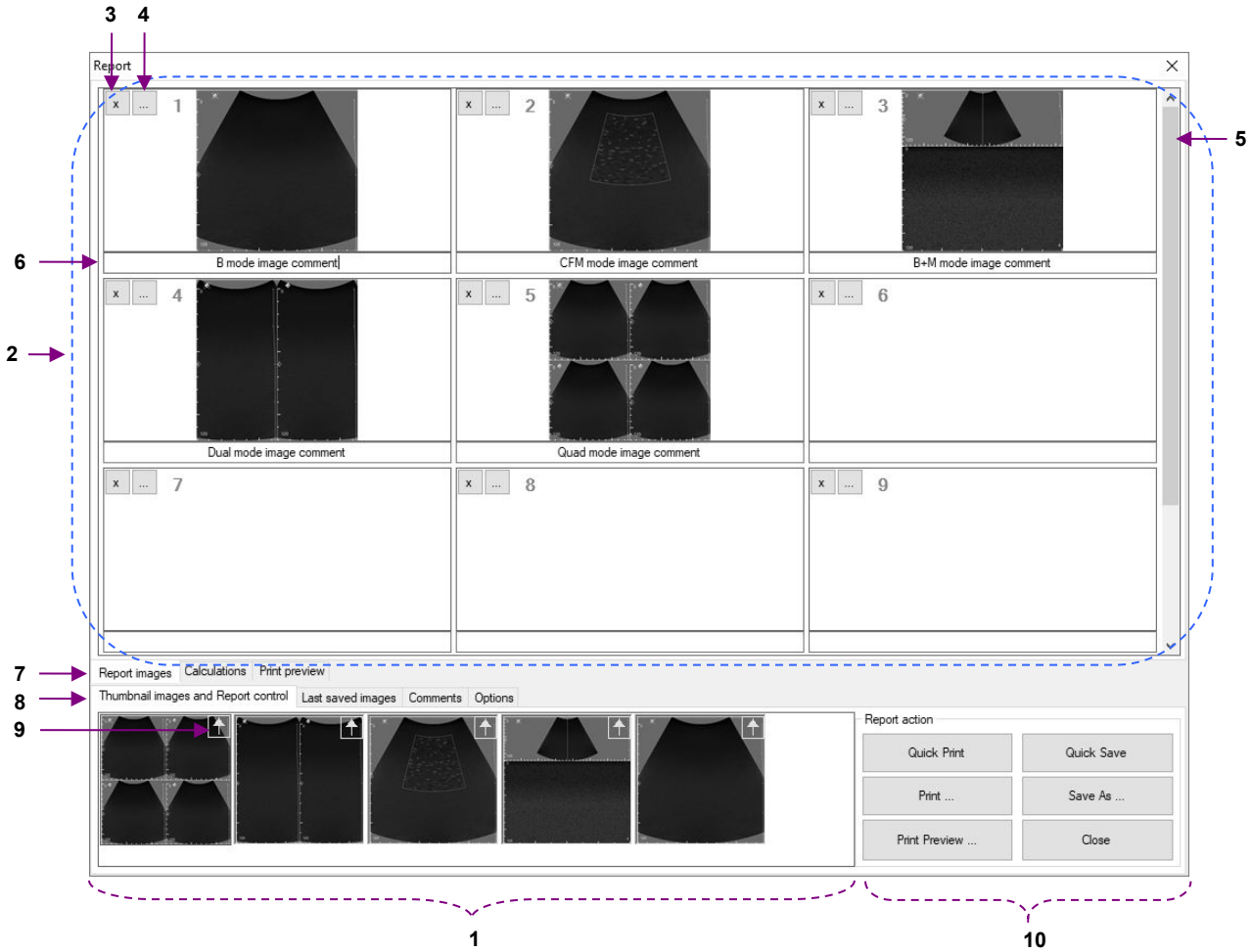


To see DICOM printers in this menu, you must first configure the printers at "Menu->Tools->Options->DICOM" group "DICOM Printers".

Before starting to use DICOM printing, we strongly recommend you to read the "Echo Wave II DICOM Conformance Statement" and Conformance Statements and manuals of the used DICOM printers and perform thorough compatibility testing.

20.1. Using Reports with Multiple Images

To create a report using the multiple thumbnail images or multiple recently (during current patient exam) *saved* images, on the software bottom ToolBar select the "Report…" menu item from the ("v") menu from the multifunctional "Report" button . This will open the advanced report creation window.



Main elements of "Report" window

Num	Description
1	Thumbnail images. Most recently saved images are added to the left side of the list.
2	Report images area. In order to add an image to a report, click the left mouse button on the desired thumbnail image in the thumbnail images area, keep the mouse button pressed down, drag the image to the report images area and then release the left mouse button. The image will be copied to the report images area. The same drag-and-drop operation can be used in order to change the location of an image and its comment inside report images area.
3	Button for deleting appropriate image and its comment from the report images area.
4	Button for adding image to a report from the previously saved file (shows File Open dialog).
5	Scrollbar control for scrolling through multiple rows of report images.
6	Comment below report image. Each image can have its own comment.
7	Tab control for switching between report images, calculation results (available if were performed exam-specific calculations), report preview.
8	Tab control for switching between thumbnails and report control, last saved images, comments, report options.
9	Arrow-like button to copy image from Thumbnails to report.

10	Report action buttons. Click "Close" button in order to close "Report" window.

To add thumbnail images to a report, drag them with the mouse from the "Thumbnail images" tab to the appropriate placeholder inside the report images area ("Report images" tab) or click arrow-like button at the right top corner of desired to add image. Please note that thumbnail images only contain pure ultrasound image without any accompanying information (header, palettes, scanning parameters, measurement results).

If you want to create a report from the ultrasound images that contain ultrasound image header, palettes, scanning parameters, measurement results, then you must first scan the desired ultrasound image, optionally perform measurements and then *save* (or quick save) this image. Such saved images will appear in the "Last saved images" tab of the "Report" window.

If you perform measurements and calculations using an opened TPD/TVD file and want to add an image with performed measurements to the report, you must first save this image, then open the "Report" window and drag the image with the mouse from the "Last saved images" list to the report images area.

The "Calculations" tab allows you to see the results of calculations. At the same time you can open the "Comments" tab and write report comments.

The "Preview" tab allows you to see the print preview of report pages and, if required, increase/decrease the size of report font and spacing between report data groups.

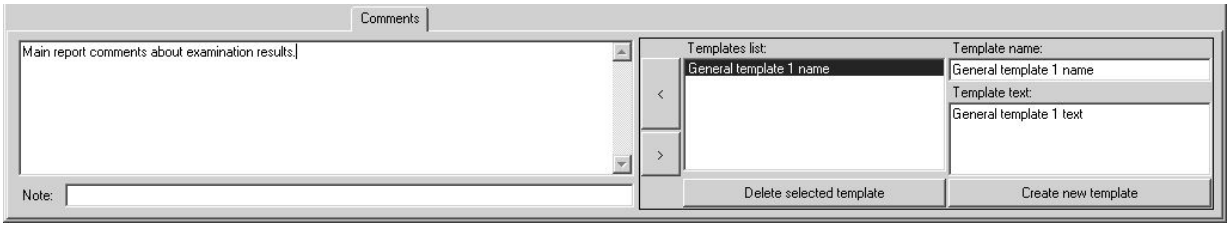
If during an examination you saved multiple TPD/TVD files and later want to perform measurements and calculations on these files and merge everything into one single report containing calculations based on these different TPD/TVD files, then you must first open (using file opening button or "0" hot key at software's bottom ToolBar) one TPD/TVD file that will act as the starting point for your report. *This file opening operation will clear current patient data, measurements and calculations and will load corresponding data from selected file.* Now you can perform measurements, calculations using opened file, save images with measurements. *In order to load other TPD/TVD files that you want to use in the same report, you must not use the general file opening button* (that clears current patient data, measurements, calculations and loads everything from file), *but from menu of "Report" button on the software bottom ToolBar select the item "Import Ultrasound Data…" and import data from desired TPD/TVD file.* This operation will load ultrasound images without discarding any current patient data and calculations. Now you can once again perform measurements, calculations using opened file, save images with measurements. Then you can add saved images to the report by dragging them with the mouse from the "Last saved images" list to the report images area on the "Report" window or insert images from external files using "…" buttons in the report images area. Finally, you can save/print created report using corresponding items of the "Report" button's menu on the software bottom ToolBar.

If you want to have measurements and calculations using different examination types in one single report, at "Menu->Tools->Options->Measurements and Calculations->Common Settings" enable the option called "Merge data of different exam types into single report" and close the options dialog with the "OK" button. In such case on the right-side calculations ControlBar you will now be able to change not only the study type but also select an examination type that changes the calculations package.

The list of thumbnail images and last saved images is cleared when a new patient is selected (manually or automatically during file opening) or if the software is restarted. If images that you want to add to a report are not available in the list of last saved images on the "Report" window but you have them saved on the computer hard drive, you can insert such images into the report using buttons "…" (near image deletion buttons "x") that show the "File Open" dialog for image file selection.

When printing reports, the software automatically fits report images (if required) to suit page width and height. Printing margins can be changed on the software main menu ("Menu->File->Page Setup"). The layout of printed report images (the number of rows and columns) can be changed under report "Options" tab.

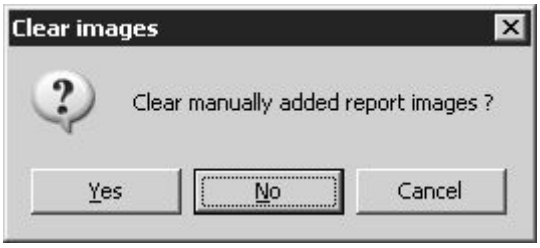
To add comments to the end of a report, select the "Comments" tab at the bottom of "Report" window.



Comments entered on the left-side edit box of the "Comments" tab will be displayed at the bottom of the saved/printed report and are used for the entire report. This is the same comments field that is visible in the "Patient Information" window.

The controls on the right-side of the "Comments" tab allow you to select from the list and insert (button "<") pre-defined texts (templates of comments) into the comments field. For creating a new template, use the "New" button, enter the template name and then enter the template text.

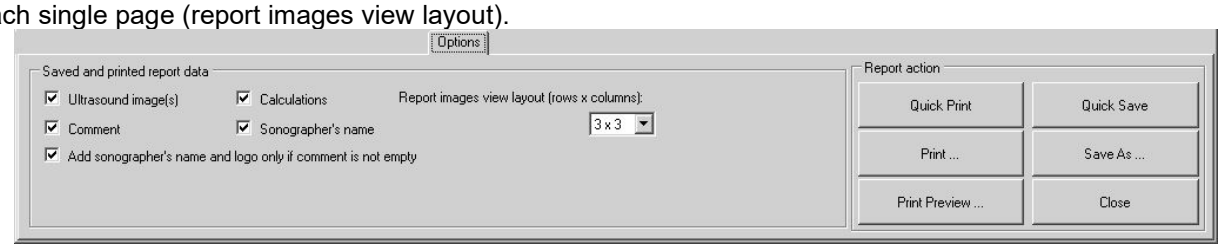
After creating and saving/printing a report, close the "Report" window by clicking the "Close" button in the "Report controls" tab. If images were added to the report images area, the software will ask if you want to delete these images or not.



If you have finished working with the current report and saved/printed it and do not plan to add more images to it, click the "Yes" button. If instead you plan to scan more images and add them to the same report, then click on "No".

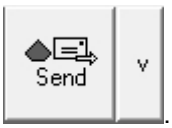
The list of available images and other data is cleared when selecting a new patient by clicking the appropriate button in the "Patient" dialog. For more information read the section about starting examinations of a new patient and the typical exam workflow.

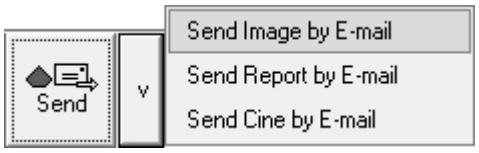
The "Options" tab allows you to select which data must be saved/printed inside the report, how many columns of images the report will contain and the minimum number of rows of images that will be printed on each single page (report images view layout).



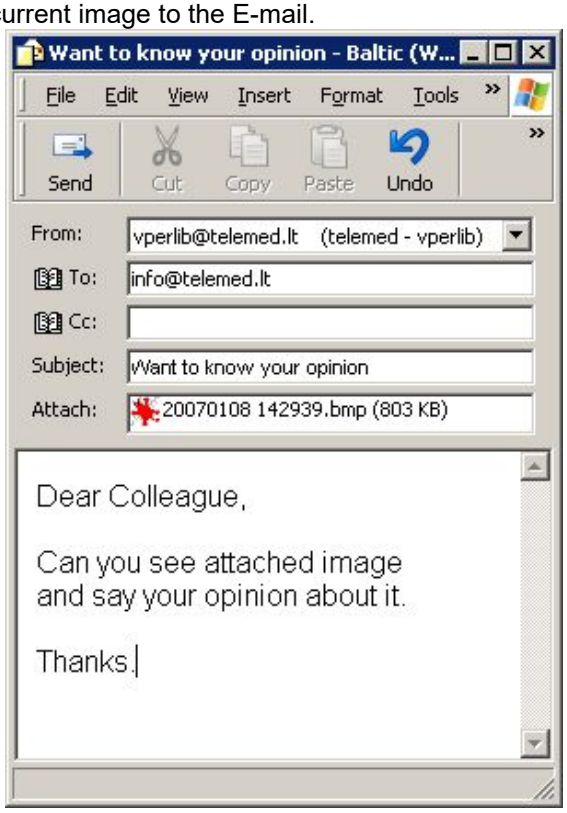
21. Direct E-mail Sending

To send a currently visible ultrasound image by E-mail, perform the following:

1. On the software bottom ToolBar click the menu button of the "Send" button  .



2. From the displayed menu choose what (image or report) you wish to send by E-mail, and click on the appropriate menu item. The software will open the Windows default E-mail client and will attach the current image to the E-mail.



