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MyLabX8
MyLabX8 eXP

Advanced Operations

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Introduction

This manual details **MyLab** operations and describes the available optional packages.

The manual is composed of the following sections:

- Section 1: Advanced Features.
- Section 2: Image Optimization.
- Section 3: Measurements.
- Section 4: Archiving.

Advanced tools, like 3D/4D, are described in dedicated and optional manuals.

In this manual device controls are indicated using the following graphical conventions:

- Control panel buttons are indicated by **GREY CAPITAL LETTERS**.
- Touchscreen keys are indicated by **BOLD BLUE CAPITAL LETTERS**.
- Touchscreen software strings are indicated by **NORMAL BLUE CAPITAL LETTERS**.
- Screen software buttons and options are indicated by **BOLD BLACK CAPITAL LETTERS**.
- Screen software strings are indicated by **NORMAL BLACK CAPITAL LETTERS**.

Select/Click means positioning the cursor with the trackball over the desired option and pressing **ENTER** to confirm.

Right click means positioning the cursor with the trackball over the desired option and pressing **UNDO** to confirm.

Double click means positioning the cursor with the trackball over the desired option and pressing **ENTER** twice.

Tap means touching with your finger the desired command on the touchscreen.

Swipe means placing your finger on the desired area of the touch screen and moving it to the left or to the right.



WARNING

In this manual **WARNING** identifies a risk for the patient and/or the operator.



CAUTION

In this manual **CAUTION** describes the precautions necessary for protecting the equipment.

NOTE

In this manual **NOTE** points out information of special interest but not related to risks for patient, operator or device.

Before attempting to use **MyLab**, read and understand all the instructions in the set of manuals. Strictly observe all cautions and warnings. Always keep the manuals with the equipment in an easily accessible place for future reference.

The instructions for use describe the most extensive configuration of your **MyLab**, with the maximum number of options. Some functions, probes or applications described may be unavailable on your product's configuration.

NOTE

Technology and features are device/configuration dependent.

Specifications subject to change without notice. Information might refer to products or modalities not yet approved in all countries. Product images are for illustrative purposes only. For further details, please contact your Esaote sales representative.

NOTE

The manuals describe all operations to be performed for a proper and safe use of **MyLab**. Any device malfunction caused by incorrect operations is considered as falling under the user's responsibility.

The manuals can refer to:

- **MyLabX8 Family** when the contents are relevant only to this family, or
- **MyLab** when the contents are common to the other ultrasound scanners belonging to the Esaote **MyLab** platform.

ADVANCED FEATURES

1	Annotations	1-1
1.1	Annotation Overview.....	1-1
1.2	Free Text Annotations.....	1-2
1.3	By Sentence / By Word Annotations.....	1-2
1.4	Editing and Relocating Annotations	1-3
1.5	Annotations Configuration.....	1-3
1.5.1	Settings for All Applications.....	1-4
1.5.2	Settings for a specific Application.....	1-4
2	Bodymarks	2-1
2.1	Bodymark Activation.....	2-1
2.2	Bodymarks Configuration	2-2
2.2.1	Settings for a specific Application.....	2-2
3	Acquisition Protocols	3-1
3.1	Configuration Menu	3-1
3.2	How to create an Acquisition Protocol.....	3-2
3.2.1	Available Actions.....	3-4
3.3	Working with Protocols.....	3-6
4	Security.....	4-1
4.1	Security Overview	4-1
4.2	Security Configuration Menu.....	4-1
4.2.1	Settings Tab.....	4-2
4.2.2	Users Tab.....	4-3
4.3	Security Access.....	4-4
4.4	Access Security Control.....	4-5
4.5	Protection from Viruses	4-5
4.5.1	Malware Infection	4-5
4.5.2	Operating System Patches Policy.....	4-6
4.5.3	Firewall	4-6
4.6	Correct management and privacy of patient data.....	4-7
4.6.1	Data interface and transmission protocol	4-8
5	Remote Service	5-1
5.1	How to Access to Remote Service.....	5-1
5.1.1	Pre Conditions	5-1
5.1.2	Network Connection.....	5-2
5.1.3	Remote Service Connection	5-2
6	Using the Needle Guides.....	6-1
6.1	Displaying the Needle Guide.....	6-1
6.1.1	Needle Length.....	6-4
6.2	After the Examination.....	6-5
6.3	Checking the Guide Alignment	6-5
6.4	Needle Enhanced Imaging	6-6
6.5	Biopsy Configuration	6-7
7	QPack.....	7-1
7.1	QPack Activation	7-1
7.1.1	QPack analysis on frozen clips	7-1
7.1.2	QPack analysis on archived clips	7-2
7.2	Touchscreen controls in QPack.....	7-3

7.2.1	Intensity Curve.....	7-3
7.2.2	QPack deactivation.....	7-4
8	ePortal Configuration.....	8-1
8.1	Accessing to configuration menu.....	8-1
8.2	ePortal Configuration Tabs.....	8-1
8.2.1	LAN Access tab.....	8-1
8.2.2	General Settings tab	8-2
8.2.3	Streaming tab	8-3
8.2.4	MyLab Remote tab.....	8-4
8.2.5	MyLab Share tab	8-4
8.3	Streaming video activation.....	8-5
8.4	MyLab Remote activation.....	8-6
8.4.1	Use in sterile environment.....	8-8
8.5	Camera streaming.....	8-8
9	VPan	9-1
9.1	VPan Acquisition	9-1
9.1.1	Exam End.....	9-2
9.2	Reviewing a VPan Image.....	9-3
9.3	Measurements	9-4
9.4	Storing the Reconstructed Image.....	9-4
10	MyLibrary	10-1
10.1	MyLibrary overview	10-1
10.2	MyLibrary activation	10-2
10.3	MyLibrary Organization.....	10-5
11	Quality Attenuation Imaging	11-1
11.1	QAI Overview	11-1
11.2	QAI Activation.....	11-1
11.3	Touchscreen controls in QAI	11-2
11.4	QAI Measurements	11-2
11.5	QAI Settings	11-3
11.6	QAI Report.....	11-4
12	HyperDoppler.....	12-1
12.1	HyperDoppler Overview.....	12-1
12.2	HyperDoppler Activation.....	12-1
12.2.1	Procedure for frozen clips.....	12-2
12.2.2	Procedure for archived clips	12-2
12.3	Touchscreen controls in HyperDoppler	12-3
12.4	HyperDoppler Configuration	12-5
12.5	HyperDoppler Formulas	12-6
12.5.1	Flux and vorticity	12-6
12.5.2	Shaded functions.....	12-7
12.5.3	Steady Streaming.....	12-7
13	The CnTI Option	13-1
13.1	CnTI Overview.....	13-1
13.1.1	Intended Use.....	13-1
13.1.2	Additional Safety Information.....	13-1
13.2	Screen Layout in CnTI	13-2

13.3	Running a CnTI Exam	13-3
13.3.1	Controls in CnTI Mode.....	13-3
13.3.2	Freeze Functions.....	13-5
14	The ElaXto Option.....	14-1
14.1	ElaXto Overview	14-1
14.2	Activation of the ElaXto Analysis	14-2
14.2.1	Ending the ElaXto Analysis	14-2
14.3	Performing an ElaXto Analysis	14-2
14.4	The Screen Layout in ElaXto	14-3
14.5	Controls in ElaXto	14-4
14.5.1	Controls in Freeze	14-5
14.6	ElaXto Measurements	14-5
14.6.1	ElaXto Ratio Measurements.....	14-5
14.6.2	Measurements of the Hardness (Softness) Percentage	14-8
14.6.3	Export of the Histogram.....	14-10
A	ECG Cables.....	A-1
A.1	Checking the ECG Cable	A-1
A.2	Cleaning and Disinfecting the ECG Cable.....	A-1

1. ANNOTATIONS

This chapter describes the Annotations function that provides the capability to place comments and arrows on an image to identify anatomical structures and locations.

This chapter includes the following topics:

1.1 *Annotation Overview*

1.2 *Free Text Annotations*

1.3 *By Sentence / By Word Annotations*

1.4 *Editing and Relocating Annotations*

1.5 *Annotations Configuration*

1.1. Annotation Overview

Two types of annotations are available on **MyLab**:

- Free Text Annotations, to insert a free text comment: can be activated by typing from the QWERTY keyboard.
- By Sentence or By Word Annotations, to insert predefined comments from a glossary: can be activated by pressing **ABC**.

Annotations appear on all saved images and clips and on prints as well.

UNDO key closes the annotation session.

When Annotations are activated, **MyLab** displays dedicated controls on the touchscreen. Keys may change depending on the type of selected annotation.

Table 1–1 Annotations Controls

Touchscreen key	Description
BY WORD BY SENTENCE	alternatively activates the By word and By sentence annotation modality. Refer to next paragraph for further details.
DELETE ALL	cancels the whole edited text. The same button has to be pressed to cancel the displayed text.
DELETE LAST WORD	cancels the last edited text without exiting.
DELETE LINE	cancels the whole row where the cursor is without exiting.
INSERT ARROW	when pressed, it displays an arrow; rotating the knob, it rotates the arrow. Place the arrow using the trackball and confirm the final position by pressing the ENTER key.
OK	closes the annotation session without erasing the inserted text.

Table 1-1 Annotations Controls (cont'd.)

Touchscreen key	Description
SET HOME	sets the default position (HOME) for the annotation cursor based on the present position.
SCROLL	when in By Sentence Annotation, this knob scrolls the list of words.

1.2. Free Text Annotations

Pressing any alphanumeric key of the QWERTY keyboard, automatically activates text input and text is placed in the HOME position. If **AUTOMATIC WORD RECOGNITION** is enabled, during the typing, **MyLab** suggests the word, present in the glossary, starting with the same letters while rotating the trackball it browses the glossary.

To confirm the proposed word press **Enter**↵ or go on with typing text, then confirm pressing **ENTER**.

The text can be placed anywhere within the image area using the trackball.

1.3. By Sentence / By Word Annotations

Once activated By Sentence or By Word Annotations, you can insert both a sentence or a single word taken from a configurable glossary.

MyLab displays the glossary associated to the active preset. Press the **APPLICATIONS** tab to browse the glossaries available with other applications.

The sentence is composed of four words. On the touchscreen **MyLab** displays the list of the available words, organized in columns: the first column lists the available words for the first term of the sentence, the second column for the second term and so on.

Procedure for glossary By Word

1. Press **ABC**
2. If necessary select the desired glossary by browsing the navigation tabs.
3. If necessary swipe to scroll the touchscreen pages.
4. Tap on the desired word: it is displayed on the screen in HOME position or at the right side of the last word settled or at cursor position.
5. Depending on the settings of Annotation Configuration Menu, the word can be definitely placed, edited or moved. Press **ACTION** to change function:
 - When the word is yellow with cursor blinking it can be edited.
 - When the word is yellow contoured by a frame it can be placed on the screen moving the trackball.
 - When the word is gray it is definitely placed.
6. Edit or place the word, then press **Enter**↵ to confirm its final position.

Procedure for glossary By Sentence

1. Press **ABC**
2. If necessary select the desired glossary by browsing the navigation tabs.
3. Tap on each word of the sentence to select it: the sentence is displayed on the screen contoured by a frame. When the available words are more than the displayable, you can scroll each column rotating **SCROLL**.
4. The sentence is displayed on the screen contoured by a frame (unless **FIX** is selected as First Cursor Action in the Annotation Configuration Menu).
5. Move the trackball to place the sentence, then press **Enter**↵ to confirm its final position: the sentence is positioned and the frame disappears.

1.4. Editing and Relocating Annotations

Once the annotation is confirmed on the screen it can be edited and moved in another place.

Text Editing

To edit Free Text and By Word Annotations (By Sentence Annotations can not be modified):

1. Place the cursor on the text to be modified and press **ENTER** to highlight it.
2. If necessary press **ACTION** to switch to EDIT modality (refer to the *Annotations Configuration* paragraph).
3. Move the trackball to place the cursor.
4. Use the left/right arrow keys of the alphanumeric keyboard. Place the cursor on the desired position to edit the text.
5. Edit the text and press **ENTER** to confirm.

Text Relocation

To relocate Free Text, By Word and By Sentence Annotations:

1. Place the cursor on the text to be moved and press **ENTER** to highlight it: the text is contoured by a frame.
2. If necessary press **ACTION** to switch to MOVE modality (refer to the *Annotations Configuration* paragraph).
3. Move the trackball to place the text in the new position, then press **ENTER** to confirm its final position: the sentence is positioned and the frame disappears.

1.5. Annotations Configuration

Press **MENU** then **ABC - ANNOTATIONS** to enter in the Annotations Configuration Menu. It is organized in two main areas: the left side shows the list of all saved annotations, organized by applications, and the right side the glossary configuration menu.

NOTE

When an application is selected, **FACTORY** retrieves all factory annotations and deletes all user customized glossaries saved for that application.

The glossary configuration menu changes depending on the selection made on the left list, (ALL APPLICATIONS option or an application/customized glossary).

1.5.1. Settings for All Applications

When ALL APPLICATIONS has been selected, the menu allows the user to enable the following parameters:

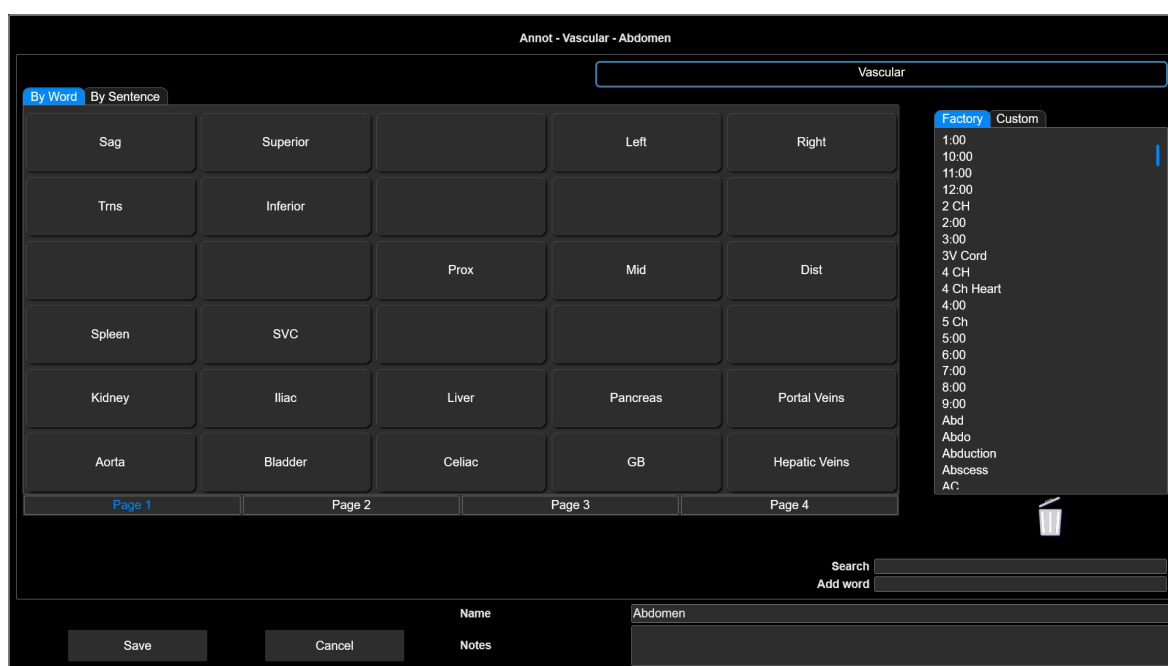
Table 1–2 Settings for All Applications

Field	Action
FONT SIZE	It sets the font size.
AUTOMATIC WORD RECOGNITION	It enables the Automatic word recognition.
DELETE WHEN UNFROZEN	When enabled, the text is automatically deleted as soon as real time is resumed.
TEXT REPLACEMENT ENABLED	When selected, the new word is placed starting from the HOME position and any existing word in such position is overwritten. When not selected, the new word is placed at the right side of the last existing one, and a space character is automatically placed in between.
FIRST CURSOR ACTION	It sets the trackball functionality when text is highlighted, whether it shall move (MOVE option cursor displayed on the screen) or edit (EDIT option text contoured by a frame) the highlighted text. A third option (FIX option) places the selected word and allows to select a new one.
TEXT COLOR	Here you can change the annotations color moving the RGB sliders. Default color is light gray (211,211,211). Once a new color is set, press RESET to return to default color.

1.5.2. Settings for a specific Application

When an application/customized glossary has been selected for editing, the configuration menu is organized with internal folders, selectable using the tabs displayed on the top of the menu.

Fig. 1-1 Glossary Configuration Menu



The glossary configuration menu shows:

- in the center the touchscreen layout. Both modalities “By Word” and “By Sentence” have their dedicated touchscreen, selectable through the corresponding tab;
- on the right the selected application and the lists of all words available in all glossaries, organized as **FACTORY** and **CUSTOM** lists;
- on the bottom the fields where the customized glossary is named and described.

1.5.2.1. Glossary Configuration

Procedure

1. Select either **BY WORD** or **BY SENTENCE** modality;
2. select the desired word from the right list with the trackball. The word can be selected either by scrolling the list with the trackball or by entering searching criteria in the **SEARCH** field;
3. by keeping **ENTER** pressed, drag and drop the word in the desired position of the touchscreen;
4. for each modality, words can be organized in different levels: select first the desired **PAGE** using the trackball and then drag and drop the word in the desired page. Words organized in more pages (or levels) can be scrolled swiping left/right on the touchscreen. Repeat the procedure to add other words.
5. **ADD WORD** field allows to add new words into the glossary. Using the alphanumeric keyboard enter the desired word and press **Enter** to confirm: **MyLab** automatically adds the new word to the **CUSTOM** list. To delete a customized word, place the cursor on the word to be removed and, by keeping **ENTER** pressed, drop it into the waste bin.

1.5.2.2. Glossary Organization in the Touchscreen

Words can be freely positioned within the touchscreen.

Moving a Word

Select the word with the trackball and by keeping the **ENTER** key pressed, move it in the desired position. Release **ENTER** to confirm.

Deleting a Word

Place the cursor on the word to be removed and by keeping the **ENTER** key pressed drop it into the waste bin.

2. BODYMARKS

This chapter describes the bodymarks that are schematic drawings of anatomical sections.

This chapter includes the following topics:

2.1 *Bodymark Activation*

2.2 *Bodymarks Configuration*

2.1. Bodymark Activation

Bodymarks are organized in groups: each application has its specific set of bodymarks.

Bodymarks can be activated pressing **MARK**. Once activated, the touchscreen displays the group of marks associated to the active application and preset while on the Navigation Bar other anatomical districts are listed when available.

Tap on each tab to browse the marks available for other districts, rotate the knob showing the current application (i.e. **VASCULAR**) at the bottom-right of the touchscreen to browse the marks available with other applications.

Procedure

1. Press **MARK**
2. If necessary, change application and/or select the desired bodymark library.
3. Select the bodymark on the touchscreen: the mark is displayed on the screen. You can also rotate **MARK** to change selection.
4. If in Dual format, use the **LEFT** or **RIGHT** button to correctly match the mark to the corresponding image.
5. Increase/decrease the dimensions of the bodymark rotating **SIZE**.
6. An arrow overlays the bodymark to indicate the probe position. Use the trackball to move it.
7. Use **ROTATE** to rotate the arrow. Alternatively you can also press **MARK**; the arrow becomes green and can be rotated by rotating **MARK**.
8. Press **OK** or **ENTER** to confirm.

Once confirmed, bodymark can be moved in any position on the image by selecting it and dragging it to the new position. Bodymarks can be moved over annotations and measurements; when this happens the label is maintained below the bodymark itself.

When bodymarks are activated, **MyLab** displays dedicated controls on the touchscreen.

Table 2–1 Bodymarks Controls

Touchscreen key	Description
SET HOME	once the bodymark is selected to be moved on the image, this key sets the default position (HOME) for the bodymark based on the current position.
SIZE	increases/decreases the size of the bodymark.
DELETE BODYMARK	exits without displaying any bodymark. The same button has to be pressed to cancel the displayed mark. Bodymarks can be added on archived images and sequences, but they are not saved on retrieved images or clips.

2.2. Bodymarks Configuration

Press **MENU** then **BODYMARKS** to enter in the Bodymarks Configuration Menu. It is organized in two main areas: the left side shows the list of all saved bodymark libraries, organized by applications, and the right side the bodymark configuration menu.

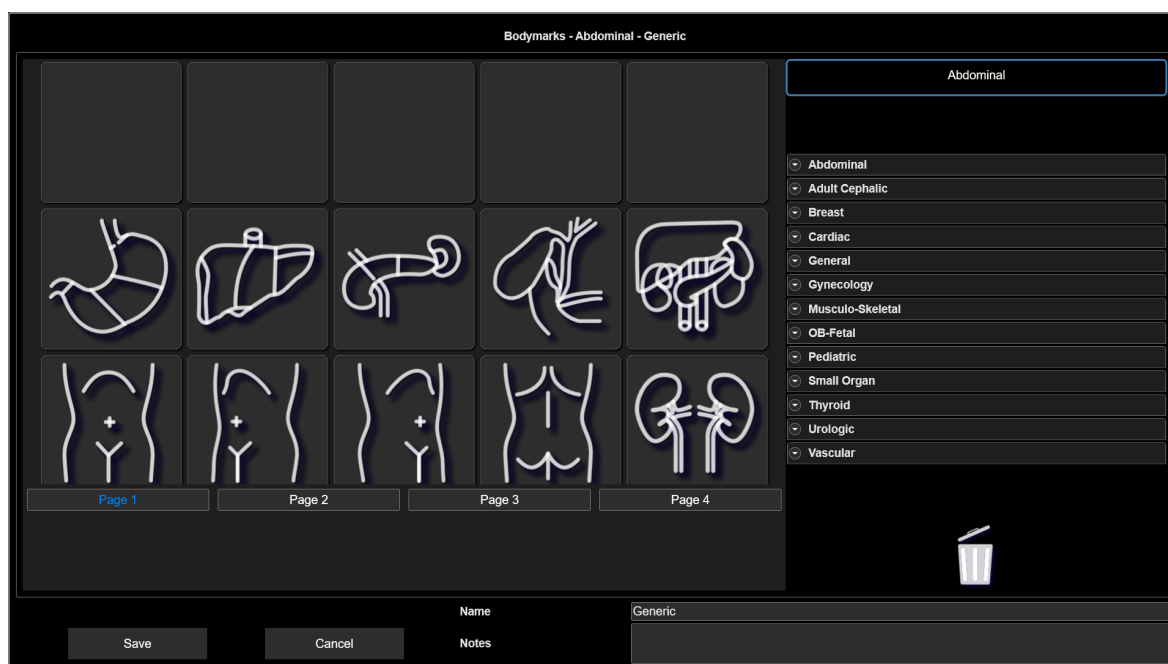
NOTE

When an application is selected, **FACTORY** retrieves all factory bodymark libraries and deletes all user customized bodymarks saved for that application.

2.2.1. Settings for a specific Application

When an application/customized bodymark library has been selected for editing, the configuration menu is organized with internal folders, selectable using the tabs displayed on the top of the menu.

Fig. 2–1 Bodymark Configuration Menu



The bodymark configuration menu shows:

- in the center the touchscreen layout;
- on the right, the selected application and the lists of all the available bodymarks grouped by application;
- on the bottom the fields where customized bodymark libraries are named and described;

2.2.1.1. Bodymark Configuration

To create a customized bodymark library, follow this procedure:

Procedure

1. using the trackball scroll the application list displayed on the right and click on the desired combo to access the single bodymark;
2. select the desired bodymark from the list on the right;
3. by keeping **ENTER** pressed, drag and drop the bodymark in the desired position of the touchscreen;
4. bodymarks can be organized in different levels: select first the desired **PAGE** using the trackball and then drag and drop the bodymark in the desired page. Bodymarks organized in more pages (or levels) can be scrolled swiping left/right on the touchscreen.
5. Repeat the procedure to add other bodymarks.

2.2.1.2. Bodymark Organization in the Touchscreen

Bodymarks can be freely positioned within the touchscreen.

2. Bodymarks

Moving a Bodymark

Select the bodymark with the trackball and by keeping the **ENTER** key pressed move it in the desired position. Release **ENTER** to confirm.

Deleting a Bodymark

Place the cursor on the bodymark to be removed and by keeping the **ENTER** key pressed drop it into the waste bin.

3. ACQUISITION PROTOCOLS

This chapter explains how to create and configure protocols.

This chapter includes the following topics:

3.1 *Configuration Menu*

3.2 *How to create an Acquisition Protocol*

3.3 *Working with Protocols*

3.1. Configuration Menu

A protocol is a sequence of actions that can be defined by the user to support procedures. A protocol is useful to:

- make it easier the usage of the **MyLab**;
- comply with clinical guidelines;
- provide standard examination even if performed by different operators.

A protocol is made of several sessions where each session is made of one or more steps. Each step can be configured to do different actions.

The **ACQUISITION PROTOCOLS** option of the **MENU** allows to access the Acquisition Protocol Configuration menu.

The menu is organized in two main areas. The left side shows the list of applications while the right side shows the list of protocols.

All saved protocols are organized by application.

Configuration

To create a protocol, follow this procedure:

- to create a completely new Acquisition Protocol, select the desired application from the left list and press the **NEW** button;
- to create a new Acquisition Protocol starting from an existing one, select the desired protocol from the left list and press the **CLONE** button. When no protocol is selected, this button is replaced by the **NEW** button.

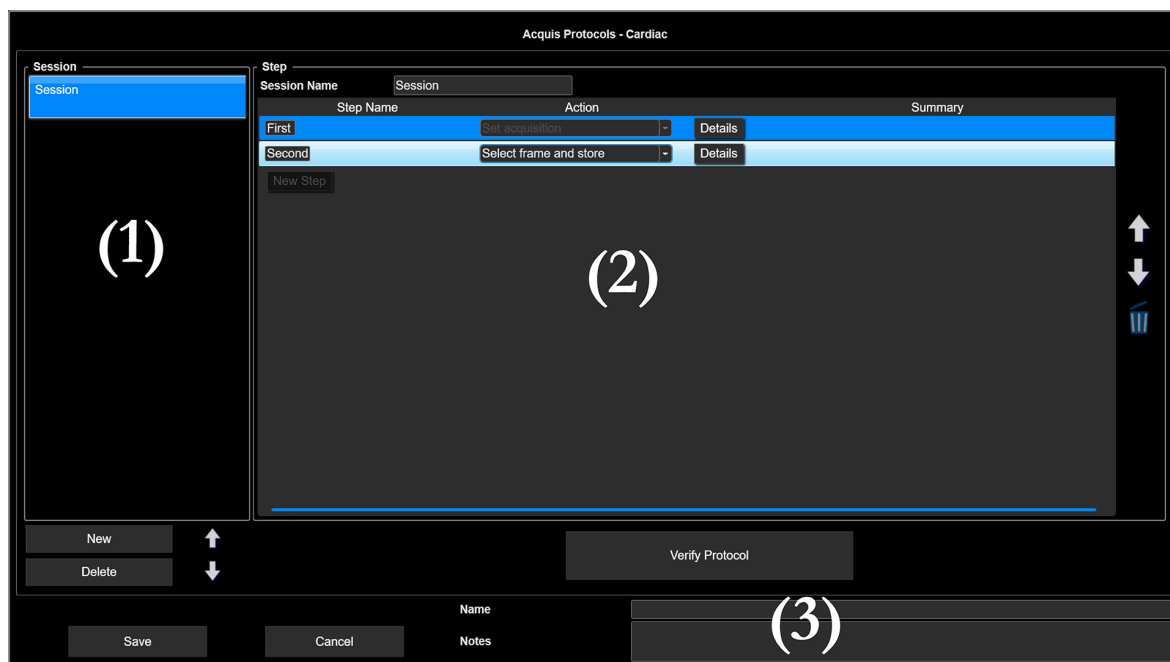
When a protocol is selected, also the following buttons can be pressed:

- **EDIT** to modify the selected protocol. Alternatively position the cursor on the desired option and press **ENTER** twice to select it;
- **REMOVE** deletes the selected protocol.

3.2. How to create an Acquisition Protocol

Once **NEW** or **CLONE** buttons have been pressed, the following menu is displayed:

Fig. 3-1 Acquisition Protocols Menu



The Acquisition Protocols menu is organized in three main areas:

- | | | |
|-----|----------|---|
| (1) | SESSIONS | on the left the list of all the sessions |
| (2) | Actions | on the right the list of configured actions organized by steps |
| (3) | AP NAME | on the bottom the fields where customized protocols are named and described |

A session is a self consistent section of a protocol (typically devoted to a specific anatomical district).

Groundwork

Before creating a protocol, it is suggested to:

- list all the required steps;
- decide how to split actions into sessions;
- order by priority mandatory and optional actions within each session;
- create custom measurements if needed.

Configuration

After **NEW** or **CLONE** have been pressed, follow this procedure to create a protocol:

1. press the **NEW** button to create a new session. Several sessions can be defined for a protocol;
2. place the cursor on the **SESSION NAME** field and using the alphanumeric keyboard enter the desired name;
3. place the cursor on the **STEP NAME** field and using the alphanumeric keyboard insert the desired step name;
4. select the desired action from the curtain menu. The first step of every section is always **SET ACQUISITION** and only its details can be modified (see next point);
5. press the **DETAILS** button to configure the proper parameters for the selected action;
6. press the **NEW STEP** button to create a new step. One or more steps can be defined for each session;
7. once all steps and sessions have been defined, press **VERIFY PROTOCOL** to validate the protocol consistency from a syntactic point of view. A feedback dialog will inform the result;
8. place the cursor on the **NAME** field and using the alphanumeric keyboard enter the desired name for the protocol and its description (**NOTES** field);
9. press **SAVE** to save the protocol. Before saving, a protocol verification is automatically done.

CANCEL exits the menu without saving the new protocol.

NOTE

Use short strings both for session and step name since they are shown on the main display as “Session name - Step name”.

Actions and steps order is important creating a protocol.

Once selected, each step can be moved up/down with the proper button on the right to modify.

Once selected, each session can be moved up/down with the proper button on the bottom.

3.2.1. Available Actions

3.2.1.1. Set Acquisition

This action allows to set the desired acquisition mode and its typical setting.

Fig. 3–2 Set Acquisition Windows

Insert step name

Summary

Acquisition Mode

Acquisition Tag

☒ Remove all previous annotations

Annot

Trace Full Screen

Enable Plex

☐ Line on image

Doppler scale Speed

Angle(*) Correction 0

☐ Automatic Doppler Profile

ADM profile Full

Ok Cancel

The **SUMMARY** field allows to input a description for the action under definition. This description is the one used in the summary column of the main editor screen.

ACQUISITION MODE allows to set the desired acquisition mode. Depending to the selected acquisition mode, different parameters can be set.

As additional option the **ACQUISITION TAG** field allows to add an annotation or remove all previous annotations from screen.

When completed, press **OK** to save the changes or **CANCEL** to discard them.

3.2.1.2. Select Frame & Store

This action allows to select the desired frame and save it in the archive.

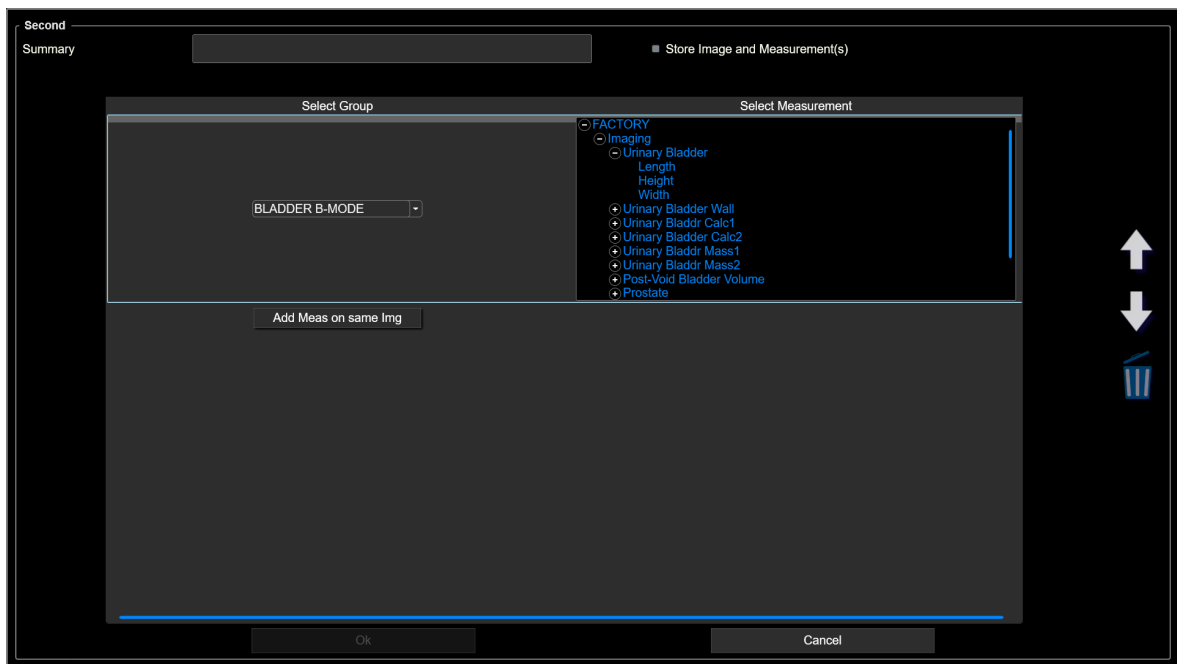
Only the **SUMMARY** field is present. No other controls are available.

When completed, press **OK** to save the changes or **CANCEL** to discard them.

3.2.1.3. Select Frame & Measurement

This action allows to select the desired frame and runs the selected measure on it.

Fig. 3-3 Select Frame & Measurement Windows



The desired measure can be selected from the list of measures available for the current application. The measure list is divided in two main branches: **FACTORY** and **CUSTOM**.

The **ADD NEW MEAS ON SAME IMAGE** allows to run other measures on the same image.

When **STORE IMAGE** and **MEASUREMENT** are selected, the measured image is automatically saved in the archive (no click needed).

When completed, press **OK** to save the changes or **CANCEL** to discard them.

3.2.1.4. Manage Annotations

This action allows to write on the image the selected text.

Fig. 3-4 Manage Annotation Windows

Second

Summary

Annotations to be added

Insert annotation here

Leave this field empty and check REMOVE ALL PREVIOUS ANNOTATIONS to delete text from image

Position

Home

☐ Remove all previous annotations

Ok Cancel

Fill the ANNOTATIONS TO BE ADDED field with the text to be displayed on the screen. POSITION allows to specify where to add the previously defined annotation (default is home).

When REMOVE ALL PREVIOUS ANNOTATIONS is selected, the annotations are removed from the screen.

When completed, press **OK** to save the changes or **CANCEL** to discard them.

3.2.1.5. Save Clip

This action allows to save a clip in the archive.

Only the SUMMARY field is present. No other controls are available.

When completed, press **OK** to save the changes or **CANCEL** to discard them.

3.3. Working with Protocols

When protocols have been created and associated to **ETOUCH**, you can work with them using the following procedure:

1. Start a new exam inserting patient data, selecting probe, application and preset;
2. Press **ETOUCH** button;
3. Select the desired protocol on the touchscreen, the protocol automatically starts.

On the bottom left of the screen are displayed both the actual session and step (on the first row) and the next session (on the second row).

Pressing **ENTER** you can go ahead through the steps of the current session while pressing **UNDO** you can skip to the next session.

4. SECURITY

This chapter provides information on the security features offered by **MyLab** and describes the precautions suggested by Esaote to avoid attacks from viruses, and other security risks and threats.

This chapter includes the following topics:

4.1 *Security Overview*

4.2 *Security Configuration Menu*

4.3 *Security Access*

4.4 *Access Security Control*

4.5 *Protection from Viruses*

4.6 *Correct management and privacy of patient data*

4.1. Security Overview

Data and system security, for the medical devices, is a joint responsibility between all the stakeholders, including the manufacturer, the healthcare provider, and the users. All stakeholders must understand their responsibilities and work with other stakeholders to continuously monitor, assess, mitigate, communicate, and respond to potential security risks and threats throughout the life cycle of the medical device.

The access to the device, particularly to protect the archive, can be reserved to authorized users. In this case all users must enter a password to use the device and to access the archive data. The access under password allows a secure management of the archive: its data can be reviewed and modified only by authorized personnel.

You can assign different accessing profiles to different device configurations.

If the security login described below is not enabled on your **MyLab**, at every boot a reminder is displayed on the screen. The message can be disabled selecting the related check-box avoiding further notifications.

4.2. Security Configuration Menu

Two different accounts are available: administrator and user.

The system administrator can decide whether to activate the access security management. When enabled, he/she can access to the configuration menu to create, add, delete users and define their profiles. The administrator can set the emergency access to **MyLab** (access without password). More administrators can be defined.

4. Security

To access the Security Configuration Menu press **MENU** then **SECURITY, MyLab** will prompt the Login screen where to insert the administrator **USER NAME** and **PASSWORD**. Insert them and press **LOGIN** to enter the configuration menu.

NOTE

The default administrator user name and password are: **ADMINISTRATOR** and **MYLAB**. Change this account if the security management is activated.

The configuration menu is organized in two tabs: Settings and Users.

SAVE saves and activates the settings.

CANCEL exits the menu without saving the new settings.

4.2.1. Settings Tab

Only administrators can access this option.

Table 4–1 Settings available in Settings Tab

Field	Action
INACTIVITY TIME DISABLING LOGIN (DAYS)	Sets the inactivity time (in days) after which the account automatically expires.
PASSWORD MINIMUM LENGTH	Sets the minimum number of characters for the password (maximum 20).
PASSWORD EXPIRATION (DAYS)	Sets the time (in days) after which the password expires.
LOCKING TIMEOUT (MINUTES)	Sets the time (in minutes), after which MyLab is locked.
DISABLE EMERGENCY ACCESS	Disables the emergency access when checked.
DISABLE ACCESS CONTROL	Disables the security access when checked.

NOTE

MyLab is case sensitive.

When security access has been enabled, the user authentication can be local (**LOCAL USER** check-box selected) or centralized (**LOCAL USER** check-box not selected).

For centralized authentication of the users it is mandatory to define a LDAP (Lightweight Directory Access Protocol) Server: the user password and permissions can be received from the LDAP server.

Fill the **AD SERVER NAME** with the desired server name or IP address.

Export Log

EXPORT SECURITY LOG button saves on an external medium the security log files. All configurations (Settings and Users) and the access security log (see below) in the

MYLABUSERMANAGEMENT folder are saved in the USB medium. This procedure can be used to backup the security configuration, or to copy it to another **MyLab** with a compatible software release.

4.2.2. Users Tab

To access to the configuration menu press:

- **EDIT** to modify the selected user profile;
- **NEW USER** to add a new profile;
- **REMOVE** to delete the selected user profile.

Table 4–2 Settings available in User Tab

Field	Action
USER NAME	Sets the user name.
FIRST NAME	Sets the user first name.
MIDDLE NAME	Sets the user middle name.
LAST NAME	Sets the user last name.
ASSIGN PASSWORD	Sets the user password.
CONFIRM NEW PASSWORD	Confirms the set user password.
ENABLED TO MODIFY THE CONFIGURATION	When checked, the user has full capabilities.
CHANGE PASSWORD AT NEXT LOGON	When checked, it requires the user to enter a new password at the first login.
ADMINISTRATOR	When checked, it sets the user as administrator.
ENABLED	When checked, it makes the users able to access MyLab .

A user account is identified by USER NAME, LAST NAME, FIRST NAME and MIDDLE NAME.

NOTE

The Last Name will be required at the log in.

4.2.2.1. User Accounts

Two different user's profiles can be defined:

- user with full capabilities (ENABLED TO MODIFY THE CONFIGURATION field checked);
- user with limited capabilities (ENABLED TO MODIFY THE CONFIGURATION field unchecked).

In the first case the user can change all clinical and system settings; in the latter case the user can NOT modify the following presets:

- clinical settings (**PRESET MANAGER** button is not active);

4. Security

- real time settings (the option **REAL TIME PRESETS** of the **MENU** key is not displayed);
- printer settings (the option **PRINTER** of the **MENU** key is not displayed);
- import/export settings (the corresponding option of the **MENU** key is not displayed);
- DICOM settings (the corresponding option of the **MENU** key is not displayed);
- 3D settings (the corresponding option of the **MENU** key is not displayed).

Both administrator and users can access the archive, both in Exam Review and in Archive Review.

Table 4–3 Types of user

User type	Password needed	User authorization
EMERGENCY	NO	Can only archive locally; can review only the data of the current exam (EXAM REVIEW); cannot export.
NORMAL	YES	Can review and export all the data (EXAM and ARCHIVE REVIEW). Cannot change configurations.
NORMAL with rights to change configuration	YES	Can review and export all the data (EXAM and ARCHIVE REVIEW).
ADMINISTRATOR	YES	Like NORMAL, plus can create and delete NORMAL and ADMINISTRATOR users, can disable the access control and the EMERGENCY access, etc.
ESAOTE	NO (dongle)	Like ADMINISTRATOR

4.3. Security Access

When security is enabled, a password is required to access **MyLab**. When starting up, **MyLab** requires to enter user name and password.

