

ECHO WAVE
ULTRASOUND SOFTWARE
FOR
ECHO BLASTER 64 AND ECHO BLASTER 128
FAMILY SCANNERS



OPERATION MANUAL

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4. REVISION HISTORY.....70

ATTENTION:

This manual is related to ECHO BLASTER 64 and ECHO BLASTER 128 family scanners.

This description is based on ECHO BLASTER 128 scanner. Some modes and features can be differ depends on connected model.

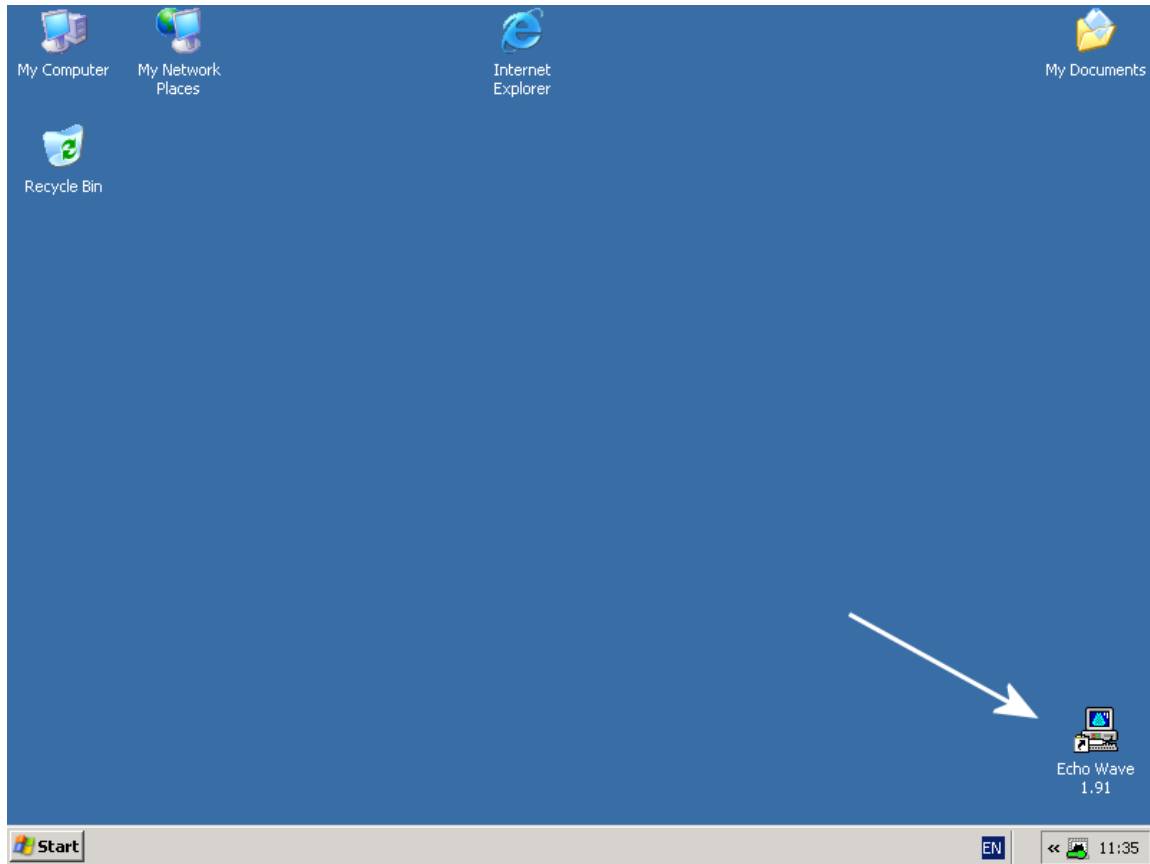
This software can be used with LogicScan 64 or LogicScan 128 family scanners also, but in black and white modes only and without Doppler modes support. For Doppler modes together with LogicScan family scanners use Echo Wave II software.



1. SYSTEM START-UP

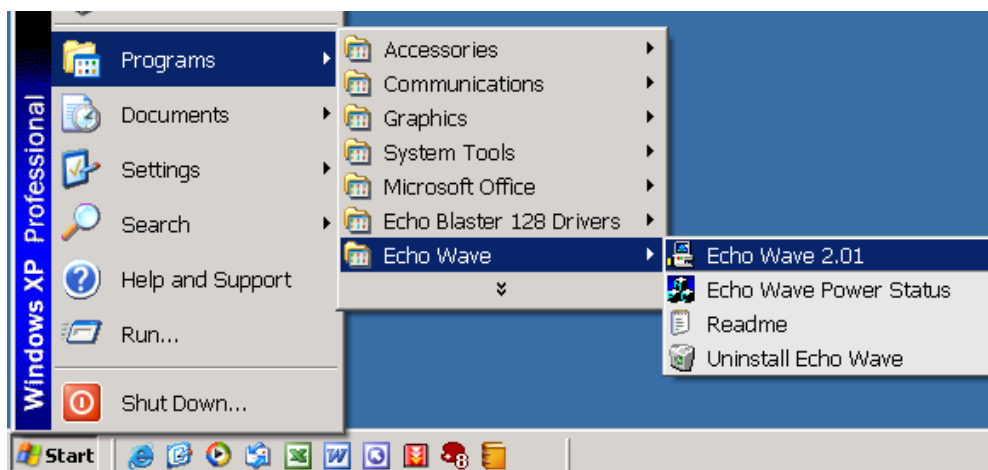
1.1. Turning the system on

After connecting all scanner parts together and installation of the **Echo Blaster 128(64) Drivers** package as described in **User Guide** manual, press the **Power** button. Please wait until the operating system (**Windows XP**) is loaded and you will see a desktop picture similar to this:



Place your mouse pointer on the **Echo Wave** icon and double click it to start the scanner software.

An alternative way to start **Echo Wave** software: go to the installed icon group and click on the **Echo Wave** icon. See the picture below.



**NOTE:**

Desktop view can differ from our example depending on the Windows theme configuring.

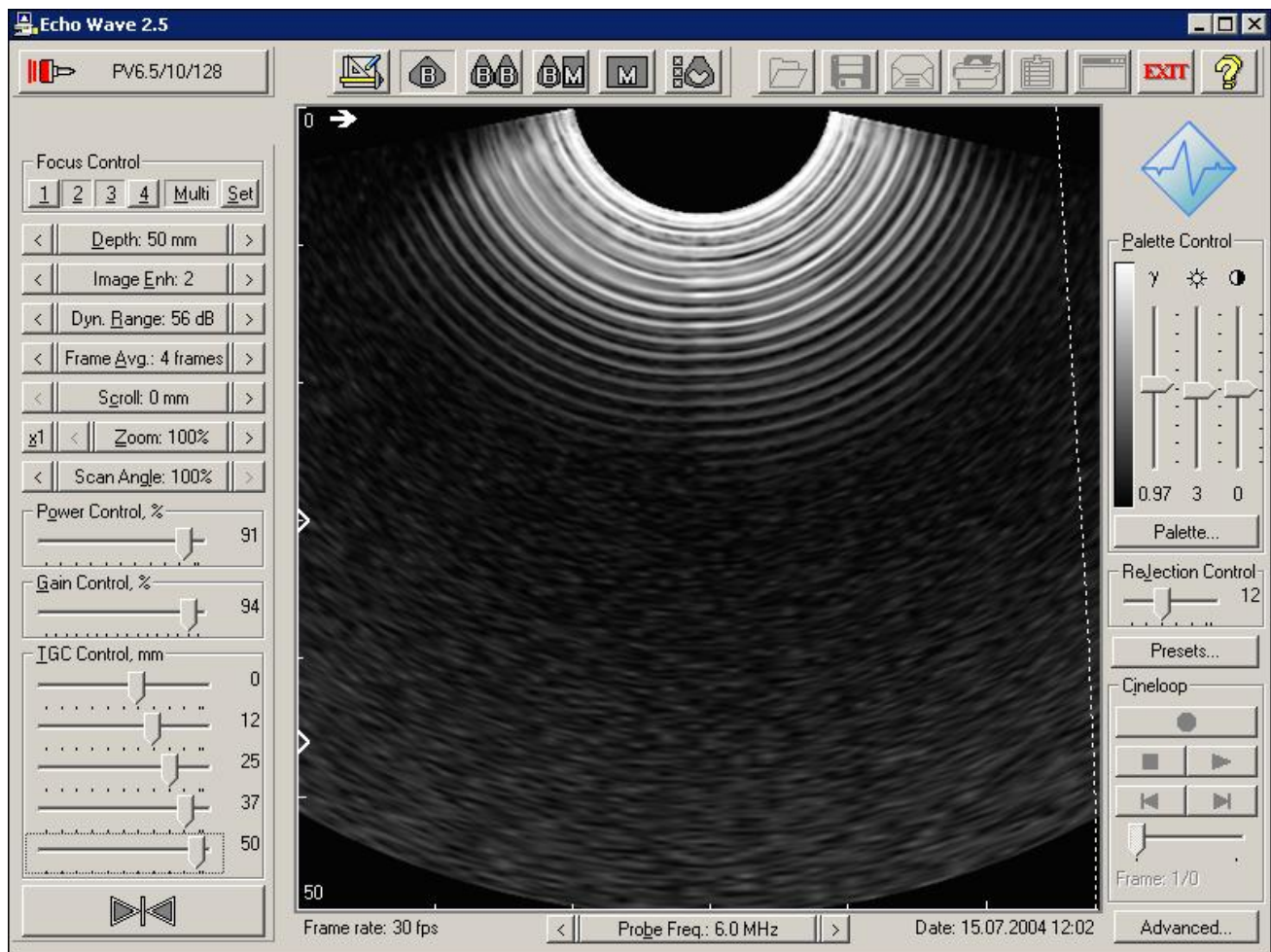
2. SOFTWARE MAIN CONTROLS

This chapter describes main controls.

2.1.1. Main controls

The Echo Wave software is intended to control various scan modes and other features such as measurements, printing, saving the echo images and cineloop to disk etc.

Some controls are available only in Scan mode, others only in Freeze mode or Measurement mode. After the software is started you will see this (or similar) window:



NOTE:

Be sure that your PC monitor properly calibrated. Please refer to chapter “Calibrate Monitor” for instructions.



NOTES:

In various versions of the software some controls and their positions can differ from the above display.

All screenshots shown are based on English interface settings.



NOTES:

Sometimes the system will ask you to confirm or cancel an action.

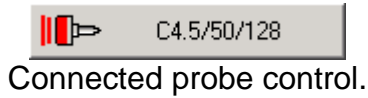
Clicking on or buttons means action confirmation.

Clicking on or buttons means action canceling.

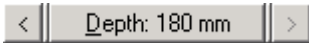
ESC button on keyboard means action canceling and closing drop-down menu lists.

2.1.2. Quick reference

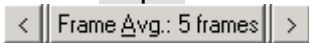
Quick controls reference see below.



Connected probe control.



Scan Depth control.



Frame Averaging control.



Scan Angle control.



Scan & Freeze modes control.

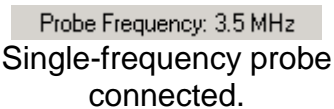


Palette controls:

- Gamma control
- Brightness control
- Contrast control



Quick pre-defined presets.



Frequency indicator.



Focal Zone control in Multi Focus mode.

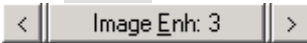
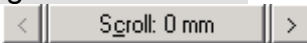


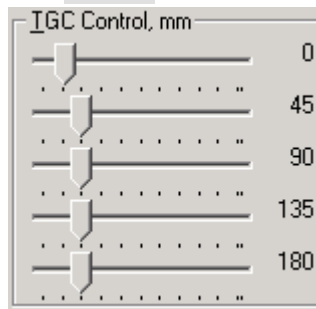
Image Enhancement control.



Depth Scroll (offset) control.



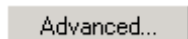
Power control.



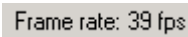
TGC (Time Gain Compensation) control.



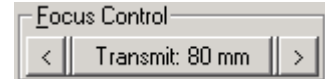
Rejection control.



Advanced options/controls.



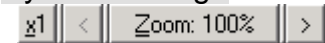
Current frame rate indicator.



Focal Zone control in Dynamic Focus mode.



Dynamic Range control.



Zoom control.



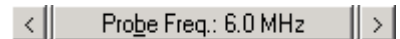
Gain control.



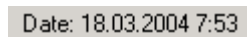
Current Palette indicator.



Advanced palette controls.



Frequency selector.



Current date and time indicator.



Cineloop controls.



B-mode control.



M-mode control.



Saving ultrasound image or Cineloop information to the disk.



Adding/editing frozen image information.



Help call.



Focus point indicator in Dynamic Focus mode.



TGC (Time Gain Compensation) curve.



B/B-mode control.



Thumbnail mode control.



Direct e-mail sending with attached image or Cineloop file.



External applications call list.



Scanning direction indicator.



Minimize / Restore / Close buttons



Measurements controls.



B/M-mode control.



Loading ultrasound image or Cineloop file from the disk.



Printing report on the system printer.



Exit and save all parameters.



Focus point indicator in Multi Focus mode.

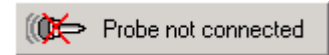
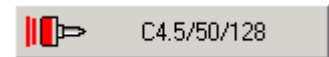
More detailed information about these controls read below.

2.1.3. Ultrasound probe connecting or changing

The scanner allows working with a wide range of linear and convex probes (transducers). Changing of the probe should be made only in the Freeze mode or if the scanner is turned off. The current connected probe type is displayed on the probe button.

Connected probe name. For two probes system pressing this button will change the active probe.

Probe(s) not connected or not installed to the system



3. DETAILED DESCRIPTION

3.1. Scanning Controls

3.1.1. Scan and Freeze modes

The scanner allows receiving an echo-image in B, B/B, B/M and M modes in a real time scale (Scan mode). For switching the scanner between live Scan and the static Freeze modes there are several methods:

- **Freeze** button;
- **Insert** key on the keyboard;
- **Space** bar on the keyboard;
- Click on the right mouse button in a echo-image zone



The Freeze mode off. Scan mode.



The Freeze mode on.



NOTE:

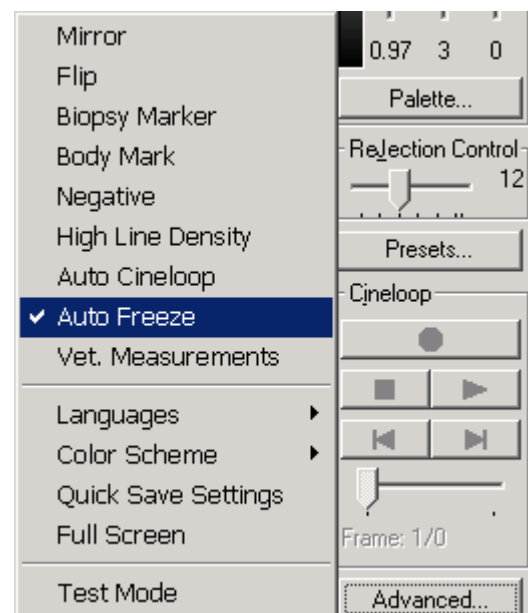
Some functions are available only in a Frozen mode, some functions only in the live Scan mode.

3.1.2. Auto Freeze option

After being on for approx. 10 min. in the live Scan mode, the scanner will automatically switch to the Freeze mode. This function was designed to prolong the probe's lifetime.

To disable this default feature:

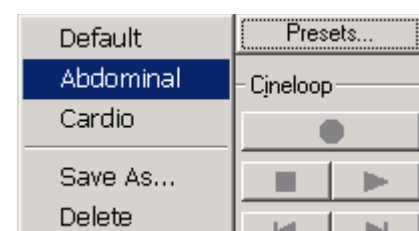
- Click on the **Advanced...** button;
- Un-check or deselect **Auto Freeze** menu item.



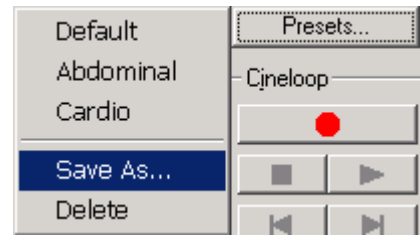
3.1.3. Presets

It is possible to save all current parameters like Gain, TGC, Gamma, Depth and many others and later to load this configuration quickly.

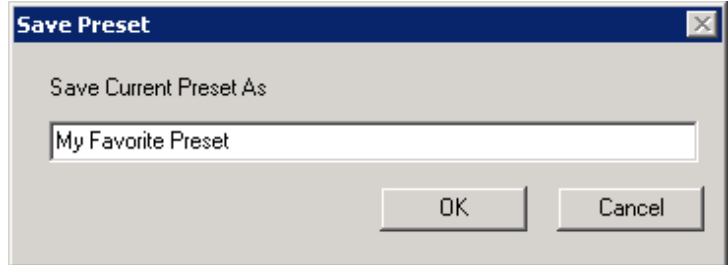
Click on the **Presets...** button and select from the drop-down list for the desired function.



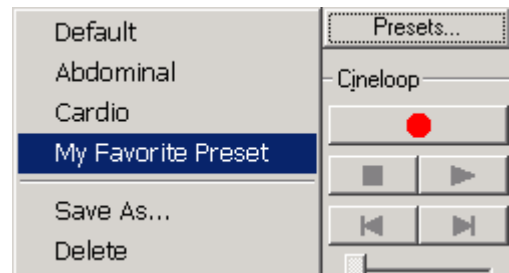
To save a current configuration you will have the system set up the way you want to remember for a specific application and then click on the **Presets...** button and then select **Save As...** from the menu item in the drop-down menu.



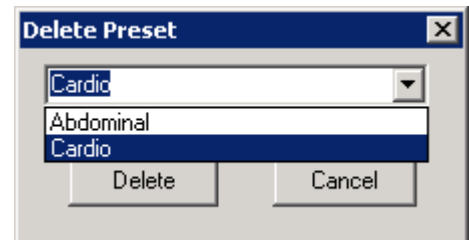
You will need to input the desired preset name you want to save the set-up under.



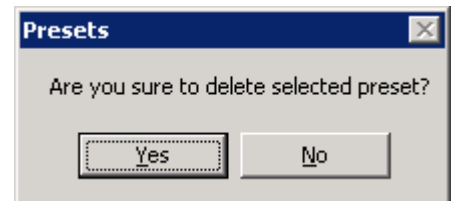
This name you will then be displayed in the presets list.



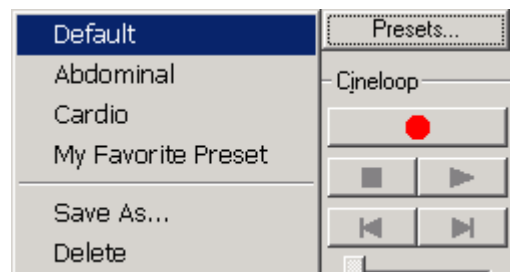
For deleting unnecessary presets select **Delete** from the menu list and then select the preset name you desire to erase or eliminate from the drop-down list.



You will need to confirm your desire to continue deleting the preset.




The **Default** preset will restore the factory settings for connected probe.



3.1.4. Exiting from the program


To exit from the system software you can do the following (several methods):

- Click on the button ;

- Click on the  button;
- Hot key: **F12**;
- Hot key: **Alt+F4**

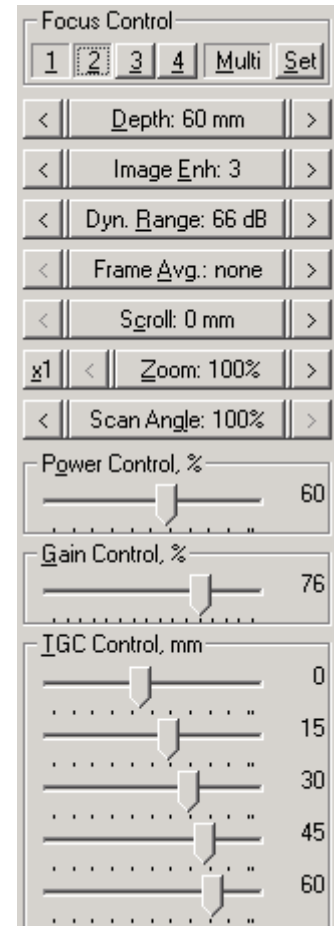
All current control states or setups (Gamma, Gain, TGC etc.) will be saved and will be restored on the next program startup.

3.1.5. B-mode control

- Click on the button ;
- Hot key: **F5**


This mode shows the real time sectional view of various organs of patient and is the basic function of ultrasound diagnosis. In the B-mode various diagnostic studies can be performed.

If the scanner was in the Freeze mode, the system automatically goes to the live Scan mode.



Scanner controls in B-mode.

3.1.6. B/B-mode control

- Click on the button ;
- Hot key: **F6**

In the B/B-mode the left half-frame is in the live Scan mode and the right half-frame is Frozen.

Above main group of scanner controls the buttons representing the live image will be highlighted as shown in the picture below.

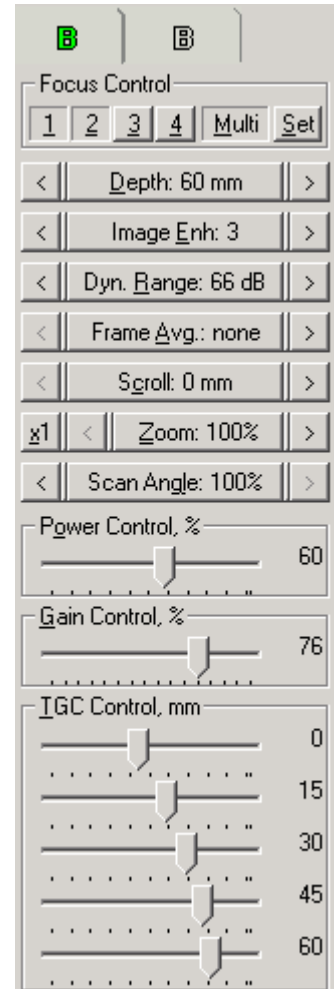


Using these buttons you can select which half-frame is in the live scan mode and make the opposite half-frame go into a Frozen mode.

Alternative method to select half-frames:


- Click on half-frame using right mouse button.

Scan / Freeze mode controls also work in this mode.



Scanner controls in B/B-mode.

3.1.7. B/M-mode control

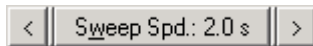
- Click on the button ;
- Hot key: **F7**

At B/M-mode the echo-image is divided on two parts. In the left part, is the B-mode with a displayed M-mode cursor displayed. The right part is in M-mode. Above the main group of scanner controls the buttons represented on the picture appear.

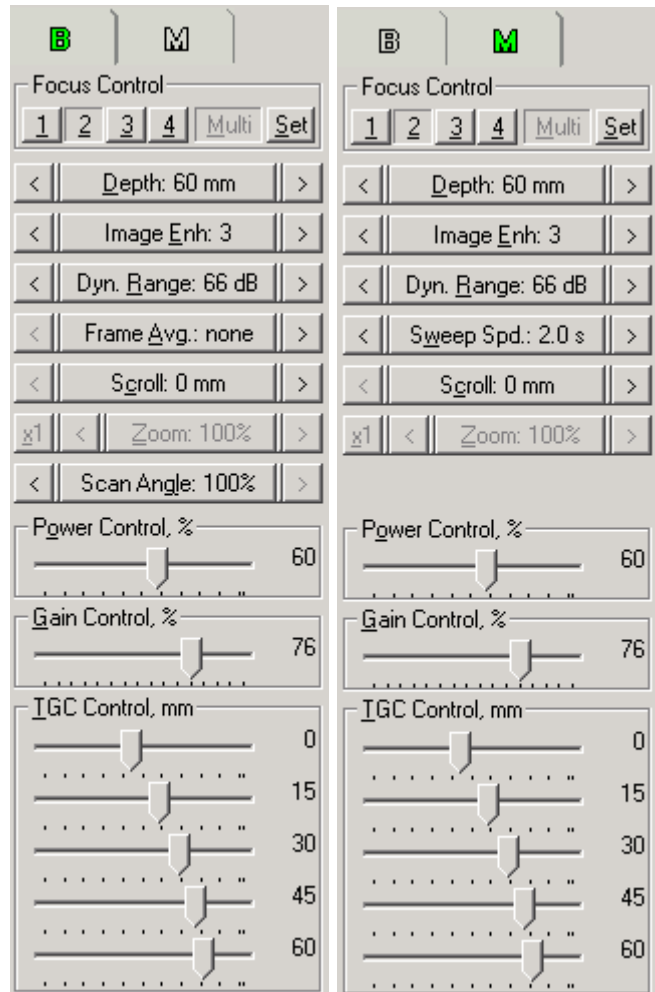


On the B-mode image the M-mode cursor line shows the position where the M-mode image is being made from. Using the mouse you can move the M-mode sample cursor to a new place in the B-mode image and see results in M-mode side of the screen.