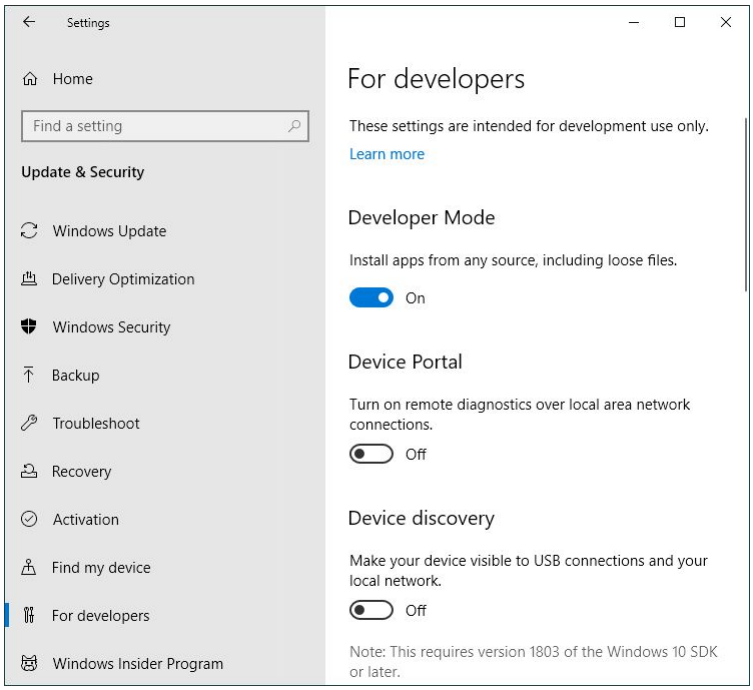
3. Enter the E-mail address of the recipient using the "To:" field, enter the subject into the "Subject:" field and also write your E-mail text. To send your E-mail, click on the "Send" button. This will close the E-mail composing window and will return you to the ultrasound scanning software.
4. Alternatively, you can close the E-mail composing window to return to the ultrasound scanning software without sending an E-mail.

Please note that in order to use the direct E-mail sending feature you must have properly configured Windows default E-mail client that supports MAPI (Messaging Application Programming Interface). Depending on the E-mail client used, software appearance, field names and controls may be different from that described above. MAPI is supported by Outlook Express, Outlook, Windows Live Mail, Mozilla Thunderbird programs. How to change default program, check documentation of your operating system or do this as follows:

On Windows 7 click "Start->Default Programs->Set your default programs". Then from the list select desired program, click "Set this program as default" and then click "OK" button.

On Windows 8 and Windows 10 click "Start" button using right mouse button and from appeared menu select "Control Panel". Then click "Programs->Default Programs->Set your default programs". Then from the list select desired program, click "Set this program as default" and then click "OK" button. It is important to note that Windows 10 built-in “Mail” program does not support MAPI.

To use Windows 10 “Mail, before “Echo Wave II” installation you will need to turn on Windows 10 “Developer Mode”. This is required for installing helper Universal Windows application without using Microsoft Store.



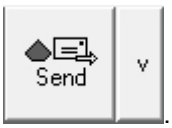
After installation, at “Echo Wave II” "Menu->Tools->Options->Saving and Printing" group "E-mail options" please check "Use Windows 10 Mail" (if not checked) and close Options dialog with “OK” button. This will make that instead of MAPI interface for starting default mail app will be used Windows 10 Mail API.

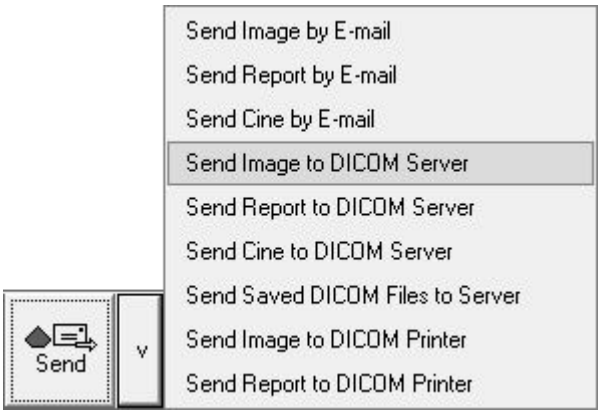
Please note that for sending E-mail using Windows 10 “Mail”, “Echo Wave II” will copy attachments to “Documents” folder of current user.

At “Echo Wave II” "Menu->Tools->Options->Saving and Printing" group "E-mail options" there are some options that you may need to change depending on installed MAPI E-mail program. If you use 64-bit Windows operating system, but installed E-mail software is 32-bit, then at “Echo Wave II” options check “Use 32-bit E-mail client”. If you use Windows Live Mail, then you may need to remove checks from “Explicitly initialize E-mail library” and “Use E-mail logon user interface” options, because otherwise MAPI library may display message “There is no email program associated to perform the requested action” even if you have set default E-mail program.

22. Sending Data to DICOM Server

To send currently visible ultrasound image to a DICOM server, perform the following:

1. On the software bottom ToolBar click the menu button of the "Send" button  .



2. From the displayed menu choose the object you want to send (image, report or cine) to the DICOM server and click on the appropriate menu item. The software will start the sending operation. Please wait for the operation to be completed.
3. After the data is sent to the DICOM server, the software will display a message box that informs about the completed operation. Click on the "OK" button in order to close the message box.

In order to send multiple previously saved DICOM files to DICOM server, select menu item "Send Saved DICOM Files to Server", in the opened dialog select folder of saved files, put checks near file names of desired to send files and click "Send" button. If in this dialog is checked option that all selected files correspond to currently examined patient, identifiers of sent images at the end of exam (when exam is finished by clicking "Finish exam" button in MWL list of "Patient" window) will be added to DICOM MPPS referenced images sequence (if is used MPPS server).

Please note that to be able to send data to a DICOM server and to see the appropriate menu items, you must select the IP address and port of your DICOM server in the "Echo Wave II" options ("Menu->Tools->Options->DICOM" group "DICOM Storage"). You can also specify a DICOM sending format at the same location.

For DICOM server configuration (another computer with third party DICOM server application that is not a part of "Echo Wave II") please read the relevant manual and DICOM Conformance Statement.

For information about data fields and formats stored in the "Echo Wave II" DICOM file, please read the "Echo Wave II DICOM Conformance Statement".

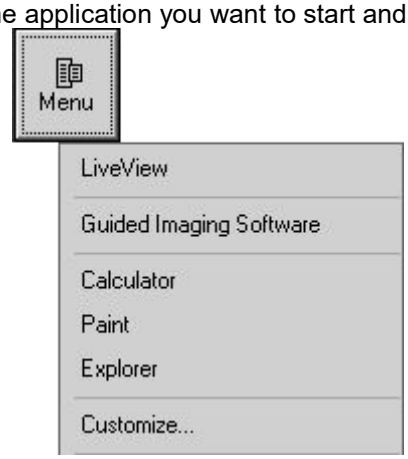
If your DICOM server supports different character sets, you can also specify a character set under the "Echo Wave II" options ("Menu->Tools->Options->DICOM"). For the list of languages that correspond to appropriate character set please see the "Echo Wave II DICOM Conformance Statement".

23. Starting External Applications

To start external application from pre-defined list of applications, perform the following:

1. On the software top ToolBar click the "Menu" button

.
2. From the displayed menu select the application you want to start and click on its name.



3. To continue working with the ultrasound scanning software, minimize or close the external application or use the Alt+Tab key combination to switch between the different applications.

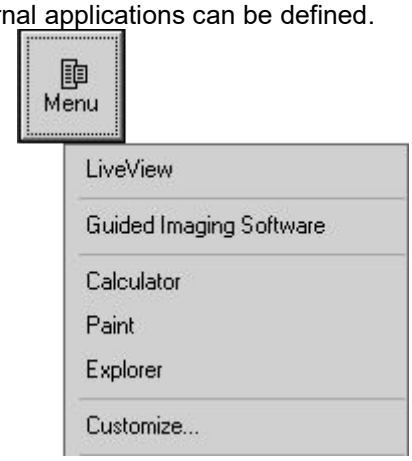
If needed, you can also minimize the "Echo Wave II" software by moving the mouse cursor over the software minimize button

located on the software right top corner and clicking it using the left mouse button. To restore a minimized software window, click on the icon on the Windows TaskBar.

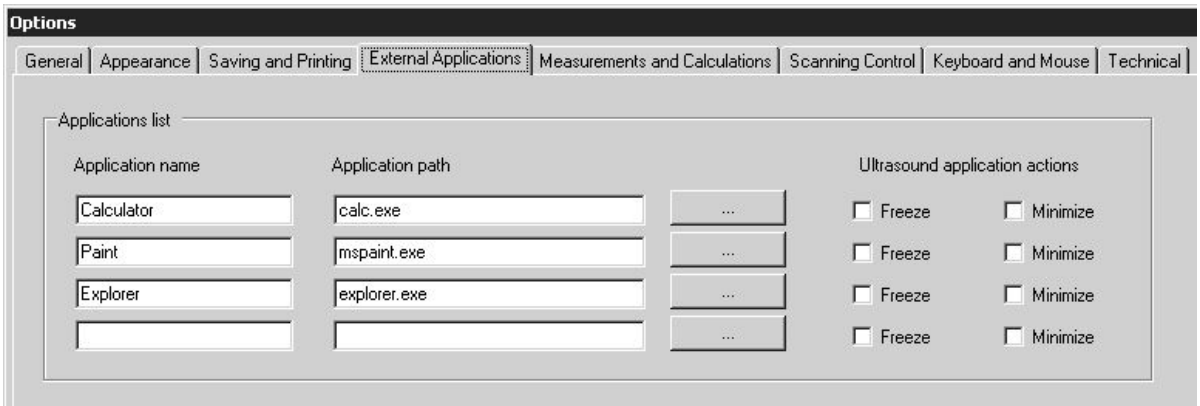
To define or manage an external applications list, perform the following:

1. On the software top ToolBar click the "Menu" button

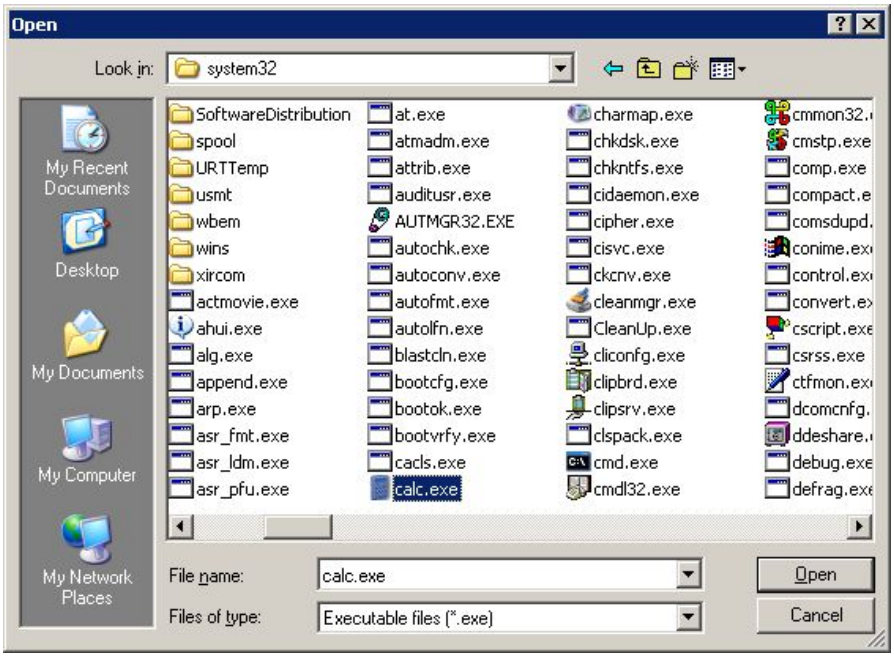
.
2. Inside the displayed menu, click the "Customize..." menu item. This will open the "Options" window and will select its tab where a list of external applications can be defined.



3. Fill the opened list with the names of the applications that will be shown in the menu of the software "Menu" button and also the names (or paths) of their corresponding executable files. Select the appropriate CheckBoxes if before starting an external application automatically must be stopped ultrasound scanning and minimized the "Echo Wave II" software.



4. Alternatively, to select an application path, click on the "Browse" button ... and, using the displayed dialog, select the desired executable file and click on the "Open" button of this dialog.



5. To store changes, close the "Options" window by clicking on the "OK" button at the bottom of this window. Alternatively, click on the "Cancel" button from the "Options" window to close this window without saving any modifications.

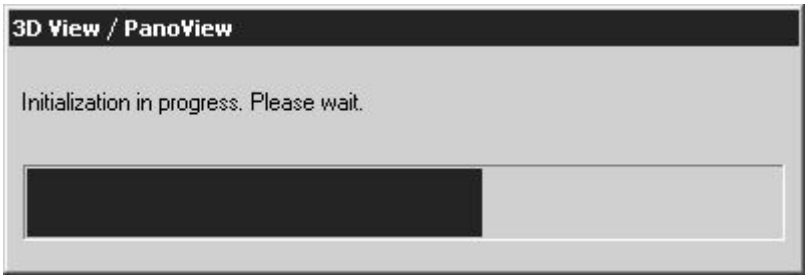
24. Using 3D Lite, Easy 3D and PanoView Plug-ins (optional)

If you have purchased and installed optional plug-ins and inserted the appropriate USB dongle key (only one key before software startup) you must perform the following actions in order to start the desired plug-in software:

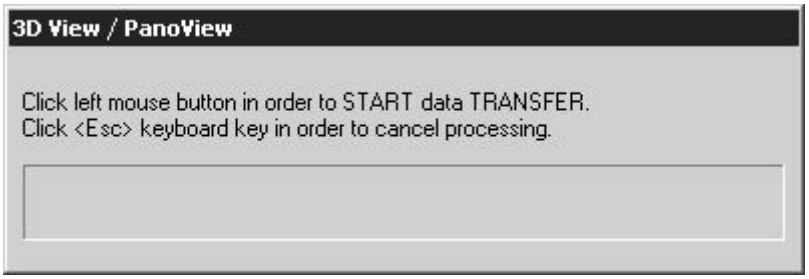
1. On the software top ToolBar click on the "Menu" button

.
2. From the displayed menu select the plug-in application you wish to start (3D Lite, Easy 3D, PanoView) and click on its name.