Emergency Access

When the Emergency option is active, exams can be performed (**EMERGENCY** button) without entering any user name and password. The Emergency access allows to perform exams and review saved images in Exam Review, but won't allow to access the Archive (**ARCHIVE** key).

NOTE

Emergency exams are automatically saved on the local archive. Only authorized users can access these exams.

Log Out and Lock

LOGOUT button is displayed in the Start Exam window. **MyLab** is set in standby by pressing this key and can be reactivated by inserting user name and password again.

LOCK button is displayed in real time, Exam Review and Archive Review allowing to lock **MyLab**. The password is required to unlock **MyLab**.

User Menu

The option **CHANGE PASSWORD** of the **MENU** key allows the user to change the user account.

4.4. Access Security Control

When enabled, the security access management produces a log file (called *UserManagementLog.txt*) tracing every access to the unit (access log). This allows the system administrator to fulfill the security regulations requiring this kind of log.

The log file can be considered to have adequate completeness, inalterability and integrity.

Completeness

The log file is automatically produced and internally archived by the **MyLab**: this file can be then considered complete and can be exported into a USB medium.

Inalterability

MyLab can be considered a closed system: the normal user (including the system administrator) can not modify the contents of the log file: this guarantees its inalterability.

Integrity

Moreover it is always possible to export again the log file to verify its integrity.

4.5. Protection from Viruses

Like every other computer-based system, **MyLab** can be exposed to malware attacks. The term “malware” indicates a software (sometimes called virus, trojan horse, worm) designed to infiltrate or damage a computer system without the owner knowing. Theoretically malware can affect the operations of a computer system in different ways: it could delete its system files, thus stopping its functioning; it could also compromise the security of the machine, allowing unwanted exposure of the data contained in it. In a medical imaging device, like **MyLab**, this could compromise the privacy of the examined patients or damage the exam database.

Unfortunately, as for any other computer-based system, internal security measures cannot ensure a complete protection of **MyLab** against malware. For this reason the user must be aware of Esaote countermeasures and must know which is the best approach to work with **MyLab** in the best possible security conditions.

4.5.1. Malware Infection

Malware can enter into a computer system when executing a program with a viral payload. Such a program could be either intentionally or accidentally executed. Normally **MyLab** does

not allow to intentionally execute other software programs than the pre-loaded ones: only exception occurs when installing a printer.

While installing the printer, **MyLab** could require specific printer drivers, if these are not already present, they should be requested to Esaote.

Besides these operations, **MyLab** can be considered a closed system. To ensure the maximum level of security, auto-running software from removable devices is disabled.



CAUTION

Use only removable devices (USB, CD or DVD) whose content is safe and whose origin is known.

NOTE

Any operation different from the ones described in the Operator manuals is not authorized by Esaote. Any malfunctioning caused by unauthorized operations is considered as falling under the user's responsibility.

4.5.2. Operating System Patches Policy

Malware can also enter a computer system through the data network, exploiting a failure of the operating system. For this reason it is very important to install as soon as possible the relevant security patches released from the manufacturer of the operating system.

The operating system is Windows® 10. Esaote includes the manufacturer operating system patches into the **MyLab** regularly scheduled software releases: this will ensure that patches do not affect operation and are validated by Esaote.

Between regularly scheduled releases, if a patch for the Operating System is made to solve known vulnerabilities with impact on **MyLab**, a corrective software version is released and provided to the user by the Esaote service or authorized service partner.

4.5.3. Firewall

It is anyway advisable to close to the malware any possible access from the data network: for this reason all unused network ports are closed in the **MyLab**.

To minimize the exposition to the threats coming from the network, medical devices based on a networked computer system, like **MyLab**, should be connected only to a properly managed data network, i.e. a network that is carefully isolated from external networks through suitable firewalls and that is not used to connect extraneous devices (such as laptops coming from outside the department, etc.)^[1].

1. Refer for example to the USA Department of Veterans Affairs Medical Device Isolation Architecture Guide, April 30, 2004, available at the HIMSS website: http://www.himss.org/ASP/topics_FocusDynamic.asp?faid=101.

**CAUTION**

Always verify that the network is protected from malware.

To ensure a complete protection of **MyLab** from any network attack, Esaote suggests to use a complete agentless intrusion-prevention system: this is a system that acts like a firewall protecting the network against malware from outside, but it also checks the internal network traffic, without requiring any additional software installation in **MyLab**^[2].

The internal Windows® 10 firewall can be enabled by the Esaote Service personnel.

Should further information be needed, please contact Esaote personnel.

4.6. Correct management and privacy of patient data

Esaote develops its products, including **MyLab**, with the aim of providing its customers with enhanced security capabilities and is committed to cooperate with customers in their efforts to comply with security and privacy laws and regulations (such as HIPAA in the U.S.A., GDPR in Europe and PRC Cybersecurity Law in China).

Modifications to personal data of patients are highly critical operations as they may constitute a breach of patient privacy or lead to an incorrect diagnosis of images.

Modifications to personal patient data may lead to incorrect diagnosis of images, caused by:

- inconsistency of images and related personal data (for example, wrong replacement of patient data with those of another person);
- inconsistency between patient data stored on images – and modified – on **MyLab** and data present on the same printed images, sent via the network, saved on removable media and/or stored on PACS prior to data modifications.

**WARNING**

The user is solely responsible for storing files containing patient data, ensuring that this data is handled correctly and that patient privacy is respected.

**WARNING**

The user is solely responsible for protecting the removable media on which the images have been saved or exported against intrusion and/or misuse by third parties, for reasons of data security and privacy.

2. Refer for example to Trend Micro Network VirusWall Enforcer or Firebox X Core Unified Threat Management products or SonicWALL TZ products, or similar.



WARNING

The backup of exams is the correct procedure to preserve data.

Saving images on removable media can be used as backup but cannot be considered a long-term archiving procedure, which requires a different procedure and suitable means.

The operation of exporting images acquired with **MyLab** onto removable media (see Archive section further in this manual), also enables the user to save a file containing the patient data related to the exported examinations.

This file can then be shared, displayed and modified by other users.

It is important to take into account a number of rules in managing removable media used to store images:

- Use good quality removable media.
- Check the condition of the media used for storage: for example a scratched CD or DVD will become unusable.
- Ensure correct care and storage as specified by product manufacturers.

Observance of these rules enables the correct creation and storage of a copy of the patient database.

4.6.1. Data interface and transmission protocol

4.6.1.1. Wired network

Transmission protocol: TCP/IP

Interface: Ethernet 10Base-T, 100Base-T, 1000Base-T, self-adaptive

Bandwidth: 10-100-1000 MbPs, self-adaptive

4.6.1.2. Wireless network

The integrated WiFi and Bluetooth adapter supports IEEE 802.11 ac/a/b/g/n dual-band (2.4 and 5 GHz) transmission standards (automatically selected), with WPA Personal or PSK (TKIP, AES) and WPA2 Personal or PSK (AES) encryption schemes; Open and WEP networks are allowed but a disclaimer suggests to use a more secure network, WPA Enterprise (Radius) is not supported. The Bluetooth capability is not used by the software, and it is disabled.

Bandwidth: according to the selected transmission standard, up to 300 Mbps.

The integrated WiFi adapter is the Qualcomm Atheros, Inc. QCNFA364A and follows the China radio regulation, see the enclosed certificate.

4.6.1.3. Storage media

- CD-R and DVD-R can be read;

- CD-RW, DVD-RW, DVD+RW can be read and written;
- USB memory devices can be read and written.

All the formats supported by Windows® 10 are admitted.

4.6.1.4. Storage format

Exam Data are available in the following formats:

- DICOM (Digital Imaging and Communications in Medicine): international standard for medical images and related information (ISO 12052)
- Esaote proprietary format UAF

The exam data can be exported in the following formats:

- Report:
 - PDF format
- Images:
 - Bitmap (.bmp)
 - Portable Network Graphics (.png)
 - Joint Photographic Expert (.jpg)
- Clips:
 - Audio Video Interleave (.avi)

5. REMOTE SERVICE

This chapter describes how to access to the Remote Service offered by Esaote.

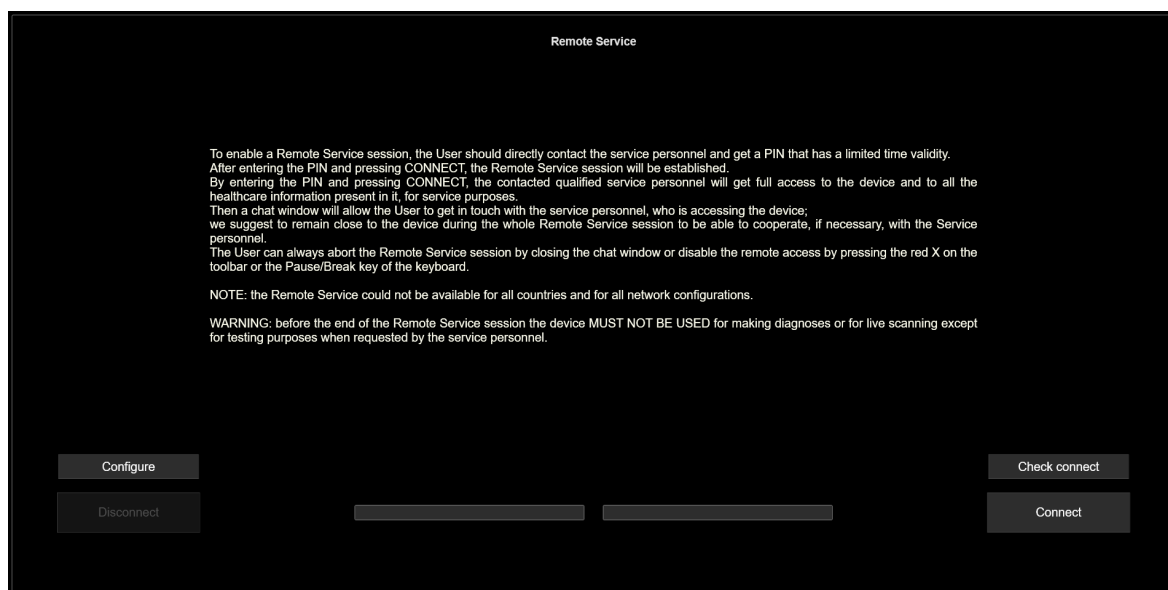
This chapter includes the following topics:

5.1 *How to Access to Remote Service*

5.1. How to Access to Remote Service

The **REMOTE SERVICE** option of the **MENU** key allows the Service personnel to access to **MyLab** in remote.

Fig. 5–1 Remote Service Menu



When active, the Service personnel can remotely interact with the user and with **MyLab** looking at the screen and at the files.

5.1.1. Pre Conditions

MyLab can be connected to the Remote Service only when:

- the network has been configured (refer to the corresponding chapter of this section for further information),
- **MyLab** is connected to the network.

NOTE

It is suggested to contact the network administrator since network characteristics will be required to establish the remote connection.

5.1.2. Network Connection

Before contacting the Service personnel, it is recommended to verify the connection following the procedure below:

Procedure

1. Configure the network.
2. Connect **MyLab** to the network.
3. Select the **REMOTE SERVICE** option of the **MENU** key.
4. Press **CHECK CONNECTION** button. If the connection is established **MyLab** will prompt the message:

Connection available.

5.1.3. Remote Service Connection

Only after having verified the network connection, contact the Service personnel for the Remote assistance. The Service personnel will provide with two PIN numbers that have to be entered in the menu.

NOTE

The PIN numbers have a limited time validity: contact the personnel only after having connected **MyLab** to the network.

The PIN numbers can be used one time only.

Procedure

1. Verify the connection by pressing **CHECK CONNECT**.
2. Enter the two PIN numbers in the two central fields using the alphanumeric keyboard.

NOTE

The fields are not case sensitive.

3. Press **CONNECT**.

MyLab displays the following menu:

Fig. 5-2 Remote Service Connection



This menu allows to chat with the Service personnel: the bottom field can be used to exchange information with the Service personnel.

Press either **DISCONNECT** button or place the cursor on the Cross icon and press **ENTER** to quit the Remote Service.

**WARNING**

During the Remote Service session, the device **MUST NOT BE USED** for diagnoses or for live scanning except for testing purposes when requested by the service personnel.

6. USING THE NEEDLE GUIDES

This chapter describes the needle guidance capabilities offered by **MyLab** and explains how to use them.

This chapter includes the following topics:

6.1 *Displaying the Needle Guide*

6.2 *After the Examination*

6.3 *Checking the Guide Alignment*

6.4 *Needle Enhanced Imaging*

6.5 *Biopsy Configuration*

6.1. Displaying the Needle Guide

MyLab, through the **BIOPSY** key, is able to display a guideline on the real-time ultrasound image that shows the anticipated path of the needle. You can use these guidelines to ensure that the needle is following the correct path.

BIOPSY key is available when the active probe can be equipped with a needle guide kit.

A wide range of probes can be equipped with optional kits for needle guided insertion procedures; refer to the “Probes and Consumables” manual for detailed instruction on how to properly and safely mount the needle guide kits and on how to reprocess them.

Display of needle guide can be activated on B-Mode and CFM images, in Dual, Dual-CFM and simultaneous formats.

To display the needle guide in CnTI and in ElaXto, activate the biopsy procedure before enter one of these modalities.

At certain scanning depths the needle insertion point or the needle itself may not be displayed. In Dual formats the area where the needle is not visible is larger. Always use scanning depths and displaying formats that make the needle visible.



WARNING

Use only Esaote approved Needle Guides. Refer to the “Probes and Consumables” manual for the complete list and for mounting instructions. Not approved Needle Guides may not properly fit probes thus compromising the patient’s safety and resulting in patient injury.

Biopsy procedures must be performed only on real time images. Do not perform biopsy procedure if the needle is not visible. Never move the needle when the image is frozen.



WARNING

The guideline displayed on the image only provides an indication of the expected needle path, according to the selected guide. Always watch the ultrasound live image while inserting the needle into the patient’s body so that any deviation from the desired path of the needle tip can be corrected.

Always verify that the whole needle working area, from its insertion point up to target, doesn’t include anatomical structures that could be touched and damaged, thus compromising the patient’s safety.

Thin needles can bend when entering tissue.

Reverberation and tissue artefacts may produce false needle images which can be mixed-up with the real needle image. Be sure the needle path follows the guideline and that you are not using a false needle image to locate the needle.

Due to mechanical constraints of the needle guide kit, the needle can enter in the tissue in a blind spot.



WARNING

When scanning vascularized structures, display the needle guide working area keeping the CFM mode active so that vessel can be detected and avoided when inserting the needle. Once identified the optimal zone for biopsy, turn CFM off to gain the maximum needle visibility.



WARNING

Perform a manual and visual inspection of the entire kit prior to use.

DO NOT use the kit if it has been damaged or if any damage or distortion are suspected.

Mount the adaptor, following the instruction provided by the manufacturer of the needle guide kit. Before inserting biopsy needle, ensure orientation groove on bracket is aligned with orientation rib on probe handle.

**WARNING**

Before performing the biopsy procedure, check for the correct assembly and positioning of the needle guide kit. Also check that the insertion angle is equal to the angle selected using the user interface software. Needle insertion into a guide with an insertion angle other than the one of the selected angle involves risks to the patient's safety.

Follow the instructions provided by the manufacturer of the needle guide kit to properly mount and use it.

NOTE

In Dual format or at certain scanning depths or in ZOOM the needle insertion point could not be displayed.

Procedure

1. If necessary, protect the probe with a cover mounting it according to the instruction provided by the manufacturer.
2. Assemble the needle guide on the probe, following the provided instructions.
3. Connect the probe to **MyLab**.
4. Start a new exam setting the image parameters for the optimal view of the examination area and needle path.
5. Tap **BIOPSY**, then, according to the probe and guide being used, select, when necessary, the guide tapping the corresponding key with the name of the kit (i.e. **ABS424**).
6. When more than one insertion angle is available for the selected needle guide, the available insertion angles will be displayed beside the key with the name of the kit (through a key indicating the angle values in degrees, i.e. **25°**).
7. As soon as the selection has been done, **MyLab** displays the forecast needle path (through a channel, a line or both according to the settings - see further on this chapter). Dots are stepped every 0,5 cm. The selected angle is shown on the screen beside the needle insertion point.

Fig. 6-1 Superimposed needle guide line



8. Tap **OK** to display the mode commands; **MyLab** temporarily disables all modes, except B-Mode or CFM, in Dual, Dual-CFM and simultaneous formats; tap **CANCEL** to come back to real time without displaying any line.
9. Select a new, sterile, straight needle that matches the needle-gauge size on the biopsy guide clip you are using (if applicable).
10. Insert the needle into the needle guide groove and perform the biopsy by sliding the needle through the groove in the guide until the needle intercepts the target.
11. Tap **BIOPSY** again to set the guide line to off and exit the procedure.
12. Remove the needle guide after use.

If the needle is not following the expected path, discontinue the procedure and contact your Esaote representative.

For linear probes, when displaying the needle guide, **REF LINE** is available to display, once tapped, a line in the center of the probe. At the same time the depth measurement function is enabled.

6.1.1. Needle Length

As soon as the needle biopsy is displayed, the trackball is linked to a yellow spot displayed in the middle of the needle working area.

The spot position provides the distance from the needle guide exit point to the spot itself. The distance value is displayed above the image sector, on the opposite site of the needle insertion point.

The trackball moves the cursor along the forecast needle path and the distance value is automatically updated.

**WARNING**

The value displayed represents the average distance between the kit exit point and the spot itself. The kit length must be added to this distance to obtain the appropriate needle length.

Press **ACTION** to change trackball function as usual.

6.2. After the Examination

When the biopsy procedure has been completed, remove the needle and the guide from the probe. Clean the items following the instructions provided in the “Probes and Consumables” manual and by the manufacturer and, when applicable, dispose of the items according to the local regulations.

6.3. Checking the Guide Alignment

Perform the alignment verification before the first use of the biopsy guide. The procedure verifies the relationship among **MyLab**, the probe and the needle guide.

Procedure

1. Assemble the needle guide on the probe, following the provided instructions.
2. Connect the probe to **MyLab**.
3. Start a new exam setting the image parameters for the optimal view of the examination area and needle path.
4. Immerse the probe to the allowed limit (refer to the “Probe and Consumables” manual) in a basin with water at 47°C.
5. Tap **BIOPSY**, then, according to the probe and guide being used, select, when necessary, the guide tapping the corresponding key with the name of the kit (i.e. **ABS424**).
6. When more than one insertion angle is available for the selected needle guide, the available insertion angles will be displayed beside the key with the name of the kit (through the key indicating the angle values in degrees, i.e. **25°**).
7. As soon as the selection has been done, **MyLab** displays the forecast needle path (through a channel, a line or both according to the settings - see further on this chapter).
8. Tap **OK** to display the mode commands; **MyLab** temporarily disables all modes, except B-Mode or CFM, in Dual, Dual-CFM and simultaneous formats; tap **CANCEL** to come back to real time without displaying any line.
9. Select a new, straight needle that matches the needle-gauge size on the biopsy guide clip you are using (if applicable).
10. Insert the needle into the needle guide groove and move it down into the water bath until its ultrasound image is visible on screen.

11. Check that the needle, during insertion, follows the guideline superimposed on the screen along the entire depth of the image.

If the needle is not following the expected path, discontinue the procedure and contact your Esaote representative.

6.4. Needle Enhanced Imaging

The Needle Enhanced Imaging provides a better visualization of the needle in the real time image. The displayed image is the composition of a standard B-Mode image plus a steered image where the needle brightness is increased.

The feature is available in B-Mode for a wide number of probes in all applications with exception of the Cardiac one.

The Needle Enhanced Imaging is activated/deactivated pressing **NEEDLE ENHANCEMENT**; when active, a yellow reference line is displayed on the image and additional keys are present on the touchscreen.

OVERLAP

activates/deactivates the overlapping of the steered needle of the enhanced image.

N° LEFT/RIGHT

Tap the key to set the entry side of the needle (**LEFT** or **RIGHT**) and, according with its inclination, rotate the knob to define the related steering angle (**10°**, **20°**...).

NOTE

For the correct algorithm functionality it is mandatory to set the proper side and angle before the needle insertion. Wrong settings of these parameters can lead to emphasize anatomical structures and not the needle.



WARNING

Please verify that when Needle Enhancement Imaging feature is active, the anatomical structure and the biopsy target remain visible.



WARNING

The enhanced needle algorithm works in a portion of the entire B-mode image. The needle enhancement is intended to get evidence of the needle trajectory once in tissue. This does not include the needle tip portion since, due to different reasons, it can be outside of the enhanced image.

**WARNING**

Hyperechogenic structure oriented in the needle direction can be wrongly enhanced. Enable and disable the function (overlap control) to verify the proper structure enhancement.

6.5. Biopsy Configuration

Refer to the “Getting Started” manual for information on the configuration procedure.

Press **MENU** then **GENERAL SETUP** then access the **BIOPSY** folder.

The BIOPSY VIEW TYPE curtain menu allows to set the type of needle guide line to be superimposed on the image during biopsy procedures. The selection is among a channel (BIOPSY CHANNEL VIEW), a single line (BIOPSY NEEDLE VIEW) or both (BIOPSY CHANNEL/NEEDLE VIEW).

After selection you can confirm and save the settings (**SAVE**) or exit the menu without saving the settings (**CANCEL**).

7. QPACK

This chapter describes the QPack (Quantification Curves) function that provides capabilities to evaluate time/intensity curves of Doppler or CnTI signals within the organ under examination.

This chapter includes the following topics:

7.1 *QPack Activation*

7.2 *Touchscreen controls in QPack*

7.1. QPack Activation

QPack can be activated both on:

- frozen clips,
- archived clips saved in raw data format,
- dual mode.

7.1.1. QPack analysis on frozen clips

Procedure

1. Scan the patient during a Contrast or a Doppler examination,
2. Press **FREEZE**,
3. If necessary, tap **STOP** to stop the cine loop,
4. Tap **TOOLS** then **QPACK** to enable the analysis,
5. Rotate **CHANGE LOOP** to select the loop you want to analyze,
6. Select a frame where the contrast effect or Doppler signal is visible,
7. Define a ROI on the portion of the image to be analyzed; you can draw the ROI by **ELLIPSE**, by **TRACE** or by **VERTEX**, just follow the instruction on the screen,
8. Tap **CALCULATE** to start the processing; **MyLab** calculates the mean signal intensity within the defined ROI for all frames in the loop.
9. If necessary, repeat points 7 and 8 to add and analyze new ROIs.

Patient breathing compensation

If you want to compensate for the movement of the lesion under investigation due to patient breathing, you can continue from point 6 of the previous procedure as follows:

1. Tap **MOTION CORRECTION** to select the cine-loop you want to analyze,
2. Define the motion correction ROI on the portion of the image within which the lesion you want to analyze is assumed to move due to breathing,
3. Tap **PROCESS** to start the motion compensation algorithm; compensation will be applied to the entire clip. If compensation fails, a message is displayed. In this case, define the correction ROI again,
4. Define the calculation ROI on the portion of the image to be analyzed within the correction ROI; you can draw the ROI by **ELLIPSE**, by **TRACE** or by **VERTEX**, just follow the instruction on the screen,
5. Tap **CALCULATE** to start the processing; **MyLab** calculates the mean signal intensity within the defined ROI for all frames in the loop,
6. If necessary, repeat points 4 and 5 to add and analyze new ROIs.

7.1.2. QPack analysis on archived clips

Procedure

1. Select from the archive a clip saved in raw data format (those clips are identified as thumbnails with green counter),
2. Press **EDIT**,
3. If necessary, tap **STOP** to stop the cine loop,
4. Tap **QPACK** to enable the analysis,
5. Rotate **CHANGE LOOP** to select the loop you want to analyze,
6. Select a frame where the contrast effect or Doppler signal is visible,
7. Define a ROI on the portion of the image to be analyzed; you can draw the ROI by **ELLIPSE**, by **TRACE** or by **VERTEX**, just follow the instruction on the screen,
8. Tap **CALCULATE** to start the processing; **MyLab** calculates the mean signal intensity within the defined ROI for all frames in the loop.
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Patient breathing compensation

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3. Tap **PROCESS** to start the motion compensation algorithm; compensation will be applied to the entire clip. If compensation fails, a message is displayed. In this case, define the correction ROI again,
4. Define the calculation ROI on the portion of the image to be analyzed within the correction ROI; you can draw the ROI by **ELLIPSE**, by **TRACE** or by **VERTEX**, just follow the instruction on the screen,

5. Tap **CALCULATE** to start the processing; **MyLab** calculates the mean signal intensity within the defined ROI for all frames in the loop,
6. If necessary, repeat points 4 and 5 to add and analyze new ROIs.

7.2. Touchscreen controls in QPack

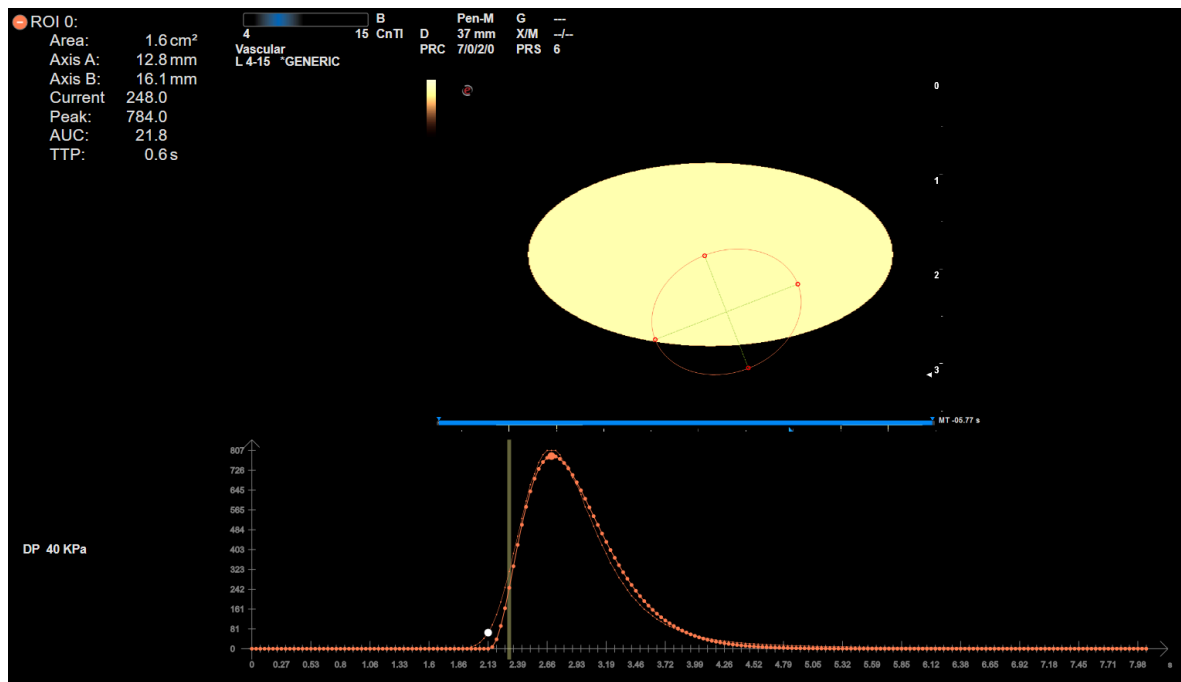
ADD TO REPORT	adds the QPack analysis to the report.
LEFT TRIM	changes the left and right extremes of the selected loop.
RIGHT TRIM	
CHANGE LOOP	At QPack activation, the clip is automatically segmented in loops each of them consistent in term of depth, frequency and other image parameters. Rotate the knob to select the loop you want to analyze.
SESSION	Rotate the knob to change session; for each clip till five sessions can be analyzed. Sessions can be enabled and renamed by accessing the QPack Configuration Menu pressing MENU then QPACK . Each session has its own identity when added to the report.
ZOOM	changes the scale factor of ultrasound image: ultrasound image only (FULL), both ultrasound image and intensity curve where ultrasound image size can be set to LARGE , MEDIUM or SMALL .
PLAY STOP	PLAY and STOP share the same key. PLAY shows the sequence of stored images in cine mode while STOP stops the cine presentation of the clip.

7.2.1. Intensity Curve

When the QPack analysis has been processed, **MyLab** displays a curve representing the mean signal intensity within the defined ROI for all frames in the loop. X axis represents the elapsed time from previous frame while Y axis the intensity itself.

Once the ROI has been placed, it can be modified moving the blue arrow cursor with the trackball and clicking on each anchor point.

Fig. 7-1 Intensity curve during QPack analysis.



On top-left of the screen, information on ROI and intensity curve are displayed, as well as measurements made automatically on the curve:

- AUC Area Under the Curve
- TTP Time To Peak
- WOT Wash Out Time

A vertical cursor moves on the curve along the X axis by rotating the trackball indicating the position in time of the frame displayed and its intensity value.

When more than one ROI has been drawn, more than one curve is displayed and each curve color corresponds to the related ROI. In the same way, the values displayed on top-left are grouped and identified with the same color.

Press **IMAGE** to save a screenshot.

7.2.2. QPack deactivation

Tap **QPACK** to exit the QPack environment.

8. EPORTAL CONFIGURATION

This chapter describes the available ePortal configurations and includes the following topics:

8.1 *Accessing to configuration menu*

8.2 *ePortal Configuration Tabs*

8.3 *Streaming video activation*

8.4 *MyLab Remote activation*

8.5 *Camera streaming*

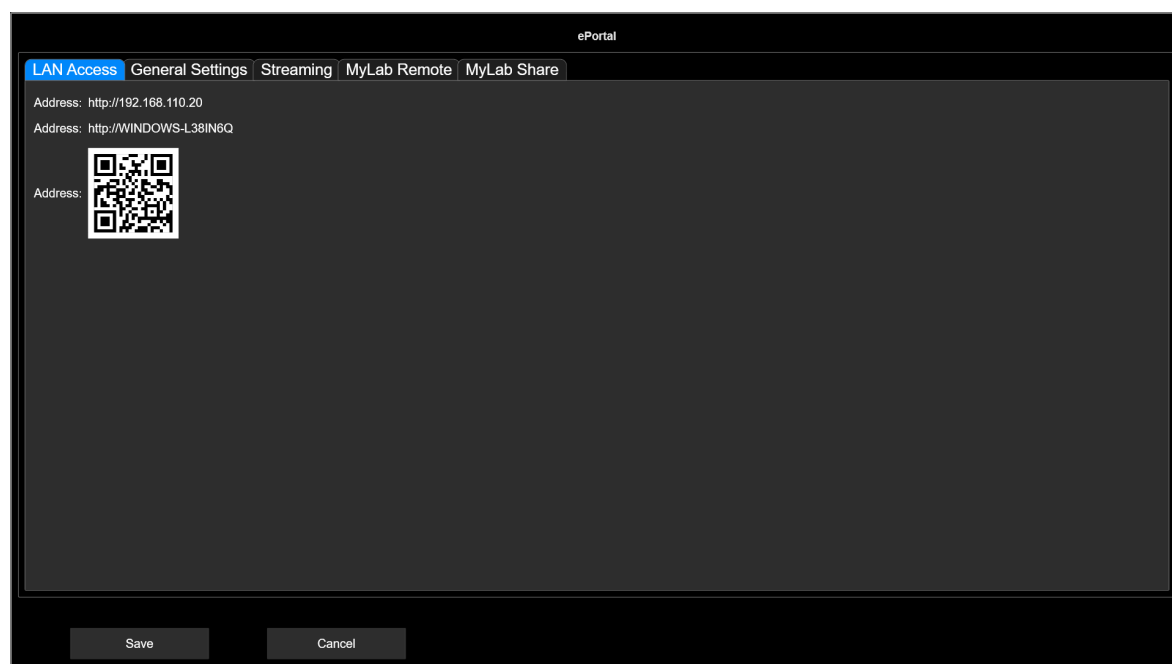
8.1. Accessing to configuration menu

Press **MENU** then **EPORTAL** to access five tabs allowing configurations for **LAN ACCESS**, **GENERAL SETTINGS**, **STREAMING**, **MYLAB REMOTE** and **MYLAB SHARE**.

8.2. ePortal Configuration Tabs

8.2.1. LAN Access tab

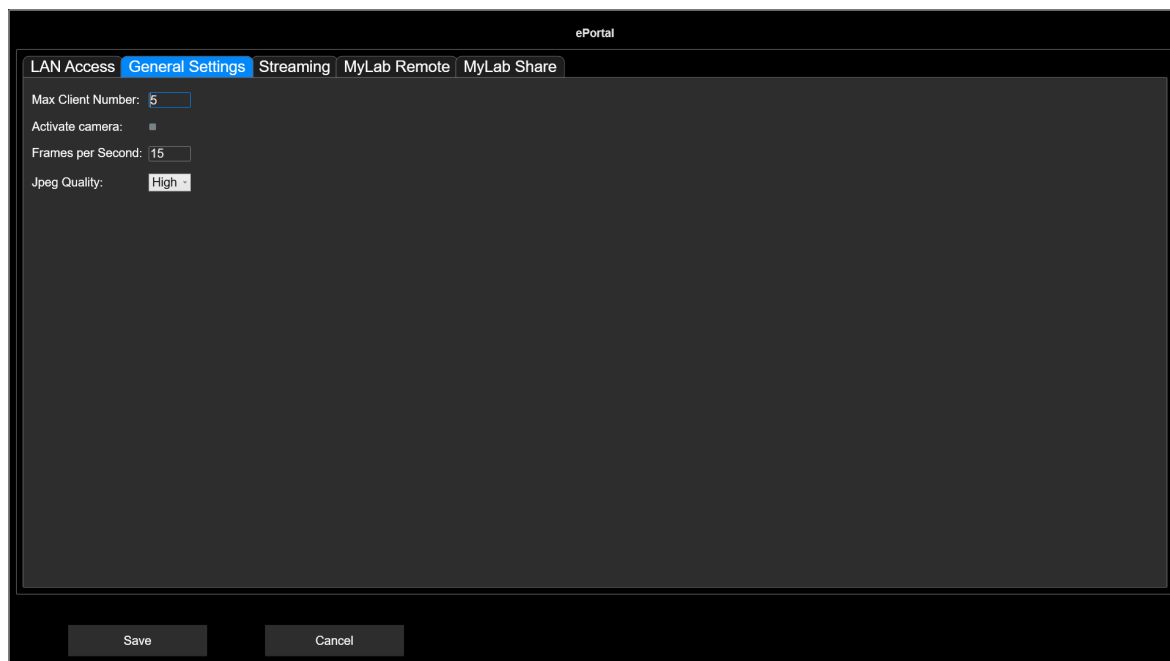
Fig. 8–1 LAN Access tab



The first two rows show the **ADDRESS** of **MyLab** in two ways: as IP address (first row) and as computer name (second row). The same information is shown below as QR code. Use one of them to access the remote content in your browser both streaming and **MyLab Remote**.

8.2.2. General Settings tab

Fig. 8–2 General Settings tab



The screenshot displays the 'ePortal' configuration window. The 'General Settings' tab is active, showing the following controls:

- Max Client Number:** A text input field containing the value '5'.
- Activate camera:** A checkbox that is currently unchecked.
- Frames per Second:** A text input field containing the value '15'.
- Jpeg Quality:** A dropdown menu set to 'High'.

At the bottom of the window, there are two buttons: 'Save' and 'Cancel'.

MAX CLIENT NUMBER is the maximum number of connections that can be established. In order to preserve bandwidth, the maximum available number is 5, but you can reduce this number if you want.

NOTE

A maximum of 5 devices can be connected at the same time to preserve the bandwidth.

If your network has a narrow bandwidth, you can decrease the **FRAMES PER SECOND** number (15 is the maximum number allowed) and the **JPEG QUALITY** to optimize the image flow.

8.2.3. Streaming tab

Fig. 8–3 Streaming tab

The screenshot shows the 'ePortal' configuration window with the 'Streaming' tab selected. The interface includes the following elements:

- Navigation Tabs:** LAN Access, General Settings, **Streaming**, MyLab Remote, MyLab Share.
- Enable Streaming:** A checkbox that is currently checked.
- Streaming Password:** Two input fields, each containing four dots. An eye icon is positioned between the two fields to toggle password visibility.
- Full Screen Streaming:** A checkbox that is currently checked.
- US Region Streaming:** A checkbox that is currently checked.
- Enforce Privacy:** An unchecked checkbox.
- Disclaimer:** A text block at the bottom stating: "By enabling the streaming, the video signal will be replicated on the external devices connected to the unit. Pay attention that on these external devices the examination could be digitally recorded or viewed by people not entitled to access the personal healthcare information present in it. To avoid that, use the 'Enforce Privacy' option above."
- Buttons:** 'Save' and 'Cancel' buttons at the bottom.

Through an internal web portal, the **MyLab** main screen can be streamed and replicated on external devices to be shared with observers.

Streaming capabilities allow to share in real-time the ultrasound exam through a network toward remote computers, smart-phones and tablets.



WARNING

The only monitor allowed for diagnosis is MyLab's main monitor, all other display internal or external are not allowed for diagnosis.

When **ENABLE STREAMING** is checked, you can stream what you can see on **MyLab** monitor on the network. Be aware that by enabling the streaming, the video signal will be replicated on the external devices connected to **MyLab**. Take care that on these external devices the examination and the patient data are visible and they could be digitally recorded. To preserve patient's privacy you can check the **ENFORCE PRIVACY** option to avoid that patient data are streamed.

When **FULL SCREEN STREAMING** is checked, both the ultrasound image and the related information on the screen are streamed, while, when **US REGION STREAMING** is checked, only the ultrasound image is streamed.

STREAMING PASSWORD is the password necessary to remotely access the streaming. It will be required by your browser to start the connection. The password is randomly generated by each **MyLab** but it is strongly advised to modify it on the first access. Keep pressed on the eye on the box to the left to show the password and edit it. Confirm the password on the box to the right.

8.2.4. MyLab Remote tab

Fig. 8–4 MyLab Remote tab

The screenshot shows the 'MyLab Remote' tab within the 'ePortal' configuration window. At the top, there are tabs for 'LAN Access', 'General Settings', 'Streaming', 'MyLab Remote' (which is selected), and 'MyLab Share'. Below the tabs, there is a section for 'Enable MyLab Remote' with a checkbox. Underneath, there are two password input fields labeled 'Remote Password:'. The first field has a small eye icon to its right, and the second field has a small eye icon to its left. At the bottom of the tab, there is a disclaimer: 'By enabling the streaming, the video signal will be replicated on the external devices connected to the unit. Pay attention that on these external devices the examination could be digitally recorded or viewed by people not entitled to access the personal healthcare information present in it. To avoid that, use the "Enforce Privacy" option above.' At the very bottom, there are 'Save' and 'Cancel' buttons.

MyLab Remote provides an external remote controller for **MyLab** ultrasound scanner duplicating the keyboard and touchscreen controls on a remote device like a computer or an iPad connected to the same network of **MyLab**.

NOTE

MyLab Remote requires a dedicated licence.

When ENABLE MYLAB REMOTE is checked, you can remotely control your **MyLab** through the controls replicated on an external tablet.

REMOTE PASSWORD is the password necessary to enable remote control of **MyLab** through **MyLab Remote**. The password is randomly generated by each **MyLab** but it is strongly advised to modify it on the first access. Keep pressed on the eye on the box to the left to show the password and edit it. Confirm the password on the box to the right.

8.2.5. MyLab Share tab

MyLab Share associated to an application for Android devices extends the eStreaming capability to the Microsoft Teams world, allowing to connect the eStreaming session to any Microsoft Teams meeting.

MyLab Share needs to be installed into a smartphone connected to the same internal data network where the **MyLab** is connected, and able to reach the Internet.

NOTE

MyLab Share requires a dedicated licence.

The QR code contains the information to make it possible to establish a connection between the Android application and **MyLab**. It only works if the Android device and **MyLab** are connected to the same network.

8.3. Streaming video activation

Procedure

1. Check **ENABLE STREAMING** in Streaming tab,
2. Tap **STREAM** on the touchscreen, **MyLab** starts to stream the ultrasound image,
3. Put the **MyLab** IP address and the streaming password in the address bar of the browser of your remote device to begin the connection.

NOTE

Streaming capabilities are supported by the following browsers: Chrome, Safari, Firefox and Edge.

When enforce privacy is enabled, some particular information (i.e. exam archive list) will be not shared for privacy reasons. When those specific windows are displayed on **MyLab**, on the remote screen will be displayed a black image and the message “streaming on hold”.

For privacy reasons, when an exam is closed, the streaming is ended, then at a new exam **STREAM** needs to be tapped to start the streaming again.

You can disable streaming at any time tapping **STREAM** again.

NOTE

Remember that the streaming flow (images and video) can be recorded. Preserve privacy of the patient.

NOTE

When you switch from cabled network to Wi-Fi or vice versa, you have to access the Web Portal tab to get the updated IP address to be used on your web browser for streaming purposes.

8.4. MyLab Remote activation



WARNING

Whenever **MyLab Remote** does not manage the **MyLab** unit as desired, use **MyLab** unit physical keyboard that must be always accessible.



WARNING

Do not use tablet with screen size less than 10”.



WARNING

Do not use **MyLab Remote** if the iPad has been jailbroken.