At the M-mode tab a new control box appears and provides a Sweep Speed control.



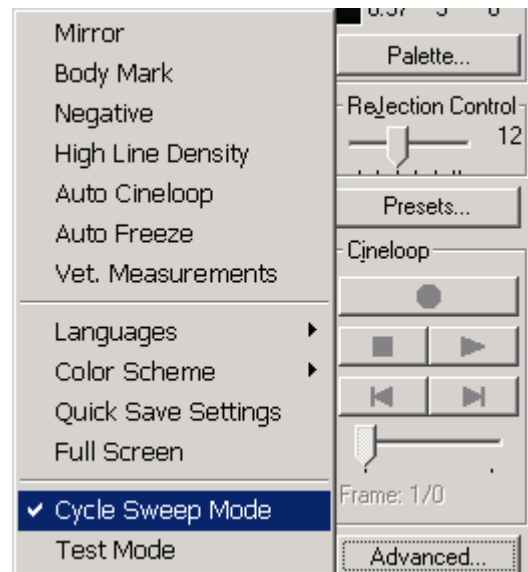
For details refer to M-mode controls described below.



Scanner controls in B/M-mode & M/B-mode.

It is also possible to change ultrasound information displaying in the M-mode window.


- Click on the **Advanced...** button;
- Select/deselect **Cycle Sweep Mode** menu item.



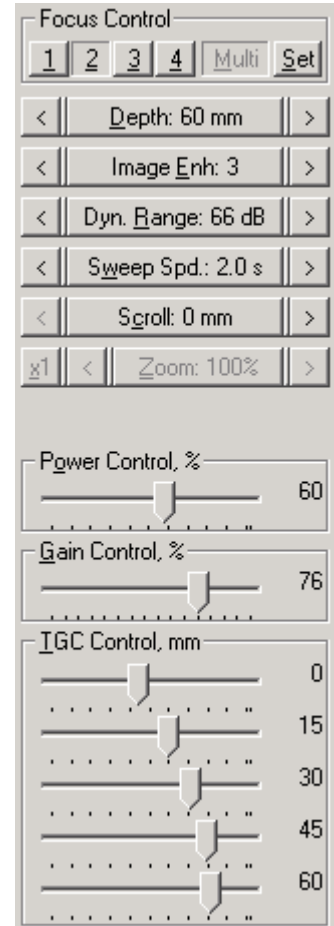
3.1.8. M-mode control

If the scanner was in B/M-mode display, the switching to M-mode will be done immediately. If the scanner was in B or B/B-mode, before going to the M-mode, the scanner will proceed to the M-mode cursor setting mode.

Set the M-mode cursor by the mouse to the necessary position and once again click on the M-mode button or press the key **F8** on the keyboard. In the main group of scanner controls the M-mode control functions will appear.

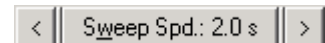
- Click on the button ;
- Hot key: **F8**

Scanner controls in M-mode.



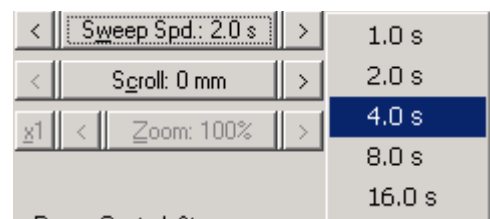
The sweep speed is controlled by **Sweep Speed** control button:

- Hot key: **W** then **<-** and **->** keyboard cursor keys;
- Use **<** and **>** buttons to also change the values.



Alternative methods to control sweep speed in the M-mode zone:

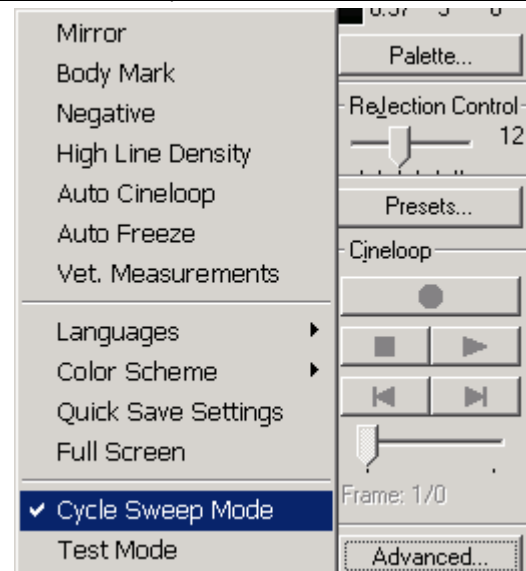
- Click on the **Sweep Speed** button and select necessary time value from the drop-down list



NOTE:
Multifocus and Zoom features do not work in M-mode.

It is also possible to change the information presentation in the **M**-mode window:

- Go to **Advanced...** menu button;
- In the drop-down list check/uncheck **Cycle Sweep Mode** menu item.



3.1.9. Setting M-cursor for M-modes scanning

First it is necessary to place an **M**-cursor on **B**-mode echo-image in the desired position. The **M**-mode cursor setting can occur during scanning in **B/M**-mode on the **B**-mode half-frame or during the turning on the **M**-mode from **B/B** or **B**-modes. The **M**-mode cursor is displayed on the echo-image as a direct white line. The **M**-mode cursor can be positioned by moving the mouse pointer to the desired position and click on the left mouse button. The **M**-mode cursor will travel to this position. Moving the mouse pointer in an echo-image zone with a pressed left button will drag **M**-cursor.

3.1.10. Focusing control

Latest revisions of Echo Blaster 128 family scanners and some probes support two focusing modes: **Multifocus** focusing and **Dynamic** focusing.

The differences between these modes are:

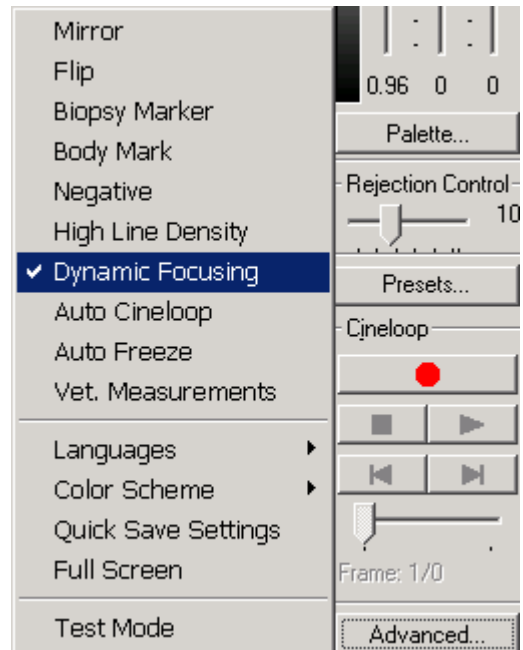
- **Multifocus** focusing mode: up to 4 focal zones can be manually activated for transmit and receive modes. Frame rate reduces when two or more focuses are active;
- **Dynamic** focusing mode: 8 active focal zones during receive mode and 8 positions of transmit focus can be chosen manually. Image quality is very sharp. Frame rate is comfortable for many applications.

For high frame rate necessary to chose **Multifocus** focusing mode with one focus selected.

To turn on dynamic focusing do following:

- Click the **Advanced...** button;
- From the drop-down menu select **Dynamic Focusing** menu item.

To turn off the **Dynamic** focusing mode repeat this procedure once more.



NOTE:

If this menu item unavailable, it means that your Echo Blaster family scanner or probe not support dynamic focus feature.

Multifocus focusing mode

To turn on/off a necessary focus zone click on the appropriate button using mouse according to the selected focusing zone.

- Hot key **1**
- Hot key **2**
- Hot key **3**
- Hot key **4**



To turn on a multifocus mode:

- Click on the **Multi** button;
- Hot key: **M**



The unnecessary focusing zone in a multifocus mode is similarly switched off. It is necessary to remember, that one focusing zone should be always turned on and if more than one focus zone is used they should be in sequential order.

A focus point indicator is displayed on the screen to show the selected focuses and their depth location.

To turn off a multifocus mode click on the **Multi** button once more. In activated multifocus mode, several focusing zones are possible but will result in a slower scanning speed or frame rate.

Clicking on the **Set** button brings up a few factory focusing presets. These sets are individual for each type of probe. After the probe connection the last used focus set (for this probe type) will be activated automatically.



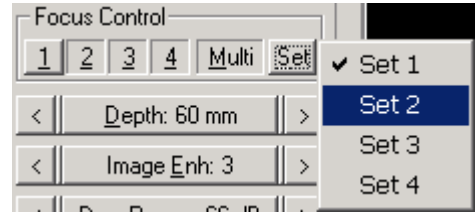
Focus sets are controlled by **Set** button:

- Hot key: **S** then **Up** and **Down** keyboard cursor keys +

ENTER

An alternative method to control focuses set:

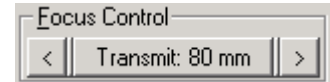
- Click on the **Set** button and using the mouse select the necessary focus set.



Dynamic focusing mode

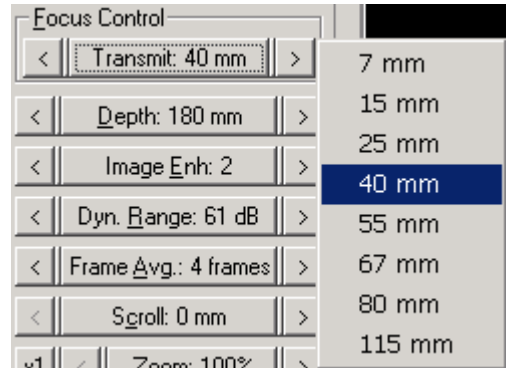
The transmit focusing is controlled by the **Transmit** control button:

- Hot key: **F** then **<-** and **->** keyboard cursor keys;
- Use **<** and **>** buttons to change the values.



Alternative methods to change transmit focusing:

- Click on the **Transmit** button and using mouse select the necessary value from the drop-down list.
- Hot key **1**
- Hot key **2**
- Hot key **3**
- Hot key **4**
- Hot key **5**
- Hot key **6**
- Hot key **7**
- Hot key **8**

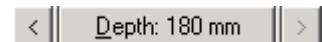


A focus point indicator **▲** is displayed on the screen the selected focus and their depth location during transmit.

3.1.11. Depth control

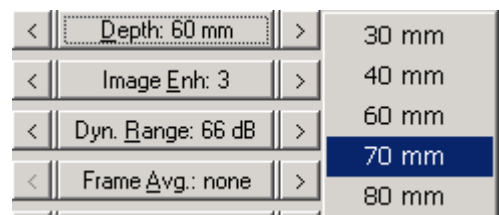
The scanning depth is controlled by the **Depth** control button:

- Hot key: **D** then **<-** and **->** keyboard cursor keys;
- Use **<** and **>** buttons to change the values.



An alternative method to control depth:

- Click on the **Depth** button and using the mouse select the necessary depth value from the drop-down list

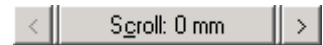


3.1.12. Scroll control

Scroll shifts the displayed scanning image from the selected depth value.

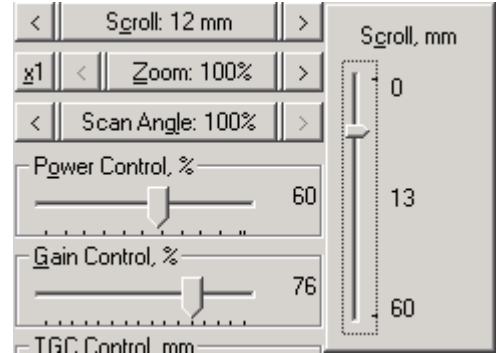
The depth offset is controlled by the **Scroll** button:

- Hot key: **C** then **<-** and **->** keyboard cursor keys;
- Use **<** and **>** buttons to change the values;



An alternative method to control offset;

- Click on the **Scroll** button and, by moving the mouse controlled vertical slider, the user can select necessary depth value;
- Use **<-** and **->** keyboard cursor keys to move slider;
- Press **Esc** or **ENTER** keyboard keys to close Scroll slider.



3.1.13. Zoom control

The coefficient of zoom can vary in the range from 1 to 8.

The zoom ratio is controlled by the **Zoom** button:

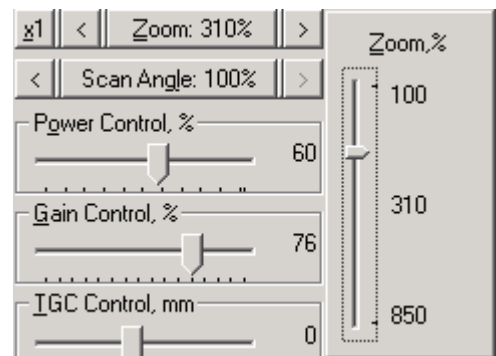
- Hot key: **Z** then **<-** and **->** keyboard cursor keys;
 - Use **<** and **>** buttons to change the values.
- Reset zoom value to original size:



- **x1** button;
- Hot key **X**

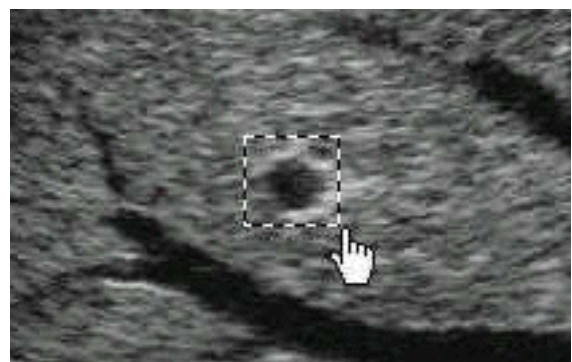
An alternative method to control zoom ratio:

- Click on the **Zoom** button and move the mouse controlled vertical slider to select the necessary zoom value;
- Use **<-** and **->** keyboard cursor keys to move the slider;
- Press **Esc** or **ENTER** keyboard keys to close the **Zoom** slider.

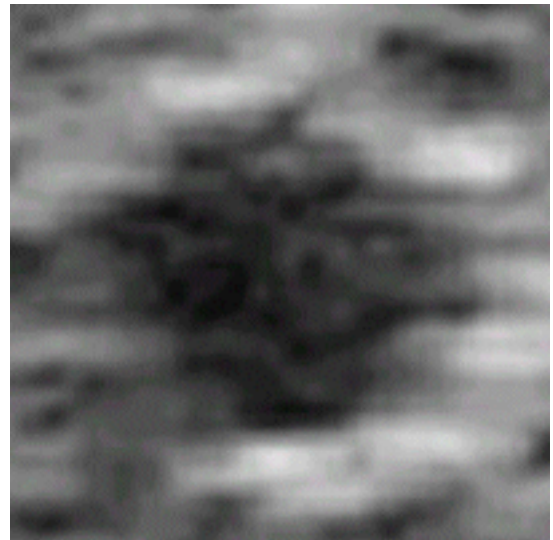


The alternate way to zoom a desired area:

- Using the left mouse button pressed select the object to be zoomed into the rectangle;



- Release the left mouse button and the image inside the rectangle will be zoomed.



In the **Zoom** mode it is possible to change the rectangle position (window) inside echo-image. To change the position locate the mouse pointer above an echo-image and press the left mouse button. Move the pointer above an echo-image pressing the left mouse button. Move the mouse pointer and the zoomed echo-image area will move also. Release the left mouse button.

Zoom ratio in all zoom methods is indicated on the **Zoom** control button.

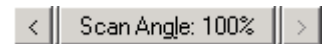


3.1.14. Scan Angle control

The scan angle can vary in the range from 50% to 100% of the viewed field. Selecting a smaller angle of view dramatically increases the ultrasound frame rate. You should use the least possible scan angle when a high frame rate is required, for example during heart tissue examination.

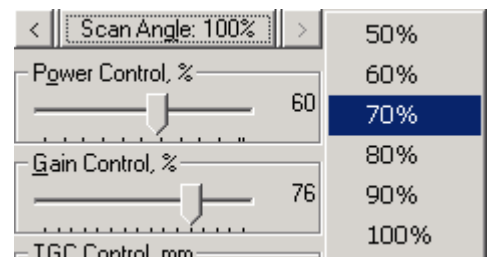
The scan angle is controlled by the **Scan Angle** control button:

- Hot key: **L** then **<-** and **->** keyboard cursor keys;
- Use **<** and **>** buttons to change the values.



Alternative method to control the scan angle:

- Click on the **Scan Angle** button and using the mouse select the necessary value from the drop-down list.



NOTE:
This feature is available for the convex probes only

3.1.15. Cineloop control

The scanner has the ability to record and playback the real time ultrasound frame stream. The number of recorded frames depends on the installed system memory size in the computer (see the table below):

Nr.	Installed memory size	Cineloop length
1	32 Mb	0 frames
2	64 Mb	more then 128 frames
3	128 Mb	more then 256 frames
4	256 Mb	more then 512 frames
5	512 Mb and more	more then 1024 frames
6	1 Gb and more	more then 2500 frames

Main Cineloop controls:

- Hot key: **[I]**



Record button



Stop button



Play button



1 recorded frame back button



1 recorded frame forward button



Slider control (frame location). Available only in **Stop** and **Play** mode.

Frame: 105/1024

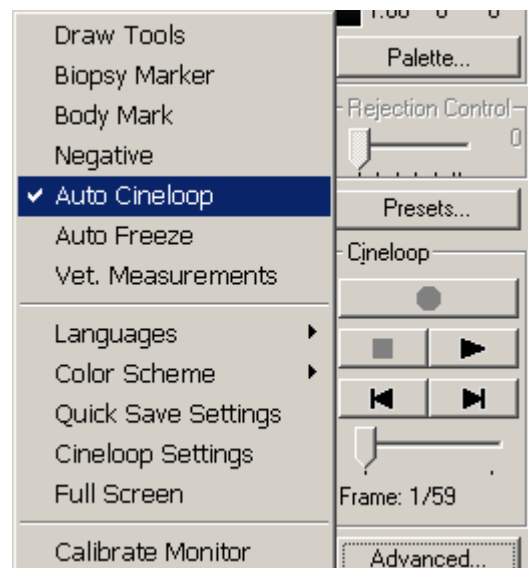
Indication of current / total recorded frames. Available only in **Stop** and **Play** mode.

The Cineloop feature has two (2) possibilities of control: manual and automatic.

- Automatic mode: the scanner automatically begins to record the stream of ultrasound frames in the live scan mode and automatically stop the recording in Freeze mode.
- Manual mode: the user must manually click on the **Record** or **Stop** button.

Automatic / Manual mode possible to select in the **Advanced** menu:

- Check / uncheck **Auto Cineloop** menu option.



Cineloop recording is possible only in the live **Scan** mode and playback is possible only in the **Freeze** mode.

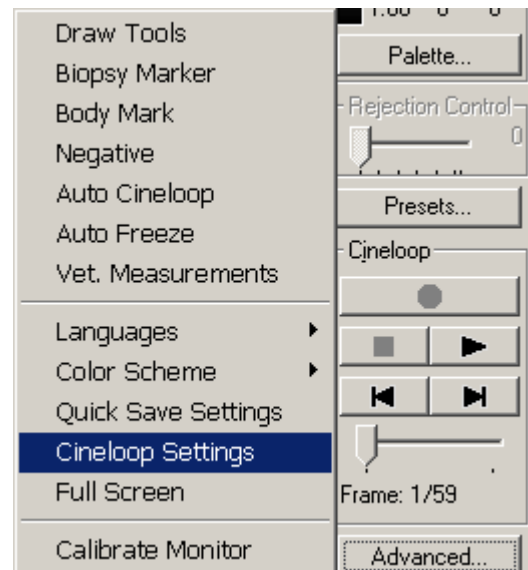
Recorded **Cineloop** contains all the scan parameters which were set before recording. **It is not recommended to change the scan parameters during the Cineloop recording.** If you need to change some of the parameters then stop recording and change the parameters before starting the recording again. If, during the **Cineloop** recording scan parameters were changed, **Cineloop** will contain the latest scan parameters values.

During playback **Cineloop** parameters are shown in the usual places. For example, the probe description is displayed on the probe control button; frame rate value is displayed at the bottom of the window and so on. Most of the parameters are shown at the scanner control panel of the main window.

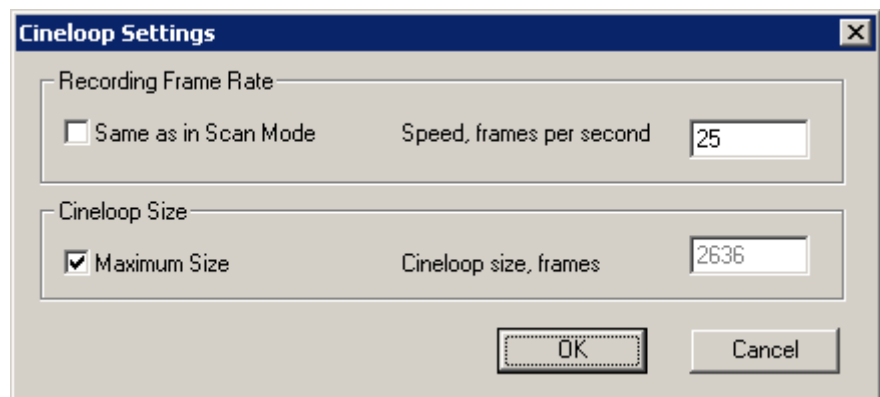
By default **Cineloop** recording speed is 25 frames/sec and **Cineloop** length is maximum. Sometimes need to change these values.

Cineloop settings possible to change in the **Advanced** menu:

- Switch scanner to the **Freeze** mode;
- Click the **Advanced...** button;
- From the drop-down menu select **Cinellop Settings** menu item;
- **Cinellop Settings** window will appear;



- Here is possible to change **Cineloop** settings like recording FPS and **Cineloop** size;
- Click **OK** button when all settings done;
- Switch scanner to the **Scan** mode;
- Scanner will work with new settings.



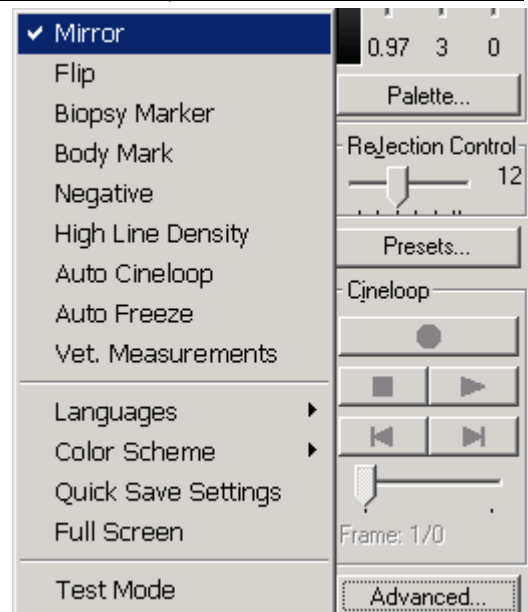
3.1.16. Scanning direction control

The mode is intended to change ultrasound image orientation from left to right and up to down. Probe enclose has a relief mark to affix the scanning direction.