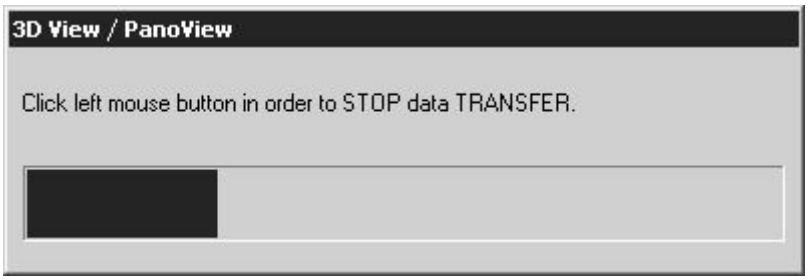
After that the plug-in initialization progress window will appear:



Please wait for a short period while the plug-in is initialized and will display message that it is ready for data transfer:



3. Click using the left mouse button on the ultrasound image or in the displayed window to start the transfer of the ultrasound frames to the plug-in software. Then move (or rotate) the probe according to the user instructions for the chosen plug-in. The software will then display the data transfer progress:

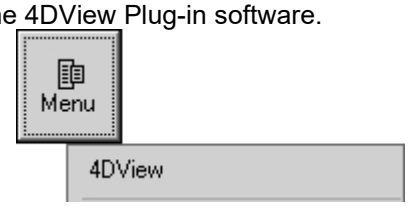


4. Click using the left mouse button on the ultrasound image or in the transfer progress window to stop the data transfer and see the user interface for the plug-in software. After clicking on the mouse you may hear a sound signal and the plug-in software user interface will automatically appear on the top of "Echo Wave II" user interface.
5. Perform the desired operations (render, save, print or measure) with the transferred ultrasound data using the plug-in software user interface. If required, refer to the user manual of the appropriate plug-in.
6. Finish work with the plug-in software by clicking on its "Close" button on the software right top corner.
7. Optionally, perform steps 1-6 in order to create more 3D images or panoramic images.

25. Using 4DView Plug-in (optional)

If you have purchased a device and probe that supports real-time 4D scanning, you can perform 4D scanning in the following way using the connected device and probe:

1. Using the B mode ultrasound scanning controls adjust the B mode scanning parameters in order to obtain the desired image quality and a sufficient high B mode frame rate.
2. On the software top ToolBar click on the "Menu" button and from the displayed menu select "4DView". This will open the user interface of the 4DView Plug-in software.



3. Optionally, using the B mode scanning controls, perform additional adjustment of the B mode parameters.
4. Use the 4D mode controls to adjust the 4D scanning parameters.

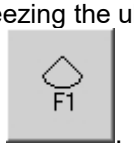
"Volume Size" control adjusts the 4D scanning angle in the same way as in B mode the scanning angle of the 2D image is adjusted using the "View Area" control.

"Volume Density" control adjusts 4D scanning density in the same way as in B mode the density of the 2D image is adjusted using the "Lines Density" control.
Smaller volume density means that scanned 3D volume contains a smaller number of 2D images. Using a smaller density you can achieve faster 4D scanning, but scanned 3D volumes are less accurate (contain a smaller number of 2D images).

5. Use the 4DView Plug-in controls in order to adjust the rendering parameters. These controls are described in the "Echo Wave II Software 4DView Plug-in User Manual".

6. To freeze/run the ultrasound scanning, use the "Freeze/Run" button .

7. You can create cine, perform measurements and annotations using the 4DView Plug-in controls.
8. Save/print out images.
9. Optionally, you can scan more 3D/4D images by unfreezing the ultrasound and repeating steps 3-8.

10. Return to B mode by clicking on the "B mode" button 

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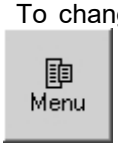
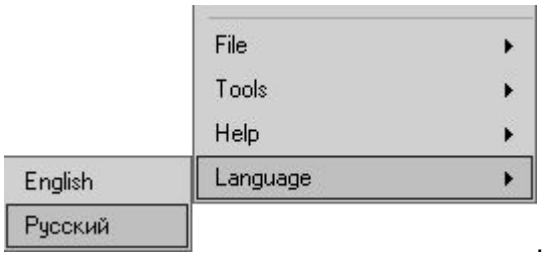
If the 4DView Plug-in software is opened without being connected to an ultrasound scanner, it can be closed by clicking on the "Probe" button on the software left-top corner.

26. Changing User Interface Language

To change the user interface language, select the software main menu (by clicking on the menu button 

on the software top ToolBar) and the "Language" sub-menu (if available). In the displayed sub-menu select the desired user interface language:



Language files are available in the software configuration folder "…\Config\Languages\". New languages can be added by copying already available language files and translating them. After the next startup, the software should allow you to select the newly added language if you kept the same file naming rules and internal data format.

If you cannot see the symbols of any East Asian language, activate the support for these languages on the Windows Control Panel. In order to do this, go to Windows "Start->Settings->Control Panel", open "Regional and Language Options" dialog, select a "Languages" tab, tick "Install files for East Asian languages" and then close the dialogs using the "OK" button. If requested restart Windows.

27. Customizing Your System

To customize your system, select the software main menu (by clicking on the menu button on the software top ToolBar) and on the sub-menu "Tools->Options". In the displayed Options dialog you can perform the following customizations:

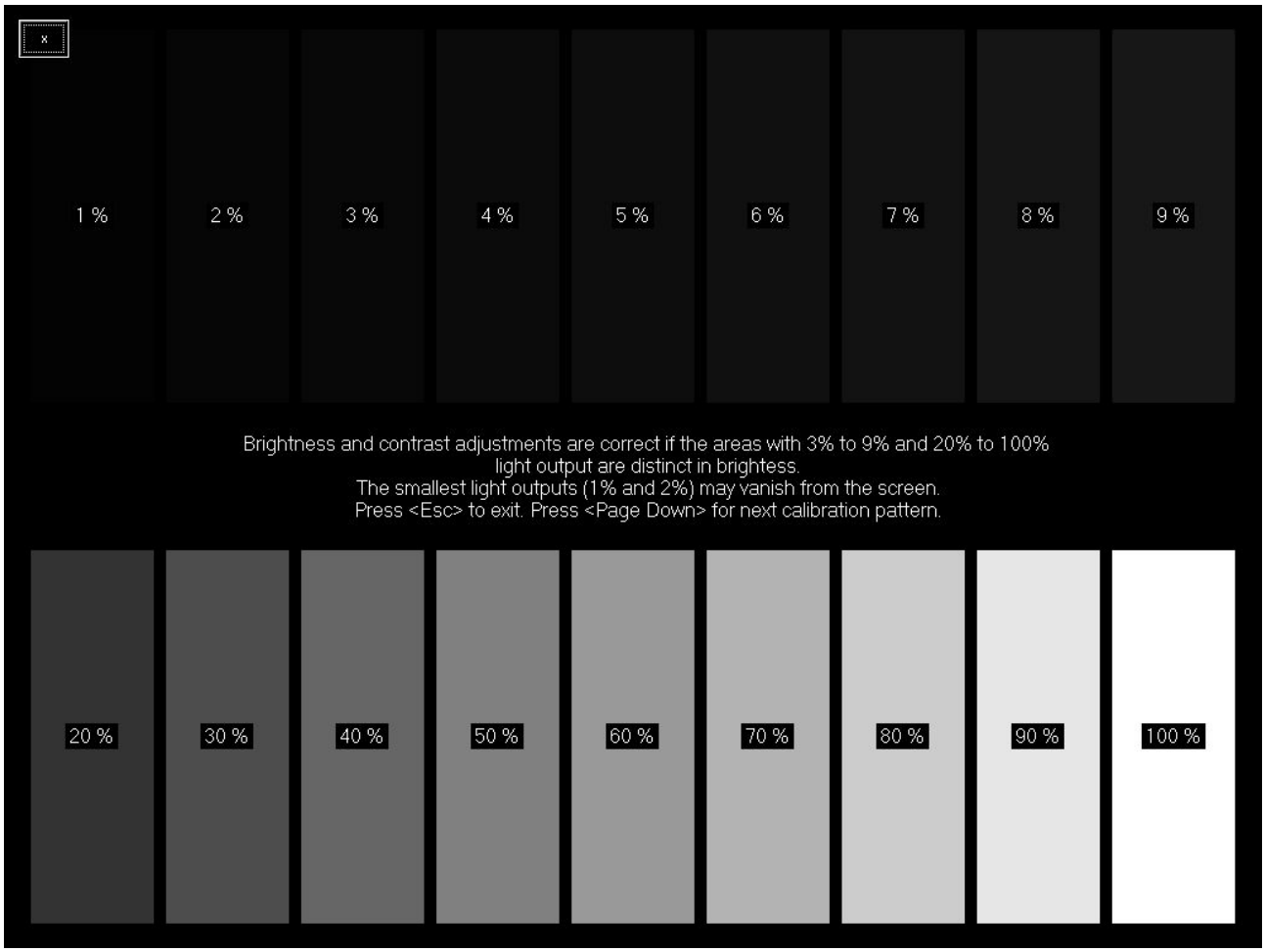
- Choose application type (humans or animals).
  Options page: "General".
- Choose what Thermal Index (TIS, TIB, TIC) must be displayed for the currently used beamformer, probe and examination.
  Options page: "Scanning Control -> General".
- Select screen layout of B+M (B+PW/CW) mode (side by side or B above M) and screen division ratio.
  Options page: "Appearance -> General".
- Select Skin (appearance) of graphical user interface.
  Options page: "Appearance -> Skins".
- Select the size of the ultrasound output area for Wide Screen systems and systems with large screen resolution.
  Options page: "Appearance -> Screen Settings".
- Adjust the size of some user interface fonts.
  Options page: "Appearance -> General".
- Select what control panels (ControlBars) and ToolBars should automatically be hidden when not being used and reappear when the mouse cursor moves over some region of the screen.
  Options page: "Appearance -> General".
- Select the size of the application's main window.
  Options page: "Appearance -> Screen Settings".
- Select Quick Saving folder, image/report format (or two formats if you want to quick save image/report with two different extensions), compression and dimensions, rules for generating folder and file names, select E-mail image format.
  Options page: "Saving and Printing".
- Select image and report printing options that include being able to remove dark background around ultrasound image, add current visible ultrasound image to report.
  Options page: "Saving and Printing".
- Set IP addresses and other options for DICOM servers/printers.
  Options page: "DICOM".
- Edit a list of external applications that can be started from "Echo Wave II" software.
  Options page: "External Applications".
- Customize measurements and calculations: allow to measure only in Freeze mode or also allow to measure during live scanning, show field names near measurement results, automatic activation of measurement fields.
  Options page: "Measurements and Calculations -> Common Settings".
- Customize Obstetrical (OB) Gestational Age (GA) and Growth tables. You can modify existing tables, add new tables, import/export tables, select what tables will be used for calculations from a very large number of available tables.
  Options page: "Measurements and Calculations -> OB Tables".
- Select what method should be used for Cardiology Left Ventricle volume calculation.
  Options page: "Measurements and Calculations -> Cardiology".
- Turn on/off display of physical mouse cursor coordinates when mouse cursor is moved over ultrasound image. Please note that these coordinates are displayed temporarily and are not saved in TPD/TVD files.
  Options page: "Measurements and Calculations -> Common Settings".
- Customize Auto Freeze (automatic freeze) timeout interval, enable or disable automatic freeze.
  Options page: "Scanning Control -> General".
- Select when measurements should be erased (on freeze, on unfreeze, on cine frame change).
  Options page: "Scanning Control -> General".

- Adjust automatic focusing options.
  Options page: "Scanning Control -> B mode".
- Adjust operation of "Automatic adjustment" (automatic image optimization) button.
  Options page: "Scanning Control -> PW/CW Doppler mode".
  Options page: "Scanning Control -> Color Doppler mode".
- Customize various Color Doppler, Pulsed Wave, Continuous Wave Doppler scanning parameters.
  Options page: "Scanning Control -> Color Doppler mode".
  Options page: "Scanning Control -> PW/CW Doppler mode".
- Import/export and organize ultrasound scanning presets.
  Options page: "Scanning Control -> Presets -> Import and Export".
- Select cine buffer size (capacity).
  Options page: "Scanning Control -> Cine".
- Define or edit keyboard hot keys for ultrasound scanning controls.
  Options page: "Keyboard and mouse -> Keyboard".
- Turn on/off on-screen keyboard for use with tablet computers that have touch screen.
  Options page: "Keyboard and mouse -> Keyboard".
- Customize interaction between mouse wheel (if present) and ultrasound scanning controls.
  Options page: "Keyboard and mouse -> Mouse".

28. Monitor Calibration

Before using the ultrasound scanning software, it is recommended that you calibrate your computer monitor (or ensure that it is calibrated correctly) in order to achieve the best imaging quality. To perform monitor calibration, select the software main menu (by clicking on the menu button

on the software top ToolBar) and the sub-menu "Tools->Monitor Calibration". This will show the calibration pattern(s) that can be used for monitor adjustment. Follow the on-screen instructions and perform any required adjustments.