WARNING

The tablet shall be compliant to:

1. the Radio Equipment Directive 2014/53/EU (RED)
2. at least one of these standards:
 - EN 55011, Class B
 - EN 55032, Class B
 - FCC Part 15, Class B



WARNING

Any incoming call shall disconnect the equipment with the **MyLab**.



WARNING

Do not contemporary touch:

- the tablet and the **MyLab** unit, including probes, or
- the tablet and the patient, or
- the tablet and the operator handling the probe.

**WARNING**

Do not introduce tablet in patient environment as defined in safety standard IEC 60601-1 3rd Ed.

Maintain at least 15 cm (6 inches) of separation between your pacemaker (operators included) or defibrillator and tablet; do not use any smart cover, or smart case.

**WARNING**

Put your tablet in airplane mode with enabled Wi-Fi when using **MyLab Remote** in surgery room or in proximity of lifesaving devices.

**WARNING**

During the use of **MyLab Remote**, tablet must not be connected nor to its battery charger nor to USB ports.

Procedure

1. Check ENABLE MYLAB REMOTE in **MyLab Remote** tab,
2. Tap **REMOTE** on the touchscreen, **MyLab** starts the sharing of keyboard,
3. Put the **MyLab** IP address and the remote password in the address bar of the browser of your remote device to begin the connection.



When **MyLab Remote** is active, beside the Esaote logo at top-left of the **MyLab** screen, a connection active icon is displayed.

You can always control **MyLab** by its keyboard also when **MyLab Remote** is active, that means when **MyLab Remote** is active, **MyLab** can be controlled both by **MyLab Remote** itself and by the physical keyboard.

You can disable **MyLab Remote** at any time tapping **REMOTE** again.

NOTE

MyLab Remote capabilities are supported by the following browsers: Chrome, Safari, Firefox and Edge.

NOTE

When you switch from cabled network to Wi-Fi or vice versa, you have to access the Web Portal tab to get the updated IP address to be used on your web browser for streaming purposes.

8.4.1. Use in sterile environment

The tablet can not be disinfected not sterilized.

In the case tablet is used in sterile environment, a sterile sheath for tablet is provided by Protek (http://www.protekmedical.com/Images/pdf_brochure_tabletcover.pdf).



WARNING

Use a protective sterile sheath for tablet when in a sterile environment.

8.5. Camera streaming

When streaming video or **MyLab Remote** are active, you can overlap on them a video live streamed by an optional camera connected to **MyLab**. The buttons below are available only when a camera is connected to **MyLab**. The buttons below are available only when a camera is connected to **MyLab**.

Tap **CAMERA STREAM** in the Stream tab to start the camera streaming: the video camera output is sent over the network and you can see it on an external computer using a web browser. Tap **SHOW INFO** to know the IP address and related information for the connection.

Tap **CAMERA PIP** in the Stream tab to start the camera streaming: the video camera output is displayed as Picture-in-Picture (PiP).

Rotate **PIP SIZE** to change the size of the overlapped image.

The position of the camera is fixed, so we recommend that you check the default position of body mark, measurements and annotations.



WARNING

The streamed video contains pictures of the patient that are not anonymized.

Tap **IMAGE** or **CLIP** to save an image or clip with camera image overlapped.

9. VPAN

This chapter describes the VPan function that allows to acquire B-Mode images on extended surfaces. The final image is composed of consecutive frames placed side by side so that the whole surface can be reconstructed.

This chapter includes the following topics:

9.1 *VPan Acquisition*

9.2 *Reviewing a VPan Image*

9.3 *Measurements*

9.4 *Storing the Reconstructed Image*

9.1. VPan Acquisition

The panoramic acquisition can be activated in real time at any time by tapping **VPAN** in the touchscreen tools section. VPan can be used with all the imaging probes except the phased array and the transesophageal probes.

NOTE

Do not use the VPan acquisition in structures having black areas or in moving structures.

Procedure

1. Place the probe on one end of the area to be scanned. The probe lens should be as parallel as possible to the scanning surface.
2. Adjust the B-Mode image.

NOTE

Before the VPan acquisition adjust the controls so that the image results “filled” with echo signal, minimizing the empty space.

During VPan acquisition do not modify the imaging controls.

3. Tap **VPAN** to activate it. **MyLab** displays a ROI on the B-Mode image: the panoramic image will be composed using the images acquired within the ROI.
4. Position the ROI with the trackball. If necessary, press **ACTION** to modify the ROI dimensions and position with the trackball.

5. Select the type of visualization of the reconstructed VPan image during the scanning:

OFF LINE

It shows the reference frame only.

CENTERED

Both the reconstructed image and the reference frame are shown and the reference frame is centered on the screen.

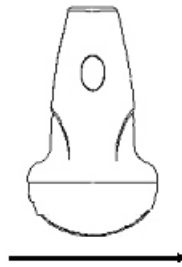
CURVED

Both the reconstructed image and the reference frame are shown and the reconstructed image is centered on the screen.

6. Press **ACQUIRE** to start the panoramic acquisition. **MyLab** automatically identifies the probe direction (from left to right or vice versa).
7. During VPan scanning, move the probe slowly and with a constant velocity along the scanning area.

During acquisition on a flat surface the probe must be moved along an axis which is parallel to the surface itself (as shown in the figure below). If the probe is moved around a curve surface, be sure that the contact between the probe and the surface always occurs on the terminal end of the probe. If the contact changes during the acquisition overlaid images could be produced.

Fig. 9-1 Probe movement



8. Press **ACQUIRE** or **FREEZE** to end the acquisition.

NOTE

The panoramic acquisition automatically stops after one minute of acquisition.

At the end of the acquisition **MyLab** automatically freezes and displays the VPan image: you can immediately check if the image has been correctly reconstructed and if there are distortions or misalignments. Should this be the case, repeat the acquisition.

9.1.1. Exam End

To exit the VPan acquisition, press again **VPAN** in the touchscreen tools section.

9.2. Reviewing a VPan Image

Once the acquisition is completed, **MyLab** automatically freezes and shows the VPan image at full screen.

The following controls are displayed on the touchscreen:

FILTER

modifies the filter applied to the panoramic image, increasing or decreasing the smooth. The selected filter setting is stored: it will be automatically used for next panoramic image reconstruction.

ORIENTATION

flips the image left/right.



REF FRAME

allows to change the screen presentation. Tap it then rotate the **FORMAT** knob to select the way of visualization of the reference image among:

DUAL

the reference frame is displayed to the right of the VPan image.

SMALL

the reference frame is displayed below the VPan image with small size.

MEDIUM

the reference frame is displayed below the VPan image with medium size.

FULL

only the reference frame is displayed with full size.

Unless in full screen, the whole panoramic image is displayed, reduced by the factor indicated beside the gray scale, and the single reference frame is displayed into a box. The trackball moves the yellow line on the panoramic image and allows to scroll it frame by frame.

REVERSE

flips the image up/down.



ROTATE

rotates the panoramic image.

ZOOM

changes the magnified factor. When the zoomed image exceeds the image area, a box is displayed beside the zoomed image indicating which part of the panoramic image is displayed on the screen. The trackball pans the image and allows to scroll it frame by frame.

FREEZE exits from VPan image revision activating the real-time.

9.3. Measurements

Both generic and specific measurements can be performed on a VPan image. The frame visualization is suggested to perform measurements.

A poor image quality can considerably twist and degrade the measure accuracy: it is strongly suggested not to perform measurements on twisted and misaligned images.

The measurements session is activated by pressing either the **+...+** or the **MEASURE** key: Refer to “Measurements” section on this manual for detailed information.



This symbol is displayed on the screen when in frame visualization. The symbol indicates that the VPan image may not be optimal for the reporting functions.



WARNING

It is strongly recommended to perform measurements on single frames only. The VPan image can not match the scanned anatomy because of misalignments or distortions. Be aware that measurements on single frames acquired while moving the probe are affected by a systematic error (less than 10%).

9.4. Storing the Reconstructed Image

Both the VPan image and the single frame can be archived (**IMAGE** key) with or without measurements.

10. MYLIBRARY

This chapter describes **MyLibrary** and includes the following topics:

10.1 *MyLibrary overview*

10.2 *MyLibrary activation*

10.3 *MyLibrary Organization*

10.1. MyLibrary overview

MyLab incorporates the concept of the **MyLibrary**.

MyLibrary gives an “on-board” viewing possibility showing several procedures according to reference doctors. The information is set up following a commonly used approach meaning: an image of the relevant anatomical structure, a picture showing the suggested probe positioning on the specific anatomical site, the clinical ultrasound image normally resulting from the scan in the specific anatomical site and some explanatory text. **MyLibrary** is intended to be used for training, review or reminding. All presented information inside **MyLibrary** is made under the full authority of the reference doctor who is mentioned in the credits page. A basic level of ultrasound scanning is needed before using the information given in **MyLibrary**.

MyLibrary is a software environment with a limited numbers of image examples that may help the user to perform the examination because, if used properly, it may help the user to recall the correct interpretation of the images and recognize the main anatomical structures. **MyLibrary** must be used in accordance with the following warnings in order to avoid possible harm to the patient due to the wrong interpretation of the images or inappropriate use of the ultrasound equipment or the inappropriate performance.



WARNING

Only a limited numbers of cases/images are represented as examples without considering all possible anatomical variance or pathological findings between different individuals.



WARNING

The procedures showed are based on the ultrasound procedures as defined by the **MyLibrary** reference specialist and local procedures can be different from this one. The **MyLibrary** reference specialist is indicated in the credit window of the **MyLibrary**.



WARNING

A basic level of medical ultrasound scanning, ultrasound image interpretation and a basic level of ultrasound probe manipulation are needed to perform ultrasound procedures.

Misinterpretation of the **MyLibrary** images can give a risk for wrong probe anatomical location.

It is recommended to the user to consider this warning appropriately in order to correctly interpret the ultrasound images and perform the examination and the procedures considering the specific conditions of the single patient under examination.

NOTE

MyLibrary requires a specific license.

10.2. MyLibrary activation

MyLibrary is an optional tool that provides application aid and tips in the use of **MyLab** during procedures.

To activate **MyLibrary**, tap **MYLIBRARY** in touchscreen tools section, then the topic of your interest. The acceptance page will be displayed.

The acceptance page emphasizes to the user the importance of using **MyLibrary** in accordance with the instruction of this User Manual and **MyLibrary**'s inherent limitations and provides to the user the following information:

MYLIBRARY IS A SOFTWARE ENVIRONMENT WITH A LIMITED NUMBERS OF IMAGE EXAMPLES THAT MAY HELP THE USER TO PERFORM THE EXAMINATION BECAUSE, IF USED PROPERLY, IT MAY HELP THE USER TO REMIND THE CORRECT INTERPRETATION OF THE IMAGES AND RECOGNIZE THE MAIN ANATOMICAL STRUCTURES. MYLIBRARY MUST BE USED IN ACCORDANCE WITH THE FOLLOWING WARNINGS IN ORDER TO AVOID POSSIBLE HARM TO THE PATIENT DUE TO THE WRONG INTERPRETATION OF THE IMAGES, TO THE INAPPROPRIATE USE OF THE ULTRASOUND EQUIPMENT OR TO THE BAD PERFORMANCE OF THE APROCEDURE.

- ONLY LIMITED NUMBERS OF CASES/IMAGES ARE REPRESENTED AS EXAMPLES WITHOUT CONSIDERING ALL POSSIBLE ANATOMICAL VARIANCE OR PATHOLOGICAL CHANGES AMONG DIFFERENT PATIENTS.
- ESAOTE UNDERLINES THE IMPORTANCE FOR THE USER TO REACH THROUGH ADEQUATE TRAINING COURSES PROPER SKILLS IN THE USE OF ULTRASOUND EQUIPMENTS, ULTRASOUND IMAGE INTERPRETATION AND PROCEDURES.
- MYLIBRARY CANNOT SUBSTITUTE THE PROPER TRAINING OF THE USER IN THE MANAGEMENT OF THE ULTRASOUND EQUIPMENT, IN THE INTERPRETATION OF THE ULTRASOUND IMAGES AND IN THE PERFORMANCE OF PROCEDURES.

IN ADDITION TO THESE WARNINGS, THE USER SHOULD READ AND FOLLOW THE INSTRUCTIONS AND WARNINGS IN THE USER MANUAL IN ORDER TO SAFELY USE MYLIBRARY. IT IS UP TO THE USER TO CORRECTLY INTERPRET THE ULTRASOUND IMAGES AND TO PERFORM THE EXAMINATION AND THE PROCEDURES CONSIDERING THE SPECIFIC CONDITIONS OF THE SINGLE PATIENT UNDER EXAMINATION.

To proceed further and activate **MyLibrary** you have to press **ACCEPT**.

The user should press this button only if he/she has reached the proper level of understandings through reading this User Manual about **MyLibrary** tool functions and limitations and he/she is able to correctly interpret the information provided in **MyLibrary**.

After the acceptance, the Credit Screen is displayed showing the **MyLibrary** version and the author of the Library.

Fig. 10–1 Credits Screen



The Credit Screen displays also the following additional disclaimer message:

MYLIBRARY IS A REFERENCE TOOL PROVIDING INFORMATION AND SUGGESTIONS, NOT AIMED TO OVERRULE OR MODIFY IN ANY CASE THE LOCAL STANDARD OPERATING PROCEDURE.

THE PROCEDURES SHOWED ARE BASED ON THE ULTRASOUND PROCEDURES AS DEFINED BY THE MYLIBRARY REFERENCE SPECIALIST AND LOCAL PROCEDURES CAN BE DIFFERENT FROM THIS ONE. ESAOTE IS NOT RESPONSIBLE FOR THE RESULTS AND/OR CONSEQUENCES OF ANY PERFORMED PROCEDURE. THE USER SHOULD READ AND FOLLOW THE WARNINGS IN THE USER MANUAL IN ORDER TO CORRECTLY USE THE MYLIBRARY TOOL.

The Touchscreen is organized with buttons representing several anatomical sites related to the topic of the selected library (i.e. **JOINT** or **WRIST** for Rheumatology); when an anatomical site is selected, additional buttons allows to choose among the available views (i.e. **DORSAL**, **LATERAL** or **VOLAR**).

The following additional touchscreen buttons are present for all anatomical sites and views:

SCAN MODE switches to real-time full image, tap **MYLIBRARY** to come back to the **MyLibrary** environment.

CRED SCREEN opens the Credit Screen.

VIEW TYPE changes the scanning view.

Live Preview

The **LIVE** key activates the real-time image inside the **MyLibrary** environment allowing to compare this image with the example ultrasound image in the **MyLibrary** Database.

Live Preview is not available for USA market.



WARNING

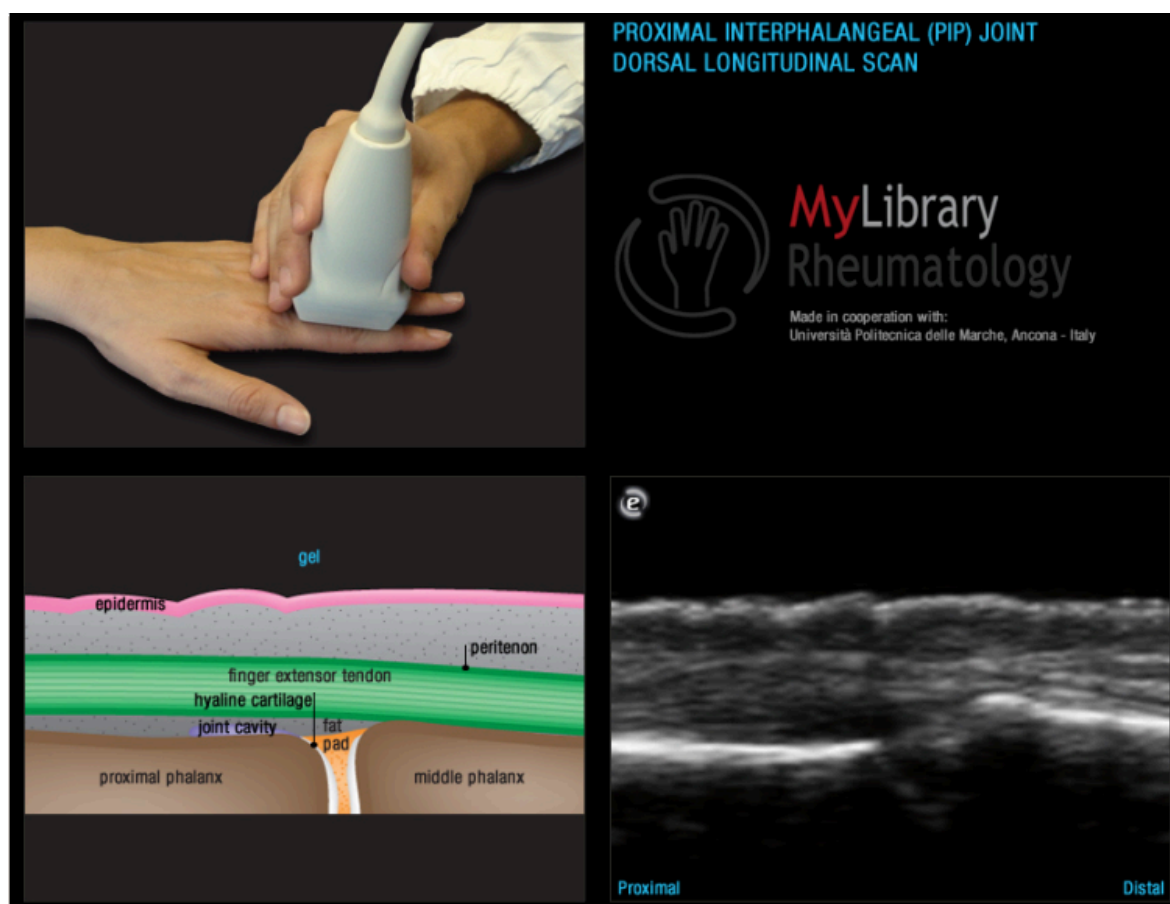
The Live Preview function allows visualizing the real time image inside **MyLibrary** to compare it with the available image examples. This viewing environment is absolutely not suited to perform any interpretation of the ultrasound images.

NOTE

In Live Preview is not possible to change settings of real-time image.

10.3. MyLibrary Organization

Fig. 10–2 MyLibrary



Once the desired library has been selected, the **MyLibrary** environment shows an image divided in four parts including:

Bottom-left	An image of the relevant anatomical structure.
Top-left	A picture with an example of scanning in the specific application, showing the suggested probe positioning on the specific anatomical site.
Bottom-right	The clinical ultrasound image normally resulting from the scan in the specific anatomical site.
Top-right	This area can contain some explanatory text or the Live Preview.

11. QUALITY ATTENUATION IMAGING

This chapter describes the Quality Attenuation Imaging (QAI) tool.

This chapter includes the following topics:

11.1 *QAI Overview*

11.2 *QAI Activation*

11.3 *Touchscreen controls in QAI*

11.4 *QAI Measurements*

11.5 *QAI Settings*

11.6 *QAI Report*

11.1. QAI Overview

Quality Attenuation Imaging (QAI) is a tool intended to give the average value of the attenuation of the ultrasound signal inside a Region of Interest (ROI).

The value is only indicative and it is not intended for diagnostic purposes.

QAI is available on **MyLabX8 Family** with C 1-8 probes in abdominal application.


11.2. QAI Activation

Procedure

1. Start a new exam in Abdominal application with C 1-8 probe;
2. When in B-Mode tap **QAI** in the touchscreen Tools section, to display the ROI on the image;
3. Position the ROI in a zone of the liver where the tissue is homogeneous (without vessels) moving the trackball;
4. If you need to change the size of the ROI, press **ACTION** then change the size of the area using the trackball. Press **ACTION** again to confirm;
5. Inside the ROI the image is colored to show the part of the image where the average value of attenuation is calculated (non homogeneous tissue like vessels are automatically excluded and appear non colored).

11.3. Touchscreen controls in QAI

When QAI has been performed, additional touchscreen controls are available in the **QAI** tab:

COLOR MAP	opens a sub-menu allowing the selection of a different color map for the attenuation: COLOR MAP this knob selects the desired color map. WR PRIOR (Write Priority) assigns priority to the color codification and B/W scale. COLOR PRIORITY enables or disables transparency between color and B/W. This command is available only with specific color maps. BACK  goes back to main menu keeping the modifications.
TRANSP	changes the value of transparency for superimposed map.
SESSION #	rotate the knob to change session: the measurements belonging to the selected session are sent to the report and identified by the label defined in QAI Settings (refer to the paragraph QAI Settings further).
DUAL	displays both B-Mode reference image and QAI map side by side.
BOX	sets the measurement ROI as a box. Using the trackball, position the box; rotate BOX RESIZE to change the box size as percentage of the ROI size.
CIRCLE	sets the measurement ROI as a circle. Using the trackball, position the circle; rotate CIRCLE DIAMETER to change the circle size.
ELLIPSE	sets the measurement ROI as an ellipse. Use the trackball to fix the length of two axis; press ENTER to confirm.
TRACE	allows to define the measurement ROI tracing its boundaries manually. Using the trackball, position the start point and confirm it pressing ENTER , then trace the ROI and confirm the final point pressing ENTER again.
VERTEX	allows to define the measurement ROI placing vertexes. Using the trackball, position each vertex and press ENTER to confirm.
CLEAR LAST MEAS	deletes the last measurement from the screen.

11.4. QAI Measurements

As soon as **FREEZE** is pressed, the Quantification environment is automatically enabled and measurements can be done.

Procedure

1. If necessary, navigate the cineloop to select the best frame rotating the **RIGHT ENCODER**.
2. Draw the quantification ROI on the portion of the image to be analyzed by tapping **TRACE**, **VERTEX**, **CIRCLE** or **ELLIPSE** as you desire, then follow the instruction on the screen.
3. Press **ENTER** to fix the quantification ROI on the image, the quantification ROI shape can be modified through touchscreen controls.
4. Parameters are calculated and displayed on the screen.

For each quantification ROI the following parameters are calculated:

- AVG: average attenuation value
- MED: median attenuation value
- SD: mean value standard deviation
- IQR: inter quartile range
- IQR/M: inter quartile range to median ratio

11.5. QAI Settings

Dedicated configuration settings for QAI are available pressing **MENU** and accessing to **QAI**.

When the option **SHOW END SEQUENCE INFO** is selected, an information dialog box is displayed at the end of acquisition. This option is disabled by default.

When the option **AUTO SAVE IMAGE AT EACH ACQUISITION** is selected, the image is automatically saved after each acquisition. This option is disabled by default.

When the option **AUTO-REPEAT** is selected, a measurement ROI is automatically placed at the end of each measurement.

GLOBAL MEASURE TYPE allows to select which global measurement to show between **AVG/MED** (average and/or median of the single measurements) and **RATIO**. You can select average, median or both through the configuration tab.

VALUES defines the value to display as global measure: **MEDIAN** or average (**AVG**).

NUMBER OF ROIS sets the maximum number of measurement ROIs.

DEFAULT ROI sets the default measurement ROI type.

ROI PROFILE sets the type of profile for the measurement ROI. When **BOX** is selected you can define its size in percentage of the main ROI dimension.

CURSOR DIAMETER sets the default diameter size for circle measurement ROI.

FIXED BOX IN ATTENUATION IMAGING fixes the acquisition ROI in the middle of the screen. The ROI size is not modifiable.

You can add three cut-off values typing them directly in the cut-off values fields.

Pressing **SAVE**, cut-offs will be available from next QAI session.

On the right side there are two tabs:

- **SESSION MANAGEMENT** where up to five sessions can be activated selecting the related checkbox (ENABLED) and for each session a different label can be defined for the report (WORKSHEET LABEL) and for the **SESSION #** key (ENCODER LABEL).
- **CONFIGURATION** to set the data to display as measurement result in the global measure, and in the report. Check/uncheck the gray box to add/remove the element. Black box does not allow any change.

11.6. QAI Report

When accessing to the **MyLab** Report, the measurements belonging to the same session are grouped and identified from the label defined by WORKSHEET LABEL.

The report page shows the values set on QAI Settings.

12. HYPERDOPPLER

This chapter describes the HyperDoppler tool.

This chapter includes the following topics:

12.1 *HyperDoppler Overview*

12.2 *HyperDoppler Activation*

12.3 *Touchscreen controls in HyperDoppler*

12.4 *HyperDoppler Configuration*

12.5 *HyperDoppler Formulas*

12.1. HyperDoppler Overview

HyperDoppler is a tool intended for the investigation of the intra-cardiac flows in humans to provide a better understanding of cardiac physiological or pathological state.

HyperDoppler is able to derive information related to the intra-cardiac flow formation by processing Color Doppler (CFM) clips and ECG trace.



WARNING

This tool is not intended for diagnostic purposes. Therefore, diagnosis performed relying only on HyperDoppler findings is not allowed.

Each diagnostic statement must be based on the evaluation of the results that can be obtained with the standard B-Mode, M-Mode, Doppler (CW / PW) and CFM methods following the guidelines and the current best clinical practices.



WARNING

Automatic measurement results are intended as a suggestion and should not be considered sufficient to make a diagnosis.

12.2. HyperDoppler Activation

HyperDoppler can be activated both in Cardiac or Pediatric Cardiac examination taken with P 1-5, P 2-9, P2 5-13, PX 1-5 or ST2612 probe and ECG connected on:

- frozen clips acquired with the ECG trace,
- archived clips acquired with the ECG trace and saved in raw data format.

12.2.1. Procedure for frozen clips

Procedure

1. Start a new cardiac exam with ECG connected;
2. Activate CFM (Color Flow Mapping) mode;
3. If necessary, resize the CFM ROI and optimize the image;
4. Acquire a ventricle image with ECG trace;

NOTE

Frame rate must be greater than 20Hz.

5. Press **FREEZE**;
6. Select the desired cardiac cycle;
7. Tap **HYPERDOPPLER** in the touchscreen Tools section, to start the flows analysis; **MyLab** processes the clip and in a while it displays the results. Additional touchscreen controls will be displayed too.

NOTE

The analysis is performed on a single cardiac cycle.

12.2.1.1. HyperDoppler Deactivation

Tap **HYPERDOPPLER** or press **FREEZE** to exit the HyperDoppler analysis.

12.2.2. Procedure for archived clips

Clips must have been acquired in Cardiac or Pediatric Cardiac application with ECG trace and saved in raw data format.

Procedure

1. Select from the archive a clip acquired with the ECG trace and saved in raw data format (those clips are identified as thumbnails with green counter and heart superimposed);
2. Select the desired cardiac cycle;
3. Tap **EDIT**;
4. Tap **STOP**;

- 5. Tap **HYPERDOPPLER** in the touchscreen Tools section, to start the flows analysis; **MyLab** processes the clip and in a while it displays the results. Additional touchscreen controls will be displayed too.

12.3. **Touchscreen controls in HyperDoppler**

When HyperDoppler analysis has been performed, the results of processing are displayed on the image as well as the related calculated parameters.

A HyperDoppler tab with the following controls is displayed on the touchscreen.

PLAY
STOP

PLAY and **STOP** share the same button.
PLAY shows the sequence of images belonging to the selected cardiac cycle in cine mode, while **STOP** stops the cine presentation of the clip.

FIRST FRAME

automatically sets the current position at the begin of the sequence.

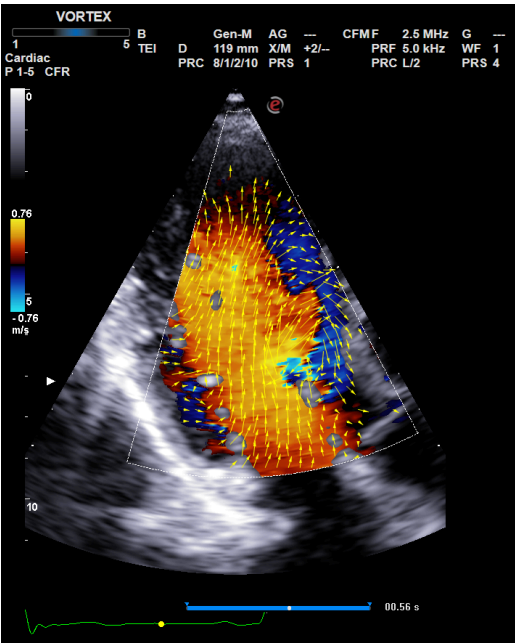
LAST FRAME

automatically sets the current position at the end of the sequence.

CENTER IMAGE

when selected, the ultrasound image with superimposed HyperDoppler analysis is displayed as shown in the picture below.

Fig. 12–1 HyperDoppler analysis - center image selected

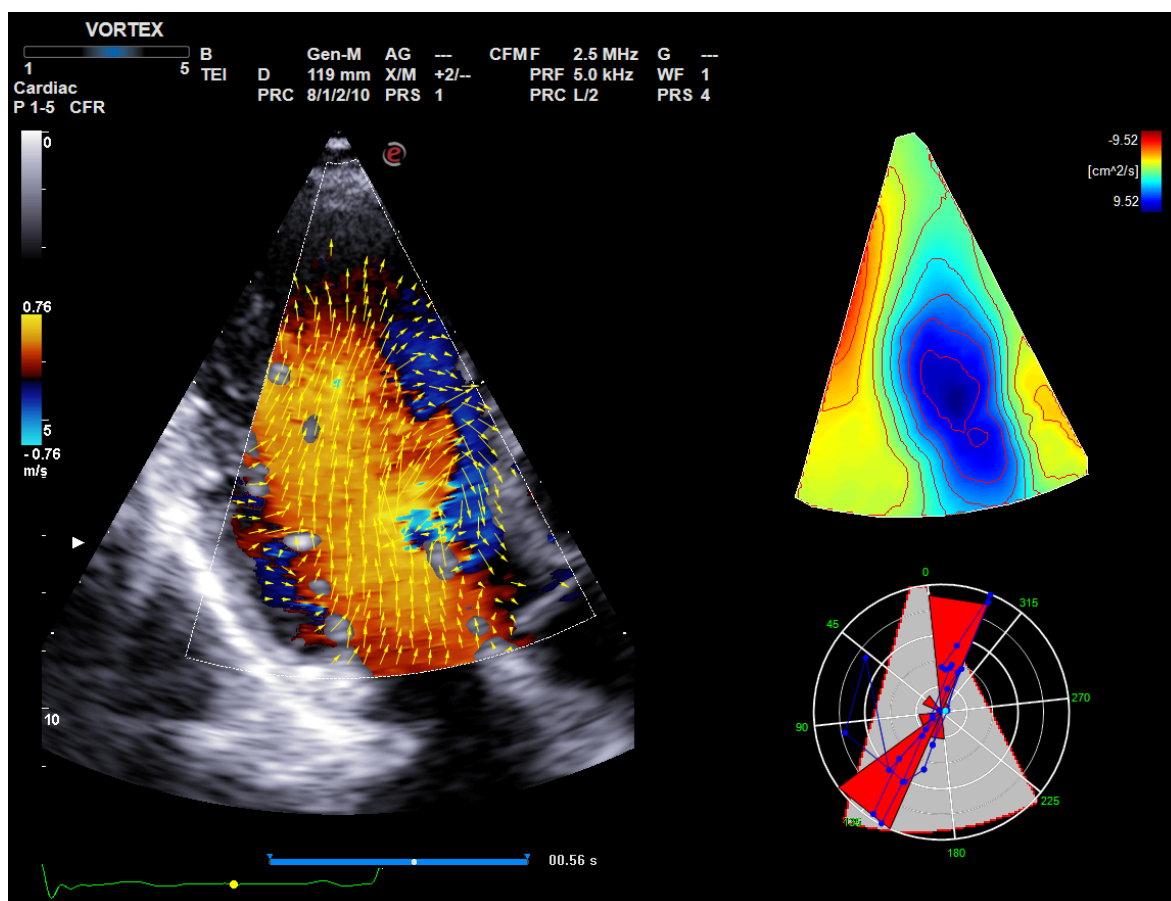


PRESSURE GRADIENT IMAGE

when selected, beside the ultrasound image with HyperDoppler analysis, additional maps are displayed:

- Steady Image, top-right, represents the steady vorticity. The map represents the mean value of the duration of the cycle.
- Polar Plot, bottom-right, is a polar plot of the pressure gradient.

Fig. 12-2 HyperDoppler analysis - pressure gradient image selected



STEADY IMAGE

when selected, the Steady Image is displayed beside the ultrasound image.

STEADY IMAGE MAP

selects which map is used for the Steady Image.

SHOW ARROWS

when selected, arrows showing blood flow direction and intensity are displayed on the ultrasound CFM image.

When not selected, the US Image Map is superimposed on the ultrasound image and two additional touchscreen controls are displayed:

TRANSPARENCY

changes the value of transparency for superimposed US Image Map;

US IMAGE MAP

selects which map is superimposed on the ultrasound image.

FRAME	Rotate the knob to scroll the sequence frame by frame.
ARROW LENGTH	Rotate the knob to change the length of the arrows displayed on the ultrasound image. Arrows on ultrasound image show blood flow direction and intensity improving the perception of blood motion.
DUST MODE ON DUST MODE OFF	When on, arrow position moves with the local flow to improve the perception of blood motion.
ATTACH TO REPORT	adds the HyperDoppler analysis to the report.
SAVE HYPERDOPPLER DATA	saves a clip of the duration of a cardiac cycle with vortex data necessary for processing in external tools.
DENSITY	Rotate the knob to change the density of the arrows: the lower is the value, the higher is the number of arrows displayed.
MODIFY CONTOUR	allows to modify the ED border without exiting the HyperDoppler.
VELOCITY FILTER	activates/deactivates (ON/OFF) filters on velocity to reduce the noise effect.

Press **ACQUIRE** to save a screenshot with HyperDoppler analysis.

12.4. HyperDoppler Configuration

To customize the HyperDoppler, press **MENU**, then **HYPERDOPPLER** on the System Settings area to access the configuration menu, and then **EDIT** to modify the settings.

The tables below list the available settings.

The image on the right gives an image preview of the setting changed.

SAVE saves the settings so that they are immediately active.

CANCEL exits the menu without saving the new settings.

SHOW ARROWS, when checked, lets arrows be displayed on the ultrasound CFM image as default at HyperDoppler activation.

Table 12–1 Map Selection

Fields	Action
ULTRASOUND MAP	Here you can select which elaborated parameter is superimposed on the ultrasound image: U : vorticity Psi: streamfunction Diss: local dissipation Pres: pressure KE: kinetic energy
STEADY STREAM MAP	Here you can select which elaborated parameter is displayed on steady stream map: U : vorticity Psi: streamfunction Diss: local dissipation Pres: pressure KE: kinetic energy

Table 12–2 Parameters

Fields	Action
DENSITY	Here you can set the default value for density. The value can be changed through the knob during an HyperDoppler analysis.
ARROW LENGTH	Here you can set the default value for arrow length. The value can be changed through the knob during an HyperDoppler analysis.
TRANSPARENCY	Here you can set the default value for transparency. The value can be changed through the knob during an HyperDoppler analysis.

12.5. HyperDoppler Formulas

12.5.1. Flux and vorticity

The two-dimensional velocity vector field $v_x(x, y, t)$, $v_y(x, y, t)$ is evaluated from Doppler velocity field.

Vorticity (a scalar function) is defined as the curl of velocity $\omega(x, y, t) = \partial v_x / \partial y - \partial v_y / \partial x$; it represents the regions of local rotation (in a loose sense the regions with higher shear stress).

Streamfunction $\psi(x, y, t)$ is the inverse Laplacian of the vorticity, computed by the solution of $\nabla^2 \psi = -\omega$, and can be considered as a smoother version of the vorticity field. The iso-streamfunction curves are the vortex-induced streamlines, the streamfunction has maximal/minimal values (an elliptic point of streamlines) at the centre of vortices.

Kinetic energy is defined as $E_k(x, y, t) = \frac{1}{2} \rho (v_x^2 + v_y^2)$, where ρ is the density ($\rho = 1050 \text{ Kg/m}^3$).

Rate of energy dissipation is

$$D(x, y, t) = 2\nu \left[\left(\frac{\partial v_x}{\partial x} \right)^2 + \left(\frac{\partial v_y}{\partial y} \right)^2 + \left(\frac{\partial v_z}{\partial z} \right)^2 + \frac{1}{2} \left(\frac{\partial v_x}{\partial y} + \frac{\partial v_y}{\partial x} \right)^2 \right],$$

where ν is the kinematic viscosity of blood ($\nu=3.3 \times 10^{-6} \text{m}^2/\text{s}$).

Relative pressure field $p(x, y, t)$ is computed similarly after inversion of the Poisson equation

$$\nabla^2 p = \left(\frac{\partial v_x}{\partial x} \right)^2 + \left(\frac{\partial v_y}{\partial y} \right)^2 + 2 \left(\frac{\partial v_x}{\partial y} \frac{\partial v_y}{\partial x} \right),$$

obtained after taking the divergence of the 2D Navier-Stokes equations. The pressure field such calculated is defined up to a constant and a bilinear function $a_1x + a_2y + a_3xy$. The coefficients of this function are again computed making use of the 2D Navier-Stokes equations that allow calculation of the coefficient by least square error.

12.5.2. Shaded functions

The positive/negative vortex is defined as the compact region about the vortex center (identified by the point where the streamfunction takes its maximum/minimum value) where the value is larger than 50% of the maximum value. Its area is normalized with respect to the LV area, its strength is the circulation, i. e. the integral of the vorticity inside the vortex, normalized with the total vorticity.

The total kinetic energy or dissipation or enstrophy (defined as the square of vorticity) is the value of the quantity integrated over the whole field. Kinetic energy and dissipation are normalized with the total steady-streaming kinetic energy, the enstrophy with the steady-streaming enstrophy.

The force vector is computed from integrating the pressure gradient in the LV region

$$F_x = \int_{LV} \frac{\partial p}{\partial x} dx dy, \quad F_y = \int_{LV} \frac{\partial p}{\partial y} dy dx,$$

normalized with the total steady-streaming kinetic energy.

12.5.3. Steady Streaming

These quantities can also be presented as steady-streaming fields. The steady streaming (heartbeat average) flow field is computed to evaluate the overall circulatory pattern in the LV during one heartbeat. This picture can be considered as a sort of fingerprint of the LV flow.

Every quantity, like the vorticity, for example, can be expressed in time-Fourier series as

$$\omega(x, y, t) = \omega_0(x, y) + \omega_1(x, y) \cos\left(\frac{2\pi}{T} t + \varphi_1(x, y)\right) + \sum_{k=2, N} \omega_k(x, y) \cos\left(\frac{2k\pi}{T} t + \varphi_k(x, y)\right)$$

12. HyperDoppler

The flow field corresponding to the fundamental harmonic is the “steady-streaming” flow, or the heart-beat-average flow.

13. THE CNTI OPTION

This chapter describes the Contrast Tuned Imaging (CnTI) technology, dedicated to ultrasound Contrast Media (CA).

This chapter includes the following topics:

13.1 *CnTI Overview*

13.2 *Screen Layout in CnTI*

13.3 *Running a CnTI Exam*

13.1. CnTI Overview

The Contrast Tuned Imaging (CnTI) technology requires a dedicated license.

13.1.1. Intended Use

The CnTI technology is a non linear imaging modality optimized for harmonic signals display. When used at low acoustic pressures, it leverages on a property of specific CA, which reflect harmonics at lower pressures than tissues: this technology allows therefore to differentiate in real time CA from tissue.

Refer to Getting Started section to know the probes where CnTI option is available.

13.1.2. Additional Safety Information



WARNING

Refer to the CA manufacturer specifications and instructions for resonance characteristics, regulatory status, clinical indications and contraindications of the Contrast Agent. This Manual does not contain information on the CA clinical indication, nor lists clinical protocols for use of the CA; for these you need to refer to the CA manufacturer.



WARNING

Refer to the CA manufacturer instructions on how to prepare and inject the Contrast Agent.

The Safety Information given in the Getting Started manual fully apply to the CnTI technology.

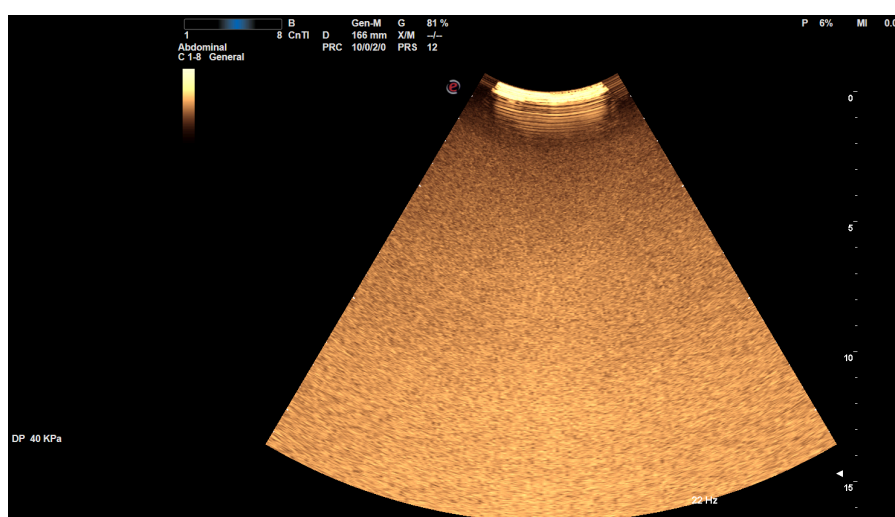
Ultrasound safety is achieved through the **ALARA** principle during the pre- CA basal study, while during CA imaging the acoustic pressure directly depends on the CA itself. Ultrasound safety is ensured by the **MyLab** maximal Acoustic Output values and the short duration of the ultrasound exposure during CnTI studies, while for real time studies it is automatically provided by the low acoustic pressures required.