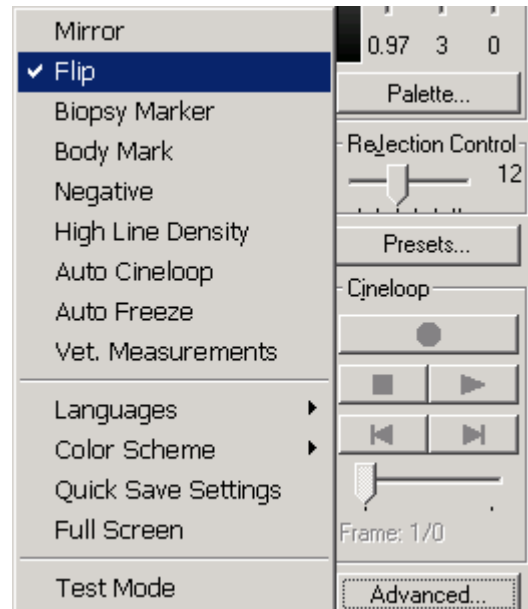
- Click on the **Advanced...** button;


Advanced...

- To change the scanning direction orientation from left to right, from the drop-down menu select the **Mirror** menu item;



- To rotate image orientation from up to down, from the drop-down menu select the **Flip** menu item.



Ultrasound image changes its scanning direction from left to right or from up to down. The scanning direction indicator  shows the scanning direction.



NOTE:

Flip (up/down) and Mirror (left/right) display modes are available only for B-mode images.

3.2. Preprocessing

Preprocessing is signal and image processing done before the echo data is stored in memory.

This chapter describes the preprocessing controls.

3.2.1. Dynamic range control

This function changes the echo-image dynamic range. Lowering the dynamic range raises the image contrast and a higher dynamic range makes a smoother or less contrasty image.

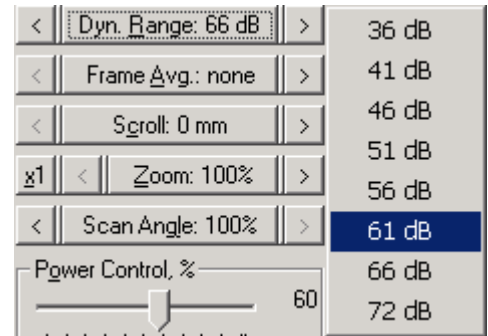
The dynamic range is controlled by the **Dynamic Range** control button:

- Hot key: **R** then **<-** and **->** keyboard cursor keys;
- Use **<** and **>** buttons to change the values.



Alternative methods to change dynamic range:

- Click on the **Dynamic Range** button and using mouse select the necessary value from the drop-down list



3.2.2. Power control

Power control is intended for the acoustic power control of the ultrasound beam.

The power is controlled by the **Power Control** slider:

- Hot key: **O** then **<-** and **->** keyboard cursor keys;
- Use mouse to move **Power Control** horizontal slider.



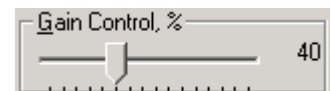
3.2.3. Overall gain control

Amplifiers increase voltage amplitudes. This is called gain. Gain is set subjectively so echo information appear with an appropriate or desired brightness.

The gain volume changes the overall gain or sensitivity level of echo-signal in **M**-mode as well as **B**-mode.

The overall gain is controlled by **Gain Control** slider:

- Hot key: **G** then **<-** and **->** keyboard cursor keys;
- Use mouse to move **Gain Control** horizontal slider.

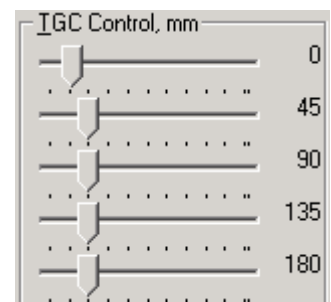


3.2.4. Time gain compensation

TGC Control (Time Gain Compensation) adjusts the gain at the specific depths.

The adjustment of TGC is controlled by a set of horizontal sliders labeled **TGC Control**:

- Hot key: **T** then **<-** and **->** keyboard cursor keys;
- Use **Tab** keyboard key to change active slider;
- Use mouse to move **TGC Control** slider.



From the right side of the **TGC Control** sliders actual depth values are shown.



At the right side of the echo-image a dashed **TGC** curve is displayed. This curve indicates the gain level on each depth point.

3.2.5. Probe frequency

If a connected ultrasound probe supports the multi-frequency feature it is possible to control its operating central frequency.

The central frequency is controlled by **Probe Frequency** control button:

- Hot key: **[B]** then **[<-]** and **[->]** keyboard cursor keys;
- Use **<** and **>** buttons to change the values.



Alternative method to control probe frequency:

- Click on the **Probe Frequency** button and using the mouse select the necessary value from the drop-down list.



If the probe connected does not support the multi-frequency feature, only the frequency indicator will be present.



3.3. Postprocessing

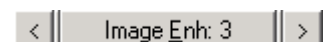
Postprocessing is image processing performed on image data in the frozen mode or retrieved from memory. It determines how echo data stored in memory will appear on the display. This chapter describes post processing controls.

3.3.1. Image Enhancement control

This function makes edges and border areas more strongly visible giving better object perspective to the image or more smoothly to observe the soft tissues structure.

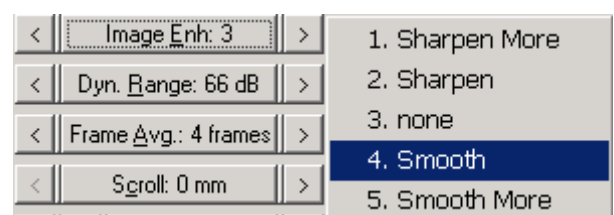
The image enhancement is controlled by the **Image Enhancement** control button:

- Hot key: **[E]** then **[<-]** and **[->]** keyboard cursor keys;
- Use **<** and **>** buttons to change the values.



An alternative method to control the image enhancement:

- Click on the **Image Enhancement** control button and using the mouse select the necessary value from the drop-down list.

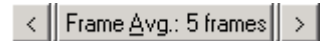


3.3.2. Frame Averaging control

Frame averaging is intended to decrease the echo-image noise level.

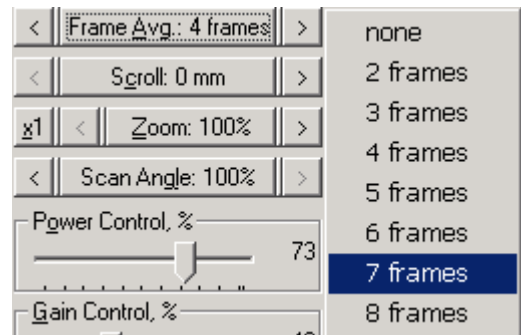
The noise reduction is controlled by the **Frame Average** control button:

- Hot key: **A** then **<-** and **->** keyboard cursor keys;
- Use **<** and **>** buttons to change the values.



An alternative method to control the noise reduction:

- Click on the **Frame Average** control button and using the mouse select the necessary value from the drop-down list.



This value means how many frames will be averaged by the ultrasound hardware to decrease the noise level.

To soften the image a high value can be chosen. It is better to choose a low value for faster moving parts (such as the heart or fetus) examination.

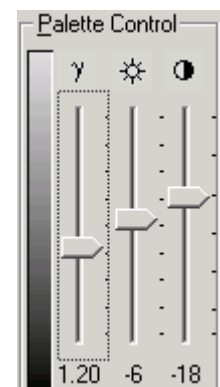
3.3.3. Palette control

The gamma control function makes it possible to select the curves that divide the gray scale into low echo, medium echo and high echo grade areas. It makes certain areas more distinct and some areas less distinct and can suppress high echo level areas. Echo brightness/contrast controls are also available.

The adjustments of **Gamma**, **Brightness** and **Contrast** are controlled by set of vertical sliders **Palette Control**:

- Hot key: **P** then **<-** and **->** keyboard cursor keys;
- Use **Tab** keyboard key to change active slider;
- Use mouse to move **Palette Control** sliders.

Palette grayscale displays all gamma, brightness and contrast changes.



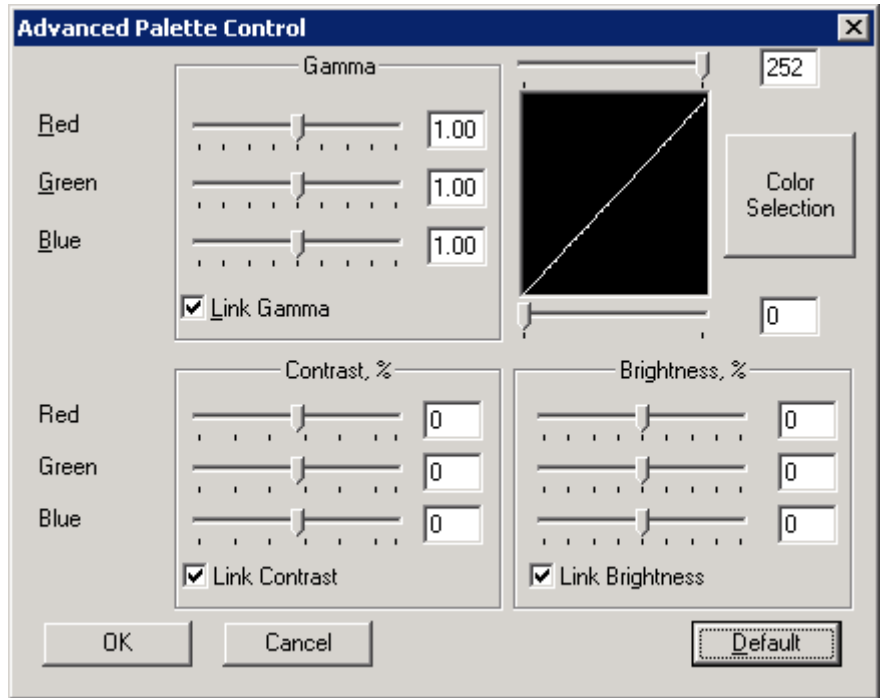
3.3.4. Advanced palette control

Advanced palette controls allow the possibility to adjust gamma, brightness and contrast levels more precisely.

Click on the **Palette...** button.

Palette ...

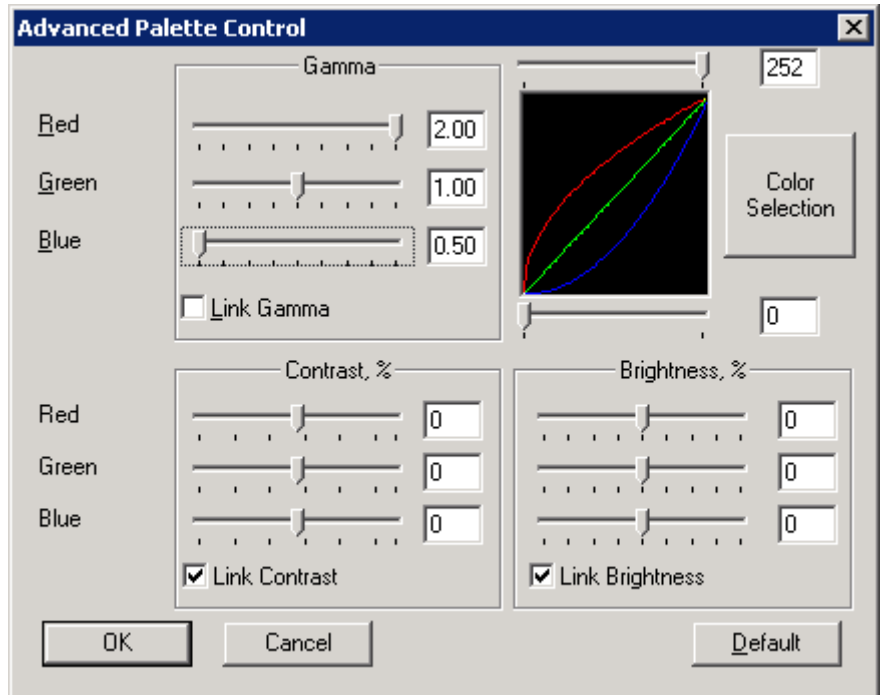
The dialog box with Advanced Palette Control management of echo - image will appear on the screen.



Use slider controls to change the gamma correction, brightness and contrast for each Red/Green/Blue channel.

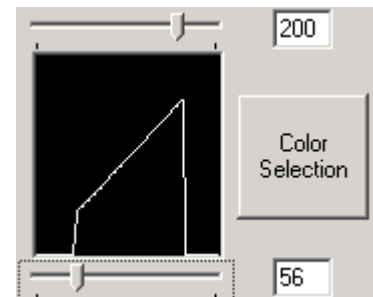
If **Link** is enabled (checkbox marked) all sliders move simultaneously.

If **Link** is disabled (checkbox not marked) all sliders moves separately.



Also it is possible to crop palette. Use these horizontal sliders or input fields to crop palette.

To replace gray scale with color click on **Color Selection** button.

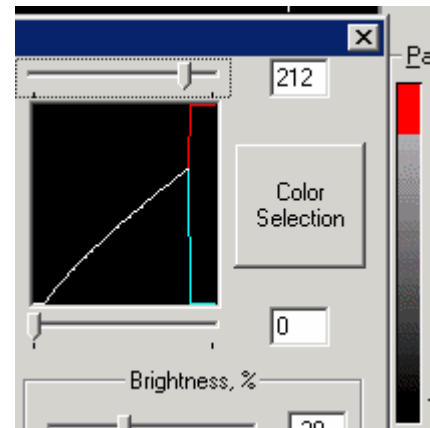


The color management dialog box will appear on the screen. Select the necessary or desired color (for example red).



Move top horizontal slider to the left as shown on the image. This action will replace the white shades on red color. Result you can see at the shade grade indicator and on ultrasound image.

You can also replace the dark shade grades by using the bottom slider.



For reset controls to default state use:

- Hot key: **[D]** keyboard key;
- Click on **Default** button.



3.3.5. Rejection Filter

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

By changing the position of **Rejection Control** slider, it is possible reduce amount of noises. To achieve best results, adjustment must be done after adjustment of other controls (**TGC, Gain, Dynamic range**). Side effect of this processing is that weakest echoes became invisible when of rejected signal is relatively high (slider position close to right).

The Rejection Filter is controlled by **Rejection Control** slider:

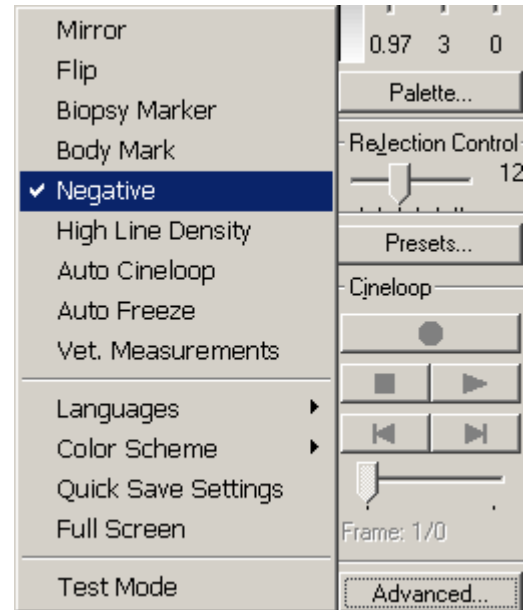
- Hot key: **[J]** then **[<-]** and **[>-]** keyboard cursor keys;
- Use mouse to move **Rejection Control** horizontal slider.



3.3.6. Negative

To get negative (inverted)/positive echo image do following:

- Go to the **Advanced...** menu;
- Check/uncheck **Negative** menu item.



3.4. Measurements

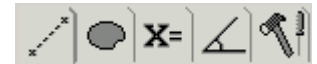
This chapter describes measurement controls.

3.4.1. Measurements control

Measurements are available in the live **Scan** or **Freeze** modes.

- Click on the button:
- Hot key: **F4**

Above controls main group the represented buttons will appear.

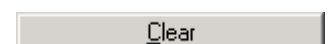


Clicking on button (tab) activates corresponding measurement tools (from left to right):

- Linear measurements
- Perimeter (circumference) and square (area) measurements
- Obstetric / cardiac / veterinary measurements
- Angle measurements
- Additional tools .

To erase all measurement calipers and current calculations do following:

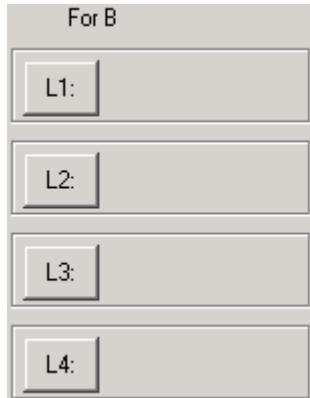
- Using mouse click on the **Clear** button;
- Hot key: **C** key on the keyboard.



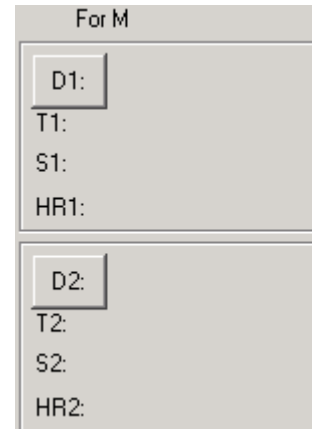
3.4.2. Linear measurements

Click on linear measurements tab . Linear measurement controls will appear.


The linear measurements are made using four sets of calipers in B-mode and two sets of calipers in M-mode.



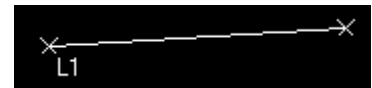
Linear measurement control panel in B-mode.



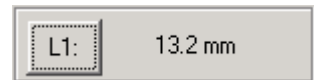
Linear measurement control panel in M-mode

For the measurement caliper selection select the  button. Move the mouse pointer on the echo-image. The pointer looks like a measuring caliper. Locate the mouse pointer above the distance first point. Press the left mouse button and, not letting off it, drag the pointer to the distance final point. Let off the left mouse button.

The measuring calipers and connecting line will appear on the echo-image.



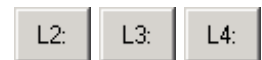
Alongside the **L1** button on linear control toolbar the measured distance results will appear.




To adjust the position of any measuring calipers locate the mouse pointer on a caliper, press the left mouse button and not letting off it, drag the marker to the necessary position. Let off the left mouse button. The measured distance automatically varies. To repeat the measurements for the 1st set of measurement calipers click on the button **L1**. The calipers and the connecting line on echo-image will be erased to start again.

The measurement of linear distances by other sets of calipers is made similarly.

The buttons **L2:**, **L3:**, **L4:** are used for linear measurements on B-image according to second, third and fourth pair of measuring markers.



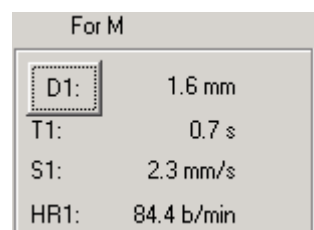
To activate the 1st set of measurement calipers on an M-mode image click on the  button. The measurement methods are similar to measurements on B-mode image.

Measuring calipers on M-mode image.




The measurement results are displayed on linear measurements toolbar as follows:

- Alongside the button **D1:** - measured distance between the calipers is displayed in millimeters (mm);
- Alongside the **T1** text is displayed the measured time, sec;
- Alongside the **S1** text is measured velocity (slope), mm/sec;
- Alongside the **HR1** text is displayed heart rate, beats/min.

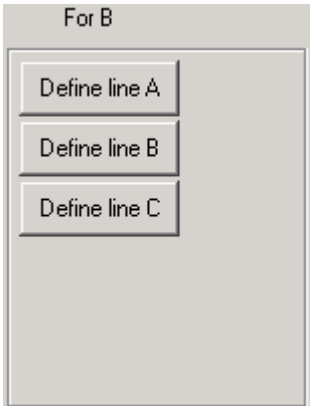


The linear measurement activation on an M-mode image by the second set of calipers is made similarly. The button **D2:** is used for the second pair of calipers.

3.4.3. Angle measurements

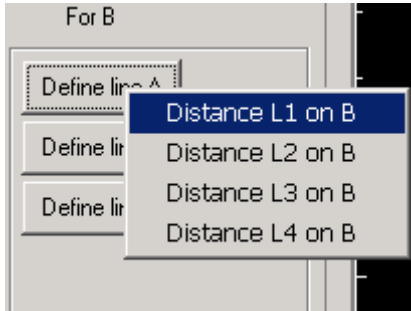
Click on the angle measurement tab .

The angle measurements can be made using three sets of calipers in B-mode. To measure an angle at least two lines need to be defined. Use L1-L4 caliper selections (lines) to define them.

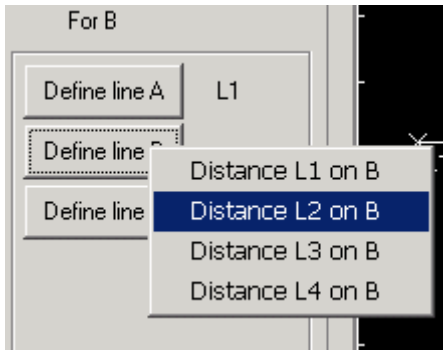
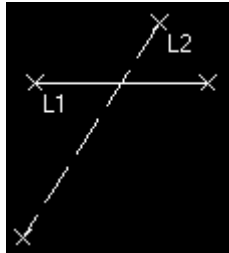


Angle measurement controls.

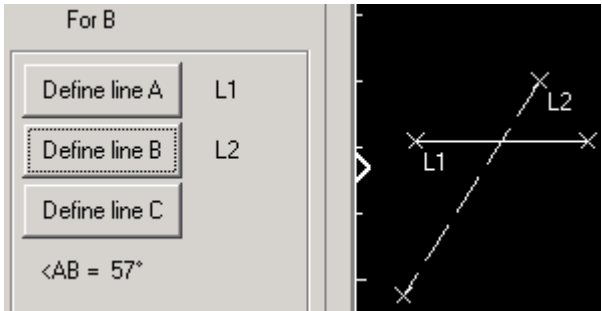
- Click on the **Define line A** button;
- Select the set of calipers labeled **L1**;
- Define (draw) the line **L1** on the echo image:



- Click on the **Define line B** button;
- Select another set of calipers labeled **L2**;
- Define (draw) line **L2** on the echo-image:




System will calculate angle value between lines **L1** and **L2**.



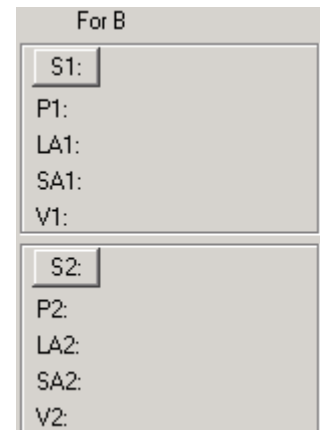
**NOTE:**

If appropriate lines are already defined, the results of the angle measurements are displayed immediately. If they are not defined yet, then the results are being calculated dynamically during the defining.


3.4.4. Perimeter and square measurements

Click on perimeter and square measurements tab . The perimeter and square measurement controls will appear.

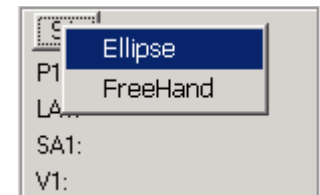
The perimeter and square measurements can be made by two independent groups of calipers. The measurements can be made by **FreeHand** or active trace method (measured area contouring) or **Ellipse** method (to overlay the ellipse on a measured area).



Perimeter and square measurements by Ellipse method

Click on the button  to activate perimeter and square measurements with the first set of calipers. Under the button a drop-down menu will appear.