29. System Requirements

Hardware requirements:

- IBM PC compatible desktop, notebook or Tablet PC computer
- Intel chipset based motherboard with integrated USB 2.0 controller: i845, i855, i865, i875 and etc...
- CPU Pentium 4 2.4-3.0 GHz / Core Duo 2.0-2.2 GHz or better
- 2 GB DDR RAM or more
- 2 GB free hard disk space
- SVGA monitor with 1024x768 resolution and 32-bit color depth or better
- AGP display adapter with 8 MB video memory. For 4D is required support of Pixel Shaders 2.0 and Vertex Shaders 1.0.
- Medical grade computer power supply

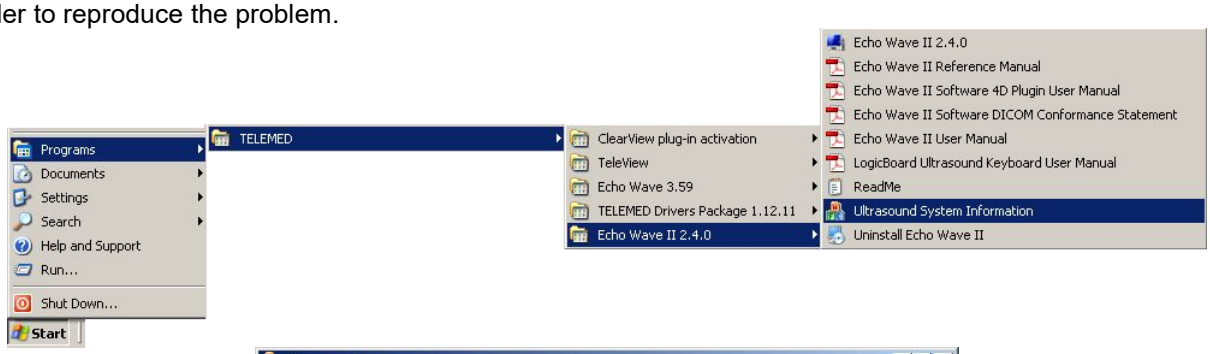
Software requirements:

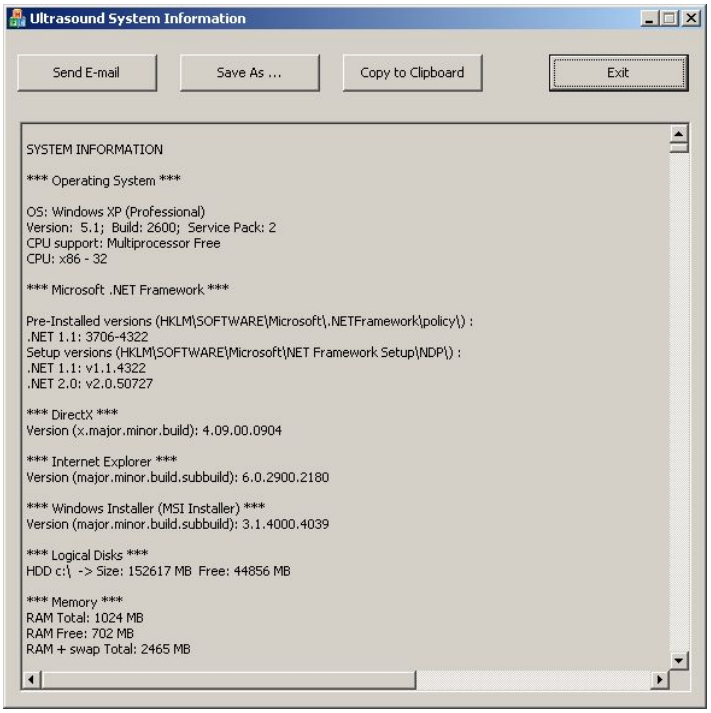
- Microsoft Windows 7 operating system with installed Service Pack 1 or more recent Microsoft Windows operating system (Windows 8/8.1, Windows 10) with latest service packs, updates and hotfixes.
- Installed Microsoft .NET Framework 3.5 Redistributable Package with Service Pack 1 (if operating system is Windows 8/8.1 or Windows 10).

  http://msdn2.microsoft.com/en-us/netframework/aa731542.aspx
  http://msdn2.microsoft.com/en-us/netframework/aa569263.aspx

30. Troubleshooting

In the event of any problems when using the "Echo Wave II" software, please start the "Ultrasound System Information" tool that is distributed together with the "Echo Wave II" software. In order to start this tool, go to the Windows start menu and click on "Start -> Programs -> TELEMED -> Echo Wave II -> Ultrasound System Information". Then wait for a short period while this tool collects system information and then send this system info to technical support together with a problem description and the required steps in order to reproduce the problem.





If "Ultrasound System Information" is unable to collect system information (in some cases of incorrect Windows registry entries) then please send the following files (if present) to technical support:

- "C:\Program Files\TELEMED\Echo Wave II\sysinfo.log"
- "C:\Program Files\TELEMED\Echo Wave II\Config\log.txt"
- And also log file that is generated when you click using the right mouse button on the "Ultrasound Scanner Monitor" icon in Windows system tray (at the right bottom corner of the screen) and select the menu item designated as "Show Log".

In case of DICOM-related problems please also send file

- "C:\Program Files\TELEMED\Echo Wave II\Config\log_dicom.txt".

31. Frequently Asked Questions (FAQ)

This section contains answers to the most commonly asked questions regarding the "Echo Wave II" software.

31.1. Changing hospital/clinic names

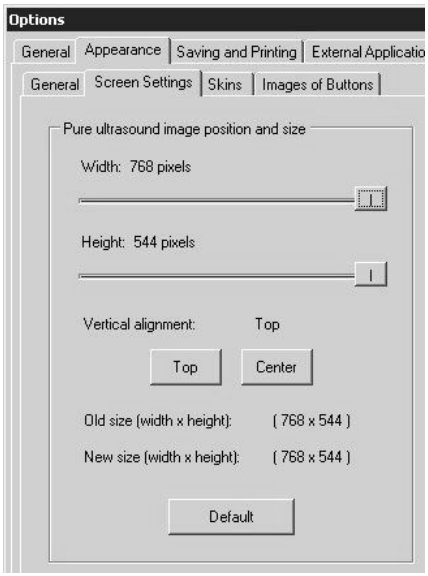
Question:
How to change hospital/clinic name?
Answer:
When ultrasound scanner and probe are connected, open Patient information window, enter desired name to field "Hospital/clinic", close window by clicking "OK" button. For other available customizations please read section "Customizing Your System".

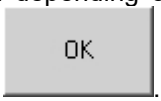
31.2. Adjusting ultrasound image size

Question:
How to change the size of displayed ultrasound image?
Answer:

For changing displayed ultrasound image size click "Menu" button

at software top ToolBar, then select sub-menu "Tools->Options" and inside opened "Options" window select tabs "Appearance->Screen Settings".



Using "Width" and "Height" sliders (in "Pure ultrasound image position and size" group) select desired ultrasound image size in pixels. Then click either "Top" or "Center" button depending on desired vertical ultrasound alignment. After that close "Options" dialog by clicking "OK" button 

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Please note that ultrasound output to computer monitor frame rate (FPS) depends on computer performance and selected ultrasound image size. If your display adapter supports very high resolutions, it is possible that maximal ultrasound frame rate will be limited by computer processor speed. In such cases you may need to set smaller ultrasound image width and height values.

31.3. Adjusting Windows 8 screen resolution

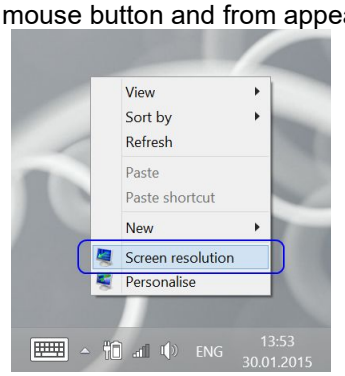
Question:

How to change Windows 8 screen resolution?

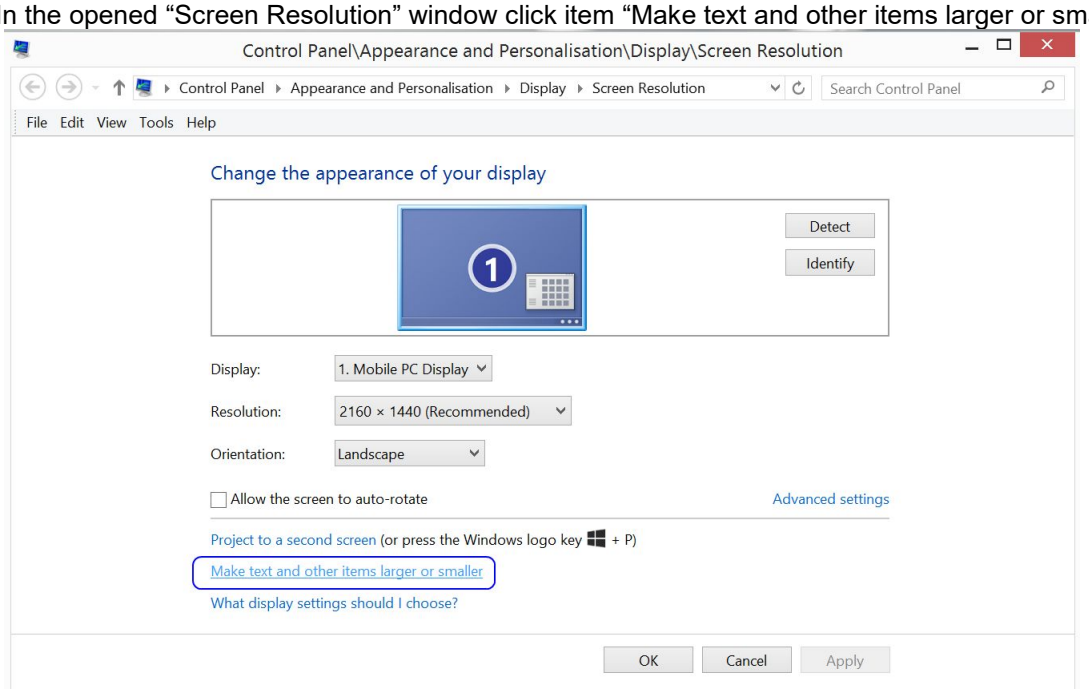
Answer:

On most computers with Windows 8 operating system by default is used 150% DPI scaling. That is, if you will select some screen resolution in Windows 8 “Screen Resolution” options, started applications may detect not your selected resolution, but scaled resolution. In order to turn off DPI scaling and select desired resolution that will be detected by all applications, do the following:

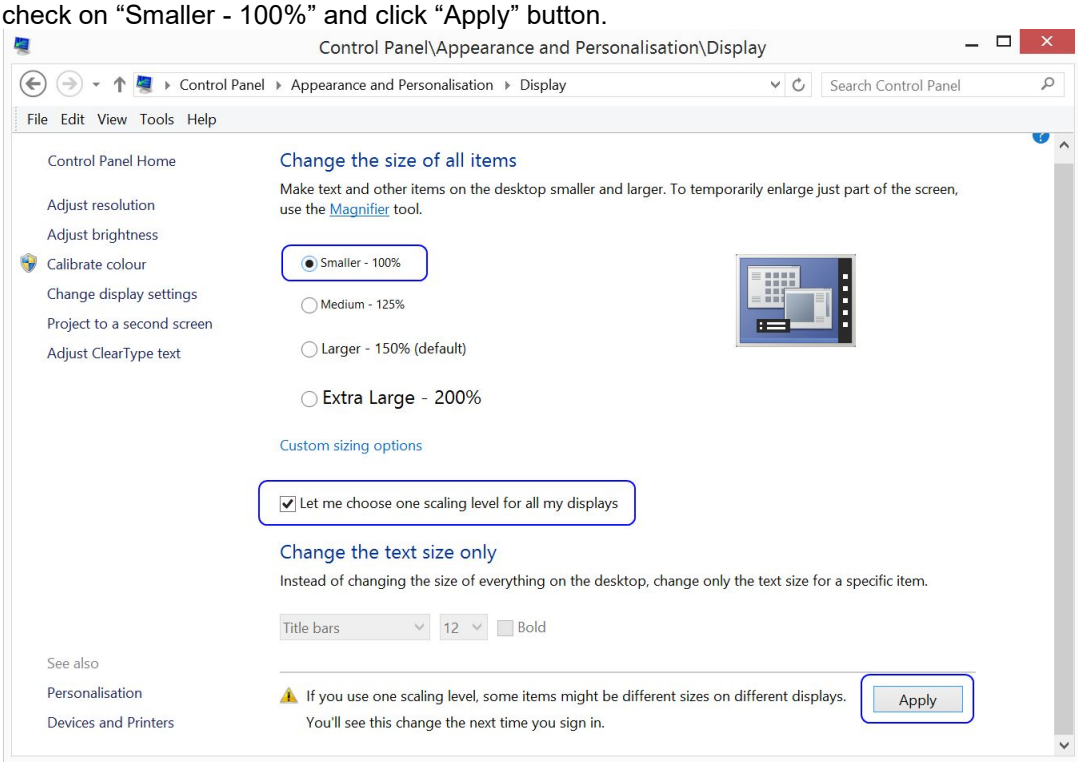
On Windows desktop click right mouse button and from appeared menu select “Screen resolution”.



In the opened “Screen Resolution” window click item “Make text and other items larger or smaller”.



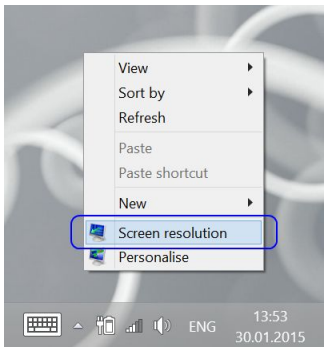
In the opened “Display” window put check on “Let me choose one scaling level for all my displays”, then put check on “Smaller - 100%” and click “Apply” button.



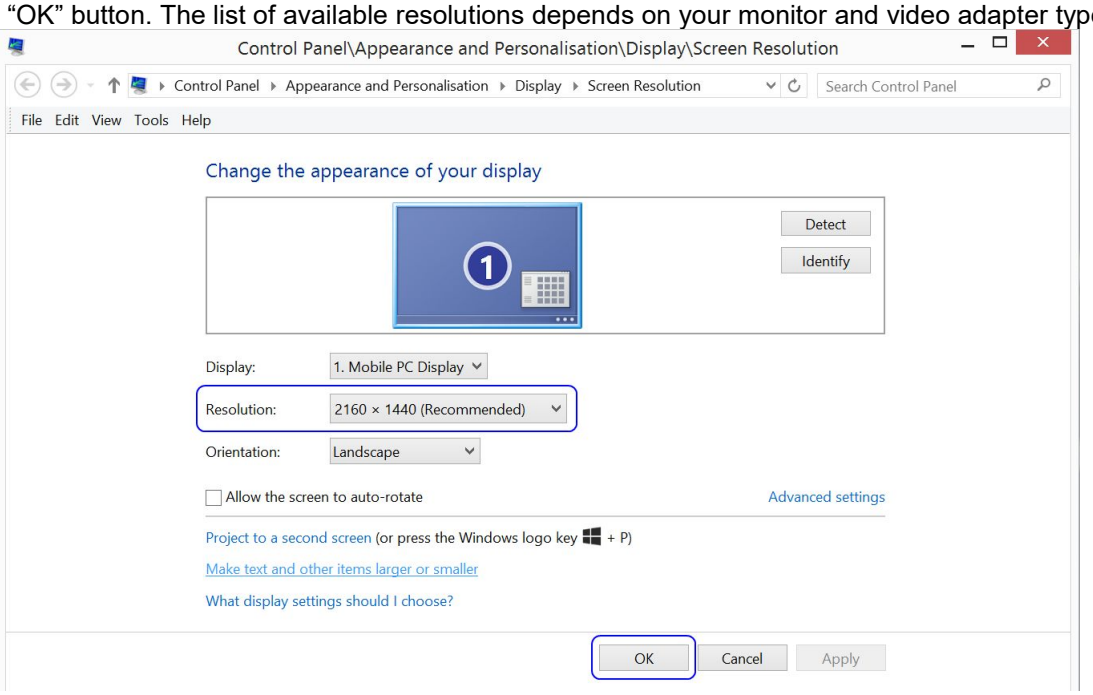
In the appeared window click “Sign out now” button and then log in to Windows with your account name and password.

From now Windows should work in 100% DPI scaling mode.