Disturbances in cardiac rhythm during perfusion studies using gas ultrasound contrast agents have been observed in the diagnostic range of Mechanical Index (MI) values. For details, see the specific package insert of the contrast agent used.

13.2. Screen Layout in CnTI

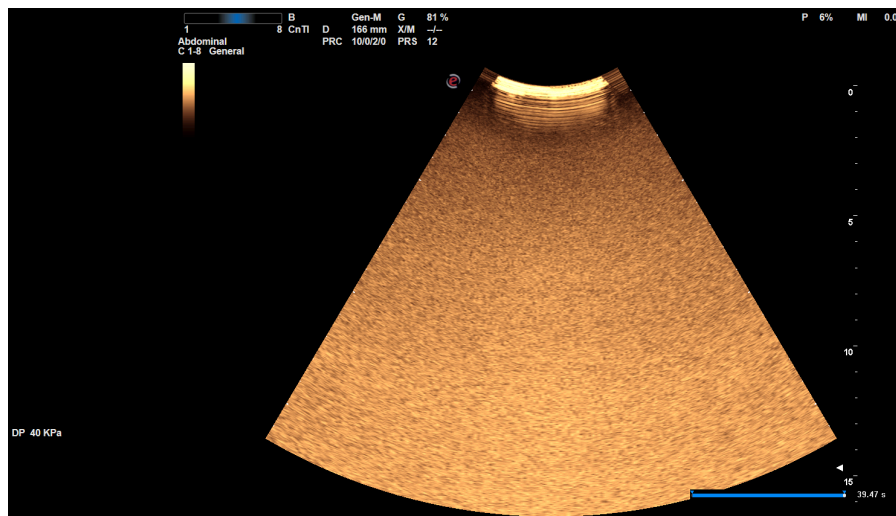
The following figure shows the screen layout during a CnTI exam:

Fig. 13–1 CnTI Image



The test timer (mm:ss) is available to control the exam duration and can be activated or reset. The applied acoustic pressure is indicated by the **DP** (Derated Pressure) parameter. The value of acoustic pressure is always stored: this means that it will be available both in Freeze and in Exam and Archive Review.

Fig. 13-2 CnTI Frozen Image



When activated, the main timer (**MT**) is indicated on the scrolling memories bar displayed in Freeze.

13.3. Running a CnTI Exam

The CnTI package can be activated in real time pressing **CNTI** on the touchscreen: the CnTI modality is automatically activated. The same button closes the CnTI modality.

Currently there is only one selectable protocol, i.e. the real time (low acoustic pressure).

NAV and **CNTI** navigation tabs switch from B-Mode imaging at low pressure with its touchscreen controls to CnTI mode imaging with its touchscreen controls. Refer to “Image optimization” section for information on how to use the controls for B-Mode imaging optimization.

13.3.1. Controls in CnTI Mode

Once the CnTI option has been activated, besides the standard controls, the **CNTI** tab of the touchscreen displays the related controls organized in two menu levels.

13.3.1.1. Baseline

B-Mode Imaging at Low Pressure

B-Mode imaging helps identifying the structure under exam before injecting CA.

While format controls (example: **DEPTH**) act on both modes (B-Mode Imaging at low pressure and CnTI), all other settings are independent; as an example, changing the transmit focal point position in B-Mode will not modify the CnTI focal point.

CnTI Imaging

MyLab provides more CnTI frequencies: with maximal sensitivity (**PEN** values), with maximal resolution (**RES** values) and with the best balance between resolution and penetration (**GEN** values).

- If necessary, compensate the energy loss by increasing the gains.
- Position the focal point on the bottom of the area under exam.
- Set the gains to obtain a homogeneous amplification throughout the field of view, at the limit of electronic noise.

13.3.1.2. Performing an Exam with CAs

TIMER RESET

activates or resets the timer provided in minutes: seconds and displayed on the left of the image.

Usually no further adjustments are required relating to the Baseline; if the signal is not adequate, gains are available to eventually increase sensitivity; also, the focal point position can be varied to selectively enhance specific areas.

DER PRESS

changes the value of the transmitted derated pressure.

FLASH

tap it to generate a Flash, i.e. a preset sequence of images at the maximum acoustic pressure, after which low pressure imaging of real time CnTI is automatically resumed. This sequence might be useful to destroy the CA and to review its distribution pattern.

DCTI

activates a flash at the end of which **MyLab** automatically freezes. When in Freeze, the **FIRST FRAME** button shows the first frame after the flash.

C-CAPT

When this key is pressed in real time, the Contrast Capture is activated providing additional information by holding signal detected from Contrast Agent.

CLIP SETTINGS

When this key is pressed, **MyLab** displays the following sub-menu keys:

CLIP SEC

rotating the knob you can select the clip duration. When unlimited duration (**MAXIMUM**) is set, the **CLIP** key both starts and stops the clip acquisition. **CLIP** archives a clip and the whole CA sequence in real-time.

STOP CLIP ON FREEZING

when selected, automatically stops the clip acquisition when either **DCTI** or **FREEZE** is pressed.

BACK



goes back to main menu keeping the modifications.

COMPOSITE IMAGE

allows to simultaneously show B-Mode (on the left) and CnTI (on the right) images; both images are in real-time. The display of the B-Mode signal helps identifying the structure under exam before injecting the CA. **NAV** and **CNTI** navigation tabs switch from B-Mode imaging at low pressure with its touchscreen controls to CnTI mode imaging with its touchscreen controls. Alternatively, by pressing **LEFT** and **RIGHT**, **MyLab** switches from one modality to the other one to allow controls adjustment.

FLASH DCTI SETTINGS

When this key is pressed, **MyLab** displays the following sub-menu keys:

AUTO SAVE

automatically saves the first frame after the flash activated by pressing the **DCTI** button.

NUM FRAMES

allows to set the number of frames in DCTI procedure.

BACK

goes back to main menu keeping the modifications.

13.3.2. Freeze Functions

FREEZE freezes the image. **MyLab** shows the memory scroll bar, where images acquired immediately before freezing are temporarily stored.

This scroll bar shows the number of the displayed images or, if the timer was active, the timer value relating to the image.

FIRST FRAME

allow to respectively place the cursor at the beginning or end of the sequence.

LAST FRAME**PLAY**

allows to review the sequence in cine mode.

GRAY M**COLORIZE**

allow to select a different post-processing map: **MyLab** provides the same map range available in real time.

14. THE ELAXTO OPTION

This chapter describes the ElaXto option that provides capabilities to perform an elastosonographic analysis of the tissues.

This chapter includes the following topics:

14.1 *ElaXto Overview*

14.2 *Activation of the ElaXto Analysis*

14.3 *Performing an ElaXto Analysis*

14.4 *The Screen Layout in ElaXto*

14.5 *Controls in ElaXto*

14.6 *ElaXto Measurements*

14.1. ElaXto Overview

Elastosonography gives information on the tissue elasticity by associating different chromatic patterns to the different tissue elasticities.

Elastosonography is based on the concept of elastic strain: an object, subject to a stress, distorts proportionally to the intensity of the applied stress and depending on the material it is made of.

Biological tissues can be studied following this concept. The elasticity degree of the tissue can be studied by applying on the patient small compression and retraction movements using the probe.

It is well known that tissue elasticity is correlated to the pathology. Palpation, which is routinely used in clinical exams, is based on this assumption.

In order to perform the elastographic exam, the user must apply a perpendicular pressure through rhythmic movements on the tissue under exam. Thanks to the strength given by that action, it is possible to evaluate the modification of the echo signal and thus to compute how the different tissues distort (if they are soft) or move (if they are hard) compared to the probe position. The result of this calculation, computed in real-time, is shown by a color image overlapped to the B-Mode image. The elasticity degree is given by a chromatic scale.

There are two fundamental concepts that need to be pointed out:

- **Elastosonography is a qualitative analysis.** Since the tissues are stressed by the probe pressure and there is no information on the force applied to the tissue, it is not possible to measure the absolute hardness of the tissue. The strain information is computed related to the surrounding tissue.

- **Elastosonography is a relative analysis.** As explained above, the computed strain value is strongly dependent on the tissue of the region of interest.

14.2. Activation of the ElaXto Analysis



The ElaXto analysis can be activated by pressing **ELAXTO** in the touchscreen.

Refer to Getting Started section to know the probes where ElaXto option is available.

14.2.1. Ending the ElaXto Analysis

To deactivate the ElaXto analysis, press **ELAXTO** again from real-time.

14.3. Performing an ElaXto Analysis

Procedure

1. Press **ELAXTO** to activate the ElaXto Analysis.
2. Place the probe on the area to be scanned. The probe lens should be as perpendicular as possible to the scanning surface.
3. Adjust the ROI size and position with the trackball. Press **ACTION** to toggle between two controls.

It is suggested to set the ROI size four times bigger than the structure under evaluation. Position the structure in the center of the ROI.

4. If necessary, adjust the image quality within the ROI cursor (the **B-MODE** tab of the touchscreen displays all the B-Mode controls).

Adjust the controls so that the structure under examination is well defined. Avoid dark area inside the ROI. If this rule is not followed, it won't be possible to obtain a correct ElaXto image.

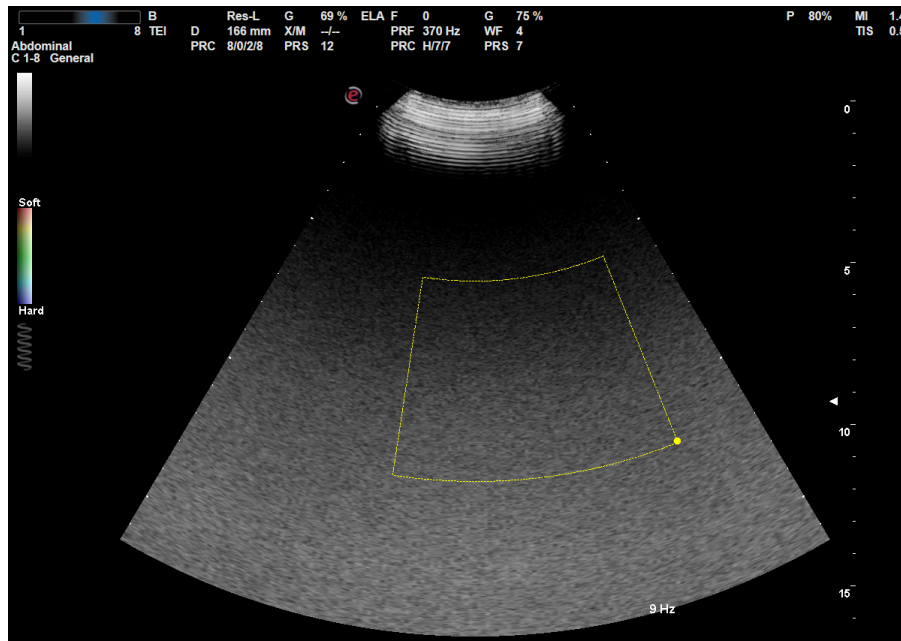
5. Press the probe performing rhythmic movements, perpendicular to the body surface.
6. The colour ElaXto image is overlapped on the B-Mode image. The **C** knob adjusts the gain of the elastosonographic image.

The ElaXto image is computed evaluating the modifications on the echo signal during the manual compression.

14.4. The Screen Layout in ElaXto

During ElaXto Analysis the screen layout shows additional parameters and information.

Fig. 14–1 ElaXto screen layout



A ROI (Region of Interest) cursor is displayed overlaid to the image. This cursor identifies which part of the image will be interested to the ElaXto analysis.

The ElaXto parameters are displayed above the image, as shown in the figure above. The following parameters are displayed:

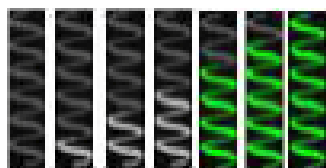
Table 14–1 Parameters in ElaXto

Parameter	Displayed format	Description
G	nn%	ElaXto gain
PRC	l/n/n	Detail, Frame Rejection, Noise Rejection
PRS	n	Persistence

The ElaXto color map, displayed just below the gray map, represents the elasticity degree on the area under analysis. Colors correspond in the lower part of the scale to the harder tissues and in the higher part to the softer tissues.

ElaXto Spring

The spring displayed below the ElaXto color map represents a real time feedback on the quality of strain image acquisition to allow adjustments of the probe movement, thus improving the strain image quality.



The color filling of the spring is correlated to the compression applied by the probe. The more the spring is filled, the more adequate is the quality of the movement to obtain a reliable ElaXto analysis.

To obtain a good ElaXto image, it is necessary to apply a mechanical stress through the ultrasound probe by pressing and releasing the probe with regular rhythmic movements, perpendicular to the body surface. This action causes a series of small strains on tissues under exam; these strains depend on various factors, as the performed movement, the applied force, the structures included in the examined body district, etc.

The ElaXto image will not be displayed when movements are not correct.

14.5. Controls in ElaXto

The **ELAXTO** tab of the touchscreen displays the following controls organized in two menu levels.

DUAL

activates/deactivates the dual presentation. In dual format the screen is split in two parts, simultaneously displaying the B-Mode image on the left and the ElaXto image on the right.

NOTE

When Dual is active, the MView mode is disabled.

ELAXTO REVERSE

For some maps it is possible to invert the color-tissue characterization correspondence by tapping this button.

COLOR MAP

rotating the knob you can select the desired scale to represent the elasticity degree: the displayed value shows the active scale. Different maps are available (chromatic, monochromatic and gray). Tapping the button:

COLOR MAP

rotate to change the map.

VEL VIS THRES

selects the threshold above which the velocity is displayed. This control is available only with specific color maps.

WR PRIOR

(Write Priority) assigns priority to the color codification and B/W scale.

BACK



goes back to main menu keeping the modifications.

DYNAM RANGE

allows tissue structures to be characterized. Depending on the area under analysis, the tissues may show some differences of elasticity more or less clearly:

Table 14–2 Dynamic Range values

Dynamic Range	Action
Low values	To visualize with a neat color small differences on the elasticity degree (achieving the color map ends).
High values	To visualize wider ranges of elasticity changes. In this case modifications of tissue elasticity which result small with respect to the average, will be displayed with similar colors. Only big differences will show colors reaching the ends of the chromatic map.

TRANSP

by rotating clockwise/counterclockwise you can increase/decrease the transparency between color and B/W images. In Freeze this key allows to display/remove the colored image in/from the box.

DETAIL

allows to change the detail level of the elastosonographic image acting on the transitions between the areas with different chrominance values. Three different values can be selected (low, medium and high).

PERSISTENCE

controls the time relationship among images for the real time presentation; higher levels of persistence improve the view perception and the stability of the image quality but worsen the perception of moving structures.

FRAME REJECTION

changes the threshold level so that entire frames are eliminated if successive acquired echo data are not coherent with themselves.

NOISE REJECTION

changes the threshold level so that noise is eliminated from the acquired image.

14.5.1. Controls in Freeze

HIDE ELAXTO

shows only the B-Mode image.

14.6. ElaXto Measurements

After the acquisition stage, by pressing the **+...+** key at any time in Freeze, you can perform some additional generic measurements specifically conceived for the ElaXto analysis.

14.6.1. ElaXto Ratio Measurements

When **ELX RATIO (ELLIPSE)** or **ELX RATIO (TRACE)** is selected, **MyLab** requires to trace from two to four zones (Z1, Z2, Z3 and Z4) on the ElaXto image and provides then a ratio between the strains occurring in the tissues included in these zones. The resulting value is

directly proportional to the bigger strainability of the tissue included in zones Z2, Z3, Z4, compared to the tissue of zone Z1.^[1]

14.6.1.1. Performing the ELX RATIO (ELLIPSE) Measurement

In the ELX RATIO (ELLIPSE) measurement the zones (Z1, Z2, Z3 and Z4) are traced using By Ellipse method.

1. Acquire an ElaXto image and press **FREEZE**.
2. In cine mode, select the desired frame.
3. Press **+...+** to activate the calculations menu.
4. Tap **ELX RATIO (ELLIPSE)** on the touchscreen.
5. Using the trackball, position the ellipse that defines the Z1 zone on the ElaXto image and press **ENTER**.
6. Use the trackball to dimension the first axis of the ellipse.
7. Press **SWAP AXIS** to select the second axis of the ellipse.
8. Use **ROTATE**, **PAN** and **RESIZE** respectively to rotate, pan and resize the traced zone.
9. Press **ENTER** to confirm.
10. Follow the instructions displayed on the screen to trace the second zone Z2 (and, if desired, the third Z3 and the fourth Z4). Pressing **SKIP** you can skip to the next zone.

How to change an ELX RATIO (ELLIPSE) measurement

The modification of any traced zone is always possible in real time.

1. Press **POINTER** to use the trackball as a pointer.
2. Place the cursor on the measurement to be modified (the selected measurement is displayed in yellow).
3. Press **ENTER** and modify the traced zone following the procedure used to trace it.

14.6.1.2. Performing the ELX RATIO (TRACE) Measurement

In the ELX-T-RAT measurement the zones (Z1, Z2, Z3 and Z4) are traced using By Contour method.

1. Acquire an ElaXto image and press **FREEZE**.
2. In cine mode, select the desired frame.
3. Press **+...+** to activate the calculations menu.
4. Tap **ELX RATIO (TRACE)** on the touchscreen.
5. Using the trackball, position the cursor on the first point of the Z1 zone and press **ENTER**.
6. Trace the contour with the trackball and press **ENTER** to close and confirm it.

1. It requires a specific licence, not available in the U.S.A.

- Repeat the given procedure to trace the Z2 zone (and, if desired, the third Z3 and the fourth Z4). Pressing **SKIP** you can skip to the next zone.

How to repeat the same measurement on a different image

The selected measurement can be performed on a different image.

- Press **ACTION** to activate the cine mode.
- Select the image with the trackball.
- Press **+...+** to repeat the measurement.

The measurement available in real time can also be executed on archived images and clips. These images and clips are respectively marked with the ElaXto symbol on the thumbnails.

14.6.1.3. Displayed Values

Basing on the performed selection, **MyLab** provides:

- area measurements (**A Z1**, **A Z2**, **A Z3** and **A Z4**, in mm² or cm²) of zones Z1, Z2, Z3 and Z4,
- value **ELX2/1**, which is the ratio between the strains produced on zones Z2 and Z1, **ELX3/1**, which is the ratio between the strains produced on zones Z3 and Z1, **ELX4/1**, which is the ratio between the strains produced on zones Z4 and Z1. This ratio, if the acquisition scale is not saturated, is independent from the used display and dynamic range. Whenever the acquisition scale reaches the saturation values, the numeric result is displayed in red with the symbol “>” (greater than) or “<” (minor than). To extend the scale, change the dynamic range (**DYN RANGE** key) taking into consideration the correlated changes in the color map distribution.

The ELX measurement can be performed only once; if the measurement is repeated, the result will overwrite the previous one.

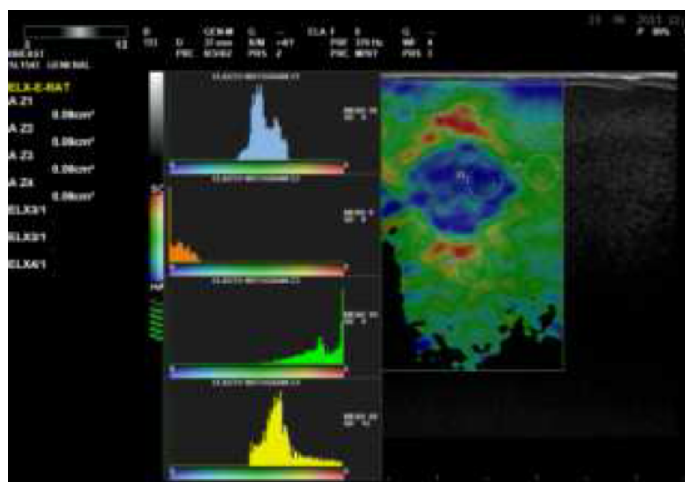
The measurement can be added to the report (**ADD TO REPORT**), it will be inserted into the tab “ELAXTO RATIO”.

After performing the measurement, **MyLab** displays the key **HISTOGRAM**, allowing to display the histograms showing how the degrees of elasticity of tissues included in the selected Z zones are distributed. This elasticity degree is distributed along the X axis, from a minimum (Hard) to a maximum (Soft) end, referring to the used color map. The Y axis shows the number of points having a certain value. This axis gives no numeric indication and its scale is automatic.

NOTE

The distribution shown in the histogram is particularly dependent on the used dynamic range, and more generally, on all ElaXto settings.

Fig. 14-2 ElaXto Histograms



In the display by histograms, showing the distribution from hard (H) to soft (S) on a 0-100 scale, **MyLab** also computes:

- the mean value MEAN (referred to the histogram) of all information included in the selected Z zone,
- the standard deviation SD (referred to the histogram) of all information included in the selected Z zone.

NOTE

To save the histogram in the report, the user must first save the image containing the histogram and then attach it to the report by using the software key **ATTACH**.



When this symbol is displayed on the screen, it indicates to carefully read the manual. Refer to the appropriate section of the manual for a detailed explanation.



WARNING

The ElaXto Ratios are for reference only and cannot be used for diagnostic purposes.

14.6.2. Measurements of the Hardness (Softness) Percentage

The measurement of the hardness percentage (ELX HARD %) counts - within a traced zone - the points that are below a set threshold. The result is expressed in percentage.^[2]

2. This measurement requires a specific license. It is not available in the United States.

The measurement of the softness percentage (ELX SOFT %) counts - within a traced zone - the points that are above a set threshold. The result is expressed in percentage.^[2]

All counted points belong to a subset of colors identified by a yellow frame displayed on the bar.

STEP HD (or **STEP SFT**) changes the threshold value that is modifiable before tracing the zone. The set value is automatically saved to be available for next exams.

The measurement can be activated in any time in Freeze by pressing the key **+...+**.

14.6.2.1. Performing the ELX HARD % (ELLIPSE) or ELX SOFT % (ELLIPSE) Measurement

In the ELX HARD % (ELLIPSE) or ELX SOFT % (ELLIPSE) measurement the Z1 zone is traced using By Ellipse method.

1. Acquire an ElaXto image and press **FREEZE**.
2. In cine mode, select the desired frame.
3. Press **+...+** to activate the calculations menu.
4. Tap **ELX HARD % (ELLIPSE)** or **ELX SOFT % (ELLIPSE)** on the touchscreen.
5. If necessary, change the threshold value by rotating **STEP HD** (or **STEP SFT**).
6. With the trackball position the ellipse that defines the Z1 zone on the ElaXto image and press **ENTER**.
7. Use the trackball to dimension the first axis of the ellipse.
8. Press **SWAP AXIS** to select the second axis of the ellipse.
9. Use **ROTATE**, **PAN** and **RESIZE** respectively to rotate, pan and resize the traced zone.
10. Press **ENTER** to confirm.

How to change an ELX HARD % (or ELX SOFT %) measurement

The modification of any traced zone is always possible in real time.

1. Press **POINTER** to use the trackball as a pointer.
2. Place the cursor on the measurement to be modified (the selected measurement is displayed in yellow).
3. Press **ENTER** and modify the traced zone following the procedure used to trace it.

14.6.2.2. Performing the ELX HARD % (TRACE) or ELX SOFT % (TRACE) Measurement

In the ELX HARD % (TRACE) or ELX SOFT % (TRACE) measurement the Z1 zone is traced using By Contour method.

1. Acquire an ElaXto image and press **FREEZE**.
2. In cine mode, select the desired frame.
3. Press **+...+** to activate the calculations menu.

4. Tap **ELX HARD % (TRACE)** or **ELX SOFT % (TRACE)** on the touchscreen.
5. If necessary, change the threshold value by rotating **STEP HD** (or **STEP SFT**).
6. With the trackball position the first point of the Z1 zone on the ElaXto image and press **ENTER**.
7. Trace the contour with the trackball and press **ENTER** to close and confirm it.

How to repeat the same measurement on a different image

The selected measurement can be performed on a different image.

1. Press **ACTION** to activate the cine mode.
2. Select the image with the trackball.
3. Press **+...+** to repeat the measurement.

The measurement available in real time can also be executed on archived images and clips. These images and clips are respectively marked with the ElaXto symbol on the thumbnails.

14.6.2.3. Displayed Values

Basing on the performed selection, **MyLab** provides:

- the measurement of the Z1 zone area **A_Z1** (in mm² or cm²),
- the **HRD_LEV** (or **SFT_LEV**) value, that is the threshold set by the operator,
- the **%HRD** value that is the percentage of the points below the set threshold within the traced area,
- the **%SFT** value that is the percentage of the points above the set threshold within the traced area.

The **%HRD** (or **%SFT**) measurement can be performed once: its repetition will overwrite the previous value.

The measurement can be added to the report (**ADD TO REPORT** key) and is displayed on the ELAXT RATIO section.

As shown in the ElaXto Ratio measurement, after performing the measurement, **MyLab** displays the key **HISTOGRAM**, allowing to display the histograms showing how the degrees of elasticity of tissues included in the traced Z zone are distributed.

14.6.3. Export of the Histogram

This function allows to export on text (.csv) file the histogram values of Z1 and Z2 zones of an image where ElaXto measurements have been performed.

Procedure

1. Execute an ElaXto measurement and save the relevant image.
2. Enter the Exam Review (**EXAM REVIEW**).
3. Select the desired image and press **EXPORT**.

The .bmp image and the relevant .csv file are saved on the selected medium. The .csv file has the following format:

```
Z1 Zone : ElaXto histogram data,,,,Z2 Zone : ElaXto histogram data Value,,Freq,,,Value,,Freq.
0,,0,,,0,,1
1,,10,,,1,,1
2,,15,,,2,,0
3,,30,,,3,,0
4,,80,,,4,,10
5,,20,,,5,,15
::::
::::
126,,2,,,126,,40
127,,0,,,127,,10
```

where comas act as delimiters of the data columns. Using a data sheet utility, the saved data are automatically organized in columns as shown in the table below:

Z1 Zone : ElaXto histogram data					Z2 Zone : ElaXto histogram data		
Value		Freq.			Value		Freq.
0		0			0		1
1		10			1		1
2		15			2		0
3		30			3		0
4		80			4		10
5		20			5		15
:		:			:		:
:		:			:		:
126		2			126		40
127		0			127		10

The table is organized in two parts, one part for each zone: Z1 and Z2; on its turn each zone is divided in two columns (Value and Freq.) that indicate:

- **Value**, a progressive index (from 0 to 127) that identifies the 128 “classes or bins” in which the horizontal axis is divided.
- **Freq**, the number of points, for a certain “class or bin”, belonging to the Z zone.

NOTE

The histogram displayed on **MyLab** is automatically re-scaled according to the maximum peak of each zone. The distribution of the “classes or bins” is distributed on a 0-99 scale for a better understanding.

Raw data are exported. These data are intended for research purposes: they are not normalized, they have a wider dynamic and are distributed on a higher number of “classes or bins” (higher than 128) to get an analysis more accurate.



A. ECG CABLES

The ECG cable supplied by Esaote are 3-Lead ECG Cable (Black, yellow and red colors) and includes leads which are equipped with a pliers terminal.

The ECG cables are compliant to both IEC (International Electrotechnical Commission) and AHA (American Heart Association) standards.

A pediatric version of ECG cable is also available.

Each button electrode can be used with the ECG cable. Esaote recommends using disposable Ag/AgCl electrodes. Read the manufacturer's instructions carefully for the correct use of the electrodes.

A.1. Checking the ECG Cable

A check of the ECG cable and leads should be made periodically.

ECG Cable Inspection

Disconnect the cable from **MyLab** and check that there are no breaks or slits.

NOTE

Esaote recommends to replace the ECG cable if there are breaks or slits.

A.2. Cleaning and Disinfecting the ECG Cable

Periodically clean the ECG cable and leads so that they remain in optimal working order.



WARNING

Never attempt to reprocess the ECG cables while they are connected to **MyLab**.

Equipment

The equipment listed in the following table will be necessary for periodic maintenance procedures.

Agent	Destined for
Solution of mild soap and water	Cleaning the ECG cable and leads
CIDEX OPA ^[1]	Disinfection of the ECG cable and leads
Indicated by the manufacturer	Disinfecting the electrodes

1. CIDEX OPA is a Johnson&Johnson Ltd. Registered brand.

Cleaning Procedure

1. Disconnect the cable from **MyLab**.
2. Dust the cable connector with a soft cloth.
3. Clean the cable and the leads by rubbing them gently with a soft cloth dampened with water and a mild detergent.
4. Rub the cable and the leads gently with a soft cloth slightly dampened with a mild detergent solution.
5. Dry the cable and the leads by rubbing them gently with a clean soft, dry cloth.

Disinfection Procedure

The ECG pliers (that are attached to the electrodes) can be disinfected using CIDEX OPA, following the manufacturer's instructions.

1. Disconnect the cable from **MyLab**.
2. Clean the cable and the leads.
3. Immerse the ECG pliers in CIDEX OPA. When using the disinfectant substance, carefully follow the manufacturer's instructions.



CAUTION

Do not immerse the ECG cable. The ECG cable is not waterproof. To disinfect the ECG pliers (that are attached to the electrodes) immerse only the pliers and a part of the leads (closest to the pliers) in the disinfection solution. Do not allow the connector of the ECG cable to become wet.

IMAGE OPTIMIZATION

1	B-Mode Controls and Optimization	1-1
1.1	Activation of B-Mode.....	1-1
1.2	Controls in B-Mode	1-1
1.2.1	Basic Controls	1-1
1.2.2	Advanced Controls.....	1-5
1.2.3	Controls in Freeze	1-10
1.2.4	EasyMode	1-10
1.2.5	Encoder controls.....	1-10
1.3	B-Mode Display Optimization	1-11
2	M-Mode Controls and Optimization	2-1
2.1	Activation of M-Mode.....	2-1
2.2	Controls in M-Mode.....	2-1
2.2.1	Basic Controls	2-2
2.2.2	Advanced Controls.....	2-2
2.2.3	M-Mode Scanning Optimization	2-3
3	Doppler Controls and Optimization	3-1
3.1	Activation of Doppler Modes.....	3-1
3.2	Controls in Doppler	3-1
3.2.1	Basic Controls	3-2
3.2.2	Advanced Controls.....	3-3
3.3	Doppler Scanning Optimization.....	3-4
4	Color Doppler Controls and Optimization.....	4-1
4.1	Activation of Color Doppler Format.....	4-1
4.2	Controls in CFM and Power Doppler	4-1
4.2.1	Basic Controls	4-2
4.2.2	Advanced Controls.....	4-3
4.2.3	Controls in Freeze	4-4
4.2.4	EasyMode	4-4
4.3	Color Doppler Scanning Optimization.....	4-4
4.4	Q-Mode - M CFM Mode.....	4-5
4.4.1	Activation of Q-Mode Format	4-5

1. B-MODE CONTROLS AND OPTIMIZATION

B-Mode provides two-dimensional images of body organs taken by ultrasound scan.

1.1. Activation of B-Mode

The system automatically enters in B-Mode each time a new exam is started. B-Mode format can be re-displayed from any other mode using the **B** key.

1.2. Controls in B-Mode

When in real time the touchscreen provides two menu levels: Basic Controls to manage exam flow and Advanced Controls for an advanced image management. Swipe left/right to switch from Basic to Advanced level. It is suggested to use Advanced Controls only if you are aware of their functions.

The lower line of control is associated to six knobs. These knobs are usually shared by two controls: the blue one is the active one, whose value can be changed rotating the knob, while the other control can be made active by tapping it.

As an alternative to those two levels, **EASYMODE** provides controls to manage the image parameters in a simplified way.

When in freeze, dedicated controls are displayed on the touchscreen.

Additional controls are associated to the Encoders.

On the left of the touchscreen are listed the available presets.

1.2.1. Basic Controls

BIOPSY

This key is displayed if the active probe supports a needle guide. Refer to the specific section in this manual for detailed information on a correct use of the needle guides in biopsy procedures.

B-STEER

steers the sector. Available with Linear Array probes only.

CNTI

This key is displayed if the CnTI option has been enabled for examinations with contrast media. Refer to the specific section in this manual for detailed information.

ESCAN	When active, it allows to automatically adjust imaging parameters without the need to repetitively press AUTO . When ESCAN is enabled AUTO is disabled.
CVX/LIN	selects the transducer (linear or convex) to be used when the transrectal probe is active.
DYN COMPR DYN RANGE	<p>DYN RANGE and DYN COMPR share the same knob; tap it to toggle between the two controls, rotate it to increase/decrease the value of the selected control (represented in blue).</p> <p>DYN COMPR controls the Dynamic Compression darkening the hypoechogenic areas and changing image contrast. The higher the selected value, the greater the contrast.</p> <p>DYN RANGE controls the Dynamic Range changing the overall contrast value. Decreasing Dynamic Range shows more shades of gray onto the same display scale reducing the overall contrast. Increasing Dynamic Range reduces the amount of gray displayed increasing the overall contrast.</p> <p>These commands are mainly subjective and patient-dependent.</p>
FULLSCREEN	enlarges the ultrasound image to full screen.
SCAN CORRELATION SIZE	<p>SCAN CORRELATION and SIZE share the same knob; tap it to toggle between the two controls, rotate it to increase/decrease the value of the selected control (represented in blue).</p> <p>SCAN CORRELATION combines the classic frame averaging algorithm with advanced beam forming and motion detection algorithms to reduce the dragging effect and improve the image fluidity. Rotate the knob to change the value. For certain values of Scan Correlation, IMOTION is active. Advanced controls are available through SCAN CORREL SETTINGS key in the Advanced Controls level of touchscreen. When MVIEW is activated the knob changes the MView values.</p> <p>SIZE widens or narrows image field of view. Rotate the knob to narrow/widen the angle. Reduce it as much as possible to maximize frame rate; the smaller the angle, the greater the number of images per second, providing a better view of rapidly moving structures, such as valves.</p>
EASY TRACE	When active, after LINE and PW pressure, automatically sets the best sample volume positioning for the vessel under examination.

FREQ FUNDAMENT TEI

FUNDAMENT and **TEI** share the same knob; tap it to toggle between the two controls, rotate it to increase/decrease the frequency (**FREQ**) value of the selected control (represented in blue).

Change the frequency of the transmitted ultrasound signal to optimize for the patient under exam. Rotate the knob until the desired frequency value is selected (**PEN** for optimal penetration, **RES** for optimal resolution, **GEN** for the best balance between resolution and penetration).

Tissue Enhanced Imaging (TEI) improves the clarity of the image by reducing the acoustic noise. Because of the non-linear response of tissues to ultrasound energy, **TEI may require higher acoustic emissions compared with conventional imaging; the use of this mode is recommended especially for patients with difficult acoustic windows.**

IMOTION

enables/disables the motion compensation.

MICROV

activates/deactivates Micro-Vascularization imaging to enhance the sensitivity to small vessel and slow flow detection. When pressed, it opens CFM tab with additional controls; refer to CFM chapter further in this manual.

When Micro V is enabled **MICROV HFR** key is displayed allowing to increase frame rate.

MICROE

emphasizes small hyperechogenic structures in the image.

MVIEW

MView combines three or more images acquired with different steering angles into a single image. MView is available with Linear and Convex Array probes. MView enhances contrast resolution with a better tissue differentiation and a clear visualization of organ borders and structure margins. Tap the key to activate/deactivate MView. Alternative controls are available through **IMOTION** in the Advanced Controls level of the touchscreen.



WARNING

MView may generate artifacts on the sector sides, particularly when scanning cavities. Place the area under exam in the middle of the scanning area.

NEEDLE ENHANCE

This key is displayed when the biopsy has been activated. Refer to the specific section in this manual for detailed information on a correct use of the needle guides in biopsy procedures.

ORIENTATION




flips the image left/right. Also available in Freeze.

POWER

changes the transmitted power. Tap the key to open the following sub-menu:

1. B-Mode Controls and Optimization

FACTORY	resets the transmitted power at the default value.
HALF	sets the transmitted power at 50% of the maximum value.
MAX	sets the transmitted power at maximum.
POWER%	Rotate this knob clockwise/counterclockwise to increase/decrease the transmitted power by steps of 10%.
BACK 	goes back to main menu keeping the modifications.



WARNING

Use the minimum power compatible with a diagnostic level of the images. If there is insufficient sensitivity, make sure the gain, focal point and probe frequency have been correctly set before increasing the power.

REVERSE



flips the image up/down. Also available in Freeze.

TILT

tilts the current field of view left/right.

TPVIEW

On selected Convex, Linear Array and Phased Array probes, tapping this key activates the trapezoidal view, providing a larger field of view in the far field.

NOTE

TPView is available only if the selected probe manages the trapezoidal view.

When TPView is selected with the Phased Array probe, the Continuous Wave Doppler (**CW** key) cannot be activated. Deselect the TPView mode to activate the CW analysis.




WARNING

The probe's field of view is enlarged by steering the ultrasound beam. The steering might cause some artifacts.

TVM	When the cardiac application is active, this key enables Tissue Velocity Mapping to display heart walls motion. This modality is available with specific probes. Refer to “Color Doppler Controls and Optimization” chapter further in this section.
XVIEW	<p>The XView algorithm reduces the unwanted effect of speckle in the ultrasound image due to noise and movement artifacts. Rotate the knob to activate the XView algorithm and change its value from off (–) to C# values and then to +# for XView+ values.</p> <p>Advanced customization is available in the Advanced Controls level of touchscreen.</p> <p>Also available in Freeze.</p>
XFLOW	Refer to <i>Color Doppler Controls and Optimization</i> chapter further in this section for detailed information on use.

1.2.2. Advanced Controls

AUTOADJUST OFF	deactivates the automatic adjustment.
AUTOADJUST SETTINGS	opens a sub-menu where you can enable ESCAN or change the optimization analysis type rotating AUTOGAIN OFFSET .
AVF	<p>makes the focus positioning automatic, improving the focus management.</p> <p>When pressed, all controls related to focus management are disabled.</p>
CLIP SETTINGS	When this key is pressed, the system displays the following sub-menu keys: Available also in Freeze.
CLIP SEC	This knob allows to change the clip duration in real time. When the duration of the clip is set to unlimited, its acquisition ends when CLIP is pressed.
CLIP CYCLE	When ECG is ON, it allows to change the clip trigger method into seconds instead of cycles.
BACK 	goes back to main menu keeping the modifications.
COLORIZE	<p>This knob changes the gamma of color for the gray scale to enhance the discrimination capabilities for B-Mode and M-Mode images or Doppler Spectrum.</p> <p>Rotate the knob to change its value.</p> <p>Available also in Freeze.</p>
DENSITY	This knob optimizes lateral resolution for the best possible image quality.
ENHANCEMENT	This knob enhances the edges of boundaries to emphasize tissues interface.

ESPEED

Ultrasound devices assume that sound waves travel at a speed of 1540 m/sec through the tissue. In reality, the speed of sound is affected by the density and the elasticity of the medium through which it is traveling and these factors are not constant for human tissues.

This knob, available with selected probes and applications, changes on-the-fly the speed of sound providing a better focusing when ultrasound propagation speed of the tissues under examination is different from 1540 m/sec.

Rotate the knob clockwise/counterclockwise to increase/decrease the speed of sound.

FOCUSES

This knob changes the number of active focuses in transmission, increasing resolution for a specific area. Rotate the knob clockwise/counterclockwise to increase/decrease the number of focal zones. A graphic caret corresponding to the focal zone position(s) is displayed on the side of the image. The frame rate decreases if more than one focal point is active.

NOTE

Several transmitting focuses can be activated; in this case, the relative distance between focuses is pre-established.

GRAY MAP

offers different gray scales for the B-Mode image presentation, ranging from minimum to maximum contrast. Rotate the knob to change gray map. Define the gray map before changing other parameters.

Also available in Freeze.

Tapping this key the system displays the following controls:

GRAY M This knob selects the desired post-processing curve: the number corresponds to the active curve.

CENTER This knob moves the center of the curve to the left or to the right.

REJECT This knob reduces the noise in the image modifying the rejection factor that is the level below which echoes will not be amplified.

SATURATION This knob modifies saturation.

SLOPE This knob changes the curve slope.

PEAK This knob increases or decreases the curve peak.

BACK goes back to main menu keeping the modifications.



LVO

This key activates the Left Ventricular Opacification (LVO) that is an optional license available in Cardiac application with Phased Array probes.

LVO enhances Ventricle Structures exploiting the presence of Intravenous Contrast Agents.

PHYSIO

When the ECG is available, this key allows to display the ECG trace and/or the EDR trace.

ECG trace has no diagnostic purposes but it is used to identify certain points, such as diastole and systole, where to take measurements. In addition, the R wave of the ECG QRS complex is used as reference for the 2D and/or 2D+CFM trigger clip acquisition of entire cardiac cycles. On the ECG trace displayed on the screen, the point where the system identifies the R wave is pointed with a marker. **MyLab** can be set to acquire in a perspective or retrospective way. ECG synchronism is necessary for stress-echo clip acquisition and XStrain processing.