In this drop-down menu select **Ellipse** method of perimeter and square measurement.

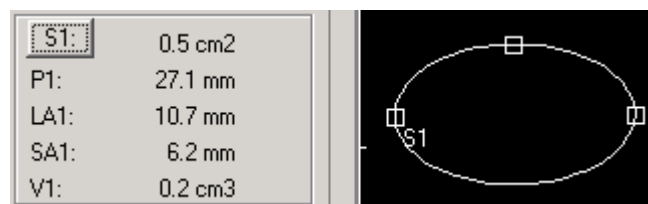


Move the mouse pointer on echo-image. The pointer looks as a measuring caliper. Place the mouse pointer to the first point of the measured area. Click left mouse button once and move the mouse pointer to the opposite point of the measured area. The ellipse appears on the echo-image. The opposite point of the ellipse will follow mouse pointer. Click the left mouse button again to stop moving and place ellipse on the image.

The measured values of:

- Square **S1** (cm²);
- Perimeter **P1** (mm);
- Lengths large **LA1** (mm);
- Small **SA1** (mm) axes;
- Value **V1** (cm³)

are displayed on the perimeter and square measurements toolbar.



The ellipse has three binding points marked as small squares. The two located on the opposite ellipse sides are intended for the ellipse largest axis. The third point is intended for the ellipse small axis setting. To adjust the position of any ellipse binding points locate the mouse pointer on it, press the left mouse button and not letting it off, drag the mouse pointer to the necessary point. Then let off the left mouse button. The system will recalculate and display new values.

The second ellipse measurement can be called by mouse clicking on **S2** button. And the same functions and controls are used as on the first ellipse measurement.

Perimeter and square measurement by FreeHand or active trace mode method

Click on the button **S1:** to activate perimeter and square measurements by the first set of calipers. Under the button a drop-down menu will appear.

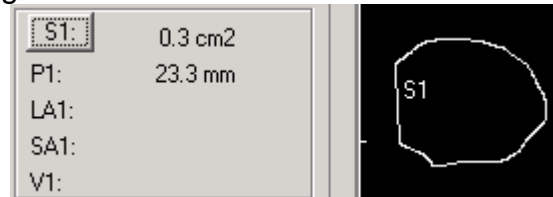
In this drop-down menu select the **FreeHand** method of perimeter and square measurement.

Move the mouse pointer on echo-image. The pointer looks as a measuring caliper. Place the mouse pointer to the first point of the measured area. Click the left mouse button once and outline or trace the measured area moving mouse. The defined area line appears on the echo-image. Click the left mouse button once again. The loop automatically closes back to the first or starting point and display a defining line.

The measured values of:

- Square **S1** (cm²);
- Perimeter **P1** (mm)

are displayed alongside on the perimeter and square measurements toolbar.



The second free hand line can be called by mouse clicking on **S2** button. The control functions are similar to the first trace line.

3.4.5. Obstetric measurements packages

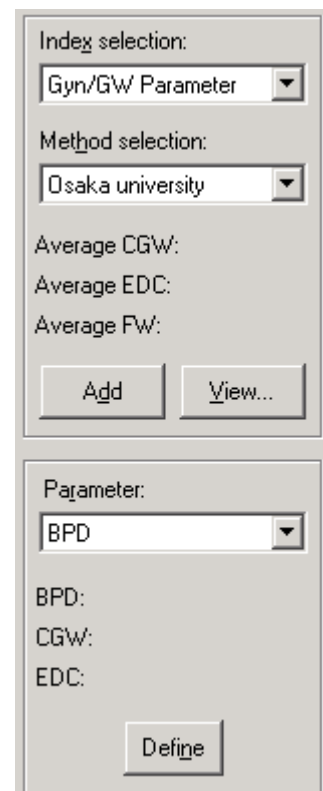
Click on the **X=** tab for obstetrical calculations control.

In the drop-down **Index selection** window lists the type of obstetrical calculations that are available:

- **Gyn/GW Indication** - calculations based on known dates of a pregnancy course;
- **Gyn/GW Parameter** - parametric calculations based on fetus geometrical parameters;
- **Gyn/Fetus Weight** - calculations of fetus weight.

Select from the **Index selection** list the item appropriate to required calculations type:

- Using mouse select from drop-down list necessary calculation type;
- Hot key: **X** then **Up** and **Down** keyboard cursor keys.



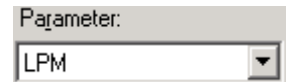
3.4.6. Calculations on known dates of a pregnancy course

For calculation based on known dates of a pregnancy course select the item **Gyn/GW Indication** in the drop-down **Index selection** list.



The calculation can be based on any from the following parameters:

- LPM – last menstrual period;
- BBT – basal body temperature;
- KED – known examination day.

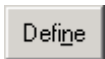


Define parameter in the drop-down list **Parameter:**

- Using mouse select from drop-down list necessary parameter;
- Hot key: **R** then **Up** and **Down** keyboard cursor keys.

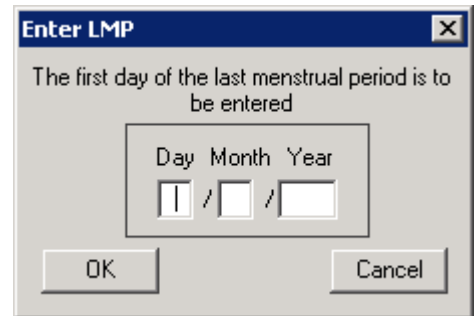
After choice of the necessary calculation:

- Using mouse click on the **Define** button;
- Hot key: **N** on the keyboard.



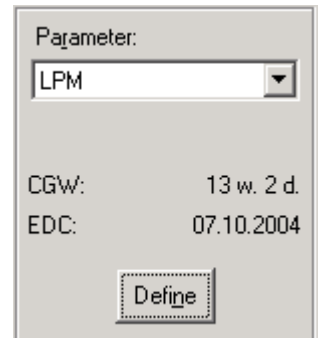
The dialog box with parameters input fields will appear. Input the required date to the fields.

During input the entered date on reliability is automatically checked.



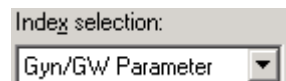
The calculations results will appear on toolbar:

- CGW - fetus age in weeks and days;
- EDC - expected date of labor (date of birth).



3.4.7. Calculations on fetus geometrical size

For pregnancy term calculation based on fetus geometrical sizes select the item **Gyn/GW Parameter** in the drop-down **Index selection** list.



The calculations can be done by one of main methods used for similar calculations. In the drop-down list **Method selection** select the item appropriate to a required method:

- USA version;
- Hansmann method;
- Campbell method;
- Tokyo university;
- Osaka university.



Select from the drop-down list **Method selection** using:

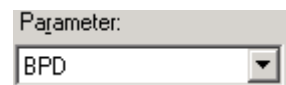
- Using mouse select from drop-down list necessary parameter;

- Hot key: **H** then **Up** and **Down** keyboard cursor keys.

Calculation can be based on one of the following parameters:

- **AC** – Abdominal Circumference;
- **BPD** – Biparietal Diameter;
- **CRL** – Crown-Rump Length;
- **FL** – Femur Length;
- **FTA** – Fetal Trunk Cross-Sectional Area;
- **GS** – Gestational Sac;
- **HC** – Head Circumference;
- **HL** – Humeral Length;
- **LV** – Length of Vertebrae.

For each selected method the list of possible parameters in the drop-down list **Parameter** is shown. Select in this list item appropriate to the required parameter.

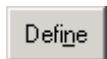


Select from the drop-down list **Parameter** using:

- Using mouse select from drop-down list necessary parameter;
- Hot key: **R** then **Up** and **Down** keyboard cursor keys.

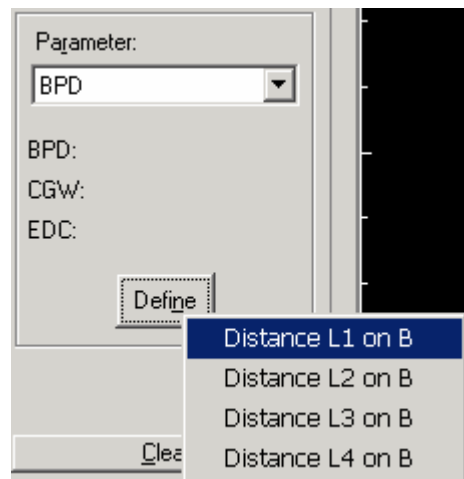
After choice of the necessary parameter:

- Using mouse click on the **Define** button;
- Hot key: **N** on the keyboard.

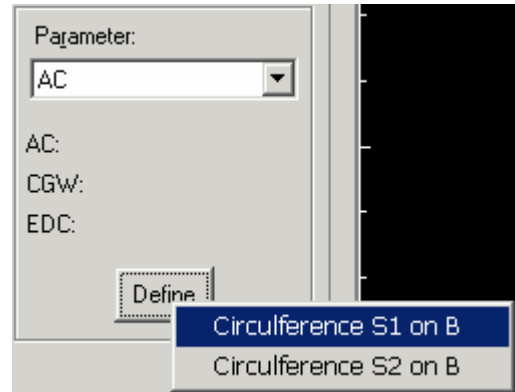


On the screen the menu containing possible methods of fetus geometrical sizes measurement appears. Depending on the selected parameter the measurement method can be linear/perimeter/square.

Marker choice for linear measurements.



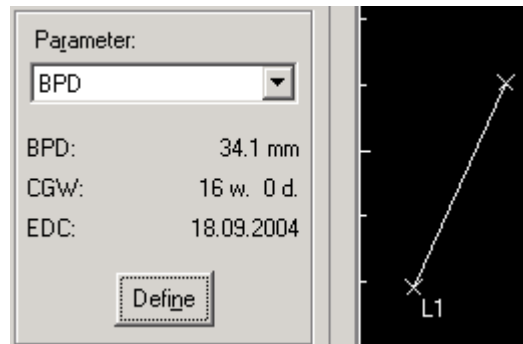
Marker choice for perimeter and square measurements.



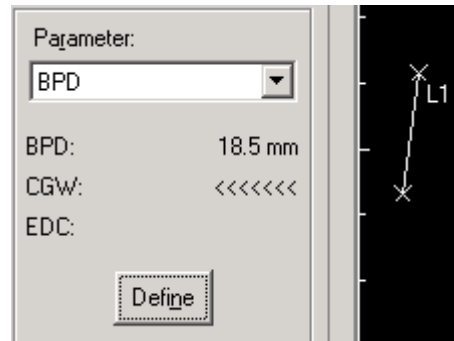
Call the marker for appropriate geometrical size measurements. The geometrical measurements can be made as linear/perimeter/square measurements. If these measurements are already made using linear/perimeter/square measurements, the calculated results are displayed immediately. If the measurements are not made yet, the results are being calculated dynamically during measurement.

The calculations results are shown in the fields located under the **Parameter** list:

- From the right of string appropriate to the selected parameter - geometrical size;
- From the right of string **CGW** - designated fetus age;
- From the right of string **EDC** – expected date of labor (birth).

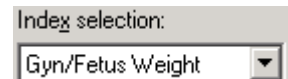


If the geometrical size is either too small or too large for calculations by given parameter, **CGW** string is shown as <<<<<< or >>>>>> accordingly. The date of birth is not shown in this case.



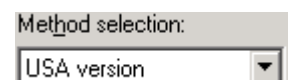
3.4.8. Fetus weight calculations

For fetus weight calculation select item **Gyn/Fetus Weight** in the drop-down **Index selection** list.



The calculations can be done by one of main methods used for similar calculations. In the drop-down list **Method selection** select the item appropriate to a required method:

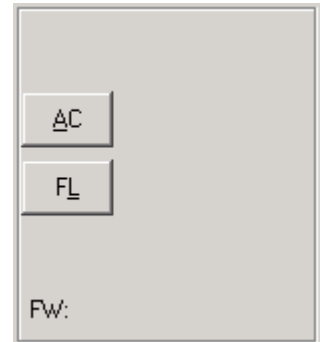
- USA version;
- Hansmann method;
- Tokyo university;
- Osaka university.



Select from the drop-down list **Method selection** using:

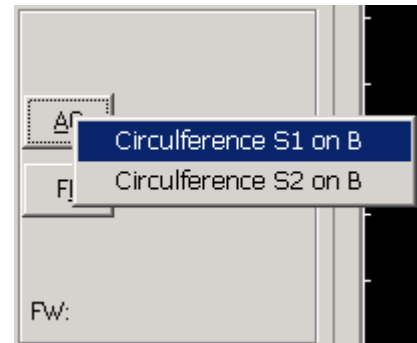
- Using mouse select from drop-down list necessary parameter;
- Hot key: [H] then [Up] and [Down] keyboard cursor keys.

The obstetrical calculations toolbar appears (USA version Method selection example).



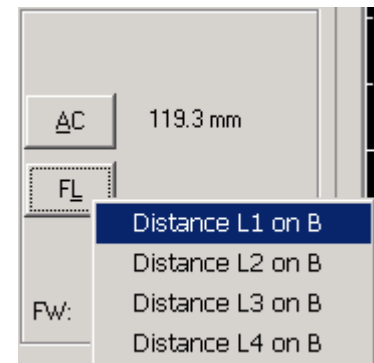
Do following:

- Using mouse click on the **AC** button;
- Hot key: [A] key on the keyboard;
- Select menu item;
- Make measurement on the echo image using selected tool.

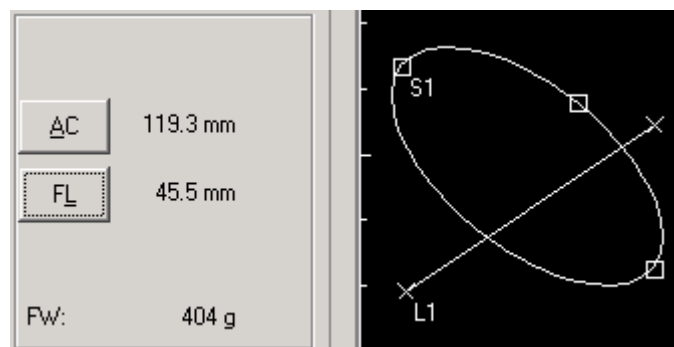


Then do following:

- Using mouse click on the **FL** button;
- Hot key: [L] key on the keyboard;
- Select menu item;
- Make measurement on the echo image using selected tool.



During measuring a dynamically updating result of fetus weight calculation will appear.



NOTE:

If appropriate linear/perimeter/square measurements are already made, the result of weight calculation is displayed immediately. If the measurements are not made yet, the fetus weight is being calculated dynamically during the measurement.



3.4.9. Managing obstetric calculations results

To store just made obstetrical calculations result for later use do following:

- Using mouse click on the **Add** button;
- Hot key: **D** key on the keyboard.



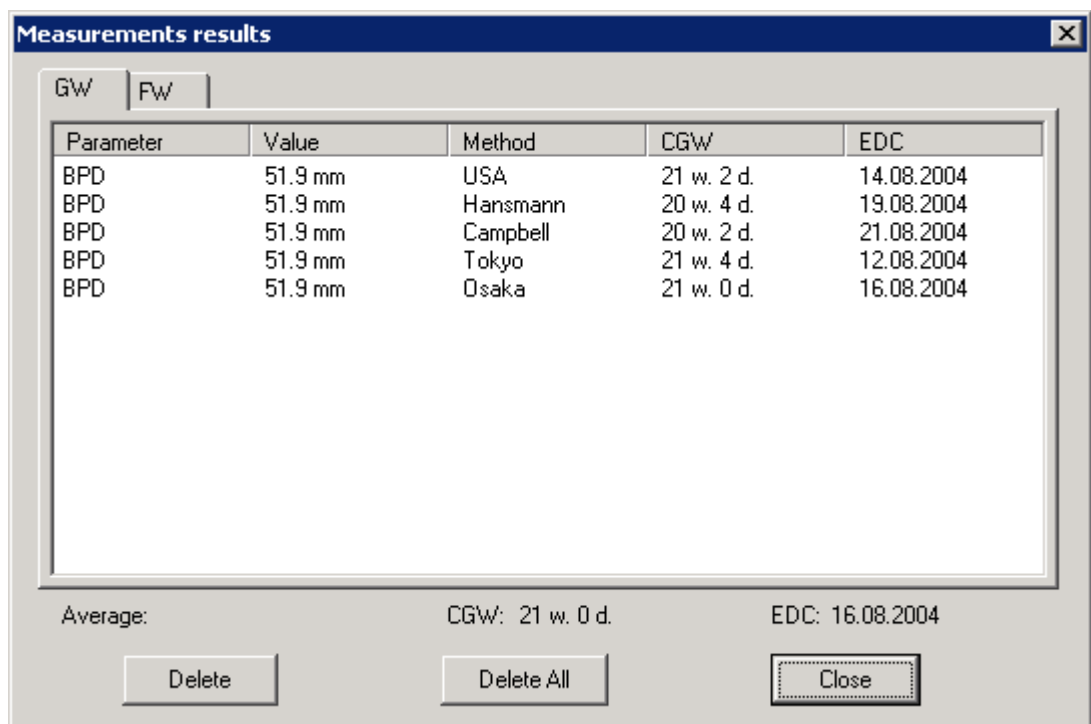
After adding the calculation result, average **CGW**, **EDC** or **FW** values are updated.

To view and manage average calculations results for different methods do following:

- Using mouse click on the **View...** button;
- Hot key: **V** key on the keyboard.



Averaging results table will appear, **GW** tab.



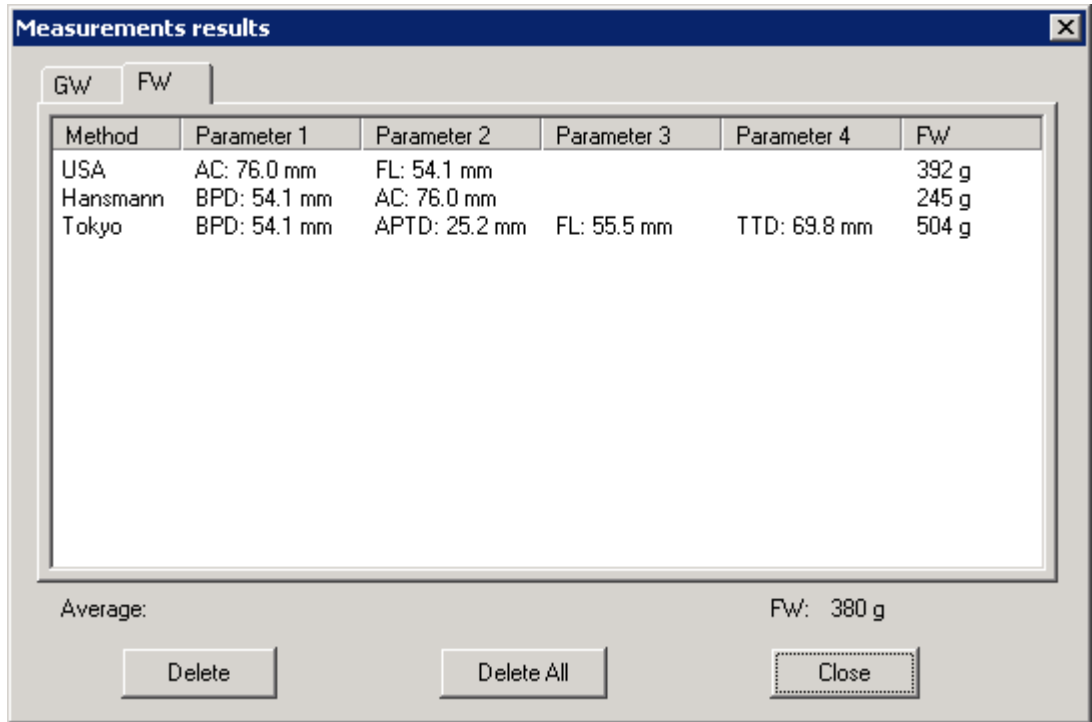
The dialog box titled "Measurements results" has a tabbed interface with "GW" and "FW" tabs. The "GW" tab is active, showing a table with 5 columns: Parameter, Value, Method, CGW, and EDC. Below the table, there are fields for "Average:", "CGW: 21 w. 0 d.", and "EDC: 16.08.2004". At the bottom, there are three buttons: "Delete", "Delete All", and "Close".

Parameter	Value	Method	CGW	EDC
BPD	51.9 mm	USA	21 w. 2 d.	14.08.2004
BPD	51.9 mm	Hansmann	20 w. 4 d.	19.08.2004
BPD	51.9 mm	Campbell	20 w. 2 d.	21.08.2004
BPD	51.9 mm	Tokyo	21 w. 4 d.	12.08.2004
BPD	51.9 mm	Osaka	21 w. 0 d.	16.08.2004

Average: CGW: 21 w. 0 d. EDC: 16.08.2004

Buttons: Delete, Delete All, Close

Averaging results table will appear, FW tab.



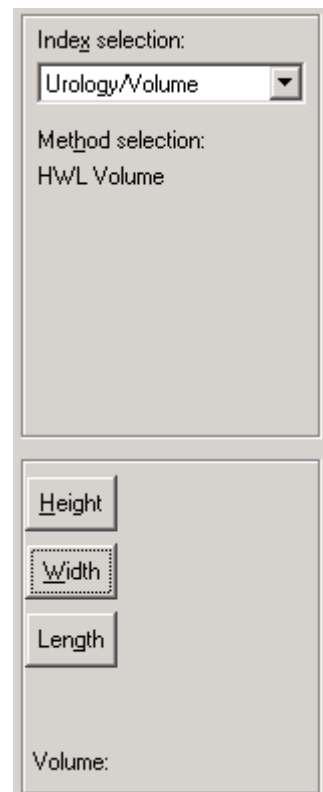
3.4.10. Urological measurements

Click on the **X=** tab for available urology calculation controls.

From the drop-down list **Index selection** select **Urology/Volume** item:

- Using mouse;
- Hot key: **X** then **Up** and **Down** keyboard cursor keys.

Urology volume calculation controls will appear. The ellipsoid volume is calculated using **HWL** method.

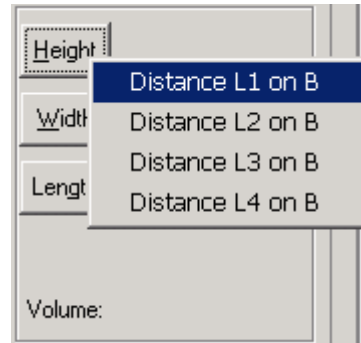


It is convenient to make volume calculations in **B/B**-mode, with longitudinal section of elliptic object on one B-image and transversal on another B-image. Then, after the object dimensions are measured, i.e. its height, width and length, it is possible to estimate its volume.

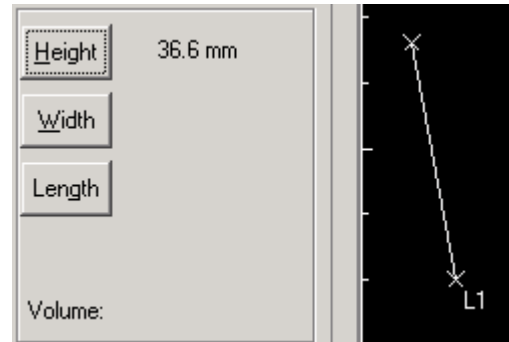
Calculations in **B**-mode can be performed in two steps: after the object dimensions' measuring in one section it is necessary to shift the ultrasound probe and measure the object size in another, perpendicular cut.

Do the following:

- Using mouse click on the **Height** button;
- Hot key: **H** key on the keyboard;
- Select the set of calipers.

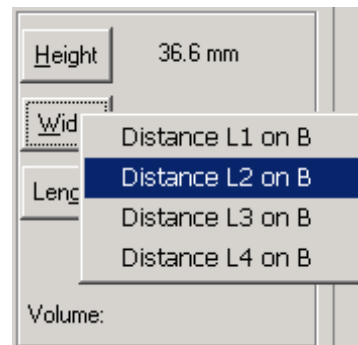


Make measurement on the echo image using selected tool.