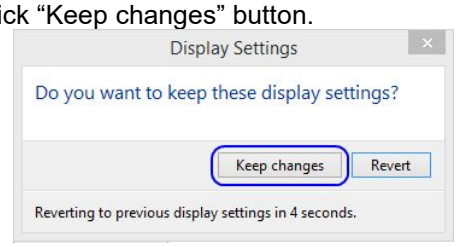
In order to select desired screen resolution, on Windows desktop click right mouse button and from appeared menu select “Screen resolution”.



Then in appeared “Screen Resolution” window select desired resolution from “Resolution” listbox and click “OK” button. The list of available resolutions depends on your monitor and video adapter type.



In the appeared window click “Keep changes” button.



When selecting screen resolution, please keep in mind that each monitor has appropriate proportions or native resolution, and proportions of selected other resolutions should be close enough to original one in order to see correct proportions of displayed images and controls. Another thing that you may need to take into account is that “Echo Wave II” has pre-defined sizes of software user interface elements for the following resolutions: 1024x768 (1.333), 1152x864 (1.333), 1260x1024 (1.230), 1280x1024 (1.250), 1280x768 (1.667), 1280x800 (1.600), 1280x960 (1.333), 1360x768 (1.771), 1366x768 (1.779), 1400x1050 (1.333), 1440x1050 (1.371), 1440x900 (1.600), 1600x1200 (1.333), 1600x900 (1.778), 1680x1050 (1.600), 1900x1200 (1.583), 1920x1080 (1.778), 1920x1200 (1.600), 1920x1280 (1.500), 2560x1440 (1.778), 2560x1600 (1.600), 2880x1800 (1.600). Here in braces are written proportions of corresponding width and height.

Also please note that for any resolution you can adjust ultrasound image size as described in FAQ section “Adjusting ultrasound image size”.

31.4. Adjusting Windows 10 screen resolution

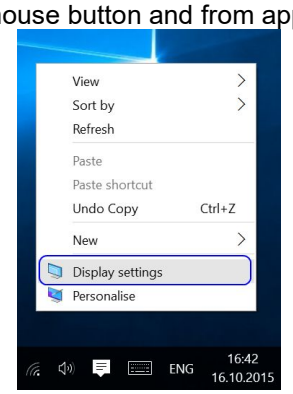
Question:

How to change Windows 10 screen resolution?

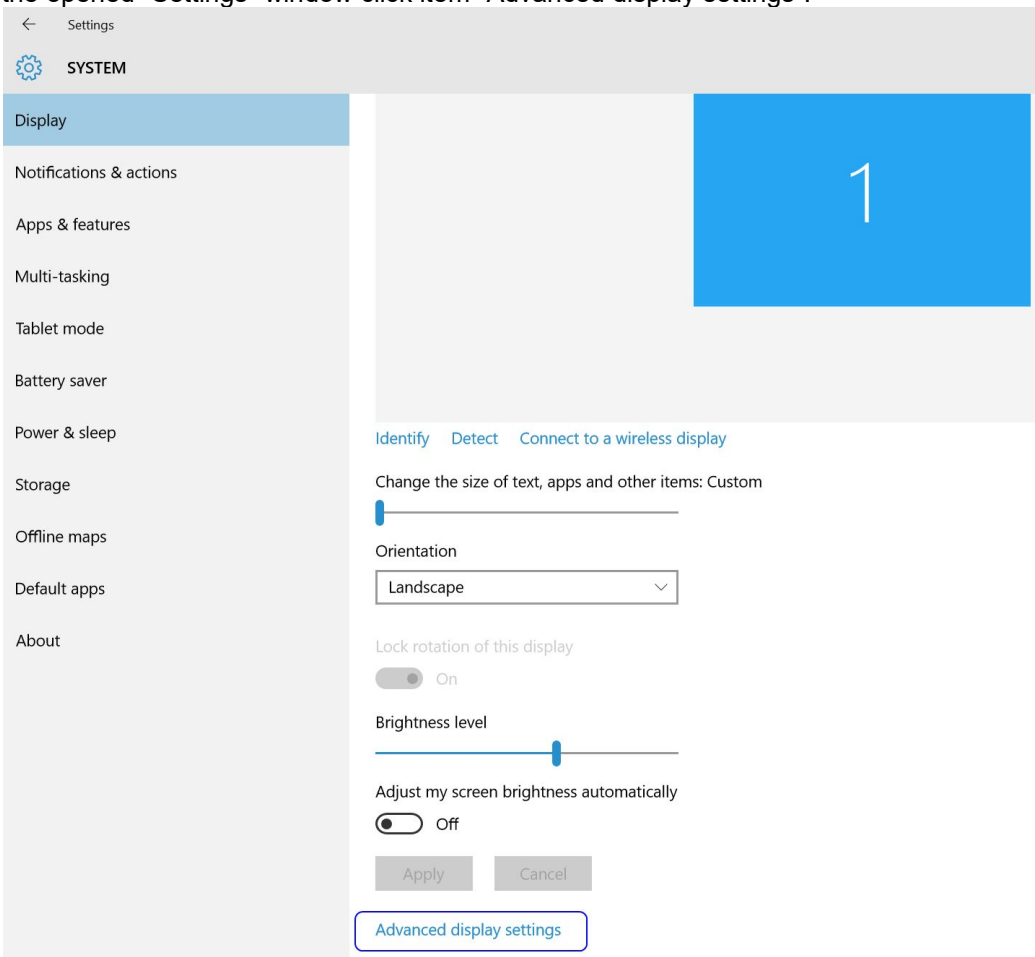
Answer:

On most computers with Windows 10 operating system by default is used 150% DPI scaling. That is, if you will select some screen resolution in Windows 10 “Display Settings”, started applications may detect not your selected resolution, but scaled resolution. In order to turn off DPI scaling and select desired resolution that will be detected by all applications, do the following:

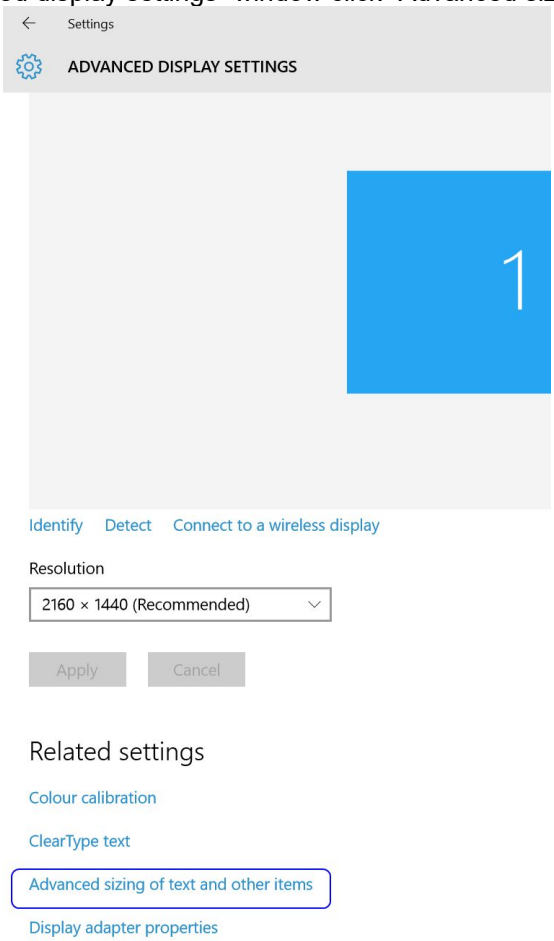
On Windows desktop click right mouse button and from appeared menu select “Display settings”.



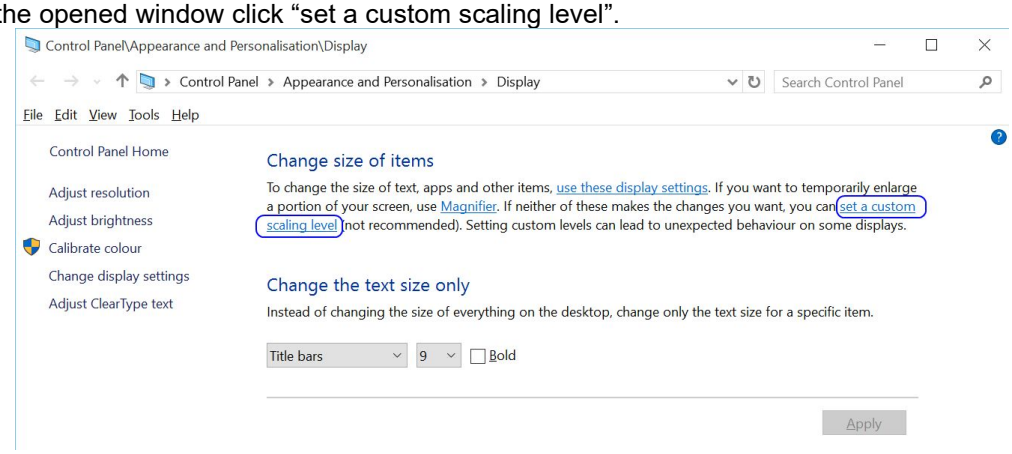
In the opened “Settings” window click item “Advanced display settings”.



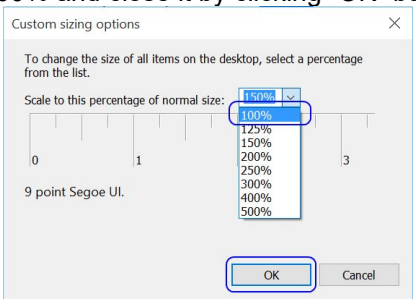
In the opened “Advanced display settings” window click “Advanced sizing of text and other items”.



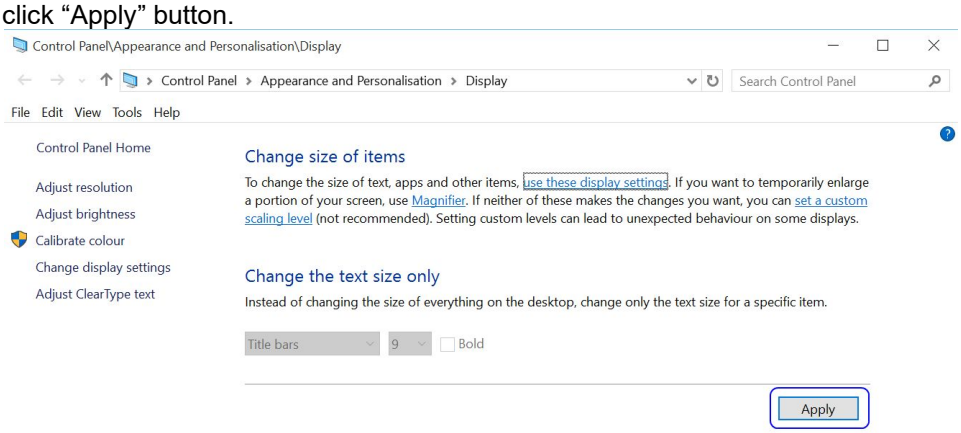
In the opened window click “set a custom scaling level”.



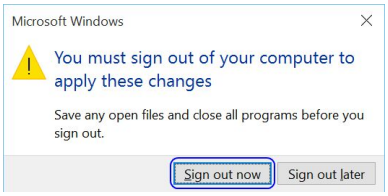
In the appeared window select 100% and close it by clicking “OK” button.



Then click “Apply” button.

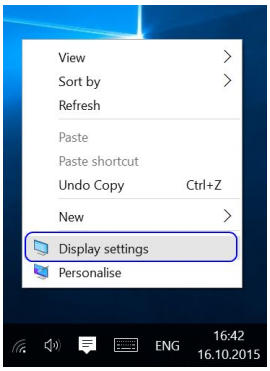


In the appeared window click “Sign out now” button and then log in to Windows with your account name and password.

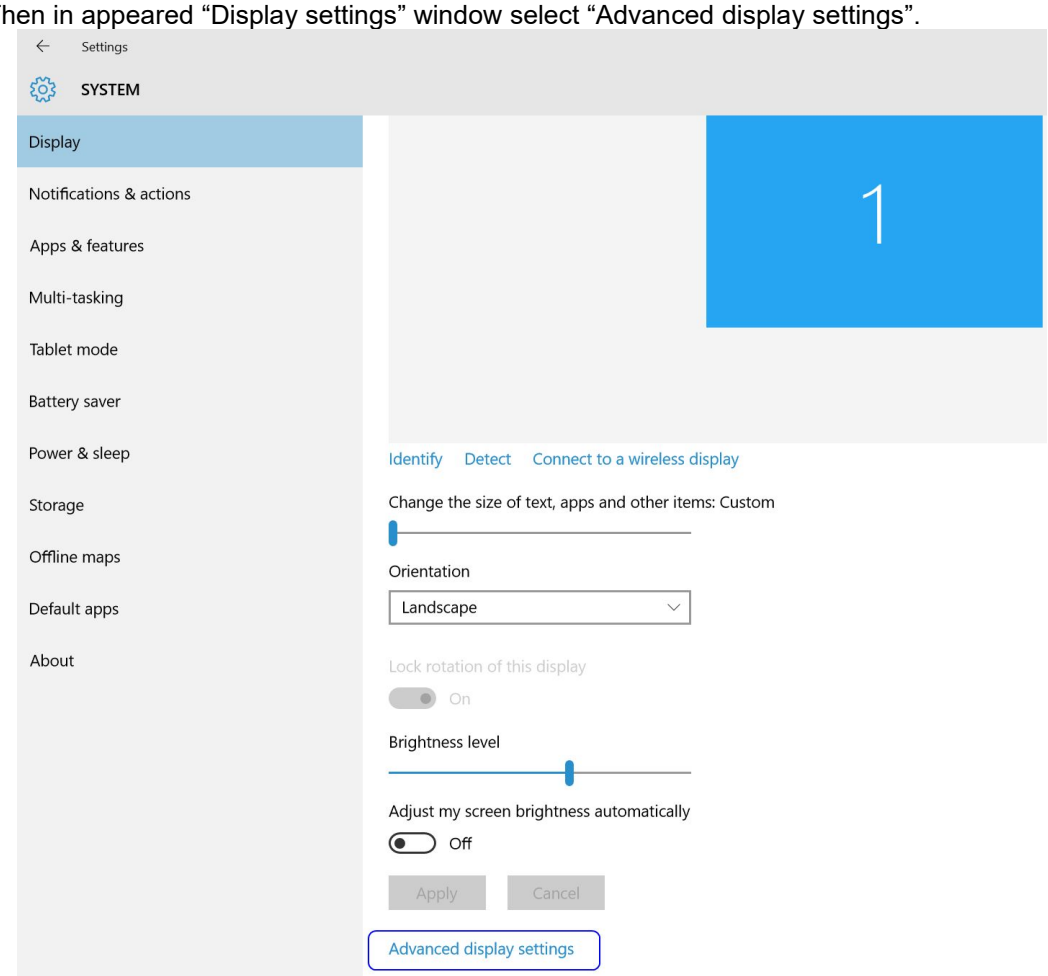


From now Windows should work in 100% DPI scaling mode.