EDR is a special algorithm retrieving information about patient breathing detected by the ECG electrodes on minor movements during the inspiration/expiration phases.

NOTE

EDR trace requires a specific license.

The EDR trace is not displayed on archived clips.



WARNING

MyLab displays on the screen one of the peripheral leads (I, II, III). The ECG trace is not intended for diagnostic purposes but it is provided as temporal reference for the physician or as an automatic synchronization to acquire clips gated on the ECG's R wave.


After **PHYSIO** tapping, ECG and EDR related keys are managed in two different tabs, **PHYSIO** and **PHYSIO EDR**, where the following controls are displayed:

ECG ON/OFF enables/disables the ECG trace visualization on the screen and the related additional controls.

EDR ON/OFF enables/disables the breathing trace visualization on the screen and the related additional controls.

GAIN This knob modifies the amplitude of the signal. Available both for ECG and EDR.

HEIGHT This knob changes the height of the area to display the trace. Available both for ECG and EDR.

POSITION	This knob moves the trace on the screen. Available both for ECG and EDR.
INVERT ECG	flips the ECG trace up/down.
LEAD	This knob exchanges the ECG limb lead electrodes.
BACK 	goes back to the real time menu.



WARNING


Do not use the physiological trace displayed on the screen for diagnosis or monitoring.

NOTE

The breathing trace is not available with ElaXto, Stress-echo, CMM, QIMT, and 3D/4D.

**SCAN CORREL
SETTINGS**

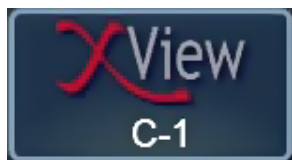
Tap the key to open the menu for dynamic imaging and MView:

MVIEW	enables/disables MView.
NUMBERS	Each key selects a different dynamic imaging or MView value when MVIEW is activated.
BACK 	goes back to main menu keeping the modifications.


TGC-ABSOLUTE

switches from absolute to relative TGC management. In absolute mode (**TGC-ABSOLUTE** pressed) all potentiometers affect the maximum probe scanning depth. In relative mode (**TGC-ABSOLUTE** not pressed) all potentiometers affect the scanning depth under analysis. Whenever the scanning depth is changed, the TGC function is redistributed.

XVIEW



Tapping this key opens the menu for XView advanced settings. The menu displays on the right side of the touchscreen the following controls:

- **XVIEW+** changes the menu on the center of the touchscreen showing the XView+ settings.
- **XVIEWC** changes the menu on the center of the touchscreen showing the XView settings.
- **OFF** disables the active XView.
-  **BACK** restores the B-Mode controls menu keeping the modifications.

While on the center of the touch screen are displayed:

Controls for XView+

- **XVIEW** knob changes the XView filter applied.
- **+ #** selects the XView algorithm to be set.
- **X BALANCE** knob defines how the XView algorithm affects the image.
- **DEFAULT** knob restores the default values.

Controls for XViewC

- **XVIEW** knob changes the XView filter applied.
- **C #** selects the XView algorithm to be set.
- **IED** (available only with specific probes in specific applications) increases the image definition.

1.2.3. Controls in Freeze

FRAME **SPEED**

FRAME and **SPEED** share the same knob and are only available in Freeze; tap it to toggle between the two controls.

Rotate **FRAME** to scroll the sequence frame by frame.

Rotate **SPEED** to increase/decrease the velocity for reviewing the sequence.

FIRST FRAME

automatically sets the current position at the begin of the sequence. Only available in Freeze.

LAST FRAME

automatically sets the current position at the end of the sequence. Only available in Freeze.

PLAY **STOP**

PLAY and **STOP** share the same button and are only available in Freeze.

PLAY shows the sequence of stored images in cine mode while **STOP** stops the cine presentation of the clip.

1.2.4. EasyMode

EasyMode provides an easy way to optimize image parameters by quickly operating with three simple sliders.

Tapping **EASYMODE** opens a menu with three sliders, each of them changes different image settings that act in opposite manner on the image:

- Resolution Vs Penetration. Changing the level increases/decreases the resolution affecting the penetration. It manages many parameters automatically, mainly the frequencies and the enhancement.
- Contrast Vs Soft. Changing the level increases/decreases the contrast of the image. It manages many parameters automatically, mainly the image dynamics.
- Smooth Vs Sharp. Changing the level increases/reduces the level of homogeneity of the image. It manages many parameters automatically, mainly the XView algorithm.

Slide directly the cursor on the touchscreen or rotate the corresponding knob to change value.

In EasyMode environment tap **TEI** to enable/disable TEI mode. Sliders can be set independently when in Fundamental and TEI.

1.2.5. Encoder controls

Each Encoder provides multiple controls to optimize image.

1.2.5.1. Right Encoder

DEPTH

Rotate **RIGHT ENCODER** clockwise to increase the scanning depth and visualize deeper structures. Rotate it counterclockwise to decrease the scanning depth and not display useless part of the image at the bottom.

FRAME

When in freeze, rotating **RIGHT ENCODER** scrolls the sequence frame by frame as **FRAME**.

1.2.5.2. Left Encoder

ZOOM

Rotate clockwise **LEFT ENCODER** to enlarge the B-Mode Area. For the first two steps the enlarged image is entirely displayed on the screen, then, due to the zoom factor, the image is crop; now the image is contoured by a frame and you can use the trackball to pan the image inside the displaying area. Rotate counterclockwise **LEFT ENCODER** to decrease zoom factor.

Press **LEFT ENCODER** to activate High Definition Zoom (HD Zoom) that offers a superior definition of the image to be enlarged.

HD Zoom

1. Position the HD Zoom ROI.
2. To change the size of the ROI, press **ACTION**. Change the size using the trackball.
3. Rotate clockwise **LEFT ENCODER** to enlarge the area inside the ROI.

When the zoom is activated, a zoom navigation window can be displayed on the screen.

The yellow box in the zoom navigation window represents where the part of the displayed zoomed image is positioned inside the whole image and its dimension.

Zoom navigation window can be enabled checking **SHOW ZOOM REFERENCE WINDOW** in the Application Preset tab within the General Setup of **MENU**.

1.3. B-Mode Display Optimization

First of all, the gain and TCG must be properly adjusted to clearly display the structures being examined; fine optimizations can then be performed interacting with the display commands or with the acoustic parameters of the probe.

B GAIN

Rotate the knob around the **B** key clockwise/counterclockwise to increase/decrease the gain within the entire sector.

1. B-Mode Controls and Optimization

TCG SLIDERS

Each TGC slider adjusts the gain in specific areas: move the cursors to the right to increase and to the left to decrease the gain.

FOCUS

Moving the trackball moves the focal zone(s) increasing the resolution and sensitivity of a specific area of the 2D.

AUTO

Pressing it automatically adjusts both the overall gain and TGC distribution improving the contrast resolution of the image. The activation is indicated on the screen by the corresponding icon and it is labeled as “AG”.

AUTOADJUST OFF deactivates the automatic adjustment while **AUTOADJUST SETTINGS** allows to change the optimization analysis type.

NOTE

Acoustic parameters and gain interact with each other; it may be necessary to review the adjustment of gain when an acoustic parameter changes.

2. M-MODE CONTROLS AND OPTIMIZATION

M-Mode provides information concerning tissue motion occurring over time along a single vector.

2.1. Activation of M-Mode

1. Starting from B-Mode, press **LINE UPDATE** to view the M-Mode cursor.
2. Place the cursor with the trackball on the corresponding B-Mode line.
3. Press **M** to activate M-Mode analysis.
4. Press **B** to return to B-Mode.

During the exam pressing **LINE UPDATE** freezes the trace acquisition and the reference B-Mode image is temporarily re-activated.

2.2. Controls in M-Mode

After M-Mode activation, beside the **B-MODE** tab on the Navigation Bar of the touchscreen, the **M-MODE** tab containing additional controls dedicated to M-Mode is displayed.

When in real time the touchscreen provides two menu levels: Basic Controls to manage exam flow and Advanced Controls for an advanced image management. Swipe left/right to switch from Basic to Advanced level. It is suggested to use Advanced Controls only if you are aware of their functions.

The lower line of control is associated to six knobs. These knobs are usually shared by two controls: the blue one is the active one whose value can be changed rotating the knob while the other control can be made active by tapping it.

When in freeze, dedicated controls are displayed on the touchscreen.

Additional controls are associated to the Encoders.

On the left of the touchscreen the available presets are listed.

Refer to previous chapter to get more information on the controls not described here.

2.2.1. Basic Controls

B-REF	enables/disables the reference B-Mode.
CMM	Compass M-Mode (CMM) generates a special M-Mode display allowing the free positioning of the cursor line. This modality is available for every application with every probe.

NOTE

Compass M-Mode requires a specific license.

Press **CMM** to activate Compass M-Mode. Once pressed, the trackball allows to move the scanning line within the sector and additional controls are displayed:

FREE	When pressed, it allows to independently move each line on the screen. When this button is not pressed, the lines are locked together in their middle position, indicated by the circle. In this case the trackball acts on all locked lines.
ANGLE	allows to freely orient the active scanning line within the sector. The corresponding trace is displayed in real time.
LINES	changes the number of active scanning lines: the corresponding traces are displayed in real time on the screen. MyLab allows to display up to three different lines and traces. The scanning lines are displayed with different colors and the ACTION key switches among the lines.
PLEX	activates and updates the reference B-Mode, while keeping the trace in real time.

2.2.2. Advanced Controls

FORMAT	opens a sub-menu allowing to change the real time display format:
B-REF SMALL	splits the screen horizontally, with a small B-Mode reference image on the upper part.
B-REF MEDIUM	splits the screen horizontally, with a medium sized B-Mode reference image on the upper part.
B-REF LARGE	splits the screen horizontally, with a large B-Mode reference image on the upper part.

DUAL

splits the screen vertically, with the B-Mode reference image on the left and the M-Mode trace on the right.

BACK



goes back to main menu keeping the modifications.

SWEEP

changes the speed at which the timeline is swept. Rotate the knob to increase/decrease the value.

2.2.3. M-Mode Scanning Optimization

To obtain a good M-Mode trace, it is important to optimize the B-Mode reference image from which the trace will then be sampled. Normally, further interactions are not necessary.

3. DOPPLER CONTROLS AND OPTIMIZATION

PW (Pulsed Wave) and CW (Continuous Wave) Doppler provide information concerning the velocity of moving tissues and flows.

In CW Doppler information is sampled along a line through the body, and all velocities detected at each time point are presented (on a time line).

In PW Doppler information is sampled from only a small region, called sample volume, defined in 2D image and presented on a timeline.

3.1. Activation of Doppler Modes

1. Starting from B-Mode, press **LINE UPDATE** to display the Doppler/M-Mode cursor.
2. Position the line (CW) or the Sample Volume (PW) on the applicable area.
3. Press **PW** to activate the Doppler PW or **CW** for the CW.
4. Press **B** to return to the full screen B-Mode.

During the exam, pressing **LINE UPDATE** freezes the trace acquisition and the reference B-Mode image is temporarily re-activated.

3.2. Controls in Doppler

After PW or CW activation, beside the **B-MODE** tab on the touchscreen the **DOPPLER** tab containing additional controls dedicated to Doppler is displayed.

When in real time the touchscreen provides two menu levels: Basic Controls to manage exam flow and Advanced Controls for an advanced image management. Swipe left/right to switch from Basic to Advanced level. It is suggested to use Advanced Controls only if you are aware of their functions.

The lower line of control is associated to six knobs. These knobs are usually shared by two controls: the blue one is the active one whose value can be changed rotating the knob while the other control can be made active by tapping it.

When in freeze, dedicated controls are displayed on the touchscreen.

Additional controls are associated to the Encoders.

On the left of the touchscreen the available presets are listed.

Refer to previous chapter to get more information on the controls not described here.

3.2.1. Basic Controls

ADM	activates Automatic Doppler Measurements: refer to “Measurements” section in this manual for further details on this feature.
ANGLE FINE ADJ	FINE ADJ and ANGLE share the same knob; tap it to toggle between the two controls, rotate it to increase/decrease the value of the selected control (represented in blue). ANGLE aligns the angle vector with the flow direction; it changes the angle with step of 60°. FINE ADJ provides a fine adjustment: it changes the angle with step of 1°.
AUDIO AUDIO MUTE	AUDIO and AUDIO MUTE share the same knob. Rotate it to increase/decrease the volume. Tap AUDIO MUTE to sets the volume to zero.
BASELINE D-STEER	BASELINE and D-STEER share the same knob; tap it to toggle between the two controls, rotate it to change the value of the selected control (represented in blue). Rotate BASELINE to move the baseline up or down to overcome aliasing problems. When the probe allows the cursor orientation, rotate D-STEER to orient the Doppler line.



WARNING

When the steering is set to the maximum step, some artifacts might occur showing color dots. In this case, reduce the steering by one step.

EASYTRACE	When active, after LINE and PW pressure, automatically sets the best sample volume positioning for the vessel under examination.
FREQUENCY	changes the Doppler frequency: lower frequency increases penetration and, based on Doppler formula, increases the maximum measurable speed.
HPRF	activates the Doppler HPRF (High Pulse Repetition Frequency), allowing to increase the available maximum PRF value to measure higher velocities by using more sample volumes. When the HPRF control is activated, by increasing the PRF (SCALE control) the user displays more sample volumes on the screen. These volumes have to be positioned so that the resulting Doppler trace is not corrupted.

NOTE

Position the sample volumes so that only one of them finds itself in correspondence of the flow under exam and the other ones on the fixed structures so that the Doppler signal is not ambiguous.

REVERSE TRACE

reverses the velocity scale without affecting the baseline to display receding flows above the baseline. It vertically inverts the spectral trace without affecting the baseline position. The plus and minus signs on the velocity scale reverse when the spectrum is inverted. Positive velocities display below the baseline.

SCALE

changes the velocity scale and consequently PRF.

SMART DOPPLER

Active only with Linear Array probe, when pressed it acts:

- by inverting the Doppler steering with reference to the vertical line,
- by inverting the Doppler scale,
- by inverting the color scale when triplex is enabled,
- by keeping constant the inclination of the angle correction factor.

SV SIZE

Available in PW Doppler, changes the sizes of the sample volume.

TV

activates Tissue Velocity mode for heart walls motion display. Tissue Velocity mode is available with specific probes.

3.2.2. Advanced Controls

ADM SETTINGS

provides a setting menu for Automatic Doppler Measurements: refer to “Measurements” section in this manual for further details.

FREQUENCY SHIFT

changes the trace unit measure in kHz.

NOTE

All factory calculation packages are based on velocity measured in cm/s. When velocity is measured in kHz, no derived parameter is automatically calculated. Custom measurements and formulas have to be added to calculate the derived parameters from velocity in kHz.

FFT RESOLUTION

affects the trace reconstruction: the higher the value, the more precise and accurate the reconstruction.



WARNING

The Doppler analysis of some pathologies could require low **FFT RESOLUTION** values. Set the **FFT RESOLUTION** on the highest value compatible with the diagnostic level of the image.

FILTER

increases/decreases the wall filter values thus reducing/increasing the noise level. Use low filter to display low flow velocity.

SWEEP

changes the scanning speed: the time scale of the trace changes accordingly.

3.3. Doppler Scanning Optimization

The gain must first be optimized using the relative knob until a clear envelope of the spectral analysis is obtained; the wall filters must be set in order to eliminate wrong low-speed signals caused by moving structures. Interaction with other commands or the acoustic parameters further improves the spectrum quality.

DOPPLER GAIN knob, placed around the **PW** key, affects the Doppler video component.

AUTO automatically optimizes the Doppler by adjusting general gain, baseline and velocity range.

When in freeze, the scrolling memories for B-Mode image and PW or CW trace can be moved independently to select the best image to be saved. Rotate the trackball horizontally to scroll through the images one by one. Press the **ACTION** key to switch between the B-Mode and PW or CW memories.

4. COLOR DOPPLER CONTROLS AND OPTIMIZATION

Color Flow Mapping (CFM) and Power Doppler (PD) are Doppler Modes providing information concerning the relative velocity and direction of fluid motion presented as a color-coded overlay on top of a B-mode image.

4.1. Activation of Color Doppler Format

1. Starting from B-Mode, press **C** or **PD/TVM**.
2. Position the ROI on the applicable area.
3. To change the area of the color box, activate the ROI by pressing the **ACTION** key. Change the size of the area using the trackball. Press **ACTION** again to confirm.

NOTE

The width of the CFM ROI and the B-Mode angle (**SIZE** button in **B-MODE** menu) must be as small as possible in order to maximize the CFM frame rate.

4. Press **C** or **PD/TVM** to disable Color Doppler and return to full screen B-Mode.

Once the Color Doppler is active, the line cursor can be displayed and you can move to Doppler/M-Mode.

4.2. Controls in CFM and Power Doppler

After CFM or PD activation, beside the **B-MODE** tab on the touchscreen the **CFM** tab containing additional controls dedicated to CFM is displayed.

When in real time the touchscreen provides two menu levels: Basic Controls to manage exam flow and Advanced Controls for an advanced image management. Swipe left/right to switch from Basic to Advanced level. It is suggested to use Advanced Controls only if you are aware of their functions.

The lower line of control is associated to six knobs. These knobs are usually shared by two controls: the blue one is the active one whose value can be changed rotating the knob while the other control can be made active by tapping it.

As an alternative to those two levels, **EASYSOURCE** provides controls to manage the image parameters in a simplified way.

When in freeze, dedicated controls are displayed on the touchscreen.

4. Color Doppler Controls and Optimization

Additional controls are associated to the Encoders.

On the left of the touchscreen the available presets are listed.

For the controls not described here refer to previous chapters.

4.2.1. Basic Controls

BASELINE **C-STEER**

BASELINE and **C-STEER** share the same knob; tap it to toggle between the two controls, rotate it to change the value of the selected control (represented in blue).

Rotate **BASELINE** to move the baseline up or down to overcome aliasing problems.

When the probe allows the cursor orientation, rotate **C-STEER** to change the steering of the color box.



WARNING

When the steering is set to the maximum step, some artifacts might occur showing color dots. In this case, reduce the steering by one step.

DUAL CFM

activates multiple views with B-Mode real time on the left side of the screen and CFM real time image on the right.

FREQUENCY

changes the CFM frequency: higher frequencies help to show low speeds.

REVERSE

reverses the color/flow direction inverting the color map.

NOTE

Reverse inverts the color map, **NOT** the color scale.

SCALE

changes the velocity scale; it affects color “filling”.

SMART CFM

When pressed it acts:


- by inverting the CFM steering with reference to the vertical line,
- by inverting the CFM scale,
- by inverting the color scale when triplex is enabled,
- by keeping constant the inclination of the angle correction factor.

XFLOW

activates/deactivates a set of more sensible and less saturated color maps.

IMOTION	enables or disables the motion compensation.
TPVIEW	switches from rectangular to trapezoidal color box.

4.2.2. Advanced Controls

COLOR MAP	opens a sub-menu allowing the selection of a different Color Map:
COLOR MAP	selects the threshold above which the velocity is displayed. This command is available only with specific color maps.
VEL VIS THRES	selects the threshold above which the velocity is displayed. This command is available only with specific color maps.
WR PRIOR	(Write Priority) assigns priority to the color codification and B/W scale.
COLOR PRIORITY	enables or disables transparency between color and B/W. This command is available only with specific color maps.
BACK 	goes back to main menu keeping the modifications.
DENSITY	changes the line density that is the number of image lines in the ultrasound image. It affects color “filling”.
FILTER	reduces the artifacts caused by acoustic decoupling or moving structures filtering low flow velocity signals.
HD-CFM # SENSITIVITY	HD-CFM # and SENSITIVITY share the same knob; tap it to toggle between the two controls, rotate it to increase/decrease the value of the selected control (represented in blue). HD-CFM # adjusts the color spatial resolution. SENSITIVITY adjusts color sensitivity. Available with specific applications.
PERSISTENCE	changes the persistence level. Higher level increase the image perception and decrease the discrimination of moving structures.
SMOOTH	makes the flow representation homogeneous.
TVM	When the cardiac application is active, this key enables Tissue Velocity Mapping to display heart walls motion. This modality is available with specific probes.

4.2.3. Controls in Freeze

HIDE CFM

enables or disables the Color presentation displaying only B-Mode reference image.

4.2.4. EasyMode

EasyMode provides an easy way to optimize image settings by quickly operating with three simple sliders.

Tapping **EASYMODE** opens a menu with three sliders, each of them manages automatically many image parameters:

- Superficial Vs Deep. Move the slider to optimize visualization for superficial or deep vessels.
- Fast Vs Slow. Move the slider to optimize visualization for fast or slow flows.
- Large Vs Small. Move the slider to optimize visualization for large or small vessels.

Slide directly the cursor on the touchscreen or rotate the corresponding knob to change value.

4.3. Color Doppler Scanning Optimization

To obtain a good CFM signal, the B-Mode reference image must first be optimized and B-Mode gain properly adjusted. ROI position and dimension have to be correctly set.

NOTE

Excessive B-Mode gain may “mask” the flow.

NOTE

Only one transmitting focal point is active in CFM, regardless of the B-Mode settings, and it is automatically positioned at the center of the ROI CFM.

Adjust the color gain rotating **CFM GAIN** (the knob around **C** key) to obtain the most useful signal level.

Optimize then other parameters so that an appropriate color flow image is achieved.

AUTO

Depending on the selection in AUTO BUTTON SETUP option (in **MENU - GENERAL SETUP - APPLICATION PRESET** folder), at **AUTO** pressure you can obtain the following actions:

- when AUTOADJUST has been selected, it automatically adjusts the color to the system default value,

- when **EDOPPLER** has been selected, it exploits the Color Doppler Signal to estimate the vessel position and orientation to automatically set:
 - Color Doppler best centering;
 - Sample gate vertical position;
 - Color Doppler beamline steering angle;
 - Doppler correction angle.
- when **BOTH** has been selected, it adjusts both the above parameters.

4.4. Q-Mode - M CFM Mode

4.4.1. Activation of Q-Mode Format

1. If needed, in CFM or in Power Doppler press **LINE UPDATE** to view the M-Mode cursor.
2. Place the cursor with the trackball on the desired position.
3. Press **M** to activate Q-Mode analysis.
4. Press **B** to return to B-Mode.

During the exam pressing **LINE UPDATE** freezes the trace acquisition and the reference 2D image is temporarily re-activated.

NOTE

When more modes are active, the navigation tab **M-MODE** allows you to access the M-Mode controls menu.

MEASUREMENTS

1	Measurements.....	1-1
1.1	Introduction to measurements	1-1
1.1.1	Diagnosis Based on Measurements.....	1-2
1.2	How to activate measurements.....	1-2
1.2.1	Additional Controls during measurements.....	1-3
1.3	How to take measurements	1-3
1.3.1	Measurement taken on two modes	1-5
1.3.2	Multi-Modality Measurements	1-5
1.3.3	Measurement on Clip of Trace	1-5
1.4	How to take a profile measurement.....	1-6
1.4.1	Manual Profile Measurement.....	1-7
1.4.2	By Cycle Measurement	1-7
1.4.3	ADM - Automatic Doppler Measurements	1-7
1.5	Generic Measurements.....	1-9
1.6	Application Measurements	1-12
1.6.1	Application Data	1-12
1.6.2	Application Measurements Organization.....	1-12
2	Measurement Configuration.....	2-1
2.1	Accessing to the Configuration Menu.....	2-1
2.2	Configuration for a specific Application.....	2-2
2.2.1	Application Measurements folder.....	2-3
2.2.2	Generic Measurements folder.....	2-4
2.2.3	Measure Units folder.....	2-5
2.2.4	Advanced folder.....	2-5
2.3	Configuration for Measurement Folder	2-6
2.4	How to Create a Measurement Folder	2-6
2.5	How to create a new group	2-7
2.5.1	Procedure to add a measurement.....	2-9
2.5.2	Procedure to add a formula.....	2-10
3	Measurement Accuracy.....	3-1
3.1	Introduction.....	3-1
3.2	Measurement Accuracy Values	3-1
3.3	Derived Data.....	3-2
4	Worksheet and Report.....	4-1
4.1	Worksheet	4-1
4.2	Report.....	4-2
4.2.1	End of the Report	4-3
4.3	Configurations	4-3
4.3.1	Report Configuration	4-3
4.3.2	Observations Configuration	4-5
5	Abdominal Measurements.....	5-1
5.1	Application Data	5-1
5.2	Available Abdominal Measurements.....	5-1
5.3	Abdominal Measurement Set Up.....	5-4
5.3.1	Advanced Folder.....	5-5
6	Adult Cephalic Measurements	6-1
6.1	Available Adult Cephalic Measurements.....	6-1
6.2	Adult Cephalic Worksheet Organization.....	6-2

6.2.1	Flow Directions.....	6-2
7	Breast Measurements.....	7-1
7.1	Available Breast Measurements	7-1
7.2	Automatic lesions contour	7-2
7.3	Automatic lesion dimensions.....	7-3
7.4	Breast Worksheet Organization	7-3
7.4.1	Structure Evaluation.....	7-3
7.5	Breast Measurement Set Up	7-5
7.5.1	Advanced Folder.....	7-5
8	Cardiac and Pediatric Cardiac Measurements.....	8-1
8.1	Application Data	8-1
8.1.1	Body Surface Area (BSA)	8-2
8.2	Cardiac Cycle manual correction	8-2
8.3	Available Cardiac and Pediatric Cardiac Measurements.....	8-3
8.4	Automatic Left Ventricle Measurements.....	8-9
8.5	Automatic Ejection Fraction	8-10
8.5.1	Auto EF calculation with Scan Plane Detection enabled	8-11
8.5.2	Auto EF calculation with Scan Plane Detection disabled.....	8-11
8.5.3	After Calculation	8-12
9	Gynecologic Measurements	9-1
9.1	Application Data.....	9-1
9.2	Available Gynecologic Measurements.....	9-1
9.3	Gynecology Worksheet Organization	9-3
9.3.1	Structure Evaluation.....	9-3
10	Obstetric Measurements.....	10-1
10.1	Application Data	10-1
10.1.1	“Gestational Age By” Area.....	10-2
10.1.2	Formulas for Expected Delivery Date (EDD)	10-2
10.2	Available Obstetric Measurements.....	10-2
10.2.1	Touchscreen Layout in Fetal Age and Fetal Growth	10-7
10.2.2	Ratios.....	10-7
10.2.3	Estimated Fetal Weight and Growth.....	10-8
10.2.4	Amniotic Fluid Index	10-8
10.2.5	APxT	10-8
10.2.6	Nuchal Translucency	10-9
10.2.7	Intracranial Translucency.....	10-10
10.3	Obstetric Worksheet Organization	10-10
10.3.1	Measure Folder.....	10-11
10.3.2	Graphics Folder	10-11
10.3.3	Biophysical Profile Folder	10-12
10.3.4	Survey Folder.....	10-13
10.4	Obstetric Measurement Set Up	10-14
10.4.1	Application Measurements Folder	10-14
10.4.2	Advanced Folder.....	10-17
11	Thyroid Measurements.....	11-1
11.1	Available Thyroid Measurements.....	11-1
11.2	Automatic lesions contour	11-2
11.3	Thyroid Worksheet Organization	11-3
11.3.1	Structure Evaluation.....	11-3

11.4	Thyroid Measurement Set Up.....	11-4
11.4.1	Advanced Folder	11-4
12	Urologic Measurements	12-1
12.1	Application Data	12-1
12.2	Available Urologic Measurements.....	12-2
12.3	Urologic Worksheet Organization	12-3
12.3.1	Structure Evaluation.....	12-4
12.4	Urologic Measurement Set Up	12-6
12.4.1	Advanced Folder	12-6
13	Vascular Measurements	13-1
13.1	Application Data	13-1
13.2	Available Vascular Measurements	13-2
13.3	Vascular Worksheet Organization.....	13-10
13.3.1	Velocities Ratio and Vessels Evaluation	13-10
13.4	Vascular Measurement Set Up.....	13-11
13.4.1	Advanced Folder	13-11
14	Lung Ultrasound	14-1
14.1	Forewords	14-1
14.2	Executing a LUS protocol	14-1
14.3	Bibliographic references	14-6
A	Formula and References in B-Mode.....	A-1
A.1	Volume in abdominal and breast	A-1
A.2	Volume in thyroid	A-1
A.3	Diameter Reduction	A-1
A.4	Length by Vertex.....	A-2
A.5	Area by Ellipse Axes	A-2
A.6	Area Reduction	A-2
A.7	Volume by Ellipse	A-3
A.8	Volume by Trace and by Area-Length	A-3
A.9	Bi-Plane Volume	A-3
A.10	Uterus, Fibroma, Ovary and Mass Volumes	A-3
A.11	Bladder Volume.....	A-4
A.12	Whole Gland and Transitional Zone Prostate Volume.....	A-4
A.13	Kidney and Testicle Volume - Biplane Method.....	A-5
A.14	Kidney and Testicle Volume - Monoplane Method.....	A-5
A.15	Predicted PSA Level.....	A-6
A.16	Predicted PSA Density	A-6
A.17	Stenosis Diameter	A-7
A.18	Stenosis Area.....	A-7
A.19	Cardiology.....	A-7
A.19.1	Left Ventricle Simpson Volume - Biplane	A-7
A.19.2	Left Ventricle/Left Atrium/Right Atrium Simpson Volume - Single Plane	A-8
A.19.3	Left Ventricle/Right Atrium Volume - Area Length	A-8
A.19.4	Left Ventricle Diastolic/Systolic and Left Atrium Systolic Volume Index.....	A-9
A.19.5	Ejection Fraction (Simpson and Area-Length).....	A-9
A.19.6	Stroke Volume.....	A-10
A.19.7	Stroke Index.....	A-10

A.19.8	Cardiac Output.....	A-10
A.19.9	Cardiac Index.....	A-11
A.19.10	Left Ventricle/Right Ventricle Area Fractional Shortening	A-11
A.19.11	Diameter Fractional Shortening.....	A-11
A.19.12	Ejection Fraction (Left Ventricle).....	A-12
A.19.13	Left Ventricle Mass.....	A-12
A.19.14	Outflow Tract Area	A-12
A.19.15	Aortic Area	A-13
A.19.16	Left Atrium/Aorta Ratio.....	A-13
A.19.17	Right Ventricle Volume	A-13
A.19.18	Pulmonary Artery/RVOT Area.....	A-13
A.19.19	Left Atrium Volume.....	A-14
A.19.20	Indexed IVC Size	A-14
A.19.21	IVC Collapsibility Index.....	A-14
A.19.22	Relative Wall Thickness	A-15
B	Formula and References in M-Mode.....	B-1
B.1	Left Ventricle Ejection Fraction	B-1
B.2	Left Ventricle Volume	B-1
B.3	Stroke Volume.....	B-2
B.4	Stroke Index.....	B-2
B.5	Cardiac Output.....	B-2
B.6	Cardiac Index.....	B-3
B.7	Left Ventricle Fractional Shortening.....	B-3
B.8	Septum Thickening	B-3
B.9	Posterior Wall Thickening	B-4
B.10	Left Ventricle Mass.....	B-4
B.11	Left Ventricle Mass Index.....	B-4
B.12	LA/Aorta Diameters Ratio	B-5
B.13	Excentricity Index	B-5
C	Formula and References in Doppler.....	C-1
C.1	Gradient.....	C-1
C.2	Peak Gradient	C-1
C.3	Flow Velocity Integral	C-1
C.4	Mean Velocity.....	C-2
C.5	Mean Gradient.....	C-2
C.6	Pulsatility Index.....	C-2
C.7	Resistive Index	C-3
C.8	Flow by Trace and by Ellipse.....	C-3
C.9	Flow by Diameter.....	C-4
C.10	Pressure Half-Time	C-4
C.11	Cardiology.....	C-4
C.11.1	Mitral Valve Area.....	C-4
C.11.2	E Wave/A Wave.....	C-5
C.11.3	Miocardiac Performance Index.....	C-5
C.11.4	dP/dt Ratio	C-5
C.11.5	Regurgitation Flow (PISA)	C-6
C.11.6	Effective Regurgitation Orefice (PISA)	C-6
C.11.7	Mitral Regurgitation Volume (PISA).....	C-6
C.11.8	Aortic Regurgitation Volume (PISA)	C-7
C.11.9	E' Wave/A' Wave	C-7
C.11.10	E Wave/E' Wave.....	C-8

C.11.11	Intraventricular Mechanical Delay	C-8
C.11.12	Effective Aortic Valve Area.....	C-8
C.11.13	Maximal Aortic Valve Area.....	C-9
C.11.14	Systolic Pressure.....	C-9
C.11.15	Systolic Velocity/Diastolic Velocity	C-9
C.11.16	Heart Rate.....	C-10
C.11.17	Stroke Volume.....	C-10
C.11.18	Stroke Index.....	C-10
C.11.19	Cardiac Output.....	C-11
C.11.20	Cardiac Index	C-11
C.11.21	Qp/Qs.....	C-11
C.11.22	Coronary Reserve.....	C-12
C.11.23	Pulmonary Capillary Wedge Pressure	C-12
C.11.24	Formulas of Automatic Doppler Measurements.....	C-12

1. MEASUREMENTS

This chapter includes the following topics:

- 1.1 *Introduction to measurements*
- 1.2 *How to activate measurements*
- 1.3 *How to take measurements*
- 1.4 *How to take a profile measurement*
- 1.5 *Generic Measurements*
- 1.6 *Application Measurements*

1.1. Introduction to measurements

MyLab provides two types of measurements:

- Generic Measurements, set of measurements related to the operating mode. Press **+...+** to activate them.
- Application Measurements, set of measurements related to the active application. Press **MEASURE** to activate them.

Once activated, the available measurements are displayed on the touchscreen and listed on the left of the screen. The messages displayed on the screen guide you through the different phases, and assist you in taking the measurement. The results are displayed in a box on the screen.

A measurement can include several pieces of measurement data, for example to calculate a volume you need to measure width, length and height.

You can customize both the Generic Measurement package and the Application Measurement package to adapt them to your work-flow: refer to the chapter 2 *Measurement Configuration* further in this manual for detailed information.



This symbol is displayed on the screen when the image features, compared to the original one, may not be optimal for the reporting functions.

Ensure that you follow current medical practices when selecting views and positioning cursors on the image during measurements.



WARNING

When printing 3D/4D images with measurements, use a colour printer to maintain correspondence between the displayed volume and the measured value.

NOTE

Always enlarge the format to maximize the structure/signal to be measured.

If possible, use the full screen formats for M-Mode and Doppler measurements.

1.1.1. Diagnosis Based on Measurements

MyLab measurement packages have to be used by qualified personnel as a diagnostic tool. The diagnosis has not to be based on the measurements only, but these are to be integrated with other clinical data.

All formulas of **MyLab** Application Measurements packages refer to a number of clinical bibliographic references that are listed for each application and advanced features in the corresponding section. Users are kindly encouraged to consult the original references to draw their conclusions on clinical consistency of the measurements.



WARNING

Clips are compressed for digital storage. Compressed files involve a minimal loss of information. Be careful while diagnosing over lossy compressed images.

NOTE

The user is the only responsible for customized measurements and formulas.

1.2. How to activate measurements

Procedure

1. When a suitable image is displayed, press +...+ or **MEASURE** to activate measurements: the touchscreen displays the list of available measurements, which are automatically identified according to the active mode, application and preset.
2. Tap the desired measurement to begin it or select it from the list on the left of the screen.
3. Follow the instructions on the screen, position the cursors with the trackball and confirm the position by pressing **ENTER**.

The value being measured is displayed in a box that can be dragged anywhere within the image.

The measurements taken are marked with the \surd symbol.

UNDO closes the session, erasing all done measurements.

1.2.1. Additional Controls during measurements

The additional controls displayed on the touchscreen depend on the active measurement and are included among the following:

ADD TO REPORT

At the end of measure, it adds the Generic Measurement to the exam worksheet and report. After this key is pressed, **MyLab** asks to rename the measurement. The renamed measurement will be then available both in the worksheet (under a dedicated sub-folder) and in the report.

BACK

In case of profile measurements, it clears the dotted trace point by point.

CLEAR

cancels all measurements from the screen.

LEFT/RIGHT

When bilateral measurements are available, it toggles between them.

**MOVE/RESIZE
PANEL**

allows to move the measurement results box through the trackball. You can alternatively click on the measurement results box to move it.

PAN

moves the traced area within the sector.

ROTATE

rotates areas.

SKIP

skips to next action.

SWAP/SWAP AXIS

respectively swaps the caliper or the axis linked to the trackball. Alternatively, the **ACTION** key can be used to swap start/end calipers when measuring distances or the axis when drawing an ellipse.

1.3. How to take measurements

Regardless the type of measurement, Generic or Application, the procedure to follow to take a measurement can be limited to one or more of the following input measurement methods.

1. Measurements

Table 1–1 Procedure to take a measurement depending to the input measurement method

Input Measurement Method	Action	Procedure
3 Points	Place three points on a B-Mode image.	<ol style="list-style-type: none">1. Using the trackball, place the caliper on the first point and press ENTER to confirm.2. Place now the caliper on the second point and press ENTER to confirm.3. Place finally the caliper on the third point and press ENTER to confirm.
Caliper	Place a point on a Doppler trace.	<ol style="list-style-type: none">1. Using the trackball, place the caliper on the velocity to be measured and press ENTER to confirm.
Distance	Trace a line on a B-Mode image.	<ol style="list-style-type: none">1. Using the trackball, place the caliper on the initial point and press ENTER to confirm.2. Place now the caliper on the final point and press ENTER to confirm.
Ellipse	Trace an ellipse by placing the first axis and then the second axis on a B-Mode image.	<ol style="list-style-type: none">1. Using the trackball, place the caliper on the first point and press ENTER to confirm.2. Move the trackball to draw the axis: the resulting ellipse is displayed and can be adjusted with the trackball.3. Place the end point of the axis by pressing ENTER.4. Move the trackball to change the dimension of the ellipse and press ENTER to confirm.
Profile	Draw a profile on a Doppler trace.	Refer to paragraph 1.4 <i>How to take a profile measurement</i>
Time	Trace a line on an M-Mode or a Doppler trace.	<ol style="list-style-type: none">1. Using the trackball, place the caliper on the initial point and press ENTER to confirm.2. Place now the caliper on the final point and press ENTER to confirm.
Trace	Trace a contour on a B-Mode image.	<ol style="list-style-type: none">1. Using the trackball, place the caliper on the initial point and press ENTER to confirm.2. Draw the contour with the trackball. Moving back, the traced contour is deleted.3. Press ENTER to place the end point and confirm.
Velocity	Trace a line on an M-Mode trace.	<ol style="list-style-type: none">1. Using the trackball, place the caliper on the initial point and press ENTER to confirm.2. Place now the caliper on the final point and press ENTER to confirm.
Vertex	Place vertices on a B-Mode image: the result of the measurement is obtained connecting all vertices.	<ol style="list-style-type: none">1. Using the trackball, place the caliper on the first vertex and press ENTER to confirm.2. Place the cursor on the second vertex and press ENTER to confirm.3. Place all required vertices. The result is automatically calculated by pressing ENTER twice on the last vertex.

As you are taking any measurements, each measurement is given a sequential number. **MyLab** can display nine measurements on the screen at one time.

1.3.1. Measurement taken on two modes

Some measurements need to be taken in two different modes.

Procedure

1. Take the first measurement in the current mode;
2. If necessary, press **FREEZE** to return in real time and acquire the desired image, then press **FREEZE** again;
3. Press **+...+** or **MEASURE** to take the second measurement.

1.3.2. Multi-Modality Measurements

Multi-modality measurements (for example B-Mode and Doppler) can be performed on Dual and Split formats. On a dual format with linear probes, measurements can be taken on both images, for example a distance measurement can be activated by positioning the first cursor on one image and the last cursor on the other image. This measurement can be performed only when images are acquired at the same depth, with the same orientation, without steering and zoom.

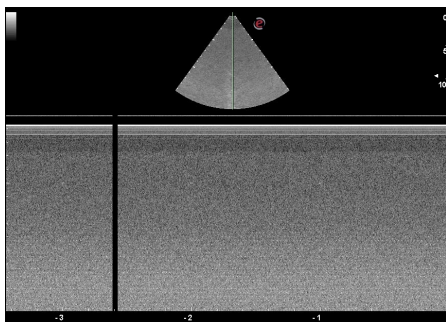
When activated, the average is based on up to three measurements.



WARNING

Before performing measurements on the two frames of a Dual format, check that the whole image (for example both side by side frames) is consistent with the structure under exam. If necessary, reacquire both images.

1.3.3. Measurement on Clip of Trace



When a saved trace clip (M-Mode, Q-Mode, Compass M-Mode and Doppler) is reviewed, either in cine mode or frame by frame, a vertical black line is displayed on the trace. This line separates the frames belonging to the same continuous time interval (on the right of the line) from the frames belonging to another continuous time interval (on the left of the line).

Both Generic and Application measurements can be taken on the single frame composing the trace clip.



WARNING

Any measurement that is based on time interval (such as slope, flow and flow integral, time interval) has to be taken only on continuous time interval. This kind of measurement has to be performed without crossing the vertical black line.

1.4. How to take a profile measurement

Profile can be drawn on a Doppler trace in three different ways:

- manual,
- auto,
- ADM.