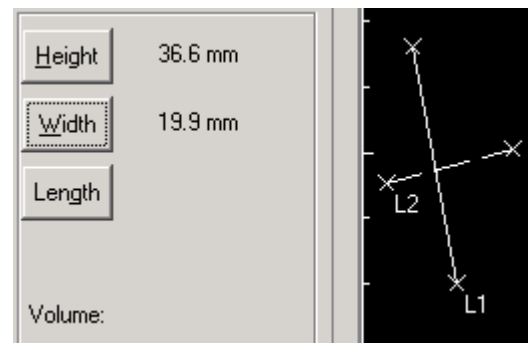


Do the following:

- Using mouse click on the **Width** button;
- Hot key: **W** key on the keyboard;
- Select the set of calipers.

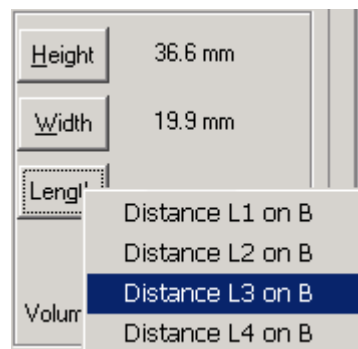


Make measurement on the echo image using selected tool.

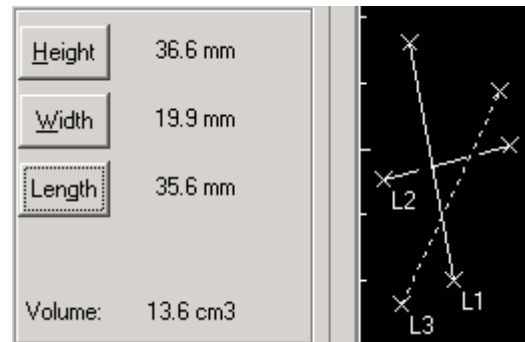


Do the following:

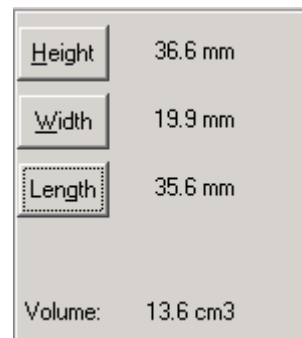
- Using mouse click on the **Length** button;
- Hot key: **G** key on the keyboard;
- Select the set of calipers.



Make measurement on the echo image using selected tool.



During measuring an updating result of elliptic object volume calculation will appear.



NOTE:

If appropriate linear measurements are already made, the result of object volume calculation is displayed immediately. If the measurements are not made yet, then the volume is being calculated dynamically during the measurement.

3.4.11. Cardiology measurements and calculations

Click on the **X=** tab for cardiology calculation controls.

In the drop-down **Index selection** are displayed a list the types of cardiology calculations available:

- **Cardio/Left Ventricle;**
- **Cardio/Aortic Valve.**

Select from the **Index selection** list the item appropriate to required calculations type:

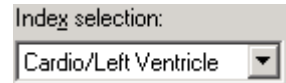
- Using mouse select from drop-down list necessary calculation type;
- Hot key: **X** then **Up** and **Down** keyboard cursor keys.



Left Ventricle (B/M or M-mode) measurements and calculations

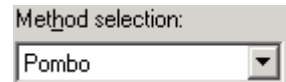
Left ventricle measurements and calculations can be performed in **B/M** or **M** modes.

Select the item **Cardio/Left Ventricle** in the drop-down list **Index selection**.



The volume calculations can be done by one of the main methods used for similar calculations.

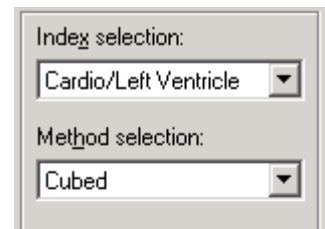
In the drop-down list **Method selection** select the item appropriate to a required method:



- Using mouse select from drop-down list necessary parameter;
- Hot key: **[H]** then **[Up]** and **[Down]** keyboard cursor keys.

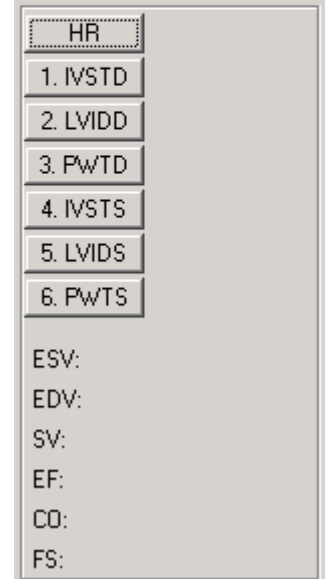
Following measurements required for calculations should be performed:

- **LVIDD** (left ventricle internal diameter - diastolic);
- **LVIDS** (left ventricle internal diameter - systolic);
- **HR** (heart rate).



There are other measurements available to perform for evaluation purposes:

- **IVSTD** (interventricular septum thickness - diastolic);
- **IVSTS** (interventricular septum thickness - systolic);
- **PWTD** (posterior wall thickness - diastolic);
- **PWTS** (posterior wall thickness - systolic).



Following calculations are shown during parameters measurement:

- **ESV** (end-systolic volume);
- **EDV** (end-diastolic volume);
- **SV** (stroke volume);
- **EF** (ejection fraction);
- **CO** (cardiac output);
- **FS** (fractional shortening).

After selecting **Cardio/Left Ventricle** item from the **Index selection** drop-down list the following controls appear.

Left ventricle measurements controls.

Also, help measurement icons appear in left-bottom corner of the echo image in **M-mode** window.



Left ventricle measurements icon.

This help icon is intended to guide the user through a basic measurement procedure. The user is supposed to perform the measurements in sequence shown on the icon.

For example, to measure first parameter (IVSTD) click the **1. IVSTD** button and perform measurement on the M-mode image. Make sure the linear calipers are well located, if not, drag them to the proper or appropriate place of the image.

Pressing the number **2. LVIDD** will erase the markers of the previous measurement, but the result is stored and visible near the appropriate button.

Follow the help icon guide through all measurement procedures. As necessary measurements (see above list) are done, partial calculation results will be displayed.

HR	96.0 b/min
1. IVSTD	3.9 mm
2. LVIDD	11.8 mm
3. PwTD	3.2 mm
4. IVSTS	3.4 mm
5. LVIDS	4.3 mm
6. PwTS	11.9 mm
ESV:	0.1 ml
EDV:	1.6 ml
SV:	1.6 ml
EF:	95.2 %
CO:	0.2 l/min
FS:	63.6 %

Aortic Valve (B/M or M-mode) measurements and calculations

Aortic valve measurements and calculations can be performed in **B/M** or **M** modes.

Select the item **Cardio/Aortic Valve** in the drop-down list Index selection.

Index selection:

Following measurements required for calculations should be performed:

- AOD (aortic diameter),
- LAD (left atrial dimension).

Following calculation is shown during parameters measurement:

- LA/AO ratio.

After selecting **Cardio/Aortic Valve** item from the **Index selection** drop-down list, the following controls appear.



Aortic valve measurement controls.

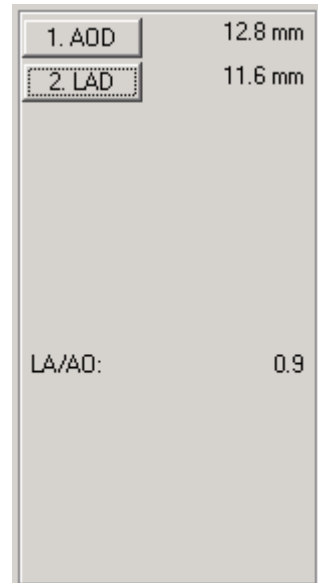


Aortic valve measurements icon.

The help measurement icon appears in left-bottom corner of the echo image in **M**-mode display window.

This help icon is intended to guide the user through the basic measurement procedure. The user is supposed to perform measurements in the sequence shown on the help icon.

To measure the first parameter (**AOD**), click the number **1. AOD** button and perform measurement on the **M**-mode image. Make sure the linear measurement calipers are well located. If not, drag them to the proper or appropriate place on the image. Pressing the number **2. LAD** button will erase the calipers of the previous measurement, but the measurement value is stored and visible alongside the appropriate button.



After the measurements are complete, a ratio calculation result is displayed.

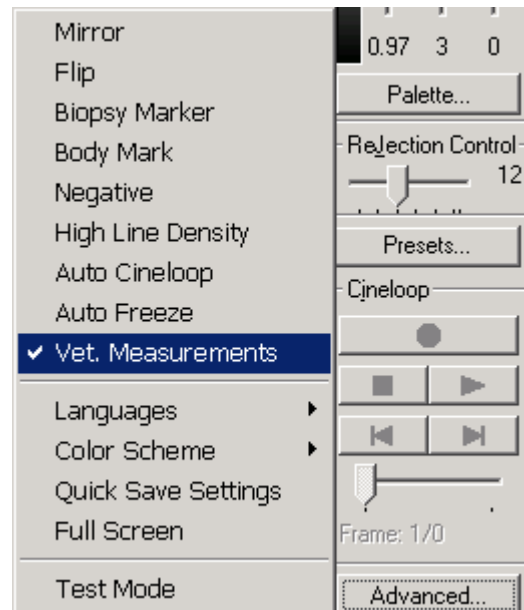
3.4.12. Veterinarian Calculations

In order to perform veterinarian measurements and calculation, be sure that the **Vet. measurements** item in the **Advanced** menu is enabled. By factory default the measurement packages are set for human medical applications and the veterinary measurement packages are turned off (not displayed).

If you want to get access to the veterinarian calculations, do following:

- Click **Advanced...** button;
- From the drop-down menu select **Vet. Measurements menu** item.

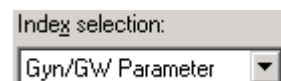
The veterinary measurements package will appear in corresponding places.



After enabling **Vet. Measurements** it is possible to select necessary type of veterinarian measurements from the appropriate drop-down lists.

Bovine fetal age estimation

To evaluate bovine fetal age, select the item **Gyn/GW Parameter** in the drop-down **Index selection** list...



...and select the **Bovine** item from the **Method selection** drop-down list.



Equine fetal age estimation

To evaluate equine fetal age, select the item **Gyn/GW Parameter** in the drop-down **Index selection** list...

Index selection:

...and select the **Equine** item from the **Method selection** drop-down list.

Method selection:

Canine fetal age estimation

To evaluate canine fetal age, select the item **Gyn/GW Parameter** in the drop-down **Index selection** list...

Index selection:

...and select the **Canine** item from the **Method selection** drop-down list.

Method selection:

Feline fetal age estimation

To evaluate feline fetal age, select the item **Gyn/GW Parameter** in the drop-down **Index selection** list...

Index selection:


...and select the **Feline** item from the **Method selection** drop-down list.

Method selection:

For more details of fetal age calculation refer to section **3.4.7 Calculations on fetus geometrical size**.

3.4.13. Draw tools

Additional tools are available in **Freeze** mode only. They consist of two toolbars: draw tools and biopsy marker toolbars. Draw tools are described below. For biopsy procedures description see the next chapter: **Biopsy needle marker**.

- Click on additional tools tab .
- Click on the **Draw Tools** button.

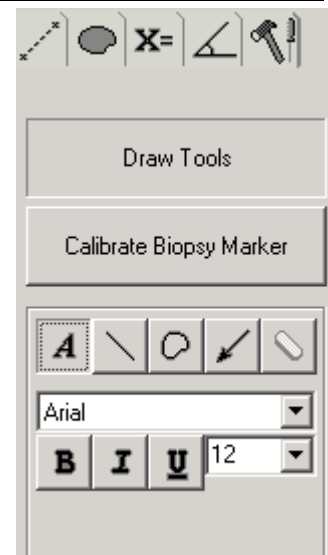
Draw Tools

Draw tools controls will appear.

Draw Tools are intended to place short text labels, highlighting and pointing to specific objects on the echo images.


Draw Tools toolbar contains tools for:

- Place the labels (text box);
- Draw the lines;
- Draw the contours;
- Draw the arrows;
- Erase all graphics.



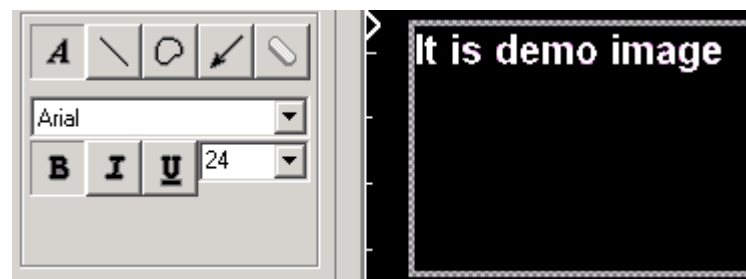
Draw tools – placing text

To place text on echo image do following:

- Click on the  button. The text control toolbar will appear.




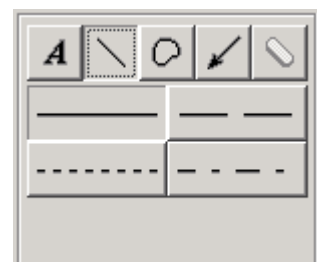
- Select font type, size and style;
- Click on the echo image, the input text field will appear;
- Input text.



Draw tools – drawing lines

To draw the lines on echo image do following:

- Click on the  or  button. The lines control toolbar will appear.




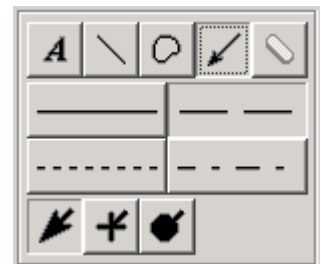
- Select the desired line style;
- Draw the line on the echo image.



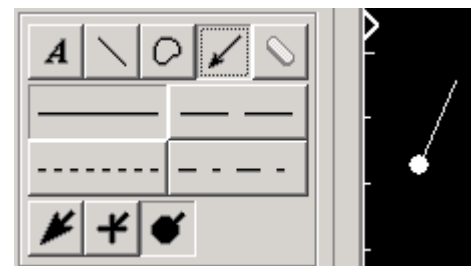
Draw tools – drawing arrows

To draw the lines on echo image do following:

- Click on the  button. The arrows control toolbar will appear.




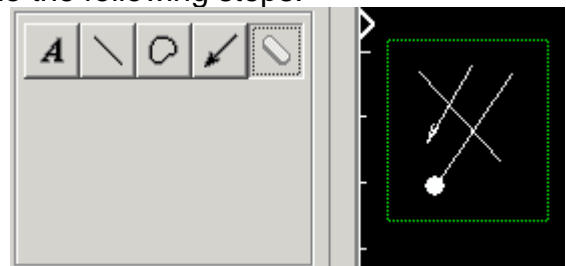
- Select the desired arrow and line style;
- Draw the arrow on the echo image.



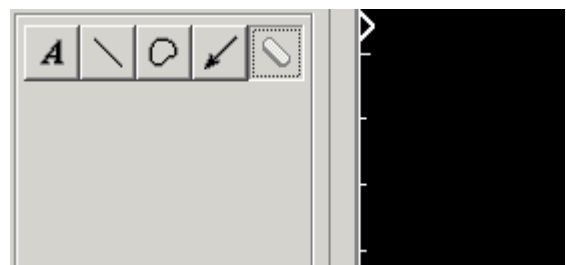
Draw tools – erase graphics

To erase displayed graphics on echo image do the following steps:

- Click on the  button;
- Using left mouse button pressed select the object to be erased into the rectangle;



- Release the left mouse button;
- Drawings or displayed graphics will be erased.



3.4.14. Biopsy needle marker

There are two modes of biopsy needle marker control: biopsy needle marker call and biopsy needle marker calibration.

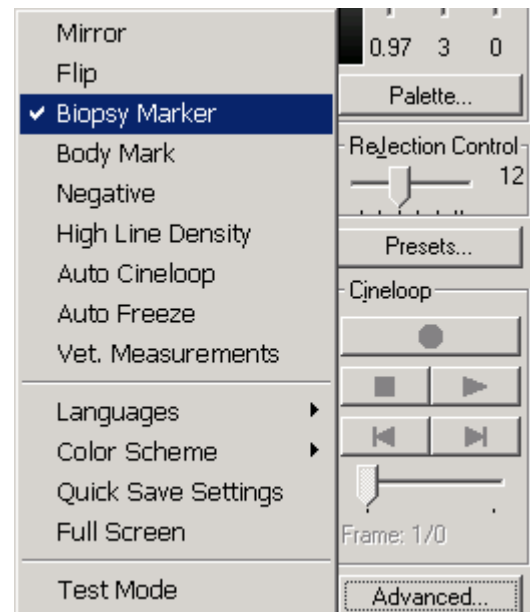
Biopsy needle marker call

Scanner must be in **Scan** mode.

To turn the biopsy marker on do following:

- Click **Advanced...** button;
- From the drop-down menu select **Biopsy Marker** menu item.

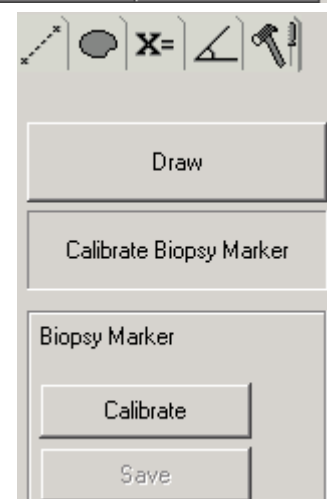
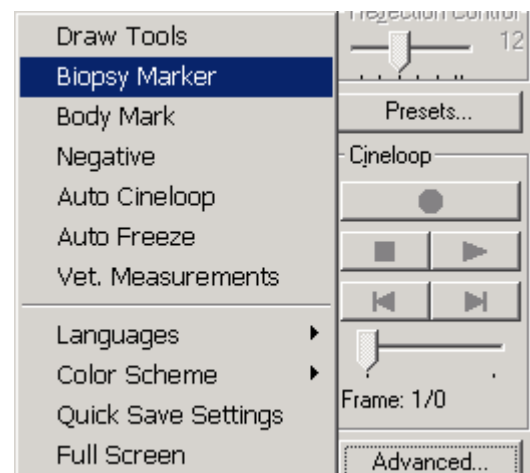
To turn off the biopsy needle marker repeat this procedure once more.



Biopsy needle marker calibration

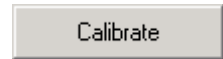
For biopsy needle marker calibration on a frozen echo-image it is necessary to receive biopsy needle image. For it connect the biopsy adapter on the ultrasound probe and immerse the probe lens to the bath with water. Set the scanner to **Freeze** mode. The echo-image showing the needle appears on the screen.

- Click **Advanced...** button;
- From the drop-down menu select **Biopsy Marker** menu item.

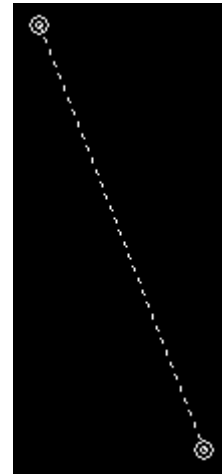


The additional tools toolbar will appear.

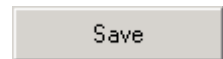
To start the calibration click on the **Calibrate** button.



The dashed line designating a needle biopsy marker appears. Locate the mouse pointer above one of marker binding points, press the left mouse button and, not letting it off, drag the pointer to the biopsy needle echo - image beginning. Let off the left mouse button. Similarly establish other point of the biopsy marker.



After installation of a biopsy marker click on the **Save** button on the toolbar. The biopsy needle marker position is saved.




The exit from the biopsy marker calibration mode goes to any other scanner mode.

3.5. Image management






3.5.1. **Thumbnail mode**

Every time the **Freeze** mode is activated a copy of the current image is saved to the disk (in the native USI format). To operate with these images, turn on **Thumbnail mode**.

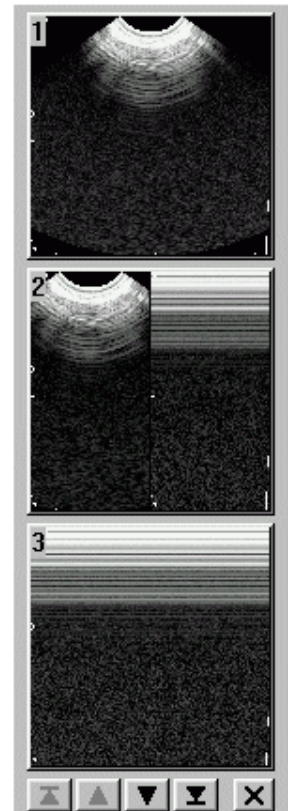
Click on  button to turn Thumbnail mode on.

Thumbnail mode panel consists of three buttons with thumbnails on them and five control buttons: **Home**, **Up**, **Down**, **End** and **Reset** respectively.

Saved images are organized into a queue, so that oldest saved image is replaced by the latest one. Use control buttons to browse through saved images:

- button  - goes to the first image in the queue;
- button  - goes one image up;
- button  - goes one image down;
- button  - goes to the last image in the queue;
- button  - delete all saved images

After locating the desired thumbnail image you can load it into the main display area clicking appropriate images by left mouse button. Now you can perform any action with it available in **Freeze** mode, for example: save it for future use, send by e-mail, perform some measurements etc.



NOTES:



The number of available images – 16. When the thumbnail queue gets full, the oldest image in it will be replaced by the current one each time “freezing” the image.

After exiting from the application all the images from the queue will be erased. So, if you need to save some of the images from the queue for later use, do it immediately.

3.5.2. Saving to file

Saving the ultrasound data to file is possible only in Freeze mode. The scanner has possibility to save files in such formats:

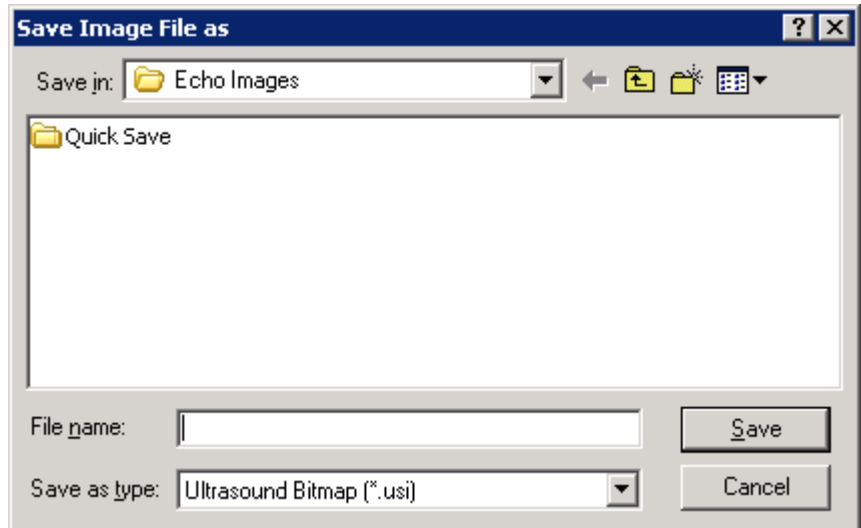
- Echo-image in BMP (Windows bitmap) format;
- Echo Image in USI (Ultrasound Image) format;
- Report Image in BMP (Windows bitmap) format;
- Recorded to memory Cineloop data in AVI compressed format;
- Recorded to memory Cineloop data in AVI un-compressed format

- Click on the button

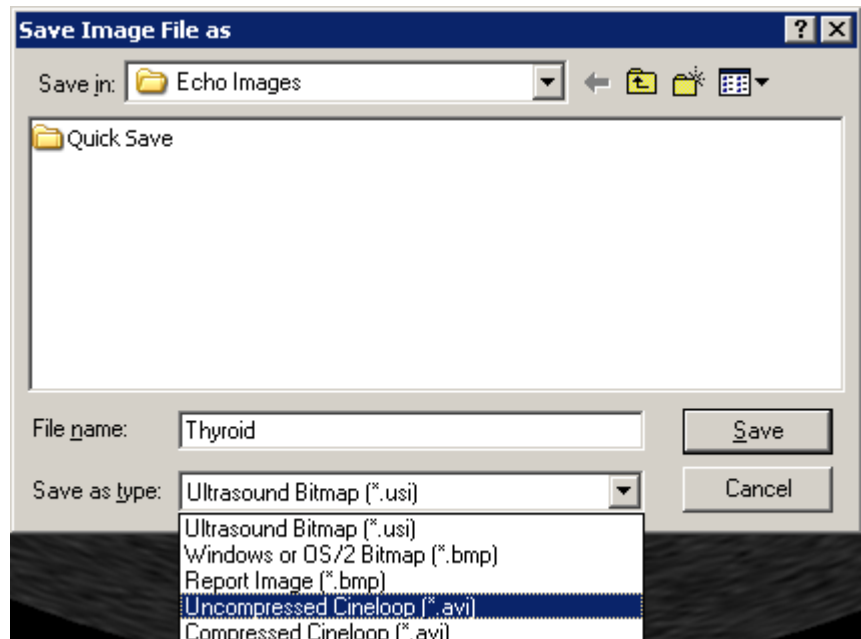


- Hot key: **F3**
- Hot key: **Ctrl+S**

The standard dialog box of the Windows operating system for file format and name input will appear.