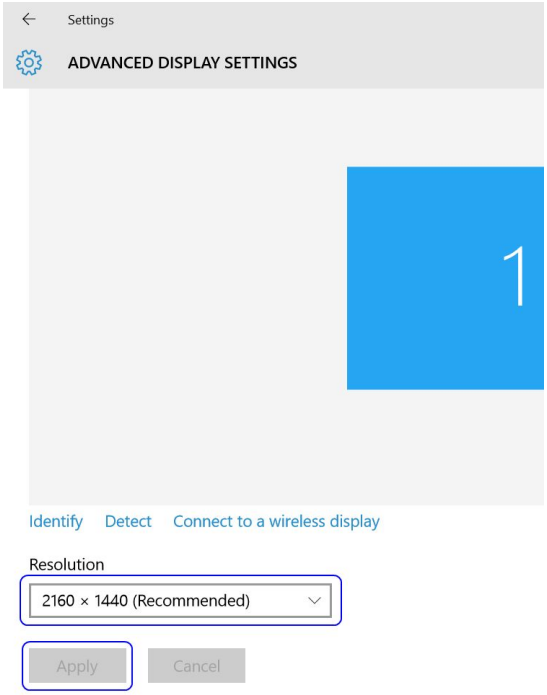
In order to select desired screen resolution, on Windows desktop click right mouse button and from appeared menu select “Display settings”.



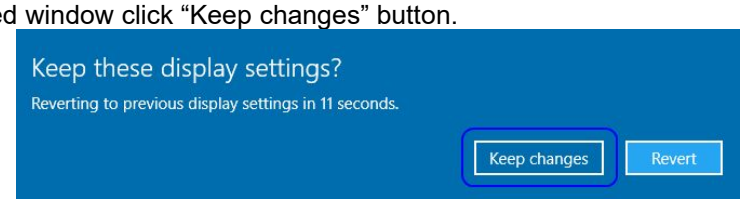
Then in appeared “Display settings” window select “Advanced display settings”.



Then in the appeared “Advanced display settings” window select desired resolution from “Resolution” listbox and click “Apply” button. The list of available resolutions depends on your monitor and video adapter type.



In the appeared window click “Keep changes” button.



When selecting screen resolution, please keep in mind that each monitor has appropriate proportions or native resolution, and proportions of selected other resolutions should be close enough to original one in order to see correct proportions of displayed images and controls. Another thing that you may need to take into account is that “Echo Wave II” has pre-defined sizes of software user interface elements for the following resolutions: 1024x768 (1.333), 1152x864 (1.333), 1260x1024 (1.230), 1280x1024 (1.250), 1280x768 (1.667), 1280x800 (1.600), 1280x960 (1.333), 1360x768 (1.771), 1366x768 (1.779), 1400x1050 (1.333), 1440x1050 (1.371), 1440x900 (1.600), 1600x1200 (1.333), 1600x900 (1.778), 1680x1050 (1.600), 1900x1200 (1.583), 1920x1080 (1.778), 1920x1200 (1.600), 1920x1280 (1.500), 2560x1440 (1.778), 2560x1600 (1.600), 2880x1800 (1.600). Here in braces are written proportions of corresponding width and height.

Also please note that for any resolution you can adjust ultrasound image size as described in FAQ section “Adjusting ultrasound image size”.

If you want to use Windows using one resolution, and use “Echo Wave II” using another resolution, “Echo Wave II” resolution can be selected at "Menu->Tools->Options->Scanning Control->General" group "Actions on startup" option "Change screen resolution to". This allows to change screen resolution before software startup and restore resolution when software is closed.

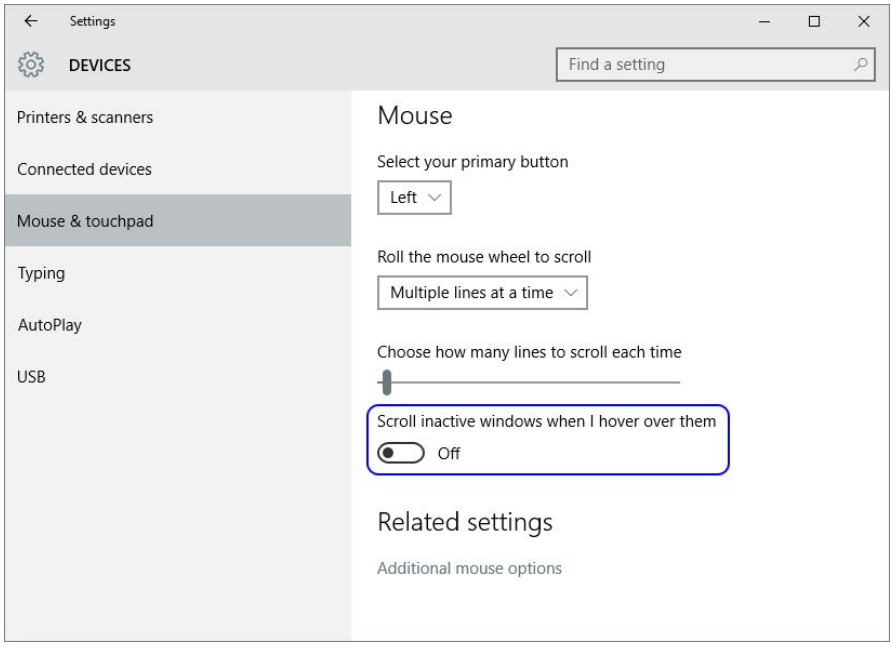
31.5. Using mouse wheel to adjust TrackBar (slider) controls in Windows 10

Question:

How to adjust values of TrackBar (slider) controls in Windows 10 using mouse wheel?

Answer:

In order to adjust ultrasound software TrackBar (slider) controls (like Gain, Power and others) in Windows 10 using mouse wheel, you may need to turn off Windows 10 option “Scroll inactive windows when I hover over them”.



31.6. Retaining data (scanning presets) during software upgrades

Question:

How to transfer settings from one installation of "Echo Wave II" to another installation of "Echo Wave II" software and keep old settings when upgrading to new "Echo Wave II" version?

Answer:

If you wish to preserve completely everything, then you should save a copy of "Echo Wave II" software "Config" folder (usually "C:\Program Files\TELEMED\Echo Wave II\Config\") and its subfolders into some backup folder (e.g., "My Documents"). After that uninstall old "Echo Wave II" version, install new "Echo Wave II" version, and overwrite "Config" folder of newly installed version with a backup copy of previously saved "Config" folder. Please check software readme file for possible data format changes.

If you wish to save only several scanning presets (that are visible on left-side ControlBar when you click hot key "7"), then go to "Menu->Tools->Options->Scanning Control->Presets->Import and Export". Using left mouse button and keyboard Shift/Ctrl keys select desired to save presets (only the ones that you created, because "Default" presets will be installed with new software version), then click "Export..." button and save these presets to some backup folder (e.g., "My Documents"). After installation of new "Echo Wave II" version, go to the same "Import and Export" tab page inside options. Then click "Open/Import" button at right-side of "Import and Export" tab page (EXTERNAL), open file with previously saved presets, select desired presets and move them using "<<" button to the left side (INTERNAL). Then click the OK button in order to close options window.

Please note that for operations with presets the appropriate ultrasound scanner and probe must be connected (for which you want to manage presets).

If you want to copy (or make back-up) of other data, here is the list of most important files and folders inside the "Echo Wave II" installation folder (or configuration folder if software was configured for multiuser environment):

- Ultrasound scanning presets
  "…\Config\Presets\"
- Last used ultrasound scanning parameters
  "…\Config\hw_state.dat"
- Options (Options Window)
  "…\Config\Options\options.dat"
- OB tables
  "…\Config\Options\ob_ga_tables.dat"
- Hot keys
  "…\Config\Options\hotkeys.dat"
- Templates of comments (Patient Window)
  "…\Config\CommentsTemplates\"
- Texts of annotations (Annotations at right-side ControlBar)
  "…\Config\Annotations\"
- Body mark images
  "…\Config\BodyMarks\"

For information about data format changes (if any), check the software "readme.txt" file.

Software settings also can be saved/restored using Backup/Restore utility that is available at "Echo Wave II" "Menu->Tools->Backup/Restore".

31.7. Video playback frame rate

Question:

During live scanning and recording, ultrasound frames are shown at one frame rate, but if we save these frames to AVI file and perform playback of this AVI file, then we see frames at different frame rate. Why this happens and how to avoid this?

Answer:

AVI file format does not support variable frame rate. It stores only single FPS (frames per second) value. If during live scanning and cine recording output to computer monitor FPS will not change (scanning

parameters will not be changed), then average recording FPS will be stored inside AVI file (if at software options was not set custom FPS). So in order to have the same FPS in all cine, click Freeze/Unfreeze or Record/Stop buttons in order to clear cine and perform recording, and then stop recording. During recording do not change scanning parameters, and after record stopping save cine to AVI file.

If scanning frame rate was larger than ~25 FPS, then for playback of saved AVI file must be used "Echo Wave II" software that loads AVI file into memory (if computer has enough free physical memory (RAM)). If AVI file is large or you will use other players, then playback may be slower because of continuous AVI file reading from hard drive.

31.8. Why ultrasound scanning is stopped after period of inactivity

Question:

Why is the ultrasound scanning stopped after some time of inactivity?

Answer:

In order to prolong lifetime of the ultrasound probe, by default software enters into freeze mode and turns off ultrasound output after ~15 minutes of inactivity. If you want to turn off this feature, open the "Options" window ("Menu->Tools->Options"), select tabs "Scanning Control->General", then inside "Automatic freeze" group box remove tick from "Enable Auto Freeze" CheckBox and close dialog with the "OK" button.

31.9. Using software in multiuser environment

Question:

How can I configure and use software in a multiuser environment?

Answer:

At first you must create a copy of "Echo Wave II" "Config" folder for each user (e.g., "Config" and "Config_user2"). Then you must set which of these folders software must use when it is started. Please note that each user must have Administrator rights.

If all users use single Windows user account, then during software startup you will need to use -config_dir command-line option followed by path to appropriate Config directory. You can implement this by, for example, creating different software shortcuts for each user on Windows Desktop that use different command-line parameters. For example, if inside "C:\Program Files\TELEMED\Echo Wave II" folder we have two copies of config folder ("Config" and "Config_user2"), then two shortcuts will have the following targets:

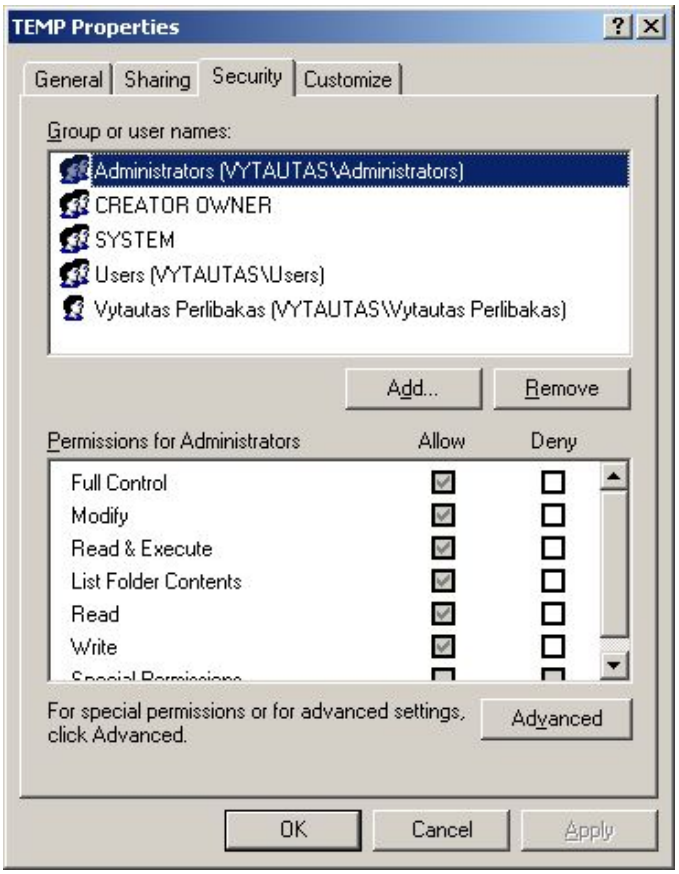
"C:\Program Files\TELEMED\Echo Wave II\EchoWave.exe" -config_dir "C:\Program Files\TELEMED\Echo Wave II\Config"

"C:\Program Files\TELEMED\Echo Wave II\EchoWave.exe" -config_dir "C:\Program Files\TELEMED\Echo Wave II\Config_user2".

If each user uses different Windows account, then "Config" folder can be set in Windows registry tree at "HKEY_CURRENT_USER\SOFTWARE\TELEMED\Echo Wave II". Create Expandable String Value named "ConfigDir" that contains path to "Echo Wave II" "Config" directory that must be used by "Echo Wave II" software for this logged in Windows user. For example, "C:\Program Files\TELEMED\Echo Wave II\Config_user2" or "%ProgramFiles%\TELEMED\Echo Wave II\Config_user2". Also create a copy of "Echo Wave II" "Config" folder that corresponds to path in Windows registry. When "C:\Program Files\TELEMED\Echo Wave II\EchoWave.exe" is executed, it will read appropriate path from Windows registry. If the user does not have permissions to write to "C:\Program Files", copy "Config" folders to another location where the user has appropriate permissions.

In order to start software using standard user account that does not have Administrator rights, at first operating system must be appropriately configured. If you use Windows 7 or more new operating system, turn off Windows User Account Control (UAC). Then using Administrator account set permissions for the desired users for "Echo Wave II" "Config" folder(s) and to Windows registry key HKEY_LOCAL_MACHINE\SOFTWARE\TELEMED (on 64-bit Windows registry key is HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\TELEMED). In order to adjust permissions of folders, click right mouse button on folder, from appeared menu select "Properties", inside dialog select "Security" tab and allow "Full control" to desired users. In order to adjust permissions of registry key, start regedit.exe software, navigate to HKEY_LOCAL_MACHINE\SOFTWARE\TELEMED (on 64-bit Windows to HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\TELEMED) registry key, click on it right mouse

button, from appeared menu select "Permissions…" and inside "Security" tab allow "Full control" to desired users. If the user is not visible in the list, use "Add" button in order to add desired users or groups.