When a profile measurement has to be performed, **MyLab** displays the controls to select which modality use to draw the profile: **METHOD MANUAL/AUTO** that allows you to select between the two modalities and **ADM** for the activation of Automatic Doppler Measurements.

At the end of the measurement, regardless of the modality chosen, beside the measured VTI, **MyLab** calculates and displays the additional parameters listed in the table below. The number of these parameters changes depending on the type of measurement, the application and customizations.

Table 1–2 Parameters calculated in Generic Doppler Measurements

Displayed Results	Description
VTI	Velocity Time Integral
PSV	Peak Systolic Velocity
EDV	End Diastolic Velocity
V Rev	Reverse velocity
TAV	Time Average Velocity
RI	Resistive index
PI	Pulsatility index
S/D	Systolic Velocity/Diastolic Velocity
D/S	Diastolic Velocity/Systolic Velocity
HR	Heart Rate (for OB measurements)
Acc	Acceleration
Acc T	Acceleration Time
Max PG	Maximum Peak Gradient
Mn PG	Mean Peak Gradient

Any adjustment performed on the velocity scale orientation, on the display format and on the angle correction will automatically re-calculate the parameters.

In non-cardiac applications, **MyLab** automatically calculates and displays the above parameters when arterial flows are analyzed.

In venous modality, only the mean and reverse velocities are calculated.

NOTE

Press **TRACE** to change the modality to detect the Doppler spectrum (for example positive or negative flow).

1.4.1. Manual Profile Measurement

The **MANUAL** measurement requires to trace the envelope of the velocity profile on a Doppler trace.

Procedure

1. Using the trackball, place the caliper on the initial point and press **ENTER** to confirm.
2. Draw the contour of the profile with the trackball. Moving back the trackball or using **BACK** encoder, the traced contour is deleted.
3. Press **ENTER** to place the end point and confirm.

1.4.2. By Cycle Measurement

When **AUTO** is selected, **MyLab** automatically detects the envelope of the velocity profile during a cardiac cycle on a Doppler trace displaying it in yellow and overlaid on the spectrum itself.

The measurement allows to better define the starting and ending points.

Procedure

1. Using the trackball move the bar on the first point of the cycle and press **ENTER** to confirm.
2. Using the trackball move the bar on the end point of the cycle and press **ENTER** to confirm.

The selected cycle of the Doppler spectrum is labeled and displayed in white.

1.4.3. ADM - Automatic Doppler Measurements

ADM activates the automatic draw of a Doppler profile.

ADM is available in real-time and Freeze while is not available in exam review and archive review.

Refer to Appendix for formulas and bibliographic references.

1.4.3.1. Activation of Automatic Doppler

Automatic Doppler tracings automatically detect the Doppler spectrum profile, which is based either on the ECG signal, when available, or on the time intervals defined by **CLIP DUR**.

The profile of the detected Doppler spectrum can be based:

- on the trace **peak** values, that means the profile of the maximum frequency of the spectrum;
- on the trace **mean** values, that means the profile of the mean frequency of the spectrum.

In non-cardiac applications automatic measurements are made on the detected profile and displayed on the left of the screen; measurements are updated every heart cycle.

In cardiac applications the detected Doppler profile can be associated to specific cardiac flow measurements: refer to next paragraphs for detailed information.

The automatic measurements are saved in the report only when they are associated to a specific flow measurement or when they are saved through **ADD TO REP** button.



WARNING

The determination of the envelope curve requires a clear and low-noise recording of the Doppler spectrum. Otherwise, the reliability of the displayed measurement results may not be ensured.

For a correct diagnostic evaluation, it is recommended to use the angle correction factor, in order to obtain the right flow alignment.

Make sure that the profile of the automatically detected Doppler flow (yellow line) corresponds to the real profile.

Activation

Automatic Doppler tracings can be activated in real time both in PW and CW Doppler and in Freeze.

ADM activates the automatic Doppler detection. Once activated, the Doppler profile is displayed in yellow, overlaid on the spectrum itself.

While in automatic Doppler measurement, **MyLab** keys and controls are available to optimize the profile display (**B-MODE**, **DOPPLER** tabs).


The Doppler sequence can be seen by scrolling the frames: the marker on the automatic Doppler profile moves accordingly. The displayed parameters values refer to the period/heart cycle selected with the marker.

NOTE

Use the controls (such as **BASELINE**, **SCALE**) to display the whole profile and spectrum within the Doppler trace so that aliasing does not occur.

1.4.3.1.1. Controls in Automatic Doppler Measurements

Upon mode activation, **ADM SETTINGS** button is displayed. Once pressed, the sub-menu shows the following controls:

ADM	displays the detected profile when pressed. Available in Freeze and Archive.
ANGLE FINE ADJ	changes the angle vector: the measured values are automatically re-calculated. Available in Freeze and Archive. Automatic Doppler tracing and measurements are automatically saved with the image (IMAGE button).
ALL UPPER LOWER	When INVERT CFM SCALE WITH STEERING is enabled in APPLICATION PRESET menu (pressing MENU , then GENERAL SETUP) these keys respectively select whether to detect the whole flow, the flow above the baseline only or the flow below the baseline only.
ALL ADM POSITIVE ADM NEGATIVE CYCLE	When INVERT CFM SCALE WITH STEERING is not enabled, these keys respectively select whether to detect the whole velocity profile, the positive velocities only or the negative velocities only.
PEAK MEAN	sets the number of cycles to be selected automatically.
ARTERIAL/VENOUS	respectively sets whether to detect the profile on peak or on mean frequency values.
AVERAGE	selects the type of flow under analysis. In the first case the period of analysis for each measurement corresponds to the detected heart cycle; in the other case the value of the toggle sets the period of analysis for each measurement.
THRESHOLD	sets the number of cycles to be averaged.
BACK 	sets the minimum level of signal to be used for the profile detection.
	exits from the settings menu.

1.5. Generic Measurements

Once **+...+** is pressed, Generic Measurements are activated and, depending on the active mode, a specific list of measurements is displayed.

The tables below list the Generic Measurements available in each mode.

Calculation results are automatically computed once all the Input Measurements have been completed.

Refer to the Appendices for the formulas used for the calculation and bibliographic references.

1. Measurements

Table 1–3 Measurement table legenda

Measurement	Description	Input Measurement (method)
This column contains the measurement name as it appears on the touchscreen and in the measurement configuration menu	This column contains a description of the measurement to be taken	This column lists each single measurement you have to perform to get the final result and in brackets the procedure method to follow in order to take the related measurement. Refer to paragraph 1.3 <i>How to take measurements</i>

Table 1–4 Generic Measurements available in B-Mode

Measurement	Description	Input Measurement (method)
Distance	Distance	Distance (Distance)
Distance Ratio	Distance Ratio	Distance1 (Distance) Distance2 (Distance)
% Diam Reduction	Percentage of Diameter Reduction	Distance1 (Distance) Distance2 (Distance)
Length (Vertex)	Length by Vertex	Length (Vertex)
Length (Trace)	Length by Trace	Length (Trace)
Area (Ellipse axes)	Area by Ellipse axes	Area (Ellipse)
Area (Vertex)	Area by Vertex	Area (Vertex)
Area (Trace)	Area by Trace	Area (Trace)
Area Ratio	Area Ratio	Area1 (Trace) Area2 (Trace)
% Area Reduction	Percentage of Area Reduction	Area1 (Trace) Area2 (Trace)
Volume (Ellipse)	Volume by Ellipse	Area (Ellipse)
Volume (Trace)	Volume by Trace	Area (Trace) Diameter (Distance)
Biplane Volume	Biplane Volume	Diameter (Distance) Diameter (Distance) Diameter (Distance)
Ellipse Ratio	Ellipse Ratio	Area1 (Ellipse) Area2 (Ellipse)
Elx Ratio (Ellipse)	Ellipse Ratio by Ellipse axes	Area1 (Ellipse) Area2 (Ellipse)
Elx Ratio (Trace)	Ellipse Ratio by Trace	Area1 (Trace) Area2 (Trace)
Elx Hard % (Ellipse)	Percentage of ellipse hardness by Ellipse	First Ellipse (Ellipse) Second Ellipse (Ellipse)
Elx Hard % (Trace)	Percentage of ellipse hardness by Trace	First Ellipse (Trace) Second Ellipse (Trace)
Elx Soft % (Ellipse)	Percentage of ellipse softness by Ellipse	First Ellipse (Ellipse) Second Ellipse (Ellipse)
Elx Soft % (Trace)	Percentage of ellipse softness by Trace	First Ellipse (Trace) Second Ellipse (Trace)
Hip Angle	Hip Angle	Hip Baseline (Distance) α - Alfa Angle (Distance) β - Beta Angle (Distance)
Angle (2 lines)	Angle by two lines	First line (Distance) Second line (Distance)
Angle (3 points)	Angle by three points	Angle (3 points)

Table 1–5 Generic Measurements available in M-Mode

Measurement	Description	Input Measurement (method)
Distance	Distance	Distance (Distance)
Distance Ratio	Distance Ratio	Distance1 (Distance) Distance2 (Distance)
Time	Time	Time (Time)
Time Ratio	Time Ratio	Time1 (Time) Time2 (Time)
HR	Heart Rate	R-R (Time)
Velocity	Velocity	Velocity (Velocity)
Velocity Ratio	Velocity Ratio	Velocity1 (Velocity) Velocity2 (Velocity)

Table 1–6 Generic Measurements available in Doppler

Measurement	Description	Input Measurement (method)
Time	Time	Time (Time)
Time ratio	Time Ratio	Time1 (Time) Time2 (Time)
Velocity	Velocity	Velocity (Caliper)
Cardiac Velocity	Cardiac Velocity	Cardiac Velocity (Caliper)
Velocity Ratio	Velocity Ratio	Velocity1 (Caliper) Velocity2 (Caliper)
HR	Heart Rate	R-R1 (Time)
S/D	Systolic velocity to Diastolic velocity Ratio	PSV ^[1] EDV ^[2]
Cardiac VTI	Cardiac VTI ^[3]	Cardiac VTI (Profile)
Vascular VTI	Vascular VTI ^[3]	VTI (Profile)
PI	Pulsatility Index	VTI (Profile)
RI	Resistive Index	PSV (Caliper) EDV (Caliper)
Flow (Trace)	Flow by Trace ^[4]	TAV ^[5] Area (Trace)
Flow (Ellipse)	Flow by Ellipse ^[4]	TAV ^[5] Area (Ellipse)
Flow (Diam)	Flow by Diameter ^[4]	TAV ^[5] Diameter (Distance)
Slope	Slope	PHT ^[6]
Velocity (Hz)	Velocity (Hz) ^[7]	Velocity (Caliper)

1. PSV = Peak Systolic Velocity – Caliper
2. EDV = End Diastolic Velocity – Caliper
3. VTI = Velocity Time Integral
4. The measurement needs to be taken on two different modes
5. TAV = Time Average Velocity – Profile
6. Pressure Half-Time
7. Available only when the trace is displayed in kHz. When velocity is measured in kHz, no derived parameter is automatically calculated.

1.6. Application Measurements

Once **MEASURE** is pressed, Application Measurements are activated and, depending on the active application, a specific list of measurement is displayed.

Application Measurements are organized in groups corresponding to specific anatomic structures, the touchscreen displays the available measurements of the selected group and the other available groups as tab on the Navigation bar. If you want to select a different group, tap on the related tab.

Refer to the following chapters for the Application Measurements available in each application.

1.6.1. Application Data

To correctly perform Application Measurements some applications need additional patient information that can be inserted in the Patient ID page.

Refer to next chapters for information on specific data to be entered in each application.

1.6.2. Application Measurements Organization

For some anatomical district, Application Measurements are bilateral, this means measurements are grouped for the right side (indicated as “R”) and for the left side (indicated as “L”): the **LEFT/RIGHT** key selects the desired side.

When sides are applicable, the label will correspond to the measurement abbreviation plus the “R” or “L” character, according to the active side.

In the next chapters bilateral measurements will be indicated by a note and Right (R label) will be used for the side indication.

2. MEASUREMENT CONFIGURATION

This chapter includes the following topics:

2.1 *Accessing to the Configuration Menu*

2.2 *Configuration for a specific Application*

2.3 *Configuration for Measurement Folder*

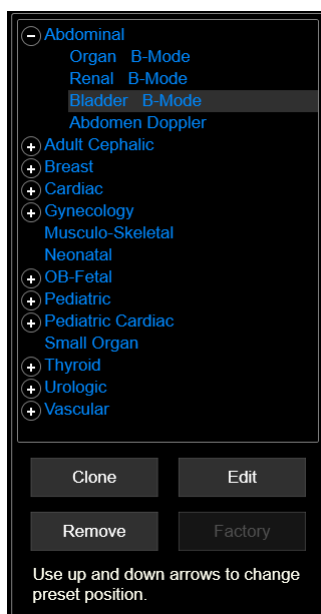
2.4 *How to Create a Measurement Folder*

2.5 *How to create a new group*

2.1. Accessing to the Configuration Menu

To access the measurement configuration menu press **MENU** then select **MEASURE**, the list of configurable items will be displayed on the left of the screen.

Fig. 2–1 List of configurable items



The measurement configuration menu depends on the item selected in the list on the left and can act on three levels:

- at _All Applications level, to **ENLARGE FONT FOR GENERIC MEASUREMENTS**;
- at single application level, when a specific application is selected;
- at Measurement Folder level, when a Measurement Folder is selected. To show the Measurement Folders, click on the **+** beside the application name.

2. Measurement Configuration

When an item from the list has been selected, a subset of the following buttons is available:

- **EDIT** to access the configuration menu of the selected item and modify it.
- **NEW** to create a new customized Measurement Folder. Refer to the paragraph 2.4 *How to Create a Measurement Folder* further in this chapter.
- **CLONE** to create a copy of an already existing and selected Measurement Folder and then modify it.
- **REMOVE** to delete the selected customized Measurement Folder.
- **FACTORY** to restore the default Measurement Folders of the selected item.

NOTE

Pressing **FACTORY** retrieves all factory Measurement Folders and deletes all user customized Measurement Folders saved for that application.

When a Measurement Folder is selected you can change its position by the up and down arrows of the keyboard.

Measurement Folder will be displayed as tab on the touchscreen after Application Measurements activation.

You can assign specific measurement configurations to a preset (or clinical setting). Refer to the “Getting Started” manual for further information on clinical settings.

2.2. Configuration for a specific Application

Select a specific application from the list and press **EDIT** or double click on it to enter the related configuration menu.

The measurement configuration menu is organized in four internal folders:

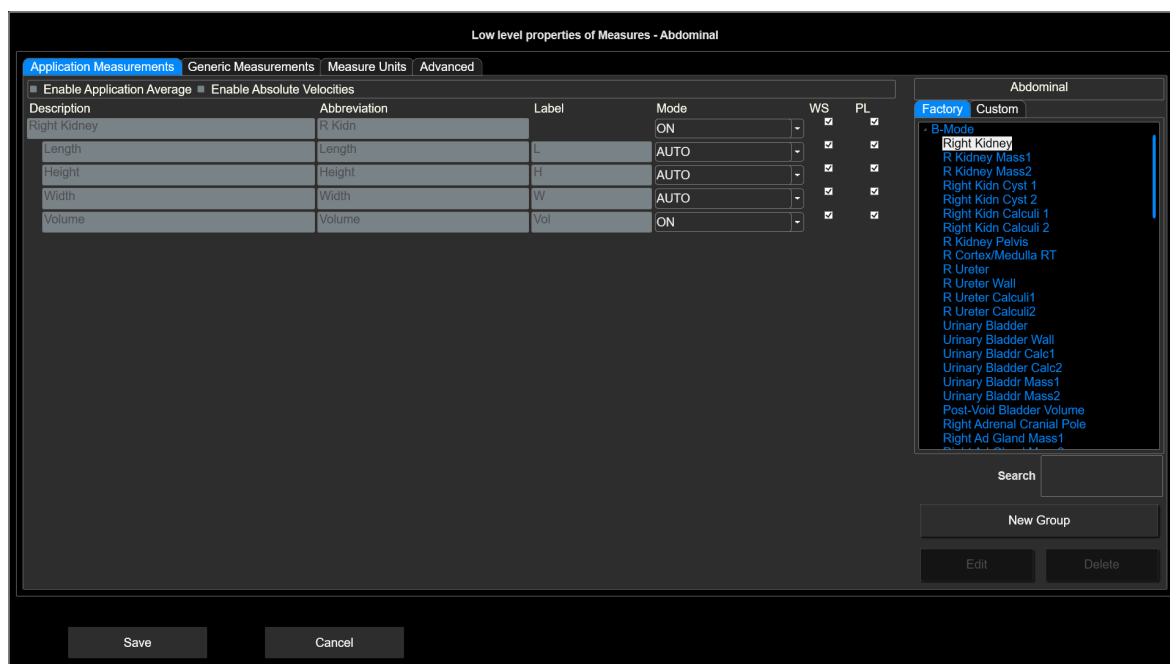
- Application Measurements folder,
- Generic Measurements folder,
- Measure Unit folder,
- Advanced folder.

SAVE saves the new settings; they will be activated at the next exam.

CANCEL exits the menu without saving the new settings.

2.2.1. Application Measurements folder

Fig. 2–2 Configuration of Application Measurements



Check **ENABLE APPLICATION AVERAGE** to activate the average for all application measurements (except generic measurements).

Check **ENABLE ABSOLUTE VELOCITIES** to activate the display of the absolute velocities values in Doppler measurements.

When absolute velocities are enabled:

- velocity and acceleration measurements are always positive, regardless the position of the cursor on the trace (up or below the baseline),
- derived parameters, such as Resistive Index and Pulsatility Index, are not affected by this setting,
- averaged measurements are evaluated using the positive values.

The box on the right lists all groups available for the selected application grouped in **FACTORY** and **CUSTOM** folders.

A group can be selected either by scrolling the list on the right or by entering searching criteria in the **SEARCH** field.

Once a group is selected, its own customization is displayed in the center of the screen. You can enable/disable the group selecting **ON/OFF** respectively in the column **MODE** beside the group name. When enabled, the group is available at **MEASURE** pressure.

For each single measure belonging to the group your can define the activation mode:

- **AUTO**: the measure is included in the automatic measurement sequence.
- **OFF**: the measure is disabled.
- **ON**: the measure should be manually activated.

2. Measurement Configuration

NOTE

AUTO for a derived parameter (that is not calculated but derived from a formula) means that this parameter will automatically be calculated and updated on the report page as soon as basic measurements have been performed.

The group and each single measurement are included in the worksheet and can be printed when the corresponding boxes (WS and PL) are checked.

NEW GROUP opens a sub-menu allowing to create a custom group. Refer to the paragraph 2.5 *How to create a new group* further in this chapter.

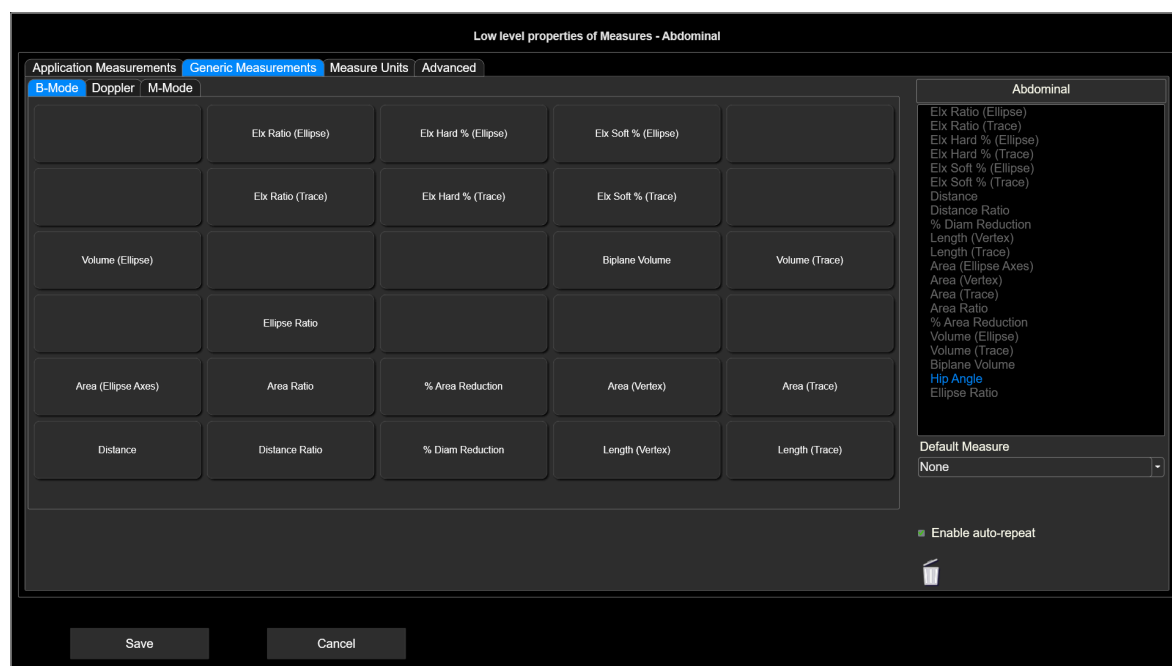
EDIT allows to modify the selected custom group.

DELETE cancels the selected custom group.

2.2.2. Generic Measurements folder

In this folder you can customize the Generic Measurements (available by pressing +...+) for each mode belonging to the selected application.

Fig. 2-3 Configuration of Generic Measurements



The configuration window shows:

- in the center the touchscreen layout. Each mode (selectable by the corresponding tab) has its dedicated touchscreen.
- on the right the list of all available measurements for the selected mode.

To customize the Generic Measurement, follow this procedure:

Procedure

1. Select the desired mode by clicking on the corresponding tab: the list of available measurements on the right is updated;
2. To add a measurement on the touchscreen, drag and drop it from the list on the right to an empty box on the touchscreen layout. All measurements already moved to the touchscreen are displayed in gray in the list on the right;
3. To change position within the touchscreen, drag and drop from current position to the new one;
4. To remove a measurement from the touchscreen, drag and drop it in the trash bin.

By **DEFAULT MEASURE** you can decide which measurement will be active at **+...+** pressure. If **NONE** is chosen, no measurement will be automatically active.

Selecting **ENABLE AUTO-REPEAT** enables the automatic repetition of distance measurement in B-Mode and of velocity measurement when in Doppler.

2.2.3. Measure Units folder

In this folder you can set the desired measure units for each type of measure, the cursor shape to be used both in Doppler and M-Mode and the cursor size.

You can also set which fields to show during ADM and VTI measurements.

ENABLE SIMULTANEOUS MEASUREMENT when selected, the caliper is displayed simultaneously on both images when in dual (i.e. Dual CFM).

VTI START MODE can be set here as **MANUAL** or **AUTOMATIC**.

2.2.4. Advanced folder

In this folder you can set the printing configuration of the report (**REPORT PRINT**) selecting the desired option from the drop-down menu.

Table 2-1 Report Print options

Report Print	Action
FACTORY	The measurements in the report are factory-organized.
BY GROUP	The measurements in the report are organized by group.
BY MODE	The measurements in the report are organized by mode.

FONT SIZE FOR B-MODE LABELS, **FONT SIZE FOR M-MODE LABELS** and **FONT SIZE FOR PW/CW LABELS** allows to select the size of the labels of the measurements placed on the screen.

Additional dedicated settings are available for some applications. Refer to next chapters for further information about it.

2.3. Configuration for Measurement Folder

Select a Measurement Folder from the list and press **EDIT** or double click on it to enter the related configuration menu. Press **NEW** or **CLONE** if you want create a new Measurement Folder.

In this folder you can customize the measurement folder (available by pressing **MEASURE**) for each application.

The configuration window shows:

- in the center the touchscreen layout. Each mode (selectable by the corresponding tab) has its dedicated touchscreen;
- on the right the list of all available measurement groups for the selected mode;
- on the bottom the **NAME** and **NOTES** fields used to define the customized measurement folder.

To customize a measurement folder, follow this procedure:

Procedure

1. Select the desired mode by clicking on the corresponding tab: the list of available groups on the right is updated;
2. To add a group on the touchscreen, drag and drop it from the list on the right to an empty box on the touchscreen layout. All measurements already moved to the touchscreen are displayed in gray in the list on the right;
3. To change position within the touchscreen, drag and drop from current position to the new one;
4. To remove a measurement from the touchscreen, drag and drop it in the trash bin.

NOTE

Measurement Folder can be customized by adding or removing groups of measurements. Single measurements cannot be added or removed from the customized Measurement Folder.

SAVE saves the settings so that they are immediately active.

CANCEL exits the menu without saving the new settings.

2.4. How to Create a Measurement Folder

When accessing the measurement configuration menu, to create a customized Measurement Folder follow the procedure below:

Procedure

1. Select the desired application from the list on the left and press **NEW** to create a completely new folder, otherwise select an existing Measurement Folder and press **CLONE** to create a new folder starting from an existing one,
2. fill the **NAME** field with the desired name for the new Measurement Folder and add an optional description in the **NOTES** field,
3. using the trackball select the desired mode by clicking on the corresponding tab: the list of the available groups is updated,
4. drag and drop the desired groups from the list on the right to the desired position of the touchscreen layout. The group can be selected either by scrolling the list with the trackball or by entering searching criteria in the **SEARCH** field. All groups already moved in the touchscreen are displayed in gray,
5. for each mode, the groups can be organized in different levels: select first the desired page (**PAGE #** button) using the trackball and then drag and drop the group into the desired position.
6. **SAVE** or **CANCEL**.

**WARNING**

The user is the solely responsible when using custom measurements and formulas.

NOTE

When a group is bilateral, it is shown with the right (R) suffix: when selected, it will be automatically activated also for the left side.

When a multi-mode group (group requiring measurements in different modes, such as the PISA group in cardiac application) is selected, it is automatically shown in the touchscreen of each required mode.

2.5. How to create a new group

When accessing the measurement configuration menu, to create a custom measurement group double click on the desired application, then press **NEW GROUP**, the window below is displayed.

Fig. 2–4 New Group of Custom Measurement

New Group

Mode

B-Mode

Name

MyMeasure

Abbrev

MyMeas

☐ Laterality

Ok

Cancel

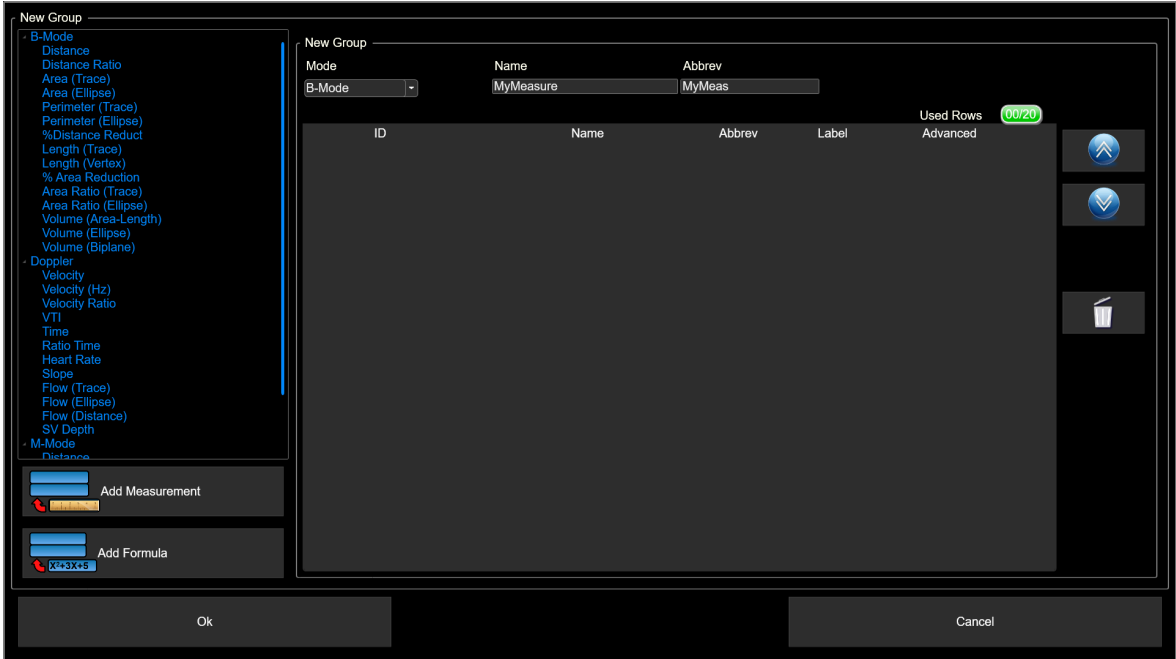
Table 2–2 New Group of Custom Measurement option

Field	Action
MODE	Sets in which mode the custom group is available.
NAME	Sets the name of the custom group.
ABBREV	Sets the abbreviation of the custom group.
LATERALITY	Sets if the custom group is bilateral; in this case two different labels have to be set for the left and right group. ^[1]

1. It is strongly suggested to use self-explanatory names and abbreviations for lateral group (for example using the suffixes “L” and “R” respectively for left and right groups).

Once all the fields have been set, press **OK**; the Custom Measurement Creation window is displayed:

Fig. 2–5 Custom Measurement Creation



The Custom Measurement Creation window shows:

- on the left the list of the available Generic Measurements in each mode. For Cardiac application two tabs are displayed allowing the selection of both Generic and Application Measurements.
- on the bottom left side the buttons to add a new measurement and a new formula,
- in the center the menu to configure the custom group.

The group can be composed of up to twenty different measurements (indicated by the counter displayed on the upper right side) that can be chosen from the list of available generic measurements by **ADD MEASUREMENT** or created using a custom formula by **ADD FORMULA**.

2.5.1. Procedure to add a measurement

To add measurements to the custom group, follow the procedure below:

Procedure

1. Select the desired measurement from the left list and press **ADD MEASUREMENT** or double click on it.
2. Assign a name, an abbreviation and a label to any item composing the custom measurement.

NOTE

If the measurement is bilateral, it is strongly suggested to use self-explanatory names and abbreviations (for example using the suffixes “L” and “R” respectively for left and right measurement).

2. Measurement Configuration

3. If the measurement requires suspension (that is a temporary stop to execution for the selection either of a different frame or of a different mode), set the desired modality:

Table 2–3 Measurement modality

Modality	Action
NONE	No suspension is required.
FRAME	The custom measurement is suspended for the selection of another frame of the same loop. MyLab prompts a message for the selection of a different frame.
MODE	The custom measurement is suspended for activating a different mode. MyLab prompts a message for the activation of a different mode.
RESUME	The custom measurement is activated in a mode not valid for the custom measurement. MyLab resumes real time to activate the correct mode.

4. Existing formula can be modified pressing **EDIT FORMULA**.

OK saves the settings.

CANCEL exits the menu without saving the settings.

NOTE

The custom group will be available for measurements only after it has been added in a Measurement Folder (refer to previous chapter for information on how to configure a Measurement Folder).

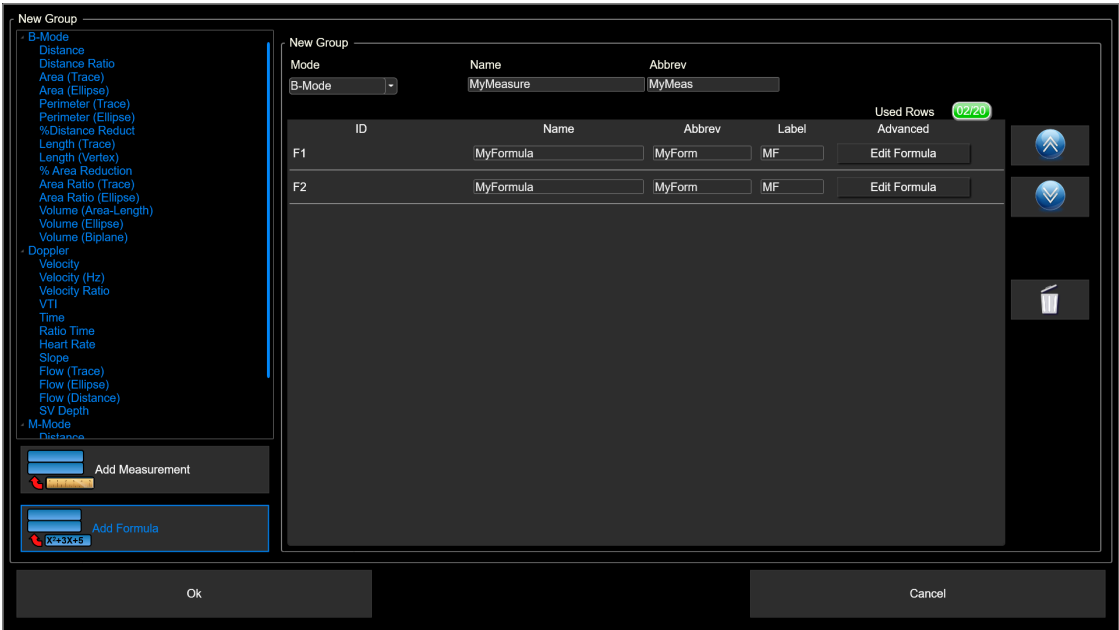
2.5.2. Procedure to add a formula

To add a custom formula to the custom group, follow the procedure below:

Procedure

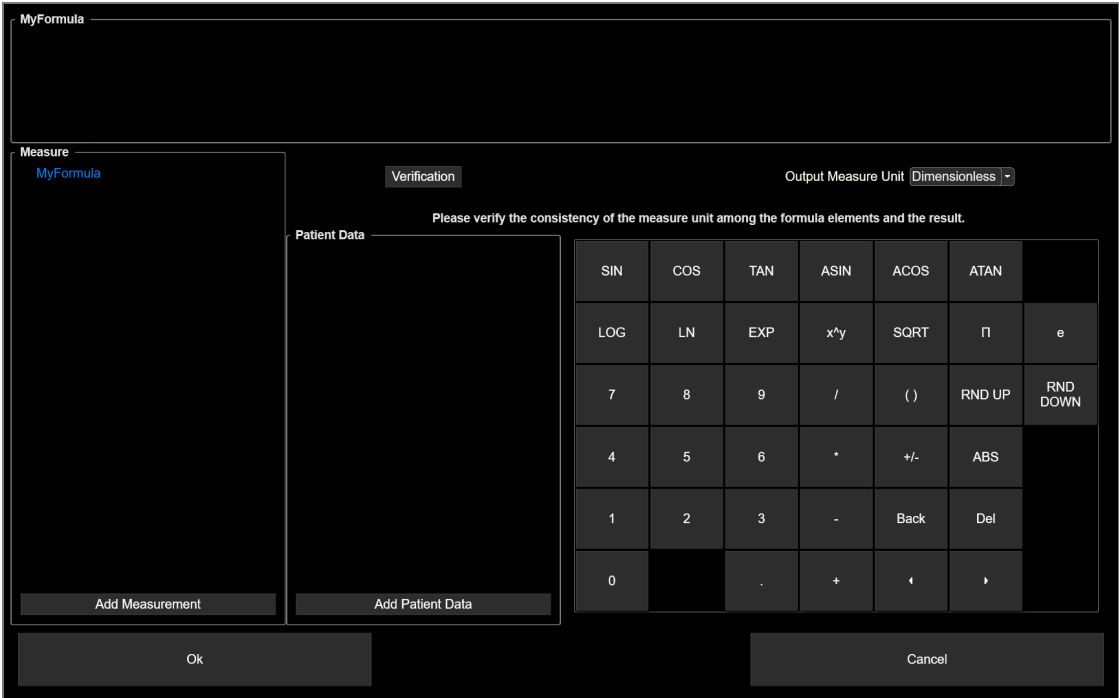
1. Press **ADD FORMULA**.
2. A new row (F#) is added to custom measurements list, as shown in the image below.

Fig. 2-6 Adding Formula



3. Assign a name, an abbreviation and a label to any item composing the custom measurement.
4. Press **EDIT FORMULA** to access the page to enter the desired formula.

Fig. 2-7 Editing Formula



5. Type the formula selecting the desired digit or mathematical operator; the formula is displayed on the custom formula field.

2. Measurement Configuration

Table 2–4 List of the available mathematical operators

Operator	Action
SIN and ASIN	Sinus and Arc Sine
COS and ACOS	Cosine and Arc Cosine
TAN and ATAN	Tangent and Arc Tangent
LOG and LN	Logarithm and Natural Logarithm
EXP	e^n
X^Y	X^Y
SQRT	Square root
Π	Pi
e	Euler number
RND UP	Rounding up the number
RND DOWN	Rounding down the number
ABS	Absolute value
BACK and DEL	Respectively delete what is before or after the cursor.
◀ and ▶	They allow to scroll the formula.

NOTE

Digit and mathematical operator can be added to the formula only through the numeric and mathematical operator keyboard.

6. If required, select the desired custom measurement from the list and either press **ADD MEASUREMENT** button or press **ENTER** twice to display it on the **FORMULA** field.
7. If required, select the desired patient and application data and press **ENTER** twice to display them on the **FORMULA** field.
8. When necessary, set the unit measure of the parameters composing the formula, selecting it from the combo box displayed beside the single parameter.
9. Set whether the result of the formula has a dimension or not.
10. Press **VERIFICATION** button to verify the formula congruence. When a formula modification is required, the part to be changed is highlighted.

OK saves the settings.

CANCEL exits the menu without saving the settings.

3. MEASUREMENT ACCURACY

This chapter is intended to provide information to evaluate the error that should be considered when performing both Generic and Application Measurements with **MyLab**.

This chapter includes the following topics:

3.1 *Introduction*

3.2 *Measurement Accuracy Values*

3.3 *Derived Data*

3.1. Introduction

The measurements in ultrasound are dependent upon the propagation velocity of sound through tissue. The propagation velocity usually varies with the type of tissue, but an average velocity of 1540 m/s is assumed, so the accuracy of the measurements is based on this assumption.

MyLab is designed for an assumed average velocity of 1540 m/s and the accuracy statements listed below are based on this value.

The accuracy of measurements is not only affected by the average velocity assumed above, but errors may result from improper use of techniques and protocols. To reduce as much as possible the potential operator errors, it is advised to follow measurement instructions and refer to the formulas and methods behind the measurements to prevent their possible limitations.

In any case measurements on ultrasound images are intended as supplement to information coming from other clinical procedures.

3.2. Measurement Accuracy Values

The table below reports each measurement accuracy values as function of scales (column "Accuracy") and the worst case values (column "%").

3. Measurement Accuracy

Table 3–1 Measurement Accuracy Values

Mode	Measurement	Units	Accuracy	%
B-Mode	Distance	mm	$\pm[1.5\% \text{Depth}(\text{mm}) + 0.1] \text{mm}$	± 5
	Perimeter	mm	$\pm[6\% \text{Depth}(\text{mm}) + 1] \text{mm}$	± 5
	Area	mm ²	$\pm[1.5\%(\text{D1} + \text{D2}) \text{Depth}(\text{mm}) + 0.025\% \text{Depth}(\text{mm}) + 1] \text{mm}^2$	± 8
M-Mode full screen	Distance	mm	$\pm[1\% \text{Depth}(\text{mm}) + 0.1] \text{mm}$	± 3
	Time	s	$\pm[1\% \text{Time}(\text{s}) + 0.005] \text{s}$	± 3
M-Mode split and dual screen	Distance	mm	$\pm[1.6\% \text{Depth}(\text{mm}) + 0.1] \text{mm}$	± 5
	Time	s	$\pm[1\% \text{Time}(\text{s}) + 0.005] \text{s}$	± 3
Doppler full screen	Inst.velocity	m/s	$\pm[2\% \text{VR}(\text{m/s}) + 0.01] \text{m/s}$	± 6
	Time	s	$\pm[1\% \text{Time}(\text{s}) + 0.005] \text{s}$	± 3
Doppler split and dual screen	Inst.velocity	m/s	$\pm[2.5\% \text{VR}(\text{m/s}) + 0.01] \text{m/s}$	± 8
	Time	s	$\pm[1\% \text{Time}(\text{s}) + 0.005] \text{s}$	± 3

VR stands for Doppler velocity range.

NOTE

If angle correction is used, a computation error of 0,1% must be added to the accuracy of the Doppler measurements.

Worst case values are calculated with the following assumptions:

- measurement values equal to one third of the analysis depth (for example: with a depth of 18 cm, a distance measurement of 6 cm),
- ultrasound speed constant at 1540m/s.

3.3. Derived Data

Derived data can be calculated through the law of error propagation; worst case accuracy, based on the above mentioned assumptions, is reported together with the formulas.

To minimize the measurement uncertainty:

1. select the optimal probe for the active application,
2. optimize image quality,
3. whenever possible, use the zoom function for maximum resolution,
4. optimize the probe alignment with the Doppler flow,
5. position the measurement markers as much accurate as possible.

4. WORKSHEET AND REPORT

This chapter includes the following topics:

4.1 *Worksheet*

4.2 *Report*

4.3 *Configurations*

4.1. Worksheet

The **WORKSHEET** button can be pressed at any time to display all performed measurements both generic and advanced.

Fig. 4–1 Worksheet

Parameter	Value	Unit	Measure 1	Measure 2	Measure 3	Measure 4	Measure 5
Pancreas Cyst 1							
Length	60.1	mm	60.1				
Height	13.8	mm	13.8				
Width	39.2	mm	39.2				
Volume	17.0	ml					
Apperance	Normal						
Other Abnormalities	Hematoma						

The worksheet is organized in pages, one page for each application indicated by the corresponding tab.