- Select type of saved file;
- Input file name;
- Choice the folder for saving;
- Click the **Save** button or press **Enter** on the keyboard to finish saving.



NOTES:

The echo-image in BMP format can be opened by third party applications such as: graphic editors, image browsers and etc.

The file in USI format contains all comments of inspection, measurement results, patient information and etc. After opening this file system restores all working environment before saving process.

Report Image in BMP format contains same information as printing to printer: patient information, measurements results, comments to image.

Compressed Cineloop format dramatically (as usual, by 20-30 times) reduce file size. We are recommending using compressed Cineloop file format for sending via e-mail, to save on floppy disk. But this format is lossy compression.

The Cineloop video file in un-compressed format has maximum image quality, but file size is too big for e-mail.

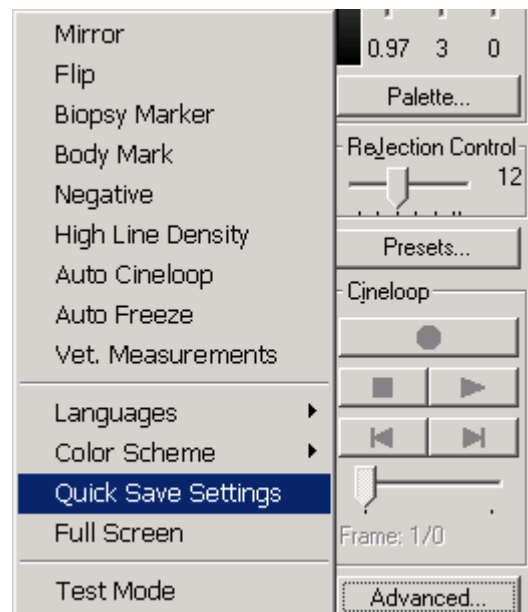


3.5.3. Quick Save option

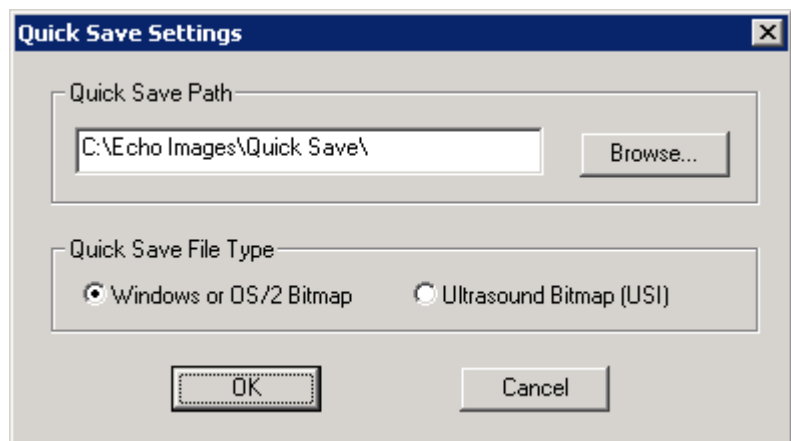
System software provides the possibility to save images on disk immediately and without additional dialog boxes on-screen.

First, user need to configure Quick Save option:

- Click **Advanced...** button;
- From the drop-down menu select **Quick Save Settings** menu item.



- Define Quick Save Path using **Browse...** button;
- Define Quick Save File Type, BMP or USI;
- Click **OK** button



Now after each **F9** keyboard key pressing an echo image will be saved as BMP or USI file (as defined by the user set-up) in the selected directory with file name as **QSYMMDD_XXXX.bmp(usi)** where:

- **QS** – Quick Save file;
- **YY** – Year;
- **MM** – Month;
- **DD** – Day;
- **XXXX** – number, each saving will increase this number;
- **BMP/USI** – file type.

3.5.4. Loading from file

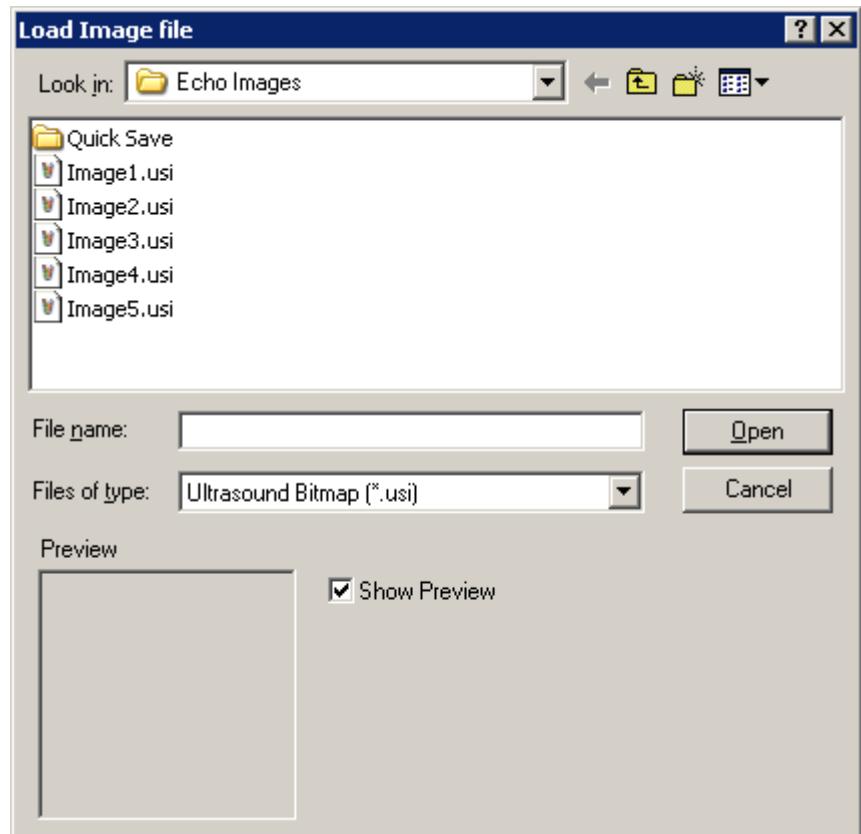
The scanner offers the possibility to load previous saved echo-images and Cineloop files. Loading is possible only in a Freeze mode.

- Click on the button

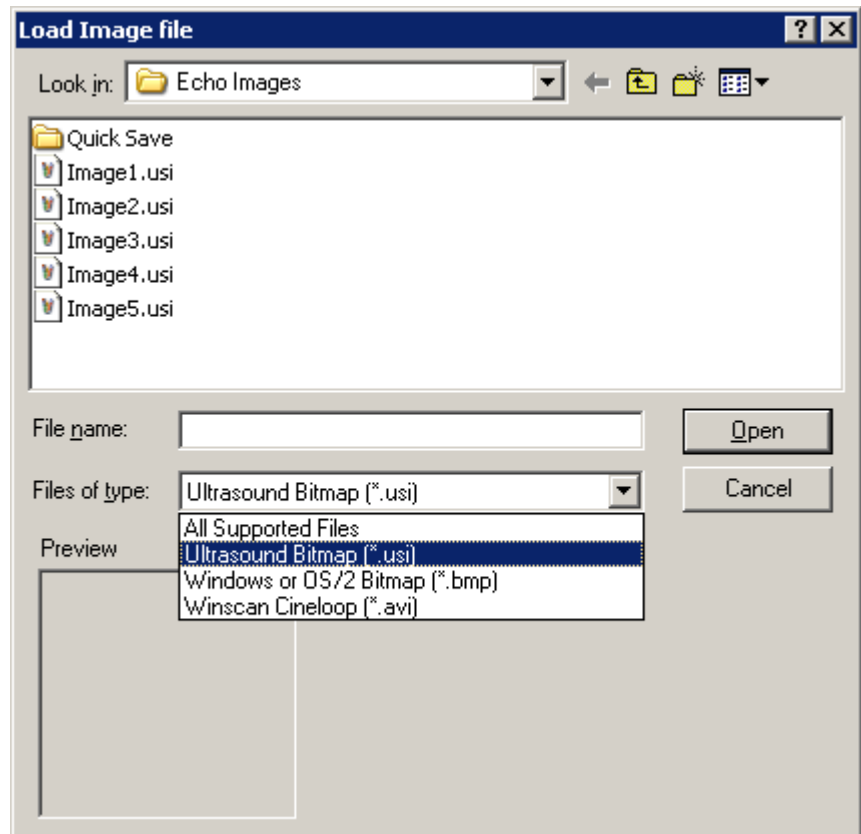


- Hot key: **F2**
- Hot key: **Ctrl+O**

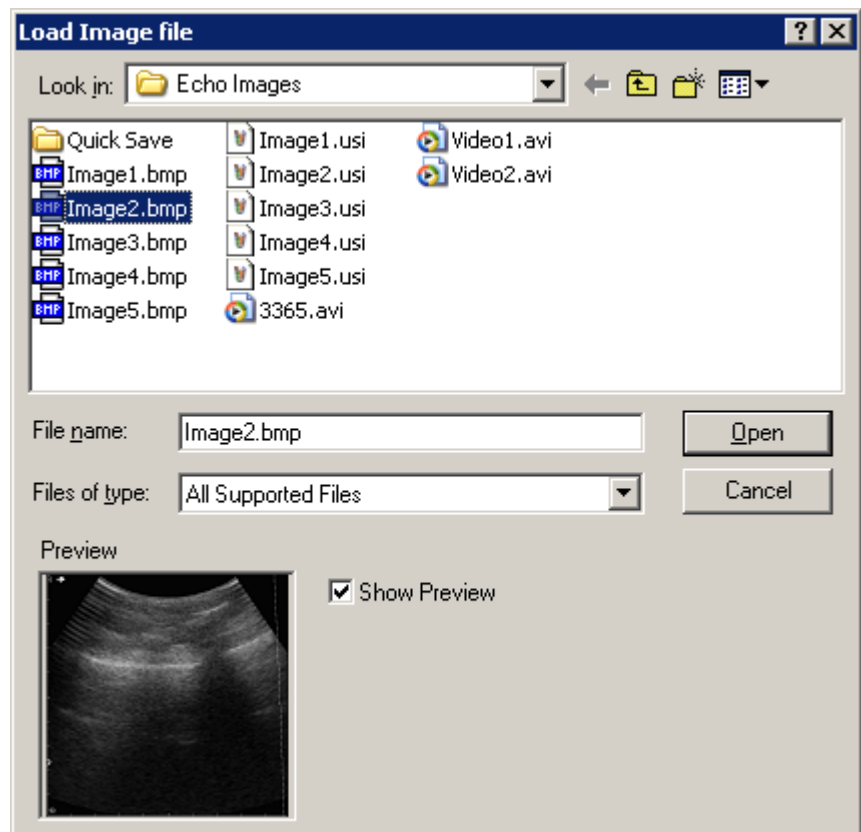
The standard open file dialog box will appear.



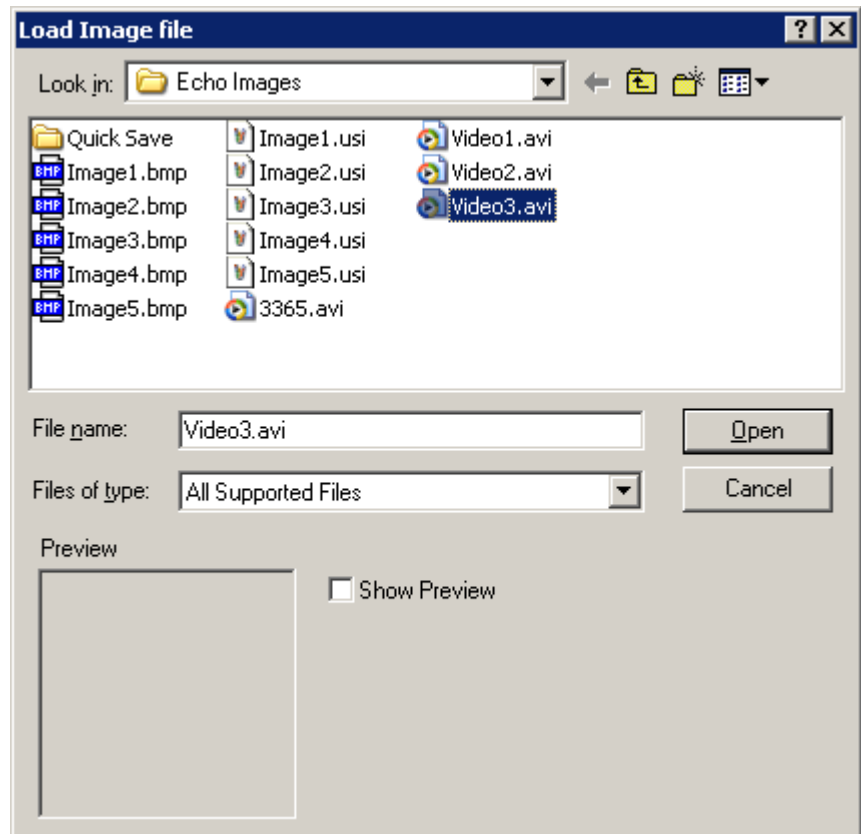
- Select disk and folder for file opening;
- Select type of file you want to open;
- Click on the file;
- Click **Open** button or press **Enter** key on the keyboard to finish operation.



- Select **All Supported Files** for all available formats can be opened;
- Check **Show Preview** option if need to preview file before opening.



- Un-check **Show Preview** option if no need to preview file before opening.



NOTES:

USI format is not supported by all third party applications such as: graphic editors, image browsers and etc. But this format is completely supported by our software, however you can open it using:

- Microsoft Paint;
- IrfanView freeware graphic viewer available at <http://www.irfanview.com>;
- Some others.




The file in USI format contains all comments of inspection, measurement results, patient information and etc. After opening this file, system restores all working environment was before saving process.

Cineloop in AVI format can be viewed with Windows Media Player or any third party applications. However, recorded scan parameters will be displayed only in our software.

3.5.5. Direct e-mail sending

You can send e-mails with attached images (in USI or BMP formats) or Cineloop (AVI video file) directly from a running application. After selecting attachment format, the program stores a temporary image or Cineloop file on disk (so, please, be patient) and then displays a new mail window with attached file. After sending mail the temporary attachment file is automatically deleted.

To send e-mail:

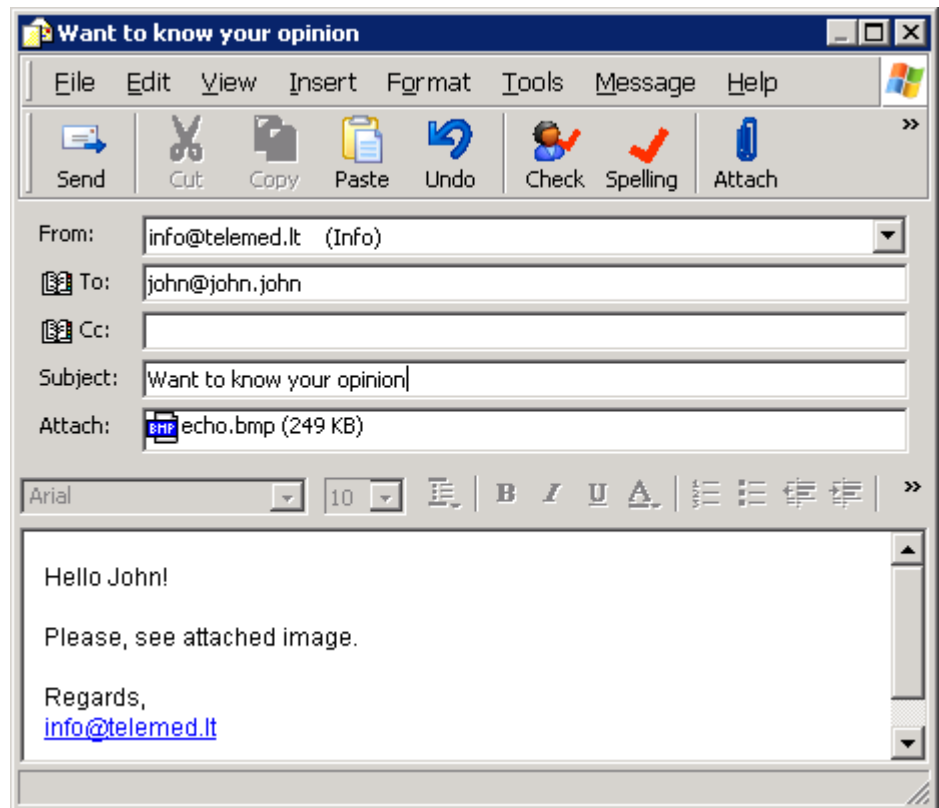
- Click on the button 
- Hot key: **Ctrl+M**

The drop-down menu list will appear. Select file type you want to send via e-mail as attachment.



E-mail software window will appear with attached ultrasound image/video.

Fill address and subject fields, send e-mail.




NOTES:



For properly **Direct e-mail sending** function operation, e-mail service in your operating system must be configured. The e-mail software can differ from shown above as it is depends on many factors: software type, version, color scheme and etc...

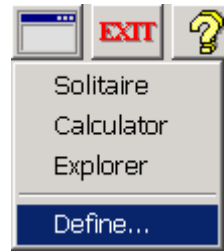
3.5.6. External applications call list

You can run pre-defined external favorite applications from the list. Our software is shipped with the predefined list of the most useful (in our humble opinion) applications. However, you can make changes to this list and define your own one.

- Click on the button ;
- Hot key: **Ctrl+E**

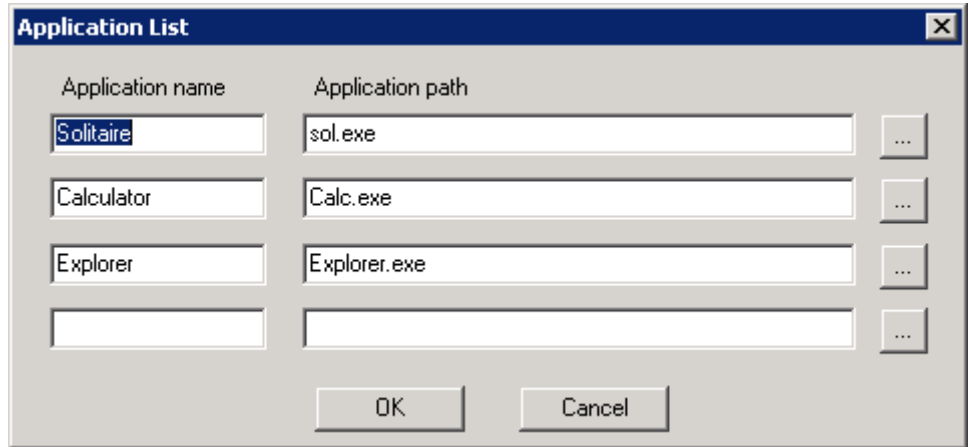
The drop-down menu list will appear. Select application you want to start.






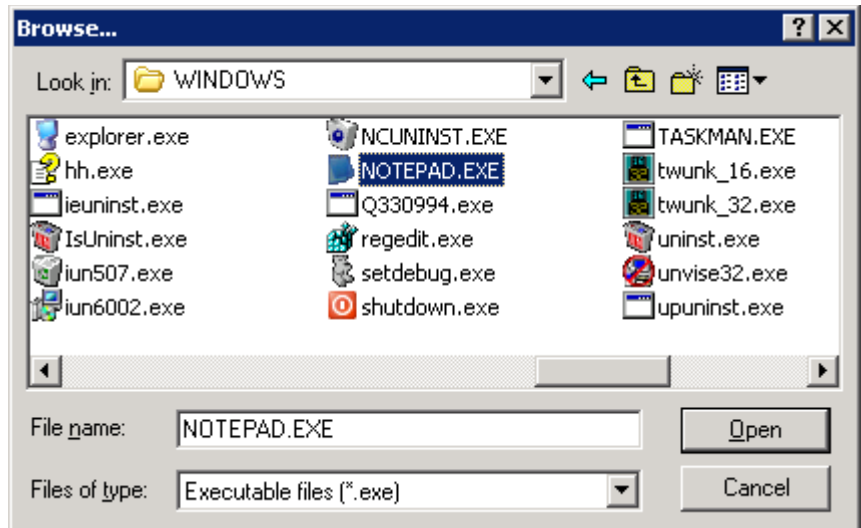
If you want to add / edit applications list, select **Define...** menu item.

Now you can edit any application from this list or make changes in it.

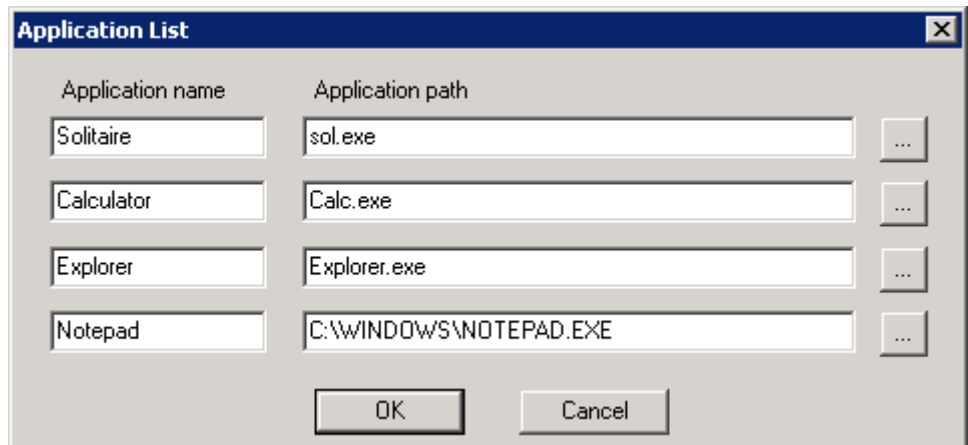


In this dialog box you can define your own applications list.

Also you can use  button to **Browse** to your new application.



Add name for new application.