31.10. Software control using command line

Question:

Is it possible to control software using command line commands?

Answer:

Yes. Software supports the following command line and main windows's WM_COPYDATA commands:

"-freeze" - stop ultrasound scanning;
"-run" - start ultrasound scanning;
"-freezerun" - stop/start ultrasound scanning;
"-clear_cine" - clear previously scanned ultrasound frames from cine buffer (uses temporary freeze);
"-quicksave" - quick save current ultrasound image (single frame);
"-save file_name" - save current ultrasound image to file (file format is determined by file extension);

Sample commands:

EchoWave.exe -save “myfile.tpd”
EchoWave.exe -save “myfile.jpg”
EchoWave.exe -save “myfile.png”
EchoWave.exe -save “myfile.tvd” (TVD cine)
EchoWave.exe -save “myfile.avi” (AVI cine format corresponds to format that is used for saving in “Cine Save As” menu)

“-save_image file_format file_name” - save current ultrasound image to file using specified format;
“-save_report file_format file_name” - save current report image to file using specified format;

As file_format parameter can be passed the following formats: tpd, bmp, png, jpg, tif, dcm, dcm_jpeg, xlsx, docx, pdf.

“-save_cine file_format file_name” - save cine to file using specified format.

As file_format parameter can be passed the following formats: tvd, avi_comp, avi, avi_cust, avi_wmv9, mp4, dcm, dcm_jpeg. For saving multislice data (multiple files), as file_format

parameter can be passed the following formats: ms_bmp, ms_png, ms_jpeg, ms_tif, ms_dcm, ms_dcm_jpeg, ms_tpd, ms_xlsx, ms_docx, ms_pdf, where “ms_” indicates multislice, and the rest of string indicates file format.

"-play_file file_name" - open and play passed file;

"-minimize" - minimize main window;
"-maximize" - maximize main window;
"-topmost_on" - set main window's topmost property to true;
"-topmost_off" - set main window's topmost property to false;
"-app_show" - show software window;
"-app_hide" - hide software window;
"-mouse_show" - show mouse cursor;
"-mouse_hide" - hide mouse cursor;
"-exit" - close software;

"-convert_directory" - convert TVD to AVI/DCM/DCM-JPEG and TPD to BMP/PNG/JPG/TIF/DCM/DCM-JPEG files in a specified directory and its subdirectories.

Command line syntax:

EchoWave.exe -convert_directory directory_name input_format output_format

Video input format: tvd. Video output formats: avi_comp, avi, avi_cust, avi_wmv9, mp4, dcm_jpeg_cine, dcm_cine. Formats avi_cust and avi_wmv9 are optional.

Image input format: tpd. Image output formats: bmp, png, jpg, tif, dcm, dcm_jpeg.

Important. Do not add slash symbol "\" at the end of directory name !

Command line samples:

EchoWave.exe -convert_directory "C:\Echo Images" tvd avi_comp
EchoWave.exe -convert_directory "C:\Echo Images" tpd jpg

"-import_presets beamformer_code import_dat_file probe_name preset_name probe_name preset_name" - import presets;

-import_presets must be single (or last) command in command line;

"-delete_presets beamformer_code probe_name preset_name probe_name preset_name" - delete presets;

-delete_presets must be single (or last) command in command line;

Beamformer codes: E1C - EchoBlaster 128 Rev.C; L1B - LS128 Rev.B; CLA - ClarUs Rev.A; L6B - LS64 Rev.B; E6A - EchoBlater 64 Rev.A; SMB - SmartUs; SMC - SmartUs Rev.C; MCA - MicrUs; MCC - MicrUs Rev.C; MDC - MicrUs Duo; ARA - ArtUs; ARC - ArtUs Rev.C and so on. Beamformer code is usually shown at software ultrasound image header.

"-new_patient" - start examination of new patient;
"-new_exam" - start new exam;
"-set_exam_type exam_type" - change exam type;

Human exam types: general, ob_gyn, cardiology, urology, endocrinology, vascular, abdominal;

Veterinary exam types: vet_general, vet_cardiology, vet_canine_ob, vet_feline_ob, vet_ovine_ob, vet_bovine_ob, vet_equine_ob, vet_llama_ob, vet_goat_ob;

Exam type is changed only if it corresponds to application category (humans/veterinary) that is selected at software options.

"-apply_preset preset_name" - apply preset with passed name;

Sample command: EchoWave.exe -apply_preset Default

"-clear_thumbnails" - delete all thumbnail images;

"-set_patient_name patient_name" - set patient name;
"-set_patient_id patient_id" - set patient id;
"-set_patient_birth_date birth_date" - set patient birth date;

Date format: YYYYMMDD (e.g., 19991120).

"-set_patient_gender gender_id" - set patient gender;

Gender id: male, female.

"-set_patient_responsible_person responsible_person" - set responsible person name (or owner name for veterinary);
"-set_patient_heart_rate heart_rate" - set patient heart rate;

Parameter format: integer beats/min (e.g., 60).
"-set_patient_weight patient_weight" - set patient weight;
Parameter format: float kg with dot (.) as decimal separator (e.g., 75.5).
"-set_patient_height patient_height" - set patient height;
Parameter format: float cm with dot (.) as decimal separator (e.g., 178.0).
"-set_patient_ob_lmp_date lmp_date" - set LMP date.
Date format: YYYYMMDD (e.g., 19991120).
"-set_patient_ob_gravida text" - set the value of OB gravida;
"-set_patient_ob_para text" - set the value of OB para;
"-set_patient_ob_ab text" - set the value of OB AB;
"-set_patient_ob_ectopic text" - set the value of OB ectopic;

"-set_hospital_name hospital_name" - set hospital/clinic name;
"-set_hospital_image image_file_name" - set hospital/clinic logo image;
Sample command: EchoWave.exe -set_hospital_image "c:\temp\img1.png"
If file name is not passed, current logo image is deleted.

"-set_sonographer_name sonographer_name" - set sonographer name;
"-set_sonographer_image image_file_name" - set sonographer logo image;
Sample command: EchoWave.exe -set_sonographer_image "c:\temp\img2.png"
If file name is not passed, current logo image is deleted.

"-set_images images_short_directory" - change images of buttons;
Directories of button images must correspond to the ones from "...\Config\Images\".
Sample commands:
EchoWave.exe -set_images SimpleBlue
EchoWave.exe -set_images Default
"-set_skin skin_short_directory" - change user interface skin;
Skin directories must correspond to the ones from "...\Config\Skins\".
Sample commands:
EchoWave.exe -set_skin Amazonite
EchoWave.exe -set_skin DarkBlue
"-set_language language_id" - change user interface language;
Language codes ("en", "lt") must correspond to codes in appropriate language files (e.g., lang_code~:=EN inside texts.en.txt) at "...\Config\Languages\".
Sample commands:
EchoWave.exe -set_language en
EchoWave.exe -set_language lt

Before starting ultrasound software control from some other application, ultrasound scanning software must be running. So start ultrasound software using any method you know (CreateProcess, ShellExecute), wait while software will be started and will finish its initialization, find main window by its name (search globally or only windows of concrete process), send WM_COPYDATA commands to main window.

dwData=1, lpData="-some_command" in ANSI,

dwData=100001, lpData="-some_command" in Unicode.

If the command is passed using WM_COPYDATA, its arguments must be separated by symbols "^#^" and quotes (") must not be used, for example, -save^#^file_name. In Windows command line, quotes (") must be used to specify arguments that have spaces.

For WM_COPYDATA description see Microsoft documentation on MSDN:

http://msdn.microsoft.com/en-us/library/windows/desktop/ms648710(v=vs.85).aspx

Initial parameters to ultrasound scanning application can be passed as a set of command line arguments (without ^#^ separators) when application is launched, but during run-time must be used WM_COPYDATA in order to avoid multiple startups of ultrasound application process. In order to pass multilanguage parameters (e.g., patient name), must be used Unicode string format.

In one command line can be passed several commands, for example

EchoWave.exe -set_patient_name "John Smith" -set_patient_id "123".

When are used command line commands, software must be run in single instance mode. That is, must be turned off option that allows to start several software instances, because otherwise each executed command line will start new software instance.

31.11. Playback and processing of AVI video files on Apple Macintosh computers with Mac OS operating system and on UNIX-like systems and using software with limited video format support

Question:

How can I save AVI video files for playing and processing on Apple Macintosh computers with Mac OS operating system and on UNIX-like systems and make AVI files compatible with software that has limited support of video formats?

Answer:

We cannot guarantee that saved AVI video files will be properly shown on operating systems other than Microsoft Windows, because other operating systems have their own video storing formats and compression methods. We can only give you some hints that may be helpful:

1. In "Echo Wave II" options ("Menu->Tools->Options->Saving and Printing" group "Video saving") turn OFF option "Save video using reduced color depth when possible".
2. When saving video in AVI format, in "Save file as" dialog's "Save as type" ComboBox choose "Uncompressed video file".
3. On Mac OS or UNIX-like operating systems open these uncompressed AVI files using latest version of Apple QuickTime -based video player.

Another way to exchange video files between different operating systems could be the use of DICOM cine format, but before its use you should check if for your operating system is available DICOM viewer that satisfies your needs and that could open "Echo Wave II" DICOM cines (JPEG compressed RGB or YBR). Also please note that most viewers cannot open large DICOM video files if all decompressed frames cannot be fit to memory at once.

31.12. Playback of AVI video files on Windows 10 operating system

Question:

How to play AVI files on Windows 10?

Answer:

Default Windows 10 video player “Movies & TV” may be unable to play compressed AVI files. In such case on AVI file you can click right mouse button, from appeared menu select “Open with” and then select another installed player. Also in menu you can click “Choose another app” at the bottom, then click “More apps”, “Look for another app on this PC”, select desired application, put check on “Always use this app to open .avi file” and close dialog with “OK” button to set newly selected application as default for opening AVI files. Alternative applications that can be used for AVI playback: VirtualDub (virtualdub.org), VLC media player (www.videolan.org).

31.13. Speeding up software startups and operation

Question:

Is it possible to make the software startup and operation faster?

Answer:

It is normally possible to make the "Echo Wave II" software, the operating system and your computer run faster but some actions may require advanced knowledge of the operating system and your computer hardware. Before performing any below described actions, please carefully read user manual (help) of your operating system, video card and computer and understand how these actions will affect your computer. In order to make software and computer start and run faster, you can perform the following actions:

1. Open software "Options" window ("Menu->Tools->Options"), select tabs "Appearance->Skins", remove check from CheckBox "Use advanced skinization mode". Select tabs "Scanning Control->Cine" and choose minimal available cine size (~20 MB). Then close "Options" dialog by clicking "OK" button and restart software.
2. Turn off ultrasound processing filters (e.g., PureView) that require many CPU resources.
3. When computer is started, instead of starting/closing software many times, start software only once and after that minimize software when it is not required for some time and maximize software when it is

required again. In such case you will not need to wait for software startup every time you need it. Minimized software freezes ultrasound scanning and does not use CPU resources.

4. If you use laptop computer, before starting software open Windows "Power Options" dialog ("Start->Settings->Control Panel->Power Options") and select "Home/Office Desk" or "Performance" power scheme depending on your computer configuration. Also you can use any other power scheme selection method (e.g., using power scheme icon at system tray if it is available) depending on operating system and its configuration. For more information about power saving please read user manuals of your operating system and computer.

5. Open Windows "System Properties" dialog ("Start->Settings->Control Panel->System"), select "Advanced" tab, inside "Performance" group click "Settings" button, inside opened "Performance Options" dialog select "Visual Effects" tab and click RadioButton option "Adjust for best performance". After that close all dialogs by clicking "OK" buttons.

6. Open Windows "Display Properties" dialog ("Start->Settings->Control Panel->Display"), select "Themes" tab, choose "Windows Classic" theme. Then select "Desktop" tab and inside "Background" ListBox select "(None)". Close dialog with "OK" button.

7. Inside video card configuration options select "Performance" mode (if available). For more information read your computer's and video card's user manual (or help).

8. Adjust Windows file indexing and other services (or always running applications), automatic updates of Windows and installed applications.

9. If your computer has installed antivirus software, disable real-time checking of "Echo Wave II" files. Read antivirus software user manual in order to find out how to configure scanning exceptions.

10. If your laptop computer has switch "Stamina/Speed", select "Speed" mode and restart computer. For more information read your computer's user manual.

11. If your computer's BIOS has CPU speed selection option (Low/Adaptive/Fast), select fastest available option. For more information read your computer's user manual.

If you are using a laptop (notebook) computer and it is running on batteries (meaning it is not connected to 220 V / 110 V mains supply), please note that the operating system may configure the computer hardware to save power and the computer may run slower than when connected to 220 V / 110 V. When the computer battery charge status gets too low (e.g., <10%), some computer features may stop working (e.g., video acceleration) and this may cause the "Echo Wave II" software to be unable to perform some of its functions. Therefore if your computer is running on batteries (meaning not connected to 220 V / 110 V mains supply), please ensure that they are sufficiently charged (at least 30%) for normal software operation. Please note that if computer was started and was running on batteries before you connected it to a mains power supply you may need to restart the computer after this change because not all computers and operating systems properly react to these power source changes.

31.14. Access to cine frames and their times from other applications

Question:

Is it possible to access "Echo Wave II" cine frames and their times from other applications (e.g., MATLAB)?

Answer:

"Echo Wave II" implements COM automation programming interface that allows to connect to running "Echo Wave II" software and access frozen cine or opened TVD file frames and their times.

In "Echo Wave II" folder "...\Config\Plugins\" is provided automation interface client .Net assembly (AutoInt1Client.dll) that can be used from 32/64-bit applications that support .Net. C# source code of this dll can be used as a reference for implementing automation interface clients in other programming languages. Also is provided sample MATLAB script AutoInt1Client_test.m.

For more information and supported automation interface functions please read file "...\Config\Plugins\autoint1client.txt" in "Echo Wave II" installation folder.

Please note that this interface is provided only for research purposes. In other cases for data exchange it is recommended to use file export to DICOM format.

31.15. Using text-based measurements data

Question:

Is it possible to get "Echo Wave II" measurements data in text-based or similar format?