Each application page is then organized in sub-folders, corresponding to the measured modes and groups, identified by corresponding sub-tabs.

To navigate through modes (for example from Doppler calculations to Cardiac application) or through groups of measurements (for example within the Vascular application) select the corresponding tab. Alternatively tap the related buttons on the touchscreen.

Measurements can be scrolled by the lateral bar: place the cursor on the bar or on the up/down arrows to scroll the worksheet.

Measurements can be selectively deleted clicking on the red cross displayed beside the group or the single parameter.

Averaged measurements

When average is enabled on measurement configuration menu (refer to previous chapter for further details), the worksheet shows the average value in the first column and the values of the individual measurements in the following columns. Single measurements can be excluded from the average computation. Click on the measurement to be excluded, its value is displayed on a dark background and the average is automatically recalculated; click again to reinsert the measurement.

Average criteria

The average is done using the parameters directly measured; the average of derived parameters is based on the average of the direct measurements.

For example the heart rate is calculated by measuring the R-R interval: the direct measurement is the time (that is the R-R interval), the heart rate is the derived parameter. When the average is enabled, the mean heart rate will be calculated by averaging the measured R-R intervals.

Deleting measurements

To delete single measurements or measurement groups, place the cursor on the cross displayed beside the single measurement a/o group and press **ENTER** to confirm.

Bilateral Measurements

LEFT/RIGHT displays lateral measurements, when available.

Press the **WORKSHEET** button again or, alternatively, press **FREEZE** to exit.

4.2. Report

REPORT

can be pressed at any time to display the report print preview containing the patient data and all measurements performed during the exam.

If the average is enabled, the report contains the average value.

The touchscreen menu displays the following controls:

PAGE

scrolls the report print preview.

ZOOM

increases or decreases the report print preview zoom factor by rotating it clockwise/counterclockwise respectively.

END REPORT

closes the report when pressed.

PREVIOUS REPORTS

allows to review the previous reports: once pressed, **MyLab** displays the closed reports that can be browsed one by one through the upper combo box.

If **MyLab** is configured with a PC printer, use the printer key to print the report. The report can be printed by **1, 2, 3, 4** when associated to a printer.

Observations

Additional text can be inserted in this section of the report.

Place the cursor on the desired field and:

- Press **ENTER** to edit text: a window will be displayed, where comments may be entered with the alphanumeric keyboard.
- Press **UNDO** to display the list of the available observations for this field. With the trackball select the desired one and press **ENTER** to confirm. Refer to the paragraph 4.3.2 *Observations Configuration* further on this chapter to know how to add fields and sentences for observations.

To exit the report, press **REPORT** again or **EXIT**.

4.2.1. End of the Report

At the end of the exam the report is automatically closed. When the exam is reviewed from the archive, a new report is created with the same patient data and the measurements performed in archive review.

The status of the new report stays open when exiting from archive review. This means that the report is updated with new measurements whenever the same exam is reviewed from the archive. When a parameter is measured more times, the old value is overwritten.

4.3. Configurations

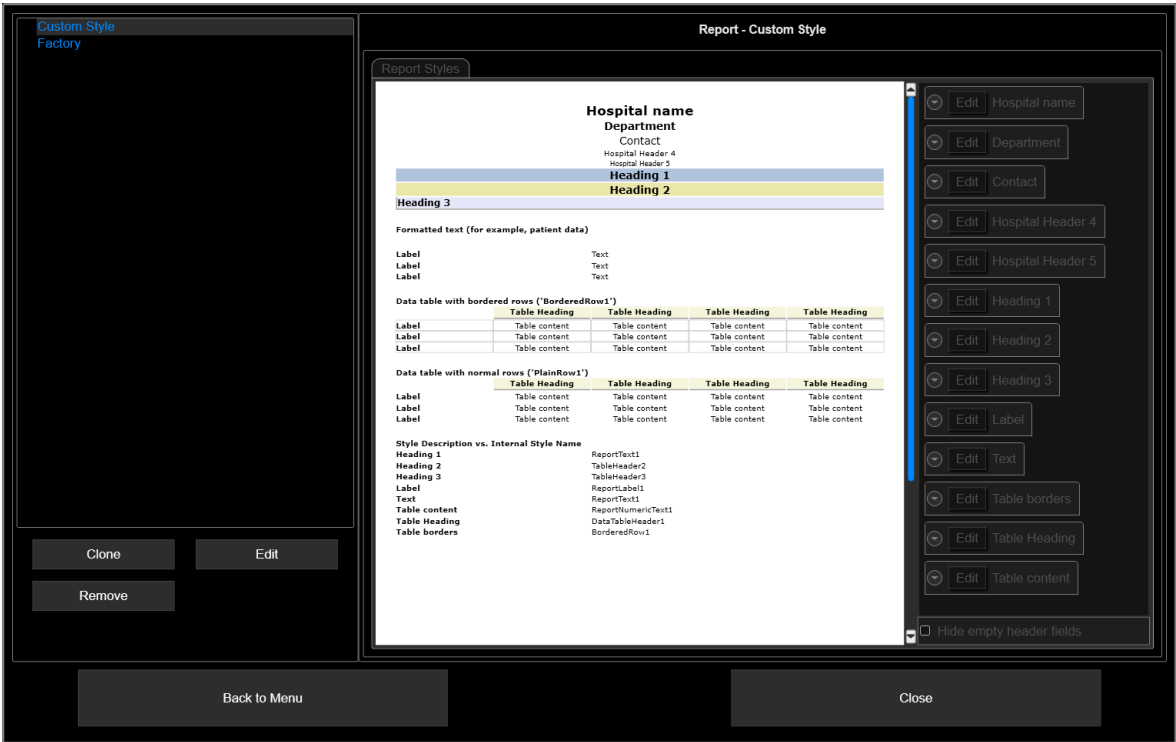
4.3.1. Report Configuration

Report Configuration allows to customize the report style, changing its sections, fonts and colors.

Press **MENU** then **REPORT** to enter in the Report Configuration page where:

- on the left side are listed all the configured profiles. Only Factory profile is listed if no new profiles have been configured;
- in the center the Report Styles for the profile selected on the left list;
- on the right side the main sections of the Report Styles with the controls to change each single item.

Fig. 4–2 Report Configuration Page



Once a profile has been selected from the list on the left, here you can modify it (pressing **EDIT**), delete it (**REMOVE**) or create a new profile starting from it (**CLONE**).

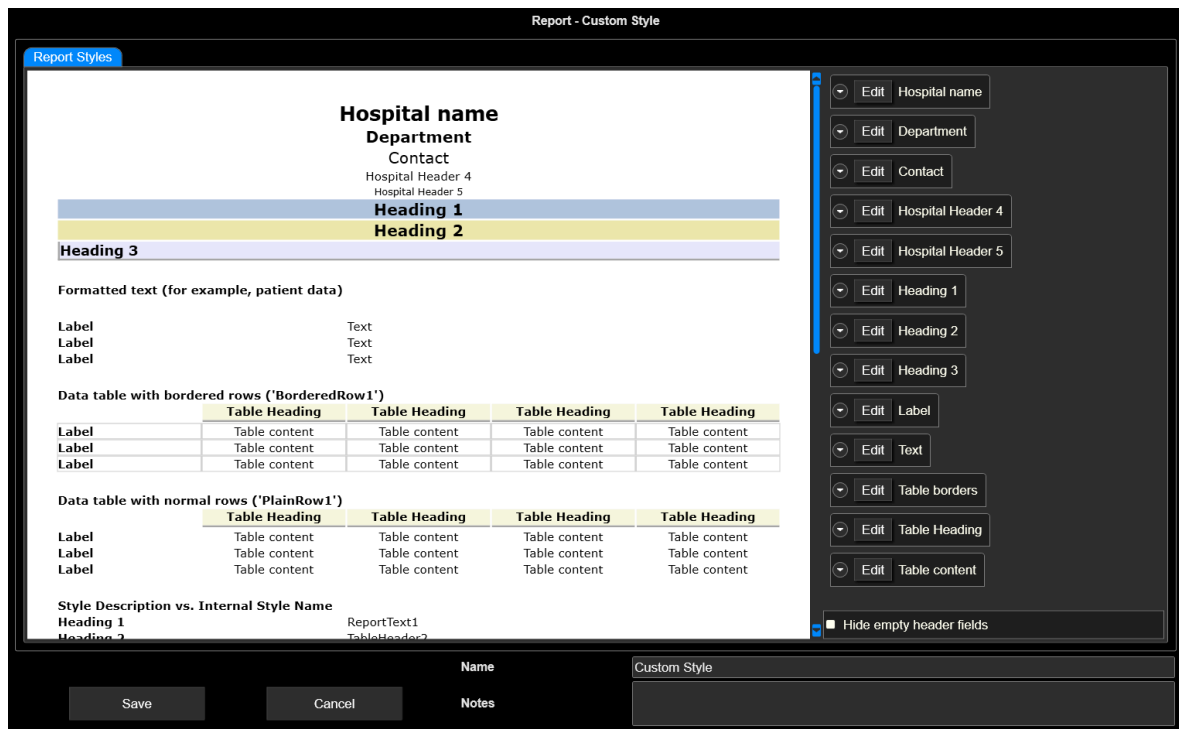
Once pressed **EDIT** or **CLONE**, **MyLab** displays the configuration page where you can edit each single item on the right and see the modifications effect on the main windows.

This window allows to the assignment of the desired font to each report field, the preferred size and color. For each section, the desired background and text alignment can be chosen.

Place the cursor in the **NAME** field and using the alphanumeric keyboard enter the desired name and description (**NOTES** field) for the profile.

Enter in editing mode selecting the item to be modified on the list on the left and pressing **EDIT** (or **NEW** if none).

Fig. 4-3 Profile configuration page



When in edit mode, on the right are listed all the report elements that can be modified.

Procedure

1. The curtain menu at top-right provides a list of predefined templates for the report page. Select the desired one.
2. Press **EDIT** beside each report element to change its settings.
3. A window displays the parameters that can be set; they can differ among elements:
 - the color of the foreground and background,
 - the border color and thickness,
 - the desired font, weight and size of the character,
 - the text alignment.
4. Change the parameters you want, then press **OK** to confirm or **CANCEL** to close the window without saving the modifications.
5. Repeat the above steps to change the style of each report element.
6. Press **SAVE** to save and activate the new settings or **CANCEL** to exit without saving the modifications.

The arrow beside each **EDIT** button shows the current configurations for the related element.

4.3.2. Observations Configuration

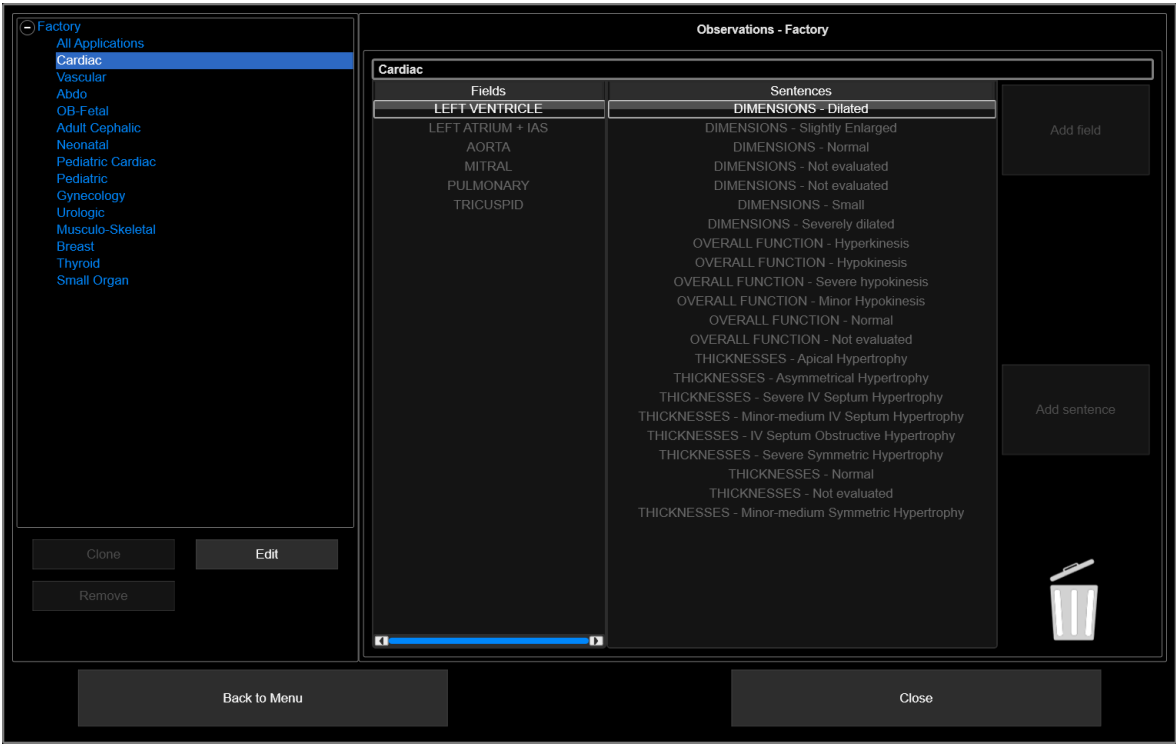
Observations Configuration allows to create groups of words and sentences to be used in the report for each application.

4. Worksheet and Report

Press **MENU** then **OBSERVATIONS** to enter in the Observation Configuration page where:

- on the left side are listed the customized groups. Only Factory groups are listed if no new groups have been created;
- on the right side the observations available for the group and application selected on the left list.

Fig. 4-4 Observations Configuration Page



Each set of observations is organized for groups, applications and fields.

Each Field may include the desired number of words and sentences.

Once an application belonging to a group is selected from the list on the left, you can see the related Fields and Sentences on the right.

Once a group is selected from the list on the left, you can modify it (pressing **EDIT**), delete it (**REMOVE**) or create a new group starting from it (**CLONE**).

Once an application is selected inside a group, from the list on the left, you can modify the related list of observation (pressing **EDIT**) adding Fields and Sentences.

Fig. 4-5 Observations Configuration Menu

Once **EDIT** is pressed, the following is displayed:

- in the first column the list of the fields for the selected application;
- in the second column the list of words and sentences for the selected field;
- on the right the buttons to add a new field in the application report (**ADD FIELD**) and to **ADD SENTENCE** in each field.

NOTE

The ALL APPLICATIONS option contains the list of the observations available for the default “Conclusions” field, that is present in the report of all applications. This option is modifiable, as the other options, following the procedure below.

Procedure

1. Press **ADD FIELD** or **ADD SENTENCE**:
 - a new row, contoured by a frame, is automatically added in the related list;
 - the frame contouring the row indicates that it can be immediately edited: change the field or sentence name using the alphanumeric keyboard.
2. If necessary, repeat the procedure to add a new field and/or sentence.

NOTE

Each added field corresponds to a new part in the Observation section of the report having the same name.

NOTE

Each added sentence will be listed when the **UNDO** key is pressed by entering comments in the corresponding field.

Moving fields and sentences

Drag and drop up or down any sentence to change its position in the list.

Deleting fields and sentences

Drag and drop the field or sentence to be removed it into the waste bin.

Changing field name and sentence

Select the field or sentence to be modified and type the text inside the box with the keyboard.

5. ABDOMINAL MEASUREMENTS

This chapter describes the Application Measurements available for Abdominal application and includes the following topics:

5.1 *Application Data*

5.2 *Available Abdominal Measurements*

5.3 *Abdominal Measurement Set Up*

5.1. Application Data

When multiparametric liver report is enabled, the **ABDOMINAL** tab is added to the start exam page.

In this tab you can insert Biochemical Results coming from current patient blood examination: ALT, AST, GGT, Bilirubin, Platelet count, Cholesterol, Triglycerides, Glucose, Albumin. Each biochemical result must be followed by proper measure unit.

The field **EXECUTION DATE** must be filled with the report blood examination date.

5.2. Available Abdominal Measurements

The tables below list the Application Measurements available for the Abdominal application in each mode.

Calculation results are automatically computed once all the Input Measurements have been completed.

You can customize the Application Measurements package to adapt it to your work-flow: the touchscreen will display only the set measurements.

Refer to Appendices for formulas and bibliographic references.

Table 5–1 Measurement table legenda

Measurement	Description	Input Measurement (method)
This column contains the measurement name as it appears on the touchscreen and in the measurement configuration menu	This column contains a description of the measurement to be taken	This column lists each single measurement you have to perform to get the final result and in brackets the procedure method to follow in order to take the related measurement. Refer to paragraph 1.3 <i>How to take measurements</i>

5. Abdominal Measurements

Table 5–2 Abdominal Measurements in B-Mode

Measurement	Description	Input Measurement (method)
R Kidney	Right Kidney Volume ^[1]	Length (Distance) Height (Distance) Width (Distance)
R Kidney Mass#	Right Kidney Mass ^[1]	Length (Distance) Height (Distance) Width (Distance)
R Kidney Cyst #	Right Kidney Cyst Volume ^[1]	Length (Distance) Height (Distance) Width (Distance)
R Kidney Calculi #	Right Kidney Calculi ^[1]	Diameter (Distance)
R Kidney Pelvis	Right Kidney Pelvis ^[1]	Diameter (Distance)
R Cortex/Medulla RT	Right Cortex/Medulla Ratio ^[1]	R Cortex (Distance) R Medulla (Distance)
R Ureter	Right Ureter ^[1]	Diameter (Distance)
R Ureter Wall	Right Ureter Wall ^[1]	Thickness (Distance)
R Ureter Calculi #	Right Ureter Calculi ^[1]	Diameter (Distance)
Urinary Bladder	Urinary Bladder Volume	Length (Distance) Height (Distance) Width (Distance)
Urinary Bladder Wall	Urinary Bladder Wall	Thickness (Distance)
Urinary Bladder Calculi #	Urinary Bladder Calculi	Diameter (Distance)
Urinary Bladder Mass #	Urinary Bladder Mass	Length (Distance) Height (Distance) Width (Distance)
Post-Void Bladder Volume	Post-Void Bladder Volume	Length (Distance) Height (Distance) Width (Distance)
R Adrenal Cranial Pole	Right Adrenal Cranial Pole ^[1]	Length (Distance) Height (Distance) Width (Distance)
R Adrenal Gland Mass #	Right Adrenal Gland Mass ^[1]	Length (Distance) Height (Distance) Width (Distance)
Pancreas Body	Pancreas Body	Thickness (Distance)
Pancreas Right Lobe	Pancreas Right Lobe	Thickness (Distance)
Pancreas Left Lobe	Pancreas Left Lobe	Thickness (Distance)
Right Pancreatic Duct	Right Pancreatic Duct	Diameter (Distance)
Left Pancreatic Duct	Left Pancreatic Duct	Diameter (Distance)
Pancreas Mass #	Pancreas Mass	Length (Distance) Height (Distance) Width (Distance)
Pancreas Cyst #	Pancreas Cyst Volume	Length (Distance) Height (Distance) Width (Distance)
Spleen Mass #	Spleen Mass	Length (Distance) Height (Distance) Width (Distance)
Spleen	Spleen Volume	Length (Distance) Height (Distance) Width (Distance)
Stomach Body	Stomach Body	Thickness (Distance)

Table 5–2 Abdominal Measurements in B-Mode (cont'd.)

Measurement	Description	Input Measurement (method)
Stomach Fundus	Stomach Fundus	Thickness (Distance)
Stomach Pylorus	Stomach Pylorus	Thickness (Distance)
Pylorus Mucosa/Muscularis	Stomach Pylorus Mucosa/Muscularis Ratio	Mucosa (Distance) Muscularis (Distance)
Liver Long Distance	Liver Longitudinal Distance	Distance (Distance)
Liver Transv Distance	Liver Transversal Distance	Distance (Distance)
Liver Mass #	Liver Mass	Length (Distance) Height (Distance) Width (Distance)
Portal V Transv	Portal Vein Transverse	Diameter (Distance) Area (Trace)
Gallbladder	Gallbladder Volume	Length (Distance) Height (Distance) Width (Distance)
Gallbladder Wall	Gallbladder Wall	Thickness (Distance)
Common Bile Duct	Common Bile Duct	Diameter (Distance)
Gallbladder Calculi #	Gallbladder Calculi	Diameter (Distance)
Prostate	Prostate Volume	Length (Distance) Height (Distance) Width (Distance)
Prostate Right Lobe Transv	Prostate Right Lobe Transverse	Height (Distance) Width (Distance)
Prostate Left Lobe Transv	Prostate Left Lobe Transverse	Height (Distance) Width (Distance)

1. The measurement is bilateral.

Table 5–3 Abdominal Measurements in Doppler

Measurement	Description	Input Measurement (method)
R Kidney	Right Kidney	PSV ^[1] EDV ^[2]
Hepatic A	Hepatic Artery	PSV ^[1] EDV ^[2]
R Renal A Origin	Right Renal Artery Origin ^[3]	PSV ^[1] EDV ^[2]
R Renal Vein	Right Renal Vein ^[3]	PSV ^[1] EDV ^[2]
R Renal A	Right Renal Artery ^[3]	PSV ^[1] EDV ^[2]
Aorta	Aorta	PSV ^[1] EDV ^[2]
Infra-renal Aorta	Infra-renal Aorta	PSV ^[1] EDV ^[2]
Supra-renal Aorta	Supra-renal Aorta	PSV ^[1] EDV ^[2]
Dist Aorta	Distal Aorta	PSV ^[1] EDV ^[2]
Mid Aorta	Middle Aorta	PSV ^[1] EDV ^[2]

5. Abdominal Measurements

Table 5–3 Abdominal Measurements in Doppler (cont'd.)

Measurement	Description	Input Measurement (method)
Prox Aorta	Proximal Aorta	PSV ^[1] EDV ^[2]
Post Prandial Celiac	Post Prandial Celiac	PSV ^[1] EDV ^[2]
Inf Mesenteric A	Inferior Mesenteric Artery	PSV ^[1] EDV ^[2]
Gastroduodenal A	Gastroduodenal Artery	PSV ^[1] EDV ^[2]
Prox Sup Mesenteric A	Proximal Superior Mesenteric Artery	PSV ^[1] EDV ^[2]
Mid Sup Mesenteric A	Middle Superior Mesenteric Artery	PSV ^[1] EDV ^[2]
Dist Sup Mesenteric A	Distal Superior Mesenteric Artery	PSV ^[1] EDV ^[2]
R Hilar A	Right Hilar Artery ^[3]	PSV ^[1] EDV ^[2]
Splenic A	Splenic Artery	PSV ^[1] EDV ^[2]
Splenic V	Splenic Vein	PSV ^[1] EDV ^[2]
Sup Mesenteric V	Superior Mesenteric Vein	PSV ^[1] EDV ^[2]
Inf Mesenteric V	Inferior Mesenteric Vein	PSV ^[1] EDV ^[2]
Prox IVC	Proximal Inferior Vena Cava	PSV ^[1] EDV ^[2]
Dist IVC	Distal Inferior Vena Cava	PSV ^[1] EDV ^[2]
L Portal V	Left Portal Vein	PSV ^[1] EDV ^[2]
R Portal V	Right Portal Vein	PSV ^[1] EDV ^[2]
Main Portal V	Main Portal Vein	PSV ^[1] EDV ^[2]
L Hepatic V	Left Hepatic Vein	PSV ^[1] EDV ^[2]
R Hepatic V	Right Hepatic Vein	PSV ^[1] EDV ^[2]
Main Hepatic V	Main Hepatic Vein	PSV ^[1] EDV ^[2]

1. PSV = Peak Systolic Velocity – caliper measurement
2. EDV = End Diastolic Velocity – caliper measurement
3. The measurement is bilateral.

5.3. Abdominal Measurement Set Up

To access the Abdominal Measurement configuration menu press **MENU**, select **MEASURE**, and then **ABDOMINAL**. The **ADVANCED** tabs provide specific options for the selected application.

5.3.1. Advanced Folder

Here you can set the parameters described in the table below.

Table 5–4 Advanced fields

Field	Action
ENABLE MULTIPARAM	<p>When checked, it enables multiparametric liver report workflow, measures and calculations.</p> <p>It also enable the abdominal tab in the start/end exam page.</p> <p>When enabled, at ADD TO REPORT pressure in QElaXto 2D, ElaXto, QPack, QAI or in case of liver mass measurement, data are saved in the report and results can be linked to parenchima or liver masses.</p>
CUTOFFS	<p>Cut-off blood values to be filled according to laboratory conventions and desired measure unit.</p> <p>To the left-side you can select the desired fibrosis / cirrhosis index formulas to be calculated from biochemical analysis results.</p>

5.3.1.1. Multiparametric Liver report

When Multiparametric Liver report is enabled, a new section is added to both abdominal – liver report and worksheet that includes all the results coming from multi-parametric ultrasound examination on liver.

Both report and worksheet are divided into three tabs where it is possible to assign specific results to each section to get a more organized reporting method:

- **LIVER ZONE PARENCHYMA**, contains all the results related to parenchyma general examination, in particular QElaXto results, attenuation imaging results, blood examination results added at start exam and fibrosis formulas selected in multiparametric liver report configuration.
- **LIVER ZONE MASS 1**, contains all the results related to the first mass found during examination, dimensional and Doppler measurements, QElaXto, ElaXto, QPack results (if performed).
- **LIVER ZONE MASS 2**, contains all the results related to the second mass found during examination, dimensional and Doppler measurements, QElaXto, ElaXto, QPack results (if performed).

Both Multiparametric Liver worksheet and report include a graphic representation of QAI and QElaXto 2D results as well as ALT and AST biochemical values.

Trend for each of the above-mentioned parameters can be displayed including on graph all the results collected in previous patient exams.

Trend functionality can be enabled on **GRAPH** tab in liver parenchyma section and allows to report ATI, QElaXto 2D, ALT, AST results and fibrosis stage on graphic representation together with fibrosis indexes calculated with formulas. In Liver mass sections, trend allows to report old volume mass dimensions to control lesion growth. Parenchyma graph shall report a temporal axis on x axis and y axis shall be scaled according to each parameter to be graphed. Graphs can be added to the report.

5. Abdominal Measurements

Liver Multiparametric report includes a graphic representation of QElaXto 2D results, QAI results, ALT and AST values.

For each of the cited parameters all results collected in previous exams belonging to the same patient are reported on graph as soon as **TREND** is pressed in worksheet.

ElaXto ratio measurement results and QPack (both CFM and CnTI) can be added to **LIVER MASS 1** or **LIVER MASS 2** sections through the dedicated touchscreen key.

For **LIVER MASS 1** and **LIVER MASS 2** a dimension table reports all measures collected on same mass in previous exams.

QElaXto and QAI examinations are collected in liver parenchyma section without any additive actions from user.

6. ADULT CEPHALIC MEASUREMENTS

This chapter describes the Application Measurements available for Adult Cephalic application and includes the following topics:

6.1 *Available Adult Cephalic Measurements*

6.2 *Adult Cephalic Worksheet Organization*

6.1. Available Adult Cephalic Measurements

The tables below list the Application Measurements available for the Adult Cephalic application in each mode.

Calculation results are automatically computed once all the Input Measurements have been completed.

You can customize the Application Measurements package to adapt it to your work-flow: the touchscreen will display only the set measurements.

Refer to Appendices for formulas and bibliographic references.

Table 6–1 Measurement table legenda

Measurement	Description	Input Measurement (method)
This column contains the measurement name as it appears on the touchscreen and in the measurement configuration menu	This column contains a description of the measurement to be taken	This column lists each single measurement you have to perform to get the final result and in brackets the procedure method to follow in order to take the related measurement. Refer to paragraph 1.3 <i>How to take measurements</i>

Table 6–2 Adult Cephalic Measurements in B-Mode

Measurement	Description	Input Measurement (method)
R MCA 1st Segm	Right middle cerebral artery depth - segment 1 ^[1]	R MCA 1 Depth (Distance)
R MCA 2nd Segm	Right middle cerebral artery depth - segment 2 ^[1]	R MCA 2 Depth (Distance)
R Ant Cerebral A	Right anterior cerebral artery depth ^[1]	R ACA Depth (Distance)
R PCA 1st Segm	Right posterior cerebral artery depth - segment 1 ^[1]	R PCA 1 Depth (Distance)
R PCA 2nd Segm	Right posterior cerebral artery depth - segment 2 ^[1]	R PCA 2 Depth (Distance)
Basilar A	Basilar artery depth	Basilar A Depth (Distance)
Ant Communic A	Anterior communicant artery depth	ACoA Depth (Distance)
R Bifurcation	Right bifurcation depth ^[1]	R Bif Depth (Distance)
R Terminal ICA	Right terminal internal cerebral artery depth ^[1]	R Term ICA Depth (Distance)

6. Adult Cephalic Measurements

Table 6–2 Adult Cephalic Measurements in B-Mode (cont'd.)

Measurement	Description	Input Measurement (method)
R Vertebral A	Right vertebral artery depth ^[1]	R Vert A Depth (Distance)
R Post Communic A	Right posterior communicant artery depth ^[1]	R PCoA Depth (Distance)
R Dist ICA	Right internal carotid artery distal depth ^[1]	R Dist ICA Depth (Distance)
R C5	Right C5 depth ^[1]	R C5 Depth (Distance)
R C6	Right C6 depth ^[1]	R C6 Depth (Distance)

1. The measurement is bilateral.

Table 6–3 Adult Cephalic Measurements in Doppler

Measurement	Description	Input Measurement (method)
R MCA 1st Segm	Right middle cerebral artery depth - segment 1 VTI ^[1]	VTI ^[2]
R MCA 2nd Segm	Right middle cerebral artery depth - segment 2 VTI ^[1]	VTI ^[2]
R Ant Cerebral A	Right anterior cerebral artery depth VTI ^[1]	VTI ^[2]
R PCA 1st Segm	Right posterior cerebral artery depth - segment 1 VTI ^[1]	VTI ^[2]
R PCA 2nd Segm	Right posterior cerebral artery depth - segment 2 VTI ^[1]	VTI ^[2]
Basilar A	Basilar artery depth VTI	VTI ^[2]
Ant Communic A	Anterior communicant artery depth VTI	VTI ^[2]
R Bifurcation	Right bifurcation depth VTI ^[1]	VTI ^[2]
R Terminal ICA	Right terminal internal cerebral artery depth VTI ^[1]	VTI ^[2]
R Vertebral A	Right vertebral artery depth VTI ^[1]	VTI ^[2]
R Post Communic A	Right posterior communicant artery depth VTI ^[1]	VTI ^[2]
R Dist ICA	Right internal carotid artery distal depth VTI ^[1]	VTI ^[2]
R C5	Right C5 depth VTI ^[1]	VTI ^[2]
R C6	Right C6 depth VTI ^[1]	VTI ^[2]

1. The measurement is bilateral.
2. VTI = Velocity Time Integral – profile measurement

6.2. Adult Cephalic Worksheet Organization

Here are described the additional fields dedicated to the Adult Cephalic worksheet.

6.2.1. Flow Directions

The worksheet, beside displaying the single measurements, also allows the insertion of an evaluation and notes of any performed measurement of flow.

Field	Evaluation
FLOW DIRECTION	<i>Free text, +, -</i>

Free text can be edited in the blank field using the alphanumeric keyboard: place the cursor on the field and press **ENTER** to activate the editing session.

7. BREAST MEASUREMENTS

This chapter describes the Application Measurements available for Breast application and includes the following topics:

7.1 *Available Breast Measurements*

7.2 *Automatic lesions contour*

7.3 *Automatic lesion dimensions*

7.4 *Breast Worksheet Organization*

7.5 *Breast Measurement Set Up*

7.1. Available Breast Measurements

The tables below list the Application Measurements available for the Breast application in each mode.

Calculation results are automatically computed once all the Input Measurements have been completed.

You can customize the Application Measurements package to adapt it to your work-flow: the touchscreen will display only the set measurements.

Refer to Appendices for formulas and bibliographic references.

Table 7–1 Measurement table legenda

Measurement	Description	Input Measurement (method)
This column contains the measurement name as it appears on the touchscreen and in the measurement configuration menu	This column contains a description of the measurement to be taken	This column lists each single measurement you have to perform to get the final result and in brackets the procedure method to follow in order to take the related measurement. Refer to paragraph 1.3 <i>How to take measurements</i>

Table 7–2 Breast Measurements in B-Mode

Measurement	Description	Input Measurement (method)
R Mass #	Right Mass Volume ^[1]	Length (Distance) Height (Distance) Width (Distance)
R Breast	Right Breast ^[1]	-

1. The measurement is bilateral. Till six lesions can be calculated both left and right side.

7.2. Automatic lesions contour

When the eDetect licence is enabled, after the operator has defined the position of a lesion with a ROI, an artificial intelligence algorithm autonomously proposes a contour for that lesion. At the end of the detection the operator can confirm/edit the proposed contour or redraw it completely.



WARNING

Automatic measurements should not be considered sufficient to make a diagnosis. Users are responsible for the results of automatic measurements and must inspect and approve the data that is being used before formulate a diagnosis.

Check that the **AUTOMATIC CONTOUR** measurement is activated in the application's measurement configuration menu.

Procedure

1. Start a new breast exam, acquire an image and press **FREEZE** or open an image from the archive.
2. Press **MEASURE** to start the measurement.
3. Select **MASS** as measurement.
4. Select **AUTOMATIC CONTOUR**, it is displayed a rectangular ROI, which can be resized and moved using the trackball and **ACTION**.
5. Press **ENTER** to fix the ROI: an automatic lesion contour is displayed and can be edited with the trackball or the **BACK** encoder.
6. Press **ENTER** again to close the tracking area: an automatic evaluation panel with the results is displayed on the touchscreen.
7. Press **APPROVE** or **DISCARD** to close the ratings and return to the main measurement menu. If approved, the assessments will be added to the worksheet where they can be edited later.

At any time press **MANUAL** or **UNDO** to switch to manual tracking.

7.3. Automatic lesion dimensions

When the eDetect licence is enabled, after the operator has defined the position of a lesion with a ROI, an artificial intelligence algorithm autonomously proposes the length and height of that lesion, which, once displayed, can be confirmed or modified by the operator.



WARNING

Automatic measurements should not be considered sufficient to make a diagnosis. Users are responsible for the results of automatic measurements and must inspect and approve the data that is being used before formulate a diagnosis.

Check that the **AUTOMATIC DIMENSION** measurement is activated in the application's measurement configuration menu.

Procedure

1. Start a new breast exam, acquire an image and press **FREEZE** or open an image from the archive.
2. Press **MEASURE** to start the measurement.
3. Select **MASS** as measurement.
4. Select **AUTOMATIC DETECTION**, it is displayed a rectangular ROI, which can be resized and moved using the trackball and **ACTION**.
5. Press **ENTER** to fix the ROI: the length and height calipers are automatically placed on the lesion. Now you can:
 - Modify the position of the calipers, pressing **ACTION** and moving the trackball. Each pression of **ACTION** cycles the calipers selection. The trackball is linked to the selected caliper that becomes yellow.
 - Repeat manually the highlighted measurement, pressing **UNDO**.
 - Confirm measurements and save them in the report, pressing **ENTER**.

Width measurement is always manual when needed.

7.4. Breast Worksheet Organization

Here are described the additional fields dedicated to the Breast Worksheet.

7.4.1. Structure Evaluation

The worksheet, besides displaying the single measurements, also allows the insertion of an evaluation of the structures under exam. The following evaluations are available with the measurements.

7. Breast Measurements

Table 7–3 Evaluations in Breast when Mass measurement is selected

Parameter	Evaluation
Location	O'clock: from 1 to 12 Region: Nipple, Areolar, Subareolar, Axillary Quadrants: Upper Inner, Lower Inner, Upper Outer, Lower Outer Profile: Posterior, Middle, Anterior
Masses	Shape: Oval, Round, Irregular Orientation: Parallel, Not Parallel Echo Pattern: Anechoic, Hyperechoic, Complex Cystic and Solid, Hypoechoic, Isoechoic, Heterogeneous Posterior Features: No posterior features, Enhancement, Shadowing, Combined Pattern
Margin	Circumscribed: Yes, No Not circumscribed - Indistinct: Yes, No Not circumscribed - Angular: Yes, No Not circumscribed - Microlobulated: Yes, No Not circumscribed - Spiculated: Yes, No
Elasticity Assessment	Elasticity Assessment: Soft, Intermediate, Hard
BI-RADS Category	Refer to Table 7–5 <i>Assessment categories (based on BI-RADS lesion classification)</i>

Table 7–4 Evaluations in Breast when Breast measurement is selected

Available when RADS is enabled (refer to <i>Breast Measurement Set Up</i> paragraph)	
Parameter	Evaluation
Tissue Composition	Homogeneous background echotexture - fat Homogeneous background echotexture - fibroglandular Heterogeneous background echotexture
Calcifications	Calcifications in a mass: Yes, No Calcifications outside of a mass: Yes, No Intraductal calcifications: Yes, No Not detectable calcifications: Yes, No
Associated Features	Architectural Distortion: Yes, No Duct Changes: Yes, No Skin Changes: Absent, Skin Thickening, Skin Retraction Edema: Yes, No Vascularity: Absent, Internal Vascularity, Vessels in Rim
Special Cases 1	Simple Cyst: Yes, No Clustered Microcyst: Yes, No Complicated Cyst: Yes, No Mass in or on skin: Yes, No Foreign body including implants: Yes, No
Special Cases 2	Lymph nodes - intramammary: Yes, No Lymph nodes - axillary: Yes, No Vascular abnormalities - AVMs: Yes, No Vascular abnormalities - Mondor disease: Yes, No Postsurgical fluid collection: Yes, No

Table 7–4 Evaluations in Breast when Breast measurement is selected (cont'd.)

Available when RADS is enabled (refer to <i>Breast Measurement Set Up</i> paragraph)	
Parameter	Evaluation
Special Cases 3	Fat Necrosis: Yes, No
BI-RADS Category	Refer to Table 7–5 <i>Assessment categories (based on BI-RADS lesion classification)</i>

Table 7–5 Assessment categories (based on BI-RADS lesion classification)

Category 0; Incomplete - Need Additional Imaging Evaluation	
Category 1; Negative	
Category 2; Benign	
Category 3; Probably Benign	
Category 4; Suspicious	
	Category 4A; Low suspicion for malignancy
	Category 4B; Moderate suspicion for malignancy
	Category 4C; High suspicion for malignancy
Category 5; Highly Suggestive of Malignancy	
Category 6; Known Biopsy-Proven Malignancy	

Evaluations can also be added from Measurement environment tapping **EVALUATE** and then selecting the group.

NOTE

This product incorporates the Breast Imaging Reporting and Data System (BI-RADS®) ATLAS of the American College of Radiology, Copyright 1992, 1993, 1995, 1998, 2003, and 2013. The developer of this product is independently owned and operated, and is not an affiliate of the American College of Radiology. The American College of Radiology is not responsible for the contents or operation of this product or its associated software, and expressly disclaims any and all warranties and liabilities, expressed or implied, in connection therewith.

7.5. Breast Measurement Set Up

To access the Breast Measurement configuration menu press **MENU**, select **MEASURE**, and then **BREAST**. The **APPLICATION MEASUREMENTS** and **ADVANCED** tabs provide specific options for the selected application.

7.5.1. Advanced Folder

Here you can set the parameters described in the table below.

Table 7–6 *Advanced fields*

Field	Action
ENABLE RADS	Enables the BI-RADS evaluation
CUTOFFS	Cut-off blood values to be filled according to laboratory conventions and desired measure unit. To the left-side you can select the desired fibrosis / cirrhosis index formulas to be calculated from biochemical analysis results.

8. CARDIAC AND PEDIATRIC CARDIAC MEASUREMENTS

This chapter describes the Application Measurements available for Cardiac and Pediatric Cardiac applications and includes the following topics:

8.1 *Application Data*

8.2 *Cardiac Cycle manual correction*

8.3 *Available Cardiac and Pediatric Cardiac Measurements*

8.4 *Automatic Left Ventricle Measurements*

8.5 *Automatic Ejection Fraction*

8.1. Application Data

Fig. 8–1 Cardiac Patient ID page

The screenshot displays the 'Cardiac Patient ID' page with the following fields and controls:

- IDENTIFICATION Section:**
 - LAST NAME, FIRST NAME, MIDDLE NAME: Text input fields.
 - BIRTH DATE: Date picker (DD/MM/YYYY).
 - AGE: Text input field.
 - GENDER: Dropdown menu.
 - ADM DIAGNOSIS: Text input field.
 - ACCESSION NUMBER: Text input field.
 - REFERRING PHYSICIAN, PERFORMING PHYSICIAN, OPERATOR: Text input fields with associated dropdown menus.
- Physical Measurements Section:**
 - HEIGHT: Text input field with units (cm, ft in).
 - WEIGHT: Text input field with units (kg, 0 lb 0 oz).
- Application Selection:** A row of tabs: CARDIAC (selected), VASCULAR, GYNECOLOGY, OB-FETAL, PED CARD.
- Additional Measurements Section:**
 - BSA: Text input field with unit m² and a dropdown menu set to STANDARD.
 - SYSTOLIC PRESSURE: Text input field with unit mmHg.
 - DIASTOLIC PRESSURE: Text input field with unit mmHg.