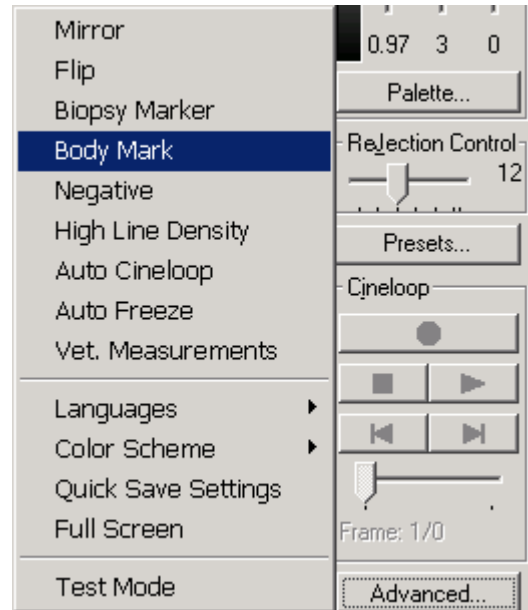
3.6. Reports

This chapter describes reports management.

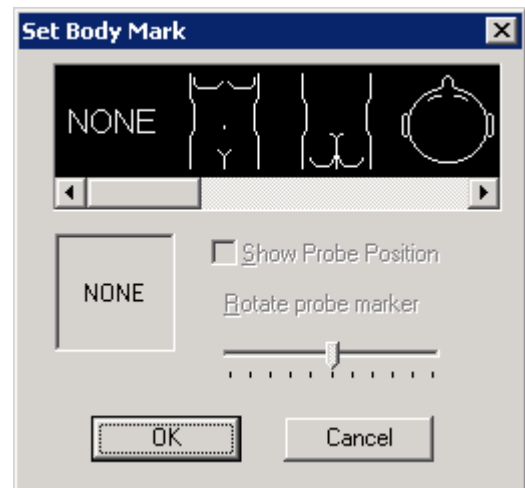
3.6.1. Body Mark control

It is possible to place on the echo-image anatomical icon with indication of probe position.

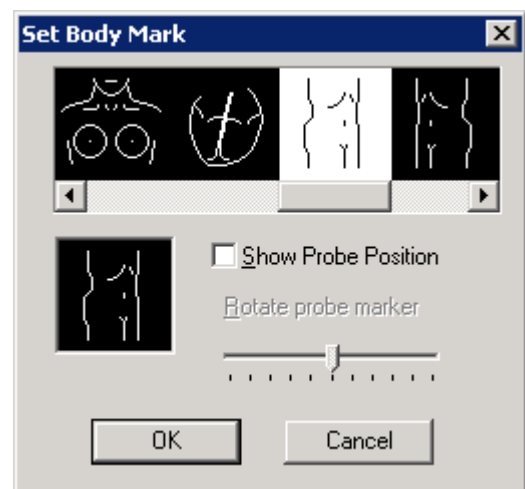
- Click on the **Advanced...** button;
- In the drop-down list click on **Body Mark** menu item.



On the screen the dialog box will appear.

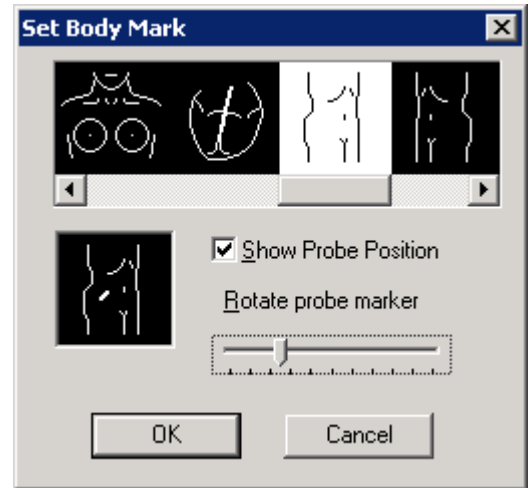


Select required anatomical icon clicking on it.

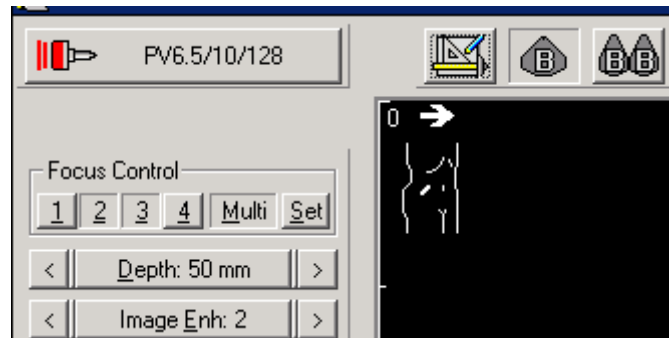


Also it is possible to place on anatomical icon indication of probe location and its angle:

- Check **Show Probe Position** option, hot key **S**;
- Using mouse move horizontal slider **Rotate probe marker**, hot key: **R** then **<-** and **->** keyboard cursor keys to rotate it;
- Using mouse move probe indication on anatomical icon.




Click on the **OK** button or **Enter** keyboard key. The anatomical icon will appear on the echo-image.



3.6.2. The comments to the patient examination

The comments to the patient are intended for imaging patient data and description of examination outcomes. The patient data and outcomes description are displayed on printed echo-image, saved image in USI (Ultrasound Image) and report BMP format files.

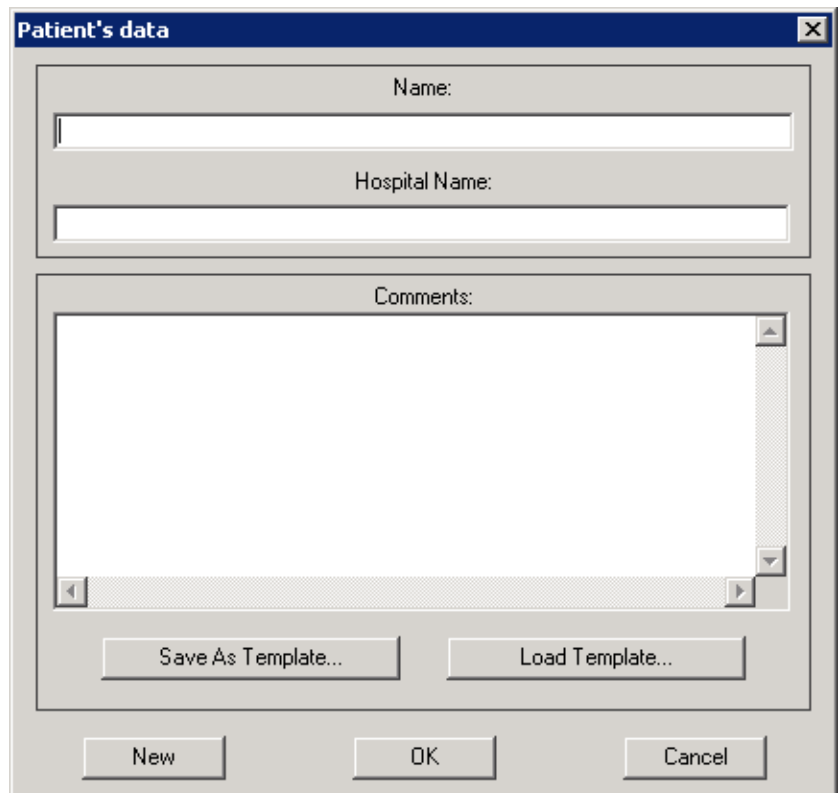
- Click on the button 
- Hot key: **Ctrl+N**

The dialog box **Patient's data** will appear on the screen.

The field **Name** is intended for the patient name input.

The field **Hospital Name** is intended to input a title of medical organization and the doctor's name.

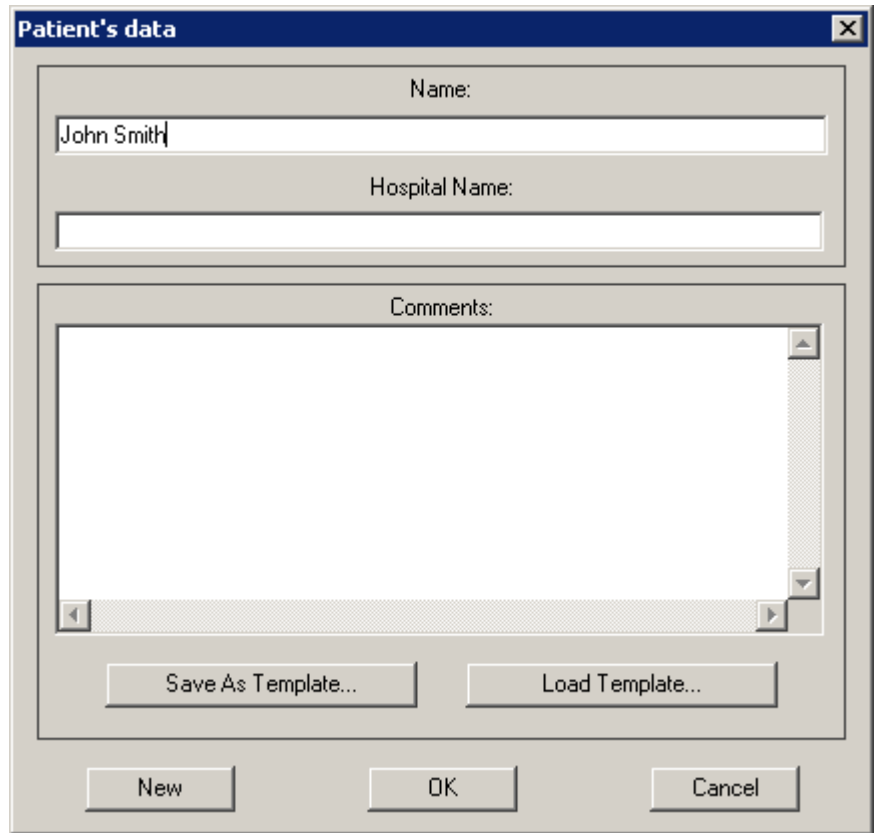
The field **Comments** is intended to input the text comments of the patient examination.



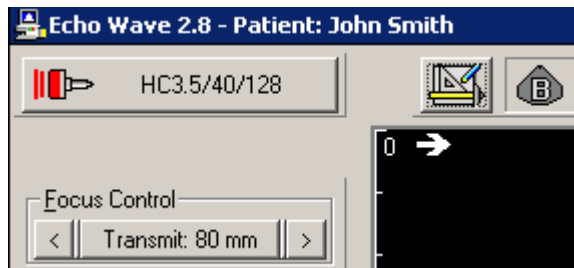
To save the comments click the **OK** button on the dialog box. For input termination click the **Cancel** button. For new comments click the **New** button.

For example:

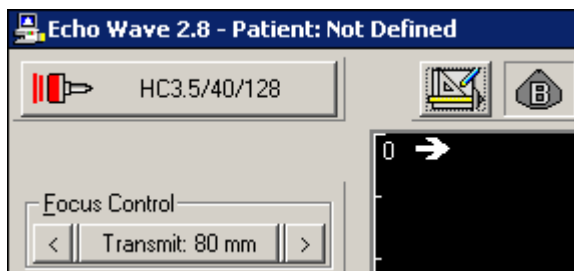
- In the field **Name** input patient name;
- Click the **OK** button.



- At the **Title Bar** patient name will appear (Patient: John Smith);

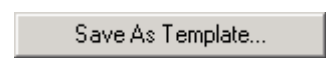


- In another case (when patient name was not added), the message **Patient: Not Defined** will present all the time at the **Title Bar**.

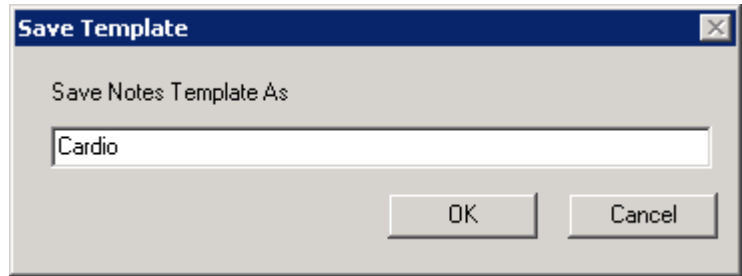


The frequently used comment can be saved as a template and quickly recalled for next examination.

Click **Save As Template...** button.



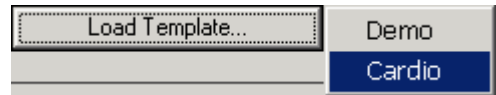
A window for template name input will appear. Input file name and click on the **OK** button or **Enter** keyboard key. The system will remember template with this name.



Click on the **Load Template...** button when you want to load a saved template to **Comments** filed.




The list of previously saved templates will appear. Click on the necessary template name from the drop-down list.



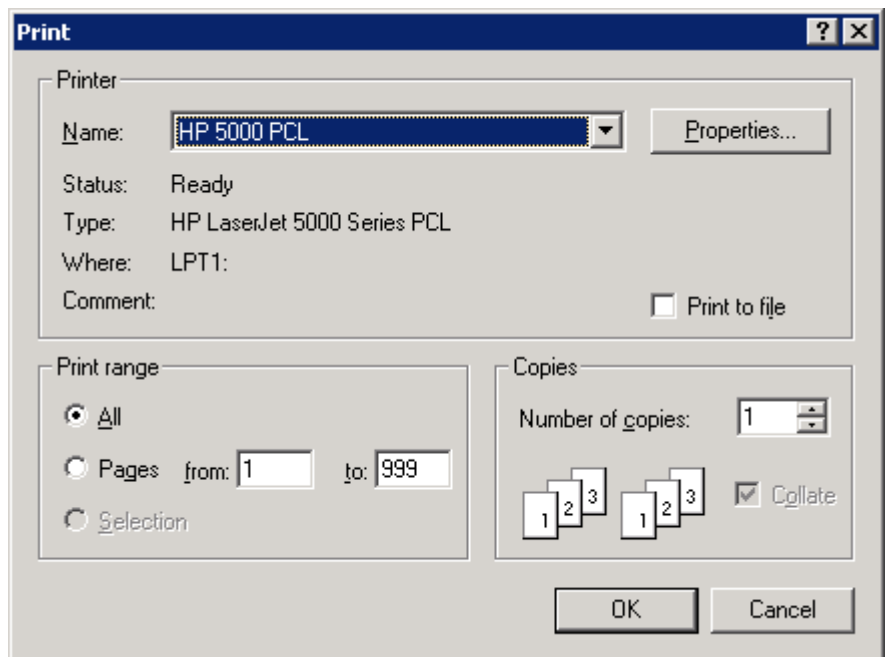
3.6.3. Printing

The scanner has possibility to print an echo-image with measurements results and added comments on any system printer, connected to computer. The echo-image printing is possible only in the **Freeze** mode.

- Click on the button ;
- Hot key: **Ctrl+P**

On the screen the dialog box of printing appears.

Click on the **OK** button to print. Click on the **Cancel** button to cancel the printing.



NOTES:
For better print quality we recommend to use laser printers with 600 dpi resolution or better.

3.7. Additional features

This chapter describes additional features.

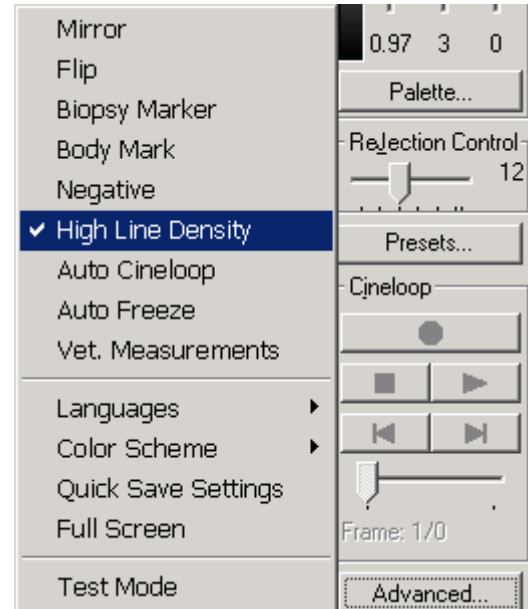
3.7.1. High Line Density

The system has possibility to increase factor of 2 number of scan lines in ultrasound frame. This gives possibility to improve image quality with cost of reduction of frame rate. So, if necessary to have high frame rate (for example for cardio applications), need to turn this feature off. In other cases this feature can be turned on.

To turn on the high line density scan mode do following:

- Click the **Advanced...** button;
- From the drop-down menu select **High Line Density** menu item.

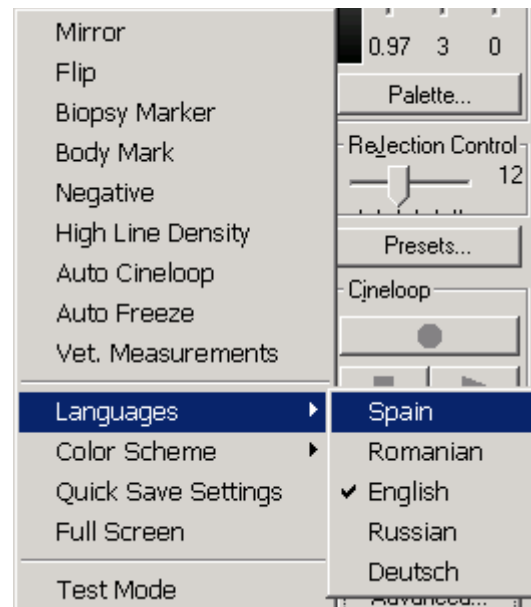
To turn off the high line density scan mode repeat this procedure once more.



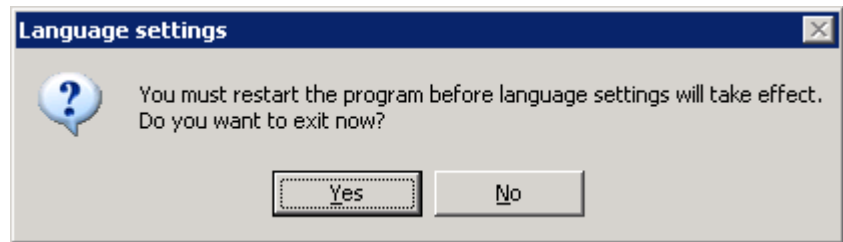
3.7.2. Language selection

Software has possibility to change user interface language. You can easy select necessary supported language and change interface language.

- Click the **Advanced...** button;
- From the drop-down menu select **Languages>** menu item;
- From the drop-down menu select necessary language.

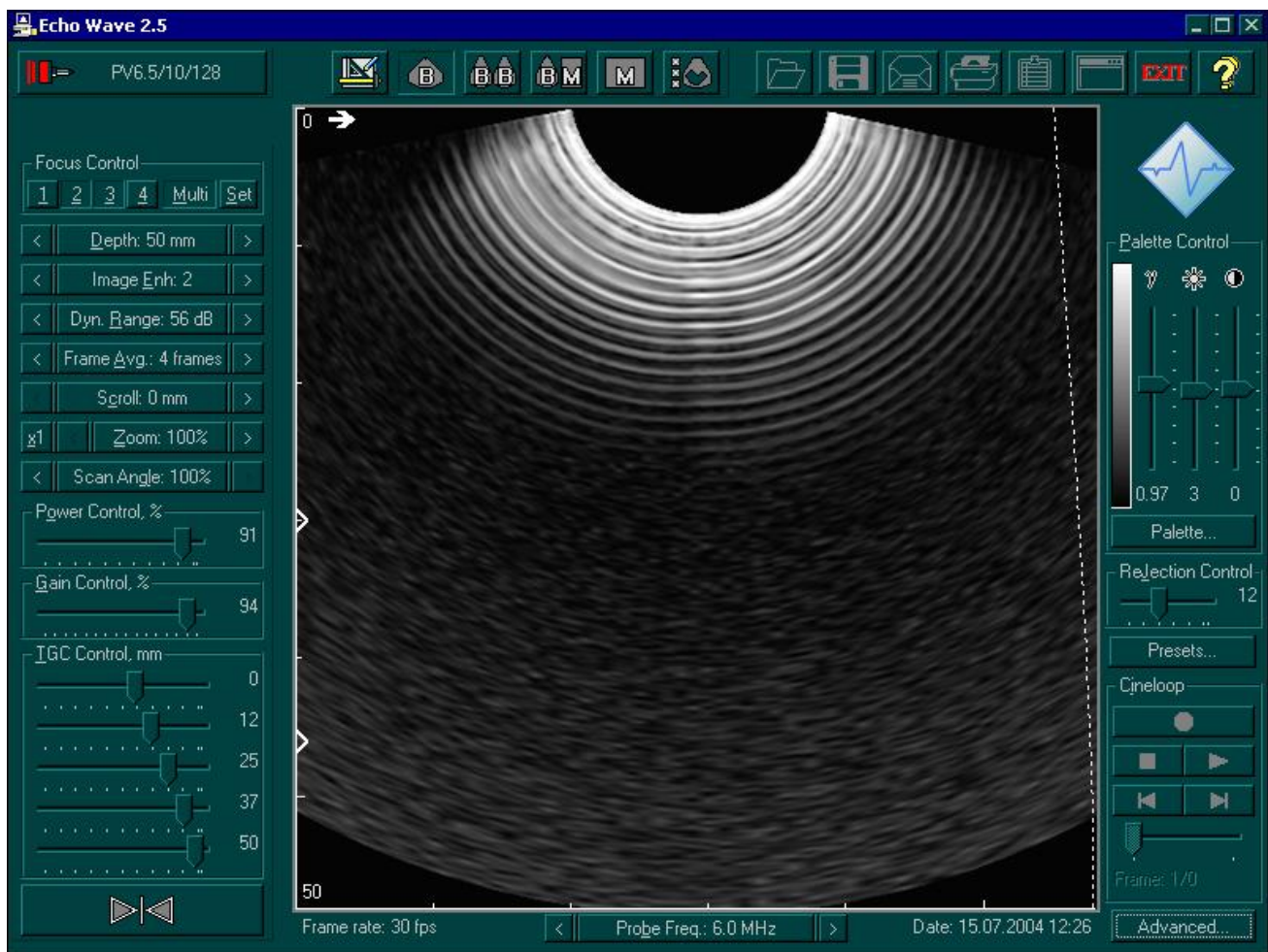


System will ask you to restart software. After restarting new language settings will take effect.



3.7.3. Color schemes

It is possible to change the color of Echo Wave user interface. If the PC will be used mainly for ultrasound examinations the black / white / grey colors are recommended for best image readability. For example you can change user interface like shown below:



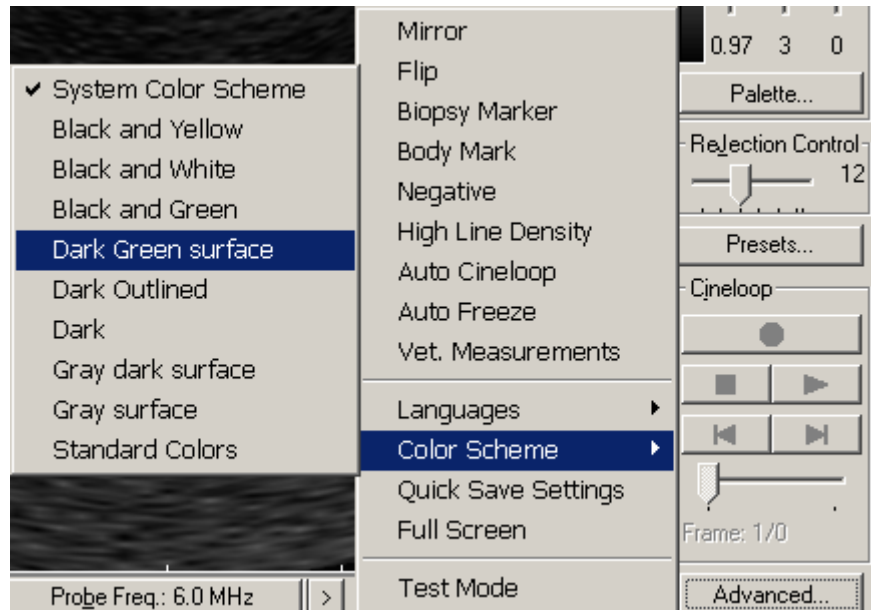
3.7.4. Color schemes – Basics

Echo Wave software is distributed with a set of predefined color schemes. The way the program looks depends on the currently selected Color Scheme. By default the program uses the system Color Scheme (described in your Display Properties). To change the standard “look&feel” do as described below.