Answer:

Using "Echo Wave II" it is possible to save image/report in XLSX format. XLSX file contains "Image" (or "Report") and hidden "Data" sheets. Hidden "Data" sheet in XLSX file contains information about patient and report measurements/calculations. If for research and automatic processing are required measurements in text-based format, it is recommended to extract them from that hidden "Data" sheet by finding string identifiers in Field ID column, because data positions (cell addresses) in both "Report" and "Data" sheets are not fixed.

Please note that reports in different formats (Printed, BMP, XLSX) may have different appearance and sizes/spacings of report elements.

For XLSX saving support must be installed Microsoft .NET Framework 3.5 SP1.

XLSX files can be viewed using Microsoft Excel Viewer or LibreOffice 4.1.

http://www.microsoft.com/en-us/download/details.aspx?id=10

http://www.libreoffice.org/

31.16. Automatic deletion of patient-related data

Question:

How to delete patient-related data (images, cines) automatically when software is closed?

Answer:

If your country law or clinic regulations require that patient data is not stored on local computer, you will need to modify some advanced ultrasound software options that can be found in "...\Config\Options\options2.txt". These options allow to delete patient-related data from local disk when software is closed or disable some software features. In order to turn on some option in file "options2.txt", using text editor like Notepad change corresponding flag values from 0 to 1.

IMPORTANT. Please note that deleted files cannot be restored, so if is selected option that deletes files, all measurements/calculations must be done in single session and, if required, images sent to DICOM server.

If, when software is closed, you want to delete files saving folder (usually C:\Echo Images), all its subfolders and also all other image/cine/report files that during software operation were saved to different locations (not only C:\Echo Images), use the following option:

on_close_delete_all_patients_files;1

Please note that this software cannot delete files that were generated by printing to file (e.g., print to PDF, XPS), copied/moved using other applications or Windows Explorer, sent by E-mail and stored by E-mail software (e.g., in its "Sent" folder or file system "Documents" folder of current user). This means that for disabling of some features you will need to do Windows administration. For example, remove PDF printer in order to avoid saving PDF files to unknown location, uninstall E-mail programs or disable access to them.

In order to delete existing and disable creation of new daily lists, use the following flag:

disable_daily_list;1

Also you may need to delete software logs. Although logs are helpful for software troubleshooting, they may contain file names that, depending on the chosen file/folder name generation options, may contain patient data (name, id).

on_close_delete_log_files;1

Disable change of files saving (quick saving) folder in options.

disable_change_of_quick_save_folder;1

Disable E-mail sending. This will disable E-mail sending from ultrasound software. If you want to disable E-mail globally, use Windows administration features or uninstall E-mail applications.

disable_e_mail_sending;1

Disable change of external applications. Set this option if you want to disable possibility to change the list of external applications in options (main menu).
disable_change_of_external_applications;1

Disable change of DICOM options. This flag may be turned on in order to avoid the change of options that affect DICOM communication after they were adjusted and tested.
disable_change_of_dicom_options;1

31.17. Saving to network drives

Question:
How to see mapped network drives in “Save As” dialog?

Answer:
To see mapped network drives in “Save As” dialog, follow instructions from Microsoft:

“Some Programs Cannot Access Network Locations When UAC Is Enabled”
https://docs.microsoft.com/en-us/previous-versions/windows/it-pro/windows-server-2008-R2-and-2008/ee844140(v=ws.10)

To work around this problem, configure the EnableLinkedConnections registry value:
1. Click Start, type regedit in the Start programs and files box, and then press ENTER.
2. Locate and then right-click the registry subkey HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Policies\System.
3. Point to New, and then click DWORD Value.
4. Type EnableLinkedConnections, and then press ENTER.
5. Right-click EnableLinkedConnections, and then click Modify.
6. In the Value data box, type 1, and then click OK.
7. Exit Registry Editor, and then restart the computer.

32. References

1. Echo Wave II Software Reference Manual.
File: "EchoWaveII_Software_Reference_Manual.*".
2. Echo Wave II DICOM Conformance Statement.
File: "EchoWaveII_Software_DICOM_Conformance_Statement.*".
3. Echo Wave II Software 4DView Plug-in User Manual.
File: "EchoWaveII_Software_4DView_Plugin_User_Manual.*".

33. Revision History

Revision	Revision Date	Description of Revision	Revision Author
0.0.1	2006.07.24	Draft	V.Perlibakas
1.0.0	2007.01.11	Initial Release	V.Perlibakas
1.0.1	2007.01.12	Added description of Color Doppler controls.	H.Alenkovich
1.0.2	2007.02.28	To "System Startup and Shutdown" section added comments about Windows Vista operating system.	V.Perlibakas
1.0.3	2007.05.14	Added information about Dual and Quad modes.	V.Perlibakas
1.0.4	2007.06.11	Updated information about B mode measurement tools.	V.Perlibakas
1.0.5	2007.06.27	Added section "Using Cine"	V.Perlibakas
1.0.6	2007.10.17	Added information about B+PW and PW modes. Updated information about Color Doppler controls. Added section "Frequently Asked Questions".	V.Perlibakas
1.0.7	2007.10.18	Added section "General PW Mode Measurements". Added section "Adjusting Pulsed Wave (PW) Doppler Mode Controls".	V.Perlibakas
1.0.8	2007.11.05	Added more information about PW controls.	H.Alenkovich
1.0.9	2007.11.09	Added section "Using 3D Lite, Easy 3D, and PanoView plug-ins".	V.Perlibakas
1.1.0	2007.12.04	Added information about Doppler Frequency control.	V.Perlibakas
1.1.1	2007.12.28	Added section "Monitor Calibration".	V.Perlibakas
1.1.2	2007.12.28	Updated information about PW Sample Volume control.	V.Perlibakas
1.1.3	2008.01.08	Updated information about control of 3D and PanoView plug-ins.	V.Perlibakas
1.1.4	2008.01.15	Added section "Using B (Color Doppler) Mode Zoom".	V.Perlibakas
1.1.5	2008.01.18	Added section "Using M Mode Zoom".	V.Perlibakas
1.1.6	2008.01.28	Updated information about M mode and Color Doppler mode controls.	V.Perlibakas
1.1.7	2008.01.29	Updated information about PW mode controls.	V.Perlibakas
1.1.8	2008.06.17	Updated information about B+PW, CFM+PW modes in subsections of section "Selecting Ultrasound Scanning Mode".	V.Perlibakas
1.1.9	2008.06.27	Updated user interface screenshots.	V.Perlibakas
1.2.0	2008.09.10	Updated information about Duplex and Triplex modes.	V.Perlibakas
1.2.1	2008.11.07	Updated information about Speckle Reduction. Added information about Tissue Harmonic Imaging.	V.Perlibakas
1.2.2	2009.01.08	Updated section "Color Averaging". Updated FAQ about presets backup and import.	V.Perlibakas
1.2.3	2009.01.21	Added section "CFM, PDI, DPDI Color Transparency".	V.Perlibakas
1.2.4	2009.03.16	Added information about software control using command line. Added section "Sending Data to DICOM Server".	V.Perlibakas
1.2.5	2009.03.20	Updated FAQ section.	V.Perlibakas
1.2.6	2009.04.17	Added section "Using Reports with Multiple Images".	V.Perlibakas
1.2.7	2009.06.01	Added section "Using Thumbnail Images". Updated information related to main menu.	V.Perlibakas
1.2.8	2009.09.07	Added section "Changing User Interface Language".	V.Perlibakas
1.2.9	2009.10.05	Added section "HPRF (High Pulse Repetition Frequency)".	H.Alenkovich V.Perlibakas
1.3.0	2009.10.29	Updated information about ultrasound scanning controls.	V.Perlibakas
1.3.1	2009.12.24	Added information about automatic B mode Gain and TGC adjustment, changed some terms.	V.Perlibakas
1.3.2	2010.01.08	Updated section "Using Reports with Multiple Images".	V.Perlibakas

Revision	Revision Date	Description of Revision	Revision Author
1.3.3	2010.01.22	Added information about arrangement of annotations and comments templates.	V.Perlibakas
1.3.4	2010.04.21	Updated information about reports, updated FAQ section.	V.Perlibakas
1.3.5	2010.05.18	Added information about possibility to invert Color Doppler palette by clicking it with mouse.	V.Perlibakas
1.3.6	2010.05.24	Added section "Using Full Screen Mode". Added section "Indication of Ultrasound System Status".	V.Perlibakas
1.3.7	2010.08.03	Updated sections "Software control using command line" and "Using Reports with Multiple Images".	V.Perlibakas
1.3.8	2010.09.09	Added information that ultrasound image must be frozen in order to perform different kinds of annotations.	V.Perlibakas
1.3.9	2010.10.25	Updated information about PW mode measurements.	V.Perlibakas
1.4.0	2010.11.23	Added information about possibility to measure exam-specific area and circumference measurement fields using single line as a diameter of a circle.	V.Perlibakas
1.4.1	2010.12.09	Added information about possibility to move graphical objects.	V.Perlibakas
1.4.2	2011.01.04	Updated section "Indication of Ultrasound System Status".	V.Perlibakas
1.4.3	2011.02.10	Added section "Using DICOM Worklist".	V.Perlibakas
1.4.4	2011.02.18	Added section "Using 4DView Plug-in".	V.Perlibakas
1.4.5	2011.03.30	Added information about printing to DICOM printers.	V.Perlibakas
1.4.6	2011.04.06	Added information about DICOM character sets.	V.Perlibakas
1.4.7	2011.05.03	Added more information about creation of reports with multiple images.	V.Perlibakas
1.4.8	2011.06.29	Updated information about printing of reports.	V.Perlibakas
1.4.9	2011.09.14	Updated information about presets, reports, TGC.	V.Perlibakas
1.5.0	2011.10.13	Added information about menus of ControlBars headers, information about B Angle control, B scanning types, updated B closed trace measurement information.	V.Perlibakas
1.5.1	2011.11.18	Added sections "Volume using One Trace" and "Volume using Two Traces".	V.Perlibakas
1.5.2	2012.03.14	Updated information about storing of presets, entering hospital/clinic name, data backup during software update.	V.Perlibakas
1.5.3	2012.03.23	Added section "Using Daily List".	V.Perlibakas
1.5.4	2012.12.11	Added information about import of previous growth data (OB exam).	V.Perlibakas
1.6.0	2013.01.07	Updated images of main software window and ControlBars, updated Patient window information.	V.Perlibakas
1.7.0	2013.04.26	Added more information about software control using command line.	V.Perlibakas
1.7.1	2013.05.30	Added information about sending of multiple previously saved DICOM files to DICOM server.	V.Perlibakas
1.8.0	2013.12.03	Added information about support of SmartUs beamformer, information about Continuous Wave (CW) Doppler mode and information about PISA calculation of cardiology package.	V.Perlibakas
1.8.1	2014.02.13	Updated information about "Patient" window.	V.Perlibakas
1.9.0	2014.03.12	Added section "Access to cine frames and their times from other applications".	V.Perlibakas
1.9.1	2014.05.26	Added information about adjustment of Color Doppler window size.	V.Perlibakas
2.0.0	2014.08.20	Added section "Using text-based measurements data".	V.Perlibakas
2.1.0	2014.11.10	Added FAQ section "Adjusting ultrasound image size".	V.Perlibakas

Revision	Revision Date	Description of Revision	Revision Author
2.1.1	2014.11.28	Added information about possibility to display physical mouse cursor coordinates.	V.Perlibakas
2.1.2	2014.12.31	Updated information about "Patient" window.	V.Perlibakas
2.2.0	2015.01.30	Added FAQ section “Adjusting Windows 8 screen resolution”.	V.Perlibakas
2.3.0	2015.04.28	Added information about controls of Compound mode.	V.Perlibakas
2.3.1	2015.06.11	Added information about command-line options -save_image, -save_report, -save_cine.	V.Perlibakas
2.3.2	2015.06.19	Updated information about thumbnail images.	V.Perlibakas
2.3.3	2015.08.18	Updated section “Direct E-mail Sending”	V.Perlibakas
2.4.0	2015.09.09	Added section “Vascular Puncture”.	V.Perlibakas
2.4.1	2015.09.16	Updated “Vascular Puncture” section.	V.Perlibakas
2.5.0	2015.10.19	Added FAQ section “Adjusting Windows 10 screen resolution”.	V.Perlibakas
2.6.0	2015.11.06	Added information about Color M mode.	V.Perlibakas
2.6.1	2015.12.23	Updated information about software customization.	V.Perlibakas
2.7.0	2016.03.04	Added section “Brachytherapy/Biopsy Grid”.	V.Perlibakas
2.7.1	2016.05.09	Added FAQ section “Using mouse wheel to adjust TrackBar (slider) controls in Windows 10”.	V.Perlibakas
2.7.2	2016.08.29	Updated information about “Send” button.	V.Perlibakas
2.7.3	2016.09.29	Updated images of measurement controls.	V.Perlibakas
2.7.4	2016.12.07	Added section “Area and Circumference using Rectangle Tool”.	V.Perlibakas
2.7.5	2017.01.31	Added FAQ section “Automatic deletion of patient-related data”.	V.Perlibakas
2.7.6	2017.12.28	Added information about Multibeam mode.	H.Alenkovich
2.8.0	2018.01.09	Added section “Using Patients Database”.	V.Perlibakas
2.8.1	2018.05.25	Added FAQ section “Saving to network drives”.	V.Perlibakas
2.8.2	2018.08.27	Updated section “Saving and Loading Images and Cines”.	V.Perlibakas
2.8.3	2018.10.15	Added FAQ section “Playback of AVI video files on Windows 10 operating system”.	V.Perlibakas
2.8.4	2018.12.07	To document header added “Echo Wave II” release version.	V.Perlibakas
2.8.5	2019.01.09	Updated Report window image.	V.Perlibakas
2.8.6	2019.03.28	Added information about patient data export from database and description of available B Lines Density values.	V.Perlibakas
2.8.7	2019.06.03	Updated information about available Color Doppler Window and PW Sample Volume values.	V.Perlibakas
2.8.8	2019.06.07	To section “Adjusting Ultrasound Image Quality” added information about FPS indicator.	V.Perlibakas
2.8.9	2020.07.01	Updated information about B Frequency adjustment.	V.Perlibakas
2.9.0	2021.08.20	Updated information about sending E-mail using Windows 10 “Mail”.	V.Perlibakas
2.9.1	2022.12.08	Updated company information.	V.Perlibakas

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