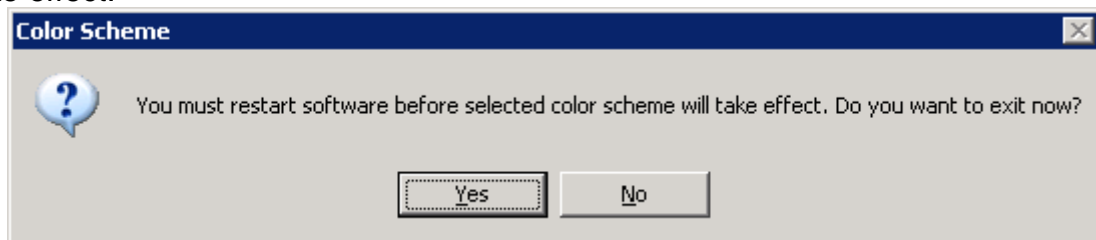
- Click the **Advanced...** button;
- From the drop-down menu select **Color Scheme** menu item;
- From the drop-down menu select necessary color scheme.

Standard Colors will load standard Windows color scheme.

System Color Scheme (default) makes program just to use current system settings. The way Echo Wave looks in this case depends on your Display Properties settings.



System will ask you to restart the software. After restarting the new color schemes will take effect.



3.7.5. Color schemes – Advanced

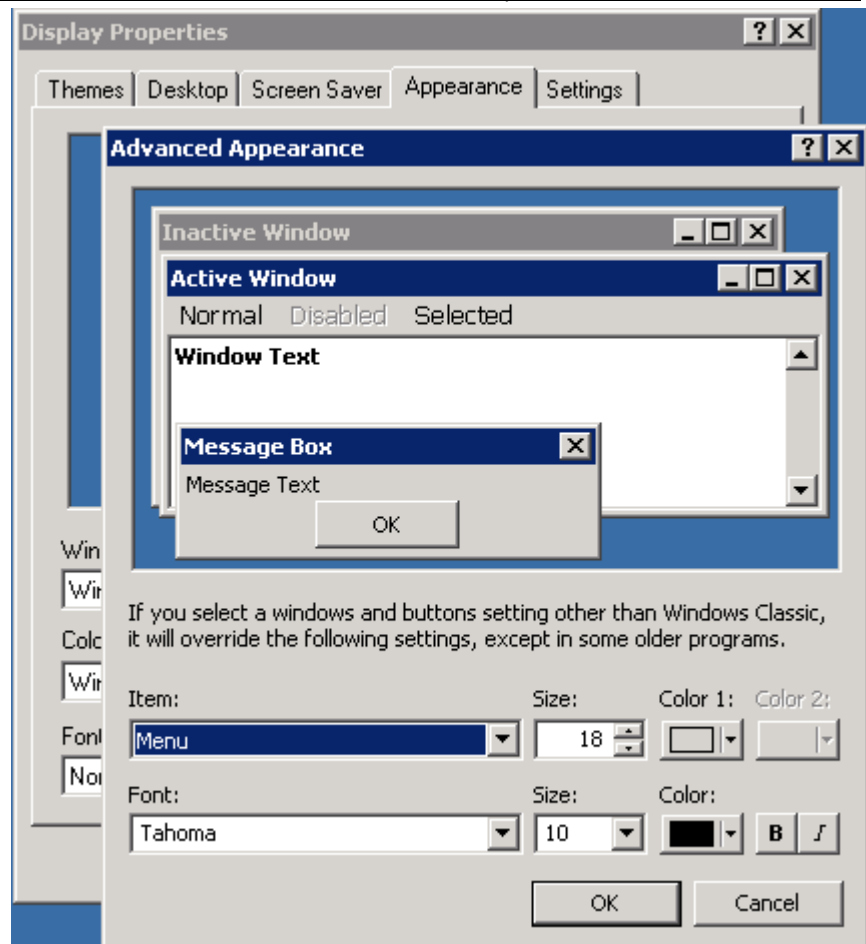
In case you are not satisfied with a set of the color schemes distributed with the Echo Wave you can make your own color schemes. There are two ways for doing it.

Making color scheme through Display Properties

Step1. Start (if not already) the Echo Wave and from the color schemes menus select the System Color Scheme. Close the application.

Step2. Go to display settings adjustments as shown at the picture.

Here you can select any of the existing Windows schemes or make your own one (for details see Windows Help).



Step3. Start Echo Wave. In its working directory you will find a file named CurrentScheme.txt. All current system colors are stored in it in format Echo Wave understands. Rename this file so it has a .clr extension, for example MyScheme.clr. Leave this renamed file in the same directory.

Step4. Switch to the Echo Wave application (or start it, if was closed during Step3). Select your just made color scheme (MyScheme) from the list and you are done.

Fine tuning color schemes

If you are still not satisfied with the way the Echo Wave looks there is one more thing you can do. It's fine tuning color schemes, distributed with the application or your custom, made through steps described in the section above.

Let's look at the structure of .clr files, since understanding it is necessary if you are going to edit it manually for fine tuning color schemes.

It's convenient to think about .clr file as consisting of a header and a body. In the header of color scheme file there are several (three as usual) lines with comments describing this scheme etc. In fact you can put whatever you want in the header.

The body of .clr file consists of line describing system colors entries. Each line has three hexadecimal numbers in the range 0-FF presenting three color components, Red, Green and Blue respectively. At the end of each line there is an optional color entry name, describing the usage of the current line. To make changes you should alter desired color components for desired system colors entries. Descriptions of all the used color entries are explained in table below.

**IMPORTANT NOTE!**

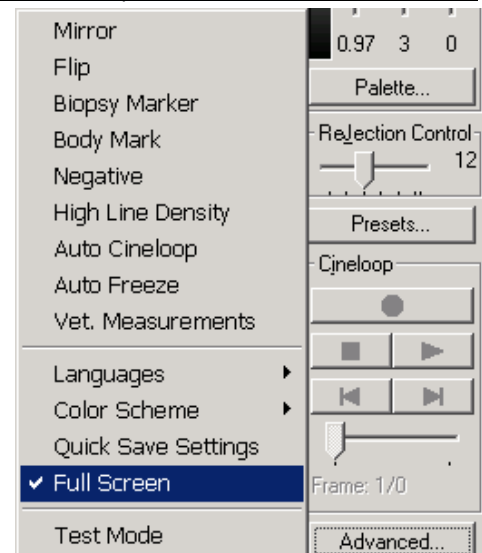
Do not change the order of the lines in **.clr** files or remove any of them!

Name	Description
COLOR_SCROLLBAR	Scroll bar gray area
COLOR_BACKGROUND	Desktop background
COLOR_ACTIVECAPTION	Active window title bar
COLOR_INACTIVECAPTION	Inactive window title bar
COLOR_MENU	Menu background
COLOR_WINDOW	Window background
COLOR_WINDOWFRAME	Window frame
COLOR_MENUTEXT	Text in popup menus
COLOR_WINDOWTEXT	Text in windows and on some controls
COLOR_CAPTIONTEXT	Text in caption, size box, and scroll bar arrow box
COLOR_ACTIVEBORDER	Active window border
COLOR_INACTIVEBORDER	Inactive window border
COLOR_APPWORKSPACE	Currently not used in Echo Wave
COLOR_HIGHLIGHT	Selected items
COLOR_HIGHLIGHTTEXT	Text of selected items
COLOR_BTNFACE	Face color for 3D display elements such as buttons and dialogs
COLOR_BTNSHADOW	Shadow color for 3D display elements
COLOR_GRAYTEXT	Grayed (disabled) text
COLOR_BTNTEXT	Text on standard buttons
COLOR_INACTIVECAPTIONTEXT	Color of text in an inactive title bar
COLOR_BTNHIGHLIGHT	Highlight color for 3D display elements
COLOR_3DDKSHADOW	Dark shadow for 3D display elements
COLOR_3DLIGHT	Light color for 3D display elements

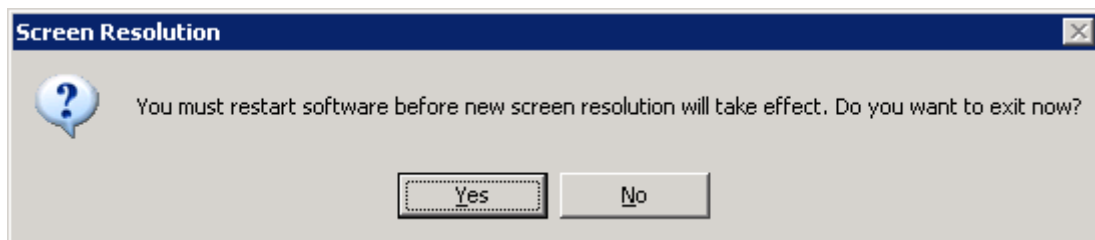
3.7.6. Full Screen mode

In 1024x768 screen resolution mode it is possible to use all the screen area, not just the usual size (800x600) software window. Displaying in Full Screen mode the echo-image area stays the same size, but all the controls become proportionally bigger and remain easily accessible.

- Click **Advanced...** button;
- From the drop-down menu select **Full Screen** menu item.



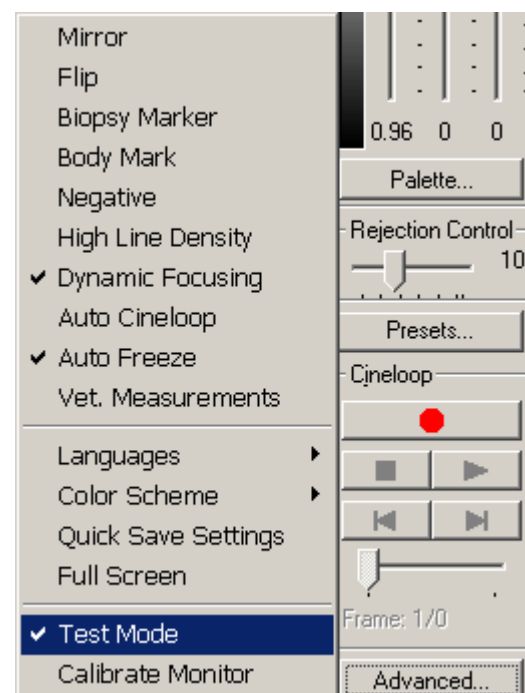
System will ask you to restart the software. After restarting full screen mode will take effect.



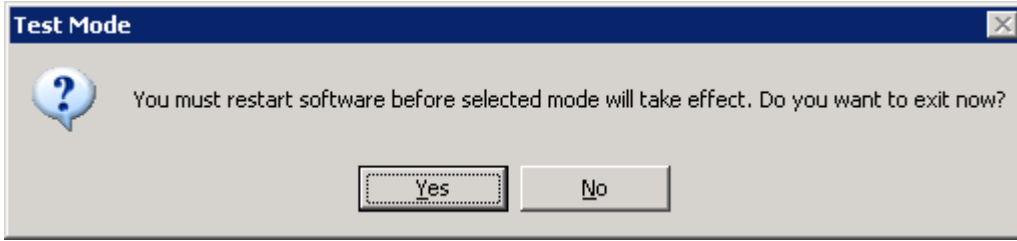
3.7.7. Test Mode

Test Mode is designed to help diagnose some possible problems with scanner hardware and software. It should be used only for troubleshooting (refer to **User Guide** FAQ chapter). Normally you don't need to use the **Test Mode**.

- Click **Advanced...** button;
- From the drop-down menu select **Test Mode** menu item

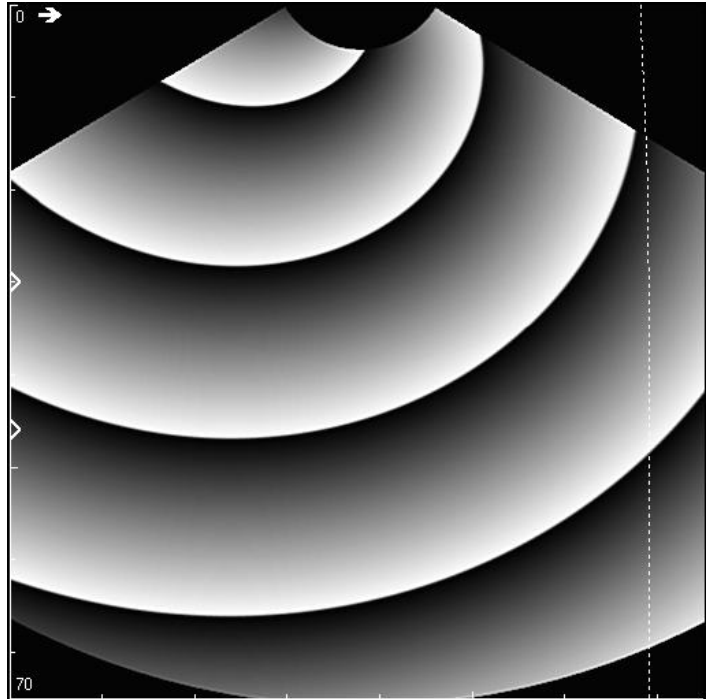


System will ask you to restart the software. After restarting the test mode will take effect.

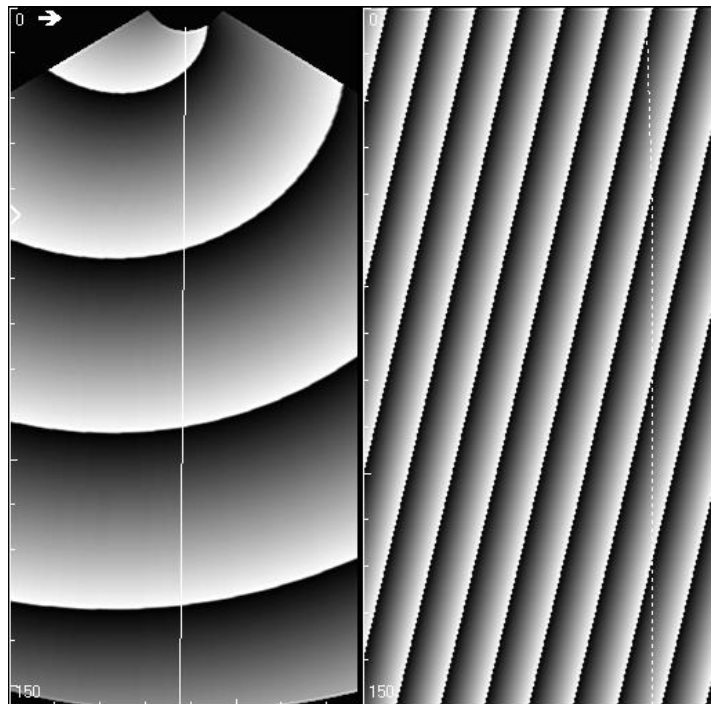


If your computer operating system, device drivers, DirectX and scanner software are configured properly, you should see the test images in scan mode.

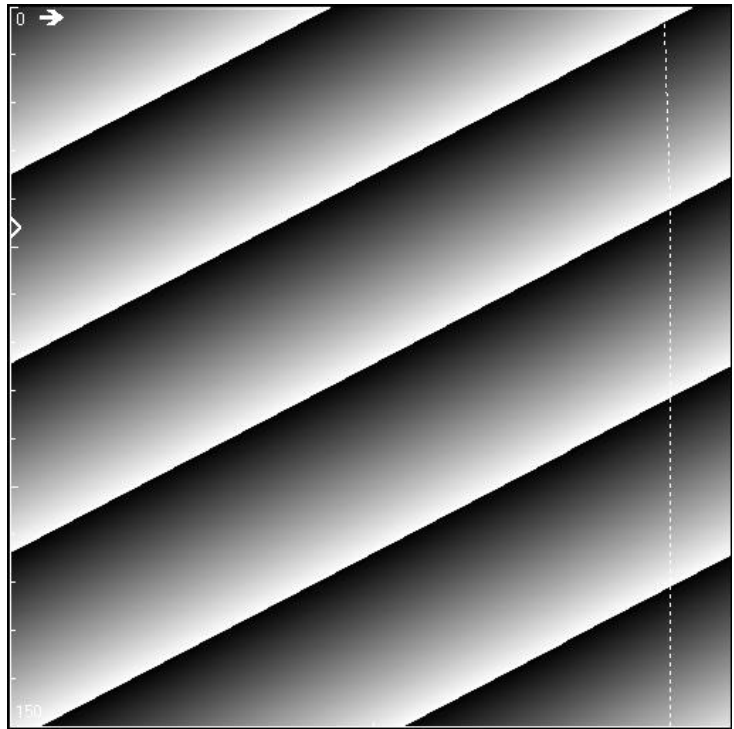
B-mode test image:



B/M-mode test image:



M-mode test image:



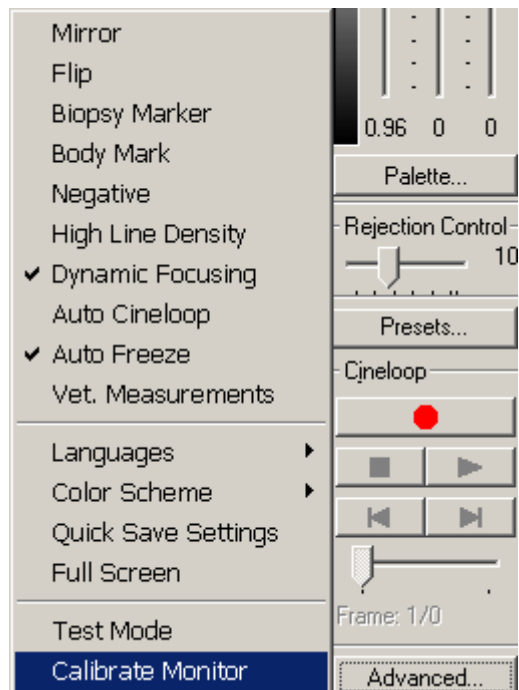
NOTE!

Images can differ from those represented above as it depends on the scanner controls settings: Depth, Frame Averaging, connected probe type and etc.

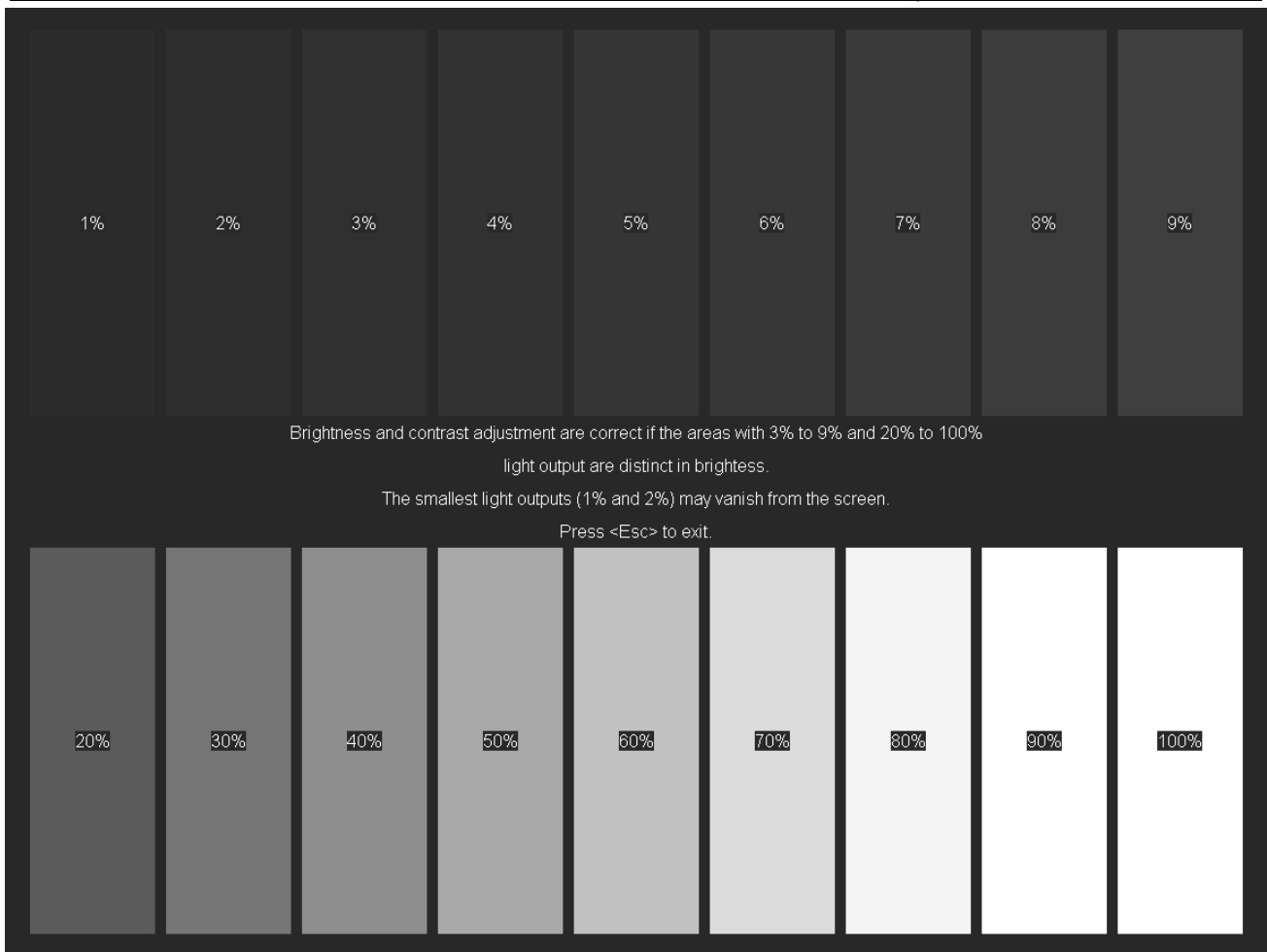
3.7.8. Calibrate Monitor

This mode intended for optimal brightness and contrast adjustment of PC monitor. It is highly recommended to calibrate monitor before operation with scanner.

- Click **Advanced...** button;
- From the drop-down menu select **Calibrate Monitor** menu item;



- You will see a desktop picture like this:



- Follow calibration instructions on the screen to get optimal image;
- Press **ESC** key on the keyboard to exit from calibration mode.

3.7.9. Plug-Ins (Optional Software)

See screenshots of plug-ins at www.telemed.it .

- **ClearView plug-in**

The ClearView software plug-in is a unique image enhancement technology. This technology enhances in real-time both, the aesthetic and clinical value of ultrasound images. It reduces speckle and noise while also achieving fine structural and edge enhancement. The ultrasound streams are filtered on the fly.

- **PanoView plug-in**

The PanoView software plug-in for Echo Blaster 64/128 family scanners allows to scan an extended field of view and create larger overview images.

- **3DView plug-in**

The 3DView software plug-in for Echo Blaster 64/128 family scanners allows to render 3D images.

4. REVISION HISTORY

REVISION	REVISION COMMENTS	ISSUE DATE
2.7	Updated "Veterinarian Calculations" chapter Updated "Cineloop control" chapter	2006.02.10
2.6	Corrected and renamed to common ECHO WAVE ULTRASOUND SOFTWARE Operation Manual due to release of ECHO BLASTER 64 series scanners	2005.07.28
2.5	Added chapter "Calibrate Monitor"	2005.01.26
2.4	Updated "Saving to file" chapter Updated "The comments to the patient examination" chapter	2004.12.27
2.3	Changed "Focusing Control" chapter	2004.10.27
2.2	Added "Rejection Filter" chapter	2004.07.15
2.1	Updated "Loading From File" chapter	2004.06.21
2.0	Added "High Line Density" chapter	2004.05.05
1.9	Spell checking	2004.04.13
1.8	Updated measurements package description	2004.04.05
1.7	Updated measurements package description	2004.02.01
1.0	Initial release of the Echo Blaster 128 INT-1Z / EXT-1Z KIT Operation Manual	2003.11.15