Table 8–1 Additional data in Cardiac Patient ID page

Field	
BSA	Body Surface Area
SYSTOLIC PRESSURE	in mmHg
DIASTOLIC PRESSURE	in mmHg

8.1.1. Body Surface Area (BSA)

The Body Surface Area (BSA) can be either automatically calculated or manually entered.

In the first case, when both height and weight data are inserted, the BSA is calculated using the following formulas^[1]:

Standard BSA

$$BSA \text{ (Adult Cardiac)} = \frac{H^{0,725} \cdot W^{0,425} \cdot 71,84}{10000}$$

Pediatric BSA

$$BSA \text{ (Pediatric Cardiac)} = \frac{H^{0,3964} \cdot W^{0,5378} \cdot 242,65}{10000}$$

where H is the height expressed in cm and W is the weight expressed in kg.

Custom BSA

To customize the BSA place the cursor on the field, press **ENTER** and use the alphanumeric keyboard to enter the desired value. The use of customized BSA is clearly indicated both in the worksheet and in the report.

NOTE

Any change both on height and on weight parameters does not affect the customized BSA.

If the customized BSA is deleted, MyLab works as if no BSA was calculated.

8.2. Cardiac Cycle manual correction

When working with ECG trace, two yellow pipe bars appear on the trace and new keys are added to the touchscreen allowing to manually select the cardiac cycle initial and final points in case of bad or absent ECG trace or when you want to choose a different frame position for consequent processing tools (i.e. AutoEF, XStrain, HyperDoppler).

The feature is available also with ECG trace OFF using only Cinebar.

1. DuBois D, DuBois EF, "A formula to estimate the approximate surface area if height and weight be known" In: Arch Intern Medicine, 1916; 17:863-71; Reading et al., "Simple Formula for the Surface Area of the Body and a Simple Model for Anthropometry" In: Clinical Anatomy, n.18 pp 126-130, 2005; Sluysmans, "Theoretical and Empirical Derivation of Cardiovascular Allometric Relationship in Children" In: J Appl Physiol, November n.19, 2004

CLIP CYCLE	sets the number of cycles per clip (Range 1-3). Available when ECG is ON.
CLIP SEC	sets the duration in seconds of a clip (Range 1-5 sec). Available when ECG is OFF.
LEFT TRIM	moves the left trim to choose the initial point of the cycle. Displayed when CLIP CYCLE is set to 1.
RIGHT TRIM	move the right trim to choose the final point of the cycle. Displayed when CLIP CYCLES is set to 1.
ED FRAME ES FRAME	Both available in Auto EF environment, once clip is processed for the first time, allowing to modify TRIM position. ED FRAME acts on the left image: rotate to define the initial point, then press to process again. ES FRAME acts on the right image: rotate to define the initial point, then press to process again.

8.3. Available Cardiac and Pediatric Cardiac Measurements

The tables below list the Application Measurements available for the Cardiac and Pediatric Cardiac applications in each mode.

Calculation results are automatically computed once all the Input Measurements have been completed.

You can customize the Application Measurements package to adapt it to your work-flow: the touchscreen will display only the set measurements.

For Cardiac and Pediatric Cardiac applications, simple measurements belonging to a macro-measurement can be ungrouped and executed individually. When **MyLab** detects that all the measurements belonging to the same macro-measurement have been executed, **MyLab** displays calculation results for this macro-measurement.

Some cardiac measurements require to be taken on two cardiac views or on two different modes.

At any time, it is possible to return to real time with **B** to complete the acquisition. **FREEZE** the image and press **MEASURE** again to complete the measurement.

Refer to Appendices for formulas and bibliographic references.

Table 8–2 Measurement table legenda

Measurement	Description	Input Measurement (method)
This column contains the measurement name as it appears on the touchscreen and in the measurement configuration menu	This column contains a description of the measurement to be taken	This column lists each single measurement you have to perform to get the final result and in brackets the procedure method to follow in order to take the related measurement. Refer to paragraph 1.3 <i>How to take measurements</i>

8. Cardiac and Pediatric Cardiac Measurements

Table 8–3 Abbreviation legenda

Acronym	Meaning
EF	Ejection fraction
CI	Cardiac index
CO	Cardiac output
HR	Heart rate
SI	Stroke index
SV	Stroke volume
A4C	Apical Four Chambers
A2C	Apical Two Chambers
d	Diastole
s	Systole
LV	Left Ventricle
RV	Right Ventricle
MV	Mitral Valve
SAX	Short Axis View
LAX	Long Axis View
Epi	Epicardium
Endo	Endocardium

Table 8–4 Cardiac and Pediatric Cardiac Measurements in B-Mode

Measurement	Description	Input Measurement (method)
EF SP (Simpson)	Ejection Fraction Single Plane (Simpson)	LVAd A4C – Left Ventricle Diastolic area 4 Chambers (Trace + Distance) LVAs A4C – Left Ventricle Systolic area 4 Chambers (Trace + Distance)
EF MOD BP (Simpson)	Ejection Fraction Method Of Disks Biplane (Simpson) ^[1]	LVAd A4C – Left Ventricle Diastolic area 4 Chambers (Trace + Distance) LVAs A4C – Left Ventricle Systolic area 4 Chambers (Trace + Distance) LVAd A2C – Left Ventricle Diastolic area 2 Chambers (Trace + Distance) LVAs A2C – Left Ventricle Systolic area 2 Chambers (Trace + Distance)
EF (A-L)	Ejection Fraction (Area-Lenght)	LVAd A4C – Left Ventricle Diastolic area 4 Chambers (Trace + Distance) LVAs A4C – Left Ventricle Systolic area 4 Chambers (Trace + Distance)
% LVFAC	Left Ventricle Fractional Area Changes	LVAd – Left Ventricle diastolic area (Trace) LVAs – Left Ventricle systolic area (Trace)
Left Ventricle	Left Ventricle Mass	IVSd – Interventricular septum diastole (Distance) LVIDd – Left Ventricle diameter diastole (Distance) LVPWd – Left Ventricle Posterior wall diastole (Distance) IVSs – Interventricular septum systole (Distance) LVIDs – Left Ventricle diameter systole (Distance) LVPWs – Left Ventricle Posterior wall systole (Distance) These measurements can be automatically calculated too. Refer to 8.4 <i>Automatic Left Ventricle Measurements</i>
LVOT	Left Ventricle Outflow Tract	LVOT Diam – Left Ventricle Outflow Tract Diameter (Distance)
Aorta/LA	Aorta and Left Atrium ratio	AV Open – Aortic valve opening (Distance) Ao Diam – Aortic diameter (Distance) AV Planimetry – Aortic planimetry (Distance) Sin Vals Diam – Diameter of Sinus of Valsava (Distance) Sinotub Junct Diam – Sinotubular junction diameter (Distance) Asc Ao Diam – Ascending aorta diameter (Distance) Ao Arch Diam – Aortic arch diameter (Distance) Asc Ao Inner Edge – Ascending aorta inner edge (Distance) LA Diam – Left atrium diameter (Distance)

8. Cardiac and Pediatric Cardiac Measurements

Table 8–4 Cardiac and Pediatric Cardiac Measurements in B-Mode (cont'd.)

Measurement	Description	Input Measurement (method)
LV Mass (A-L)	Left Ventricle Mass (Area-Length)	LVAd sax Endo – Left Ventricle Area diastole short axis endocardium (Trace) LVAd sax Epi – Left Ventricle Area diastole short axis epicardium (Trace) LVld Apical – Left Ventricle Length diastole apical (Distance)
Right Ventricle	Right Ventricle	RV Diam basal d – Basal Right Ventricle diameter diastole (Distance) RV Diam mid d – Medium Right Ventricle diameter diastole (Distance) RV L Axis d – Maximum Right Ventricle axis in 4 AC diastole (Distance) RV Area d – Right Ventricle area diastole (Trace) RV Area s – Right Ventricle area systole (Trace) RVldd – Right Ventricle diameter diastole (Distance) RV Area – Right Ventricle area (Trace) RV Length – Right Ventricle long axis (Distance)
RVOT/PA	Right Ventricle Outflow Tract and Pulmonary Artery Diameter ratio	RVOT Diam – RVOT diameter (Distance) PA Diam – Pulmonary artery diameter (Distance) PV Annulus Diam – Pulmonary valve annulus diameter (Distance)
MV	Mitral Valve	MV Annulus Diam – Mitral annulus diameter (Distance) MV Annulus Area – Mitral annulus area (Trace) MV Planimetry – Mitral Valve Planimetry (Trace)
MVA (VTI)	Mitral Valve Area	Refer to Table 8–6 <i>Cardiac and Pediatric Cardiac Measurements in Doppler</i>
LA Volume MOD BP	Left Atrium Volume Method Of Disks Biplane (Simpson)	LA Area A4C – Left atrium area 4 chambers (Trace) LA Area A2C – Left atrium area 2 chambers (Trace) LA Major Axis – Left atrium major axis (Distance) LA Minor Axis – Left atrium minor axis (Distance)
PISA MR	PISA (Mitral)	Refer to Table 8–6 <i>Cardiac and Pediatric Cardiac Measurements in Doppler</i>
PISA AR	PISA (Aorta)	Refer to Table 8–6 <i>Cardiac and Pediatric Cardiac Measurements in Doppler</i>
CO (Ao)	Cardiac Output - Aorta	Refer to Table 8–6 <i>Cardiac and Pediatric Cardiac Measurements in Doppler</i>
AVA (VTI)	AO Effective Valve Area	Refer to Table 8–6 <i>Cardiac and Pediatric Cardiac Measurements in Doppler</i>
CO (LVOT)	Cardiac Output - LVOT	Refer to Table 8–6 <i>Cardiac and Pediatric Cardiac Measurements in Doppler</i>
CO (Pulm Flow)	Cardiac Output - Pulmonary	Refer to Table 8–6 <i>Cardiac and Pediatric Cardiac Measurements in Doppler</i>
Qp/Qs	Qp/Qs	Refer to Table 8–6 <i>Cardiac and Pediatric Cardiac Measurements in Doppler</i>
IVC	Inferior Vena Cava	IVC max Diam – Inferior Vena Cava maximum diameter (Distance) IVC min Diam – Inferior Vena Cava minimum diameter (Distance)
RA Volume (SP)	Right Atrium Volume(Simpson - Single Plane)	RA Area (SP) – Right atrium area (Trace) RA Minor Axis – Right atrium minor axis (Distance) RA Length (SP) – Right atrium length (Distance)
RA Volume (A-L)	Right Atrium Volume (Area-Length)	RA Area (A-L) – Right atrium area (Trace) RA Minor Axis – Right atrium minor axis (Distance) RA Length (A-L) – Right atrium length (Distance)
PISA TR	PISA Tricuspid Regurgitation	Refer to Table 8–6 <i>Cardiac and Pediatric Cardiac Measurements in Doppler</i>
MR	Mitral Regurgitation	Refer to Table 8–6 <i>Cardiac and Pediatric Cardiac Measurements in Doppler</i>
TR	Tricuspid Regurgitation	Refer to Table 8–6 <i>Cardiac and Pediatric Cardiac Measurements in Doppler</i>
CO-MV	Cardiac Output Mitral Valve	Refer to Table 8–6 <i>Cardiac and Pediatric Cardiac Measurements in Doppler</i>
EF MOD 4C (Simpson)	Ejection Fraction Method Of Disks 4 chambers (Simpson)	LVAd A4C – Left Ventricle Diastolic area 4 Chambers (Trace + Distance) LVAs A4C – Left Ventricle Systolic area 4 Chambers (Trace + Distance)
EF MOD 2C (Simpson)	Ejection Fraction Method Of Disks 2 chambers (Simpson)	LVAd A2C – Left Ventricle Diastolic area 2 Chambers (Trace + Distance) LVAs A2C – Left Ventricle Systolic area 2 Chambers (Trace + Distance)

- The results are calculated gradually when the measurements are taken for each cardiac view without the need to complete all measurements.

8. Cardiac and Pediatric Cardiac Measurements

Table 8–5 Cardiac and Pediatric Cardiac Measurements in M-Mode

Measurement	Description	Input Measurement (method)
Left Ventricle	Left Ventricle	RVIDd – Right Ventricle Diameter diastole (Distance) IVSd – Intravascular Septum diastole (Distance) LVIDd – Left Ventricle Diameter diastole (Distance) LVPWd – Left Ventricle Post Wall diastole (Distance) IVSs – Intravascular Septum systole (Distance) LVIDs – Left Ventricle Diameter systole (Distance) LVPWs – Left Ventricle Post Wall systole (Distance) Flow Prop Vel – Flow Propagation Velocity (Time) Sept-PW Delay – Septum-Posterior Wall delay (Time)
Aorta/LA	Aorta and Left Atrium ratio	Ao Diam – Aortic diameter (Distance) LA – Left atrium diameter (Distance) AV Open – Aortic Valve opening (Distance) LVET – Left Ventricle Ejection time (Distance) Ao PEP – Aortic Pre Ejection Period (Time) PEP/ET – Pre Ejection Period and Ejection Time ratio (Time) R-R – R-R interval (Distance) AV Coapt Line – Aortic Valve Coaptation line (Distance)
MV	Mitral Valve	EPSS – E Septum (Distance) E-F Slope (Velocity) MAPSE – Displacement of the mitral annulus (Distance)
TV	Tricuspid	TAPSE – Displacement of the tricuspid annulus (Distance)
IVC	Inferior Vena Cava	IVC max Diam – Inferior Vena Cava maximum diameter (Distance) IVC min Diam – Inferior Vena Cava minimum diameter (Distance)
Event timing	Valve Event Markers	MV Open – Mitral Valve Opening (Distance) MV Close – Mitral Valve Closure (Distance) AV Open – Aortic Valve Opening (Distance) AV Close – Aortic Valve Closure (Distance)
Mitral Valve Event Markers	Mitral Valve Event Markers	Refer to Table 8–6 <i>Cardiac and Pediatric Cardiac Measurements in Doppler</i>
Aortic Valve Event Markers	Aortic Valve Event Markers	Refer to Table 8–6 <i>Cardiac and Pediatric Cardiac Measurements in Doppler</i>

Table 8–6 Cardiac and Pediatric Cardiac Measurements in Doppler

Measurement	Description	Input Measurement (method)
MV E/A	Mitral Valve	MV VTI – Mitral Valve flow Velocity Time Integral (Profile) MV E Vel – Mitral Valve E wave peak velocity (Caliper) MV A Vel – Mitral Valve A wave peak velocity (Caliper) MV PHT – Mitral Valve PHT (Caliper) MV Acc Time – Mitral Valve E wave acceleration time (Time) MV Dec Time – Mitral Valve E wave deceleration time (Time) IVRT – Mitral isovolumetric relaxation time (Time) MV IVCT – Mitral isovolumetric contraction time (Time) A Duration – A wave duration (Time) LVET – Ejection time (Time)
MR	Mitral Regurgitation	MR Vmax – Mitral regurgitation velocity (Caliper) MR dP/dt – Mitral regurgitation dP/dt (Time)
PISA MR	PISA Mitral Regurgitation	MR Radius – Mitral Regurgitation Radius (Distance) MR VTI – Mitral Regurgitation flow Velocity Time Integral (Profile) MR Alias Vel – Mitral Regurgitation Aliasing Velocity ^[1]

8. Cardiac and Pediatric Cardiac Measurements

Table 8–6 Cardiac and Pediatric Cardiac Measurements in Doppler (cont'd.)

Measurement	Description	Input Measurement (method)
Mitral TDI	Mitral TV	e' – Mitral peak velocity E' wave (Caliper) a' – Mitral peak velocity A' wave (Caliper) e' Sept – Septal E' Wave (Caliper) a' Sept – Septal A' Wave (Caliper) e' Lat – Lateral E' Wave (Caliper) a' Lat – Lateral A' Wave (Caliper) IVRT_tdi – Mitral isovolumetric relaxation time (Time) IVCT_tdi – Mitral isovolumetric contraction time (Time) T to Onset A4C-S – Time to onset 4AC septum (Time) T to Onset A4C-LW – Time to onset 4AC posterior wall (Time) T to Peak A4C-Sept – Time to peak 4AC septum (Time) T to Peak A4C-L Wall – Time to peak 4AC lateral wall (Time) T to Onset A2C-AW – Time to onset 2AC anterior wall (Time) T to Onset A2C-IW – Time to onset 2AC inferior wall (Time) T to Peak A2C-A Wall – Time to peak 2AC anterior wall (Time) T to Peak A2C-I Wall – Time to peak 2AC Inferior wall (Time) LVET_tdi – Ejection time (Time) LIMP_tdi – Ejection time (Time)
Mitral Annulus TDI	Mitral Annulus Tissue Doppler	s' Lat – Lateral S' Wave (Caliper) e' Lat – Lateral E' Wave (Caliper) a' Lat – Lateral A' Wave (Caliper) s' Sept – Septal S' Wave (Caliper) e' Sept – Septal E' Wave (Caliper) a' Sept – Septal A' Wave (Caliper) IVRT_tdi – Mitral isovolumetric relaxation time (Time) IVCT_tdi – Mitral isovolumetric contraction time (Time) LVET_tdi – LVET flow profile (Time) T to Peak A4C-S – Time to peak 4AC septum (Time) T to Peak A4C-LW – Time to peak 4AC lateral wall (Time) T to Peak A2C-AW – Time to peak 2AC anterior wall (Time) T to Peak A2C-IW – Time to peak 2AC Inferior wall (Time)
MVA (VTI)	Mitral Valve Area	MV VTI – Mitral Valve flow profile (Profile) LVOT VTI – LVOT flow profile (Profile) LVOT Diam – LVOT diameter (Distance)
Aorta	Aorta	AV VTI – Aortic flow profile (Profile)
AVA (VTI)	Aortic Effective Valve Area	AV VTI – Aortic flow profile (Profile) AV Vmax – Aortic peak velocity (Caliper) LVOT VTI – LVOT flow profile (Profile) LVOT Vmax – LVOT peak velocity (Caliper) LVOT Diam – LVOT diameter (Distance)
AR	Aortic Regurgitation	AR PHT – AO regurgitation PHT (Caliper)
Ao desc	Descending Aorta	Ao desc Vmax – Descending aorta systolic peak velocity (Caliper) Pat Duct A – Patent ductus artery (Caliper)
PISA AR	PISA Aortic Regurgitation	AR Flow – Aorta regurgitation radius (Distance) AR VTI – Aorta regurgitation profile (Profile) AR Alias Vel – Aorta aliasing velocity ^[1]
LVOT VTI	LVOT VTI	LVOT Vmax – LVOT peak velocity (Profile) LVOT VTI – LVOT flow profile (Caliper)
TV	Tricuspid Valve	TV VTI – Tricuspid flow profile (Profile) TV E Vel – Tricuspid velocity E wave (Caliper) TV A Vel – Tricuspid velocity A wave (Caliper)
TR	Tricuspid Regurgitation	TR Vmax – Tricuspid regurgitation velocity (Caliper)
Pulmonary Vein	Pulmonary Vein	PVein S Vel – Pulmonary veins systolic velocity (Caliper) PVein D Vel – Pulmonary veins diastolic velocity (Caliper) PVein A Vel – Pulmonary veins atrial velocity (Caliper) PVein A Dur – Pulmonary veins A wave duration (Time)
Pulmonary A	Pulmonary Artery ^[2]	PA VTI – Pulmonary flow profile (Profile) PA Vmax – Pulmonary peak velocity (Caliper) Ao PEP – Aortic pre-ejection time (Time) PA PEP – Pulmonary pre-ejection time (Time)

8. Cardiac and Pediatric Cardiac Measurements

Table 8–6 Cardiac and Pediatric Cardiac Measurements in Doppler (cont'd.)

Measurement	Description	Input Measurement (method)
PR	Pulmonary Regurgitation	PR PHT – Pulmonary regurgitation PHT (Caliper) PR Vmax – Pulmonary protodiastolic velocity (Caliper) PR end diast Vmax – Pulmonary end-diastolic velocity (Caliper)
CO (LVOT)	Cardiac Output - LVOT	LVOT VTI – LVOT flow profile (Profile) R-R – R-R interval (Time) LVOT Diam – LVOT diameter (Distance)
CO (Ao)	Cardiac Output - Aorta	AV VTI – Aortic flow profile (Profile) R-R – R-R interval (Profile) Ao Diam – AO diameter (Profile)
CO (Pulm flow)	Cardiac Output - Pulmonary	PA VTI – Pulmonary flow profile (Profile) R-R – R-R interval (Time) PA Diam – Pulmonary diameter (Distance)
Qp/Qs	Qp/Qs	PA VTI – Pulmonary flow profile (Profile) R-R – R-R interval (Time) PA Diam – Pulmonary diameter (Distance) LVOT VTI – LVOT flow profile (Profile) R-R – R-R interval (Time) LVOT Diam – LVOT diameter (Distance)
Event timing	Valve Event Markers	MV Open – Mitral valve opening (Time) MV Close – Mitral valve closure (Time) AV Open – Aortic valve opening (Time) AV Close – Aortic valve closure (Time)
Coronary Cardiac	Coronary Cardiac	Rest LAD Prox – Proximal left anterior descending coronary artery - Rest (Distance) Rest LAD Mid – Medial left anterior descending coronary artery - Rest (Distance) Rest LAD Dist – Distal left anterior descending coronary artery - Rest (Distance) Post LAD Prox – Proximal left anterior descending coronary artery - Post (Distance) Post LAD Mid – Medial left anterior descending coronary artery - Post (Distance) Post LAD Dist – Distal left anterior descending coronary artery - Post (Distance)
Tricuspid Annulus TDI	Tricuspid Annulus Doppler	TV s' – Tricuspid Valve S' Wave (Caliper) TV e' – Tricuspid Valve E' Wave (Caliper) TV a' – Tricuspid Valve A' Wave (Caliper)
PISA TR	PISA Tricuspid Regurgitation	TR Radius – Tricuspid Regurgitation Radius (Distance) TR VTI – Tricuspid Regurgitation profile (Profile) TR Alias Vel – Tricuspid Regurgitation Alias Velocity ^[1]
Pulmonary Capillary Wedge Pressure	Pulmonary Capillary Wedge Pressure	MV E Vel – Mitral peak velocity - E wave (Caliper) e' Lat – Lateral E' Wave (Caliper)
CO-MV	Cardiac Output Mitral Valve	MV VTI – Mitral Valve flow Velocity Time Integral (Profile) MV Annulus Diam (Distance) MV Annulus Area (Trace)
Mitral Valve Event Markers	Mitral Valve Event Markers	MV Open – Mitral Valve Opening (Distance) MV Close – Mitral Valve Closure (Distance)
Aortic Valve Event Markers	Aortic Valve Event Markers	AV Open – Aortic Valve Opening (Distance) AV Close – Aortic Valve Closure (Distance)

1. Select PISA Method for Aliasing Velocity (Als Vel) from the drop-down menu among: Manual Entry Aliasing Velocity, Automatic Top Aliasing Velocity, Automatic Bottom Aliasing Velocity
2. The group requires to enter the pressure gradient (5, 10 or 15); refer further in this section for the formula of pressure.

* means that the measurement is not directly measured, but it is derived from RVPs measurement performed in Tricuspid Regurgitation group.

8.4. Automatic Left Ventricle Measurements

IVSd, LVIDd, LVPWd, IVSs, LVIDs and LVPWs measurements can be automatically executed on B-Mode parasternal long axis view of the heart.

To enable the feature, press **MENU**, select **MEASURE**, then access **ADVANCED** tab and check **ENABLE LV AUTOMATIC CARDIAC**.



WARNING

Automatic measurements should not be considered sufficient to make a diagnosis. Users are responsible for the results of automatic measurements and must inspect and approve the data that is being used before formulate a diagnosis.

NOTE

Automatic Left Ventricle Measurements require a dedicated licence.

Procedure

1. Select a diastolic frame of parasternal long axis view of the heart in B-Mode.
2. Press **MEASURE** and select **LV DIMENSIONS** then **LEFT VENTRICLE**, IVSd, LVIDd and LVPWd measures are automatically performed.
3. Four calipers are placed on image: the last caliper of IVS is the first caliper LVID and the last caliper of LVID is the first caliper of LVPW. Now you can:
 - Modify the position of the calipers, pressing **ACTION** and moving the trackball. Each press of **ACTION** cycles the calipers selection. The trackball is linked to the selected caliper that becomes yellow.
 - Refuse the automatic measurement and switch to manual measurements, pressing **UNDO**.
 - Confirm the automatic measurement, pressing **ENTER**.
4. Select a systolic frame of parasternal long axis view of the heart in B-Mode.
5. Press **MEASURE** or **ENTER**, IVSs, LVIDs and LVPWs measures are automatically performed.
6. Four calipers are placed on image: the last caliper of IVS is the first caliper LVID and the last caliper of LVID is the first caliper of LVPW. Now you can:
 - Modify the position of the calipers, pressing **ACTION** and moving the trackball. Each press of **ACTION** cycles the calipers selection. The trackball is linked to the selected caliper that becomes yellow.
 - Refuse the automatic measurement and switch to manual measurements, pressing **UNDO**.
 - Confirm the automatic measurement and save it in the report, pressing **ENTER**.

8.5. Automatic Ejection Fraction

Automatic Ejection Fraction (Auto EF) is an automatic tool to calculate the Ejection Fraction on:

- frozen clips acquired with the ECG trace,
- archived clips acquired with the ECG trace and saved in raw data format.

Values of ejection fraction obtained by automatic measurements are intended as a suggestion and should not be considered sufficient to make a diagnosis.



WARNING

Automatic measurement results are intended as a suggestion and should not be considered sufficient to make a diagnosis.

NOTE

The Automatic Ejection Fraction calculation is available in Adult Cardiac application and it requires a specific licence (Auto EF licence).

NOTE

The Automatic Ejection Fraction calculation strongly depends on the quality of the 2D images and on their temporal resolution (frame rate).

NOTE

Improper or suboptimal acquisition of apical four chamber (A4C) and apical two chamber (A2C) views might lead to significant underestimation of the Left Ventricular End Diastolic and End Systolic Volumes.

NOTE

During imaging acquisition make sure to avoid plane positioning errors, which can lead to chamber foreshortening.

NOTE

Please refer to Tab.1 Recommendation for the echocardiographic assessment of LV size and function “Recommendations for Cardiac Chamber Quantification by Echocardiography in Adults: An Update from the American Society of Echocardiography and the European Association of Cardiovascular Imaging” Roberto M. Lang et al, J Am Soc Echocardiogr 2015; 28:1-39.

8.5.1. Auto EF calculation with Scan Plane Detection enabled

Scan Plane Detection allows to automatically recognize the cardiac projection before entering in Auto EF.

To enable the feature, press **MENU**, select **MEASURE**, then access **ADVANCED** tab and check **ENABLE CARDIO SCAN PLANE**.

Procedure to perform Auto EF calculation on frozen clips

1. Acquire a Cardiac image with ECG trace.
2. Press **FREEZE**.
3. Select the desired cardiac cycle.
4. Press **MEASURE**.
5. Select the tab **VOLUME (EF LV)** on the touchscreen.
6. Select **AUTO EF - BIPLANE** as measurement: **MyLab** automatically recognizes projection view and processes the clip.
7. After a short processing time the Automatic Ejection Fraction calculation is done. Refer to the paragraph “After Calculation” for information on how to correctly manage the results.

Procedure to perform Auto EF calculation on archived clips

1. Select from the archive a clip acquired with the ECG trace and saved in raw data format (those clips are identified as thumbnails with green counter and heart superimposed).
2. Select the desired cardiac cycle.
3. Press **EDIT**;
4. Press **MEASURE**.
5. Select the tab **VOLUME (EF LV)** on the touchscreen.
6. Select **AUTO EF - BIPLANE** as measurement: **MyLab** automatically recognizes projection view and processes the clip.
7. After a short processing time the Automatic Ejection Fraction calculation is done. Refer to the paragraph “After Calculation” for information on how to correctly manage the results.

8.5.2. Auto EF calculation with Scan Plane Detection disabled

The Automatic Ejection Fraction calculation can be performed both on frozen and on archived clips.

The Automatic Ejection Fraction calculation can be performed only on apical four chamber (A4C) and two chamber (A2C) views.

Procedure to perform Auto EF calculation on frozen clips

1. Acquire a Cardiac image with ECG trace.
2. Press **FREEZE**.
3. Select the desired cardiac cycle.
4. Press **MEASURE**;
5. Select the tab **VOLUME (LVEF)** on the touchscreen.
6. Select **AUTO EF - BIPLANE** as measurement;
7. Tap **A4C** or **A2C** to select the correct projection.
8. After a short processing time the Automatic Ejection Fraction calculation is done. Refer to the paragraph “After Calculation” for information on how to correctly manage the results.

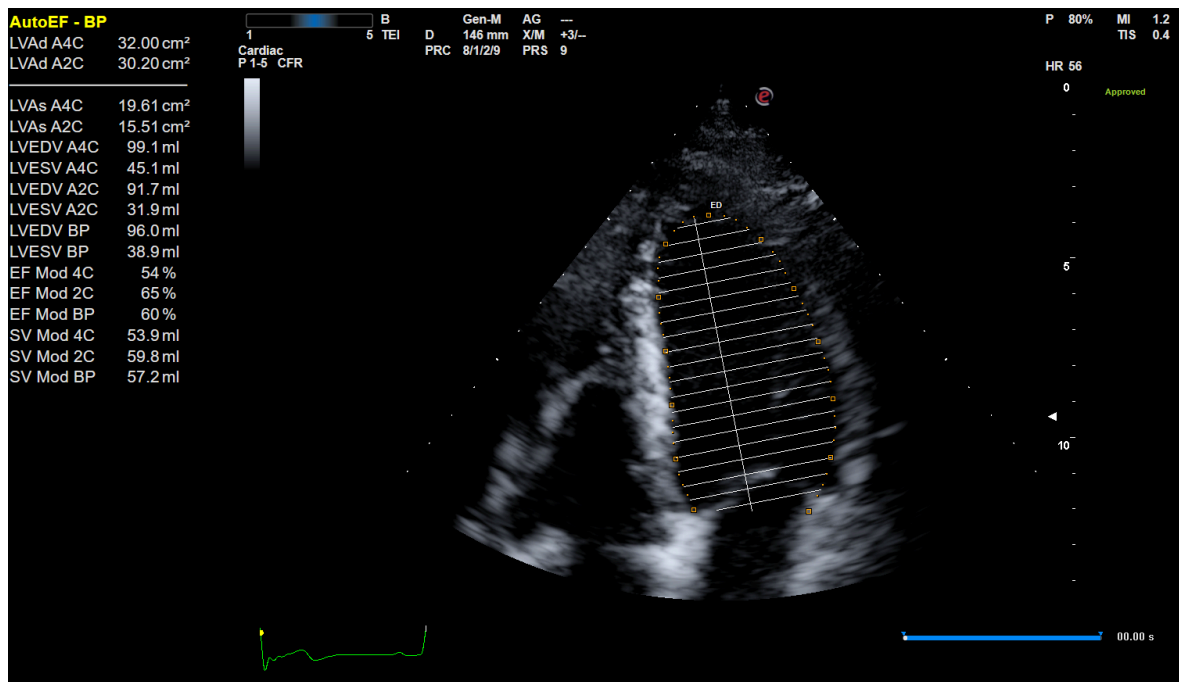
Procedure to perform Auto EF calculation on archived clips

1. Select from the archive a clip acquired with the ECG trace and saved in raw data format (those clips are identified as thumbnails with green counter and heart superimposed).
2. Select the desired cardiac cycle.
3. Press **EDIT**;
4. Press **MEASURE**.
5. Select the tab **VOLUME (LVEF)** on the touchscreen.
6. Select **AUTO EF - BIPLANE** as measurement.
7. Tap **A4C** or **A2C** to select the correct projection.
8. After a short processing time the Automatic Ejection Fraction calculation is done. Refer to the paragraph “After Calculation” for information on how to correctly manage the results.

8.5.3. After Calculation

When the Ejection Fraction has been automatically calculated, the results are displayed on the left side of the screen, the End Diastolic frame automatically contoured is also displayed and the touchscreen provides the following controls.

Fig. 8-2 Automatic Ejection Fraction calculation



NOTE

The End Diastolic frame has to be selected carefully before activating Auto EF. An inadequate selection of the End Diastolic frame can lead to underestimation of End Diastolic volumes and EF.

NOTE

Carefully verify the endocardial border tracking and make sure that papillary muscles are excluded from the cavity in the tracing. In case of incorrect or suboptimal endocardial border tracking, adjust the tracking point and process the data again.

A4C	Tap the key to update the calculation for apical four chamber (A4C) or two chamber (A2C) views.
A2C	
ED	moves the clip to the End Diastolic frame.
ES	moves the clip to the End Systolic frame.
ED FRAME	Rotate the knob to move the End Diastolic frame. Press it to repeat the reprocessing with new position.
ES FRAME	Rotate the knob to move the End Systolic frame. Press it to repeat the reprocessing with new position.
MANUAL CONTOUR	allows to trace the contour manually.

MODIFY CONTOUR-ED

MODIFY CONTOUR-ES

If the contour automatically traced by **MyLab** for End Diastolic and End Systolic is not satisfying, you can modify it. Tap **ED** to move to the End Diastolic frame then tap **MODIFY CONTOUR-ED** to modify the End Diastolic contour. Tap **ES** to move to the End Systolic frame then tap **MODIFY CONTOUR-ES** to modify the End Systolic contour. With the trackball as pointer select an anchor point on the edge of the wall (small squares) and drag it in the new position. Calculation is immediately updated.

MODIFY FRAME-ED

MODIFY FRAME-ES

If the frames automatically selected by **MyLab** for End Diastolic and End Systolic are not satisfying, you can change them. Tap **ED** then move to the End Diastolic frame you want to select and tap **MODIFY FRAME-ED** to set it as End Diastolic. Tap **ES** then move to the End Systolic frame you want to select and tap **MODIFY FRAME-ES** to set it as End Systolic. Calculation is updated in real-time discharging frames not included in the new defined clip. Tap **A4C** or **A2C** to repeat the calculation including them again.

DUAL

displays both End Diastolic and End Systolic frames side by side.

PLAY

STOP

PLAY and **STOP** share the same button. **PLAY** shows the sequence of stored images in cine mode while **STOP** stops the cine presentation of the clip.

FRAME

Rotate the knob to move the clips frame by frame. You can scroll the frame with the trackball.

APPROVE

exits the calculation attaching the calculated parameters to the report.

DISCARD

resets the calculation.

9. GYNECOLOGIC MEASUREMENTS

This chapter describes the Application Measurements available for Gynecology application and includes the following topics:

9.1 *Application Data*

9.2 *Available Gynecologic Measurements*

9.3 *Gynecology Worksheet Organization*

9.1. Application Data

Fig. 9–1 Gynecology Patient ID Page

Table 9–1 Additional data in Gynecology Patient ID page

Field	Description
LMP	Last Menstrual Period (date of the last menstruation) Once input, MyLab automatically calculates the cycle's day.
POST MENO-PAUSE	If in menopause.

9.2. Available Gynecologic Measurements

The tables below list the Application Measurements available for the Gynecology application in each mode.

9. Gynecologic Measurements

Calculation results are automatically computed once all the Input Measurements have been completed.

You can customize the Application Measurements package to adapt it to your work-flow: the touchscreen will display only the set measurements.

Refer to Appendices for formulas and bibliographic references.

Table 9–2 Measurement table legenda

Measurement	Description	Input Measurement (method)
This column contains the measurement name as it appears on the touchscreen and in the measurement configuration menu	This column contains a description of the measurement to be taken	This column lists each single measurement you have to perform to get the final result and in brackets the procedure method to follow in order to take the related measurement. Refer to paragraph 1.3 <i>How to take measurements</i>

Table 9–3 Gynecologic Measurements in B-Mode

Measurement	Description	Input Measurement (method)
Uterus Volume	Uterus Volume	Length (Vertex) Height (Distance) Width (Distance)
Endometrium	Endometrium length	Endometrium (Distance)
Cervix Length	Cervix Length	Cervix Length (Vertex)
Fibroma #	Fibroma Mass	Length (Distance) Height (Distance) Width (Distance)
R Ovary Volume	Right Ovary Volume ^[1]	Length (Distance) Height (Distance) Width (Distance)
R Follicles Diam	Right Follicles Diameter ^[1]	RA (Distance) ^[2]
R Follicles 2–Diam	R Follicles 2–Diameters ^[1]	RA (Distance) ^[2]
R Mass #	Right Mass ^[1]	Length (Distance) Height (Distance) Width (Distance)
Bladder Volume	Bladder Volume	Diameter 1 (Distance) Diameter 2 (Distance) Diameter 3 (Distance)
Fetal Mass Volume #	Fetal Mass Volume	Length (Distance) Height (Distance) Width (Distance)

1. The measurement is bilateral.
2. Many diameters can be measured at the same time, each of them is labeled with a different letter.

Table 9–4 Gynecologic Measurements for the lower limbs in Doppler

Measurement	Description	Input Measurement (method)
R Uterine A VTI	Right Uterine Artery VTI ^[1]	VTI (Profile) ^[2]
R Ovary A VTI	Right Ovarian Artery VTI ^[1]	VTI ^[2] (Profile)

Table 9–4 Gynecologic Measurements for the lower limbs in Doppler (cont'd.)

Measurement	Description	Input Measurement (method)
R Uterine A	Right Uterine Artery Peak Velocity ^[1]	PSV (Velocity) ^[3] EDV (Velocity) ^[4]
R Ovary A	Right Ovarian Artery Peak Velocity ^[1]	PSV ^[3] (Velocity) EDV ^[4] (Velocity)

1. The measurement is bilateral.
2. VTI = Velocity Time Integral
3. PSV = Peak Systolic Velocity
4. EDV = End Diastolic Velocity

9.3. Gynecology Worksheet Organization

Here are described the additional fields dedicated to the Gynecology Worksheet.

9.3.1. Structure Evaluation

The worksheet, besides displaying the single measurements, also allows the insertion of an evaluation of the structures under exam. The following evaluations are available with the measurements.

Table 9–5 Evaluations in Gynecology

Group	Parameter	Evaluation
UTERUS VOLUME	Uterus position	Median, L Lateroflexed, R Lateroflexed
	Version	Normoflexed, Retroflexed, Movable
FIBROMA	Mass kind	Fibroma, Adenomyosis, Endometrial polyp, Sarcoma
	Characteristics	Intramural, Subserous, Submucous, Pediculate, Intracavitary, Intramural-subserous, Intramural-submucous, Subserous -submucous
	Site	Anterior, Posterior, L Lateral, R Lateral, Fundus, Isthmic
OVARY VOLUME	Corpus Luteum	Yes, No
OVARY MASS	Characteristics	Unilocular, Unilocular-solid, Multilocular, Multilocular-solid, Solid

Evaluations can also be added from Measurement environment tapping **EVALUATE** and then selecting the group.

10. OBSTETRIC MEASUREMENTS

This chapter describes the Application Measurements available for OB-Fetal application and includes the following topics:

10.1 *Application Data*

10.2 *Available Obstetric Measurements*

10.3 *Obstetric Worksheet Organization*

10.4 *Obstetric Measurement Set Up*

10.1. Application Data

Fig. 10–1 Obstetrics Patient ID Page

Table 10–1 Additional data in Obstetric Patient ID page

Field	Description
LMP	Last Menstrual Period (date of the last menstruation)
DOC	Date of conception. It can be set as an alternative to LMP by checking the corresponding radio button
DATE OF FIRST DGA	Date when the first DGA has been estimated
FIRST DGA	Diagnostic gestational age estimated at the first exam
EDD	Expected Delivery Date based on LMP or DGA values
GA	Gestational Age based on LMP or DGA values

Table 10–1 Additional data in Obstetric Patient ID page (cont'd.)

Field	Description
GRAVIDA	Number of pregnancies
PARA	Number of births
ABORTA	Number of aborta
ECTOPIC	Ectopic pregnancies

10.1.1. “Gestational Age By” Area

The Expected Delivery Date and Gestational Age can be automatically estimated either from LMP/DOC date or from First DGA: the two radio buttons, displayed on the left side of this area, alternatively enable one of two criteria.

Once selected the criteria and input the data, **MyLab** automatically calculates both the expected delivery date and the diagnostic gestational age.

When the LMP/DOC criteria is selected, both EDD and DGA parameters can be directly entered: **MyLab** accordingly updates the LMP/DOC date.

When the First DGA criteria is selected, LMP/DOC date can be directly entered by the operator: this date is shown in the report but not used for the estimation of both EDD and GA parameters.

10.1.2. Formulas for Expected Delivery Date (EDD)

From LMP

$EDD = LMP \text{ (date)} + 280 \text{ days (or 290 days depending on the setting)}$

$GA = Exam \text{ date} - LMP \text{ (date)}$

From DOC

$EDD = DOC \text{ (date)} + 280 \text{ days (or 290 days depending on the setting)} - 14 \text{ days}$

$GA = Exam \text{ date} - DOC \text{ (date)} + 14 \text{ days}$

From DGA

$GA = Exam \text{ date} - First \text{ DGA date} + First \text{ DGA}$

$EDD = Exam \text{ date} + 280 \text{ days (or 290 days depending on the setting)} - First \text{ DGA}$

10.2. Available Obstetric Measurements

The tables below list the Application Measurements available for the Obstetric application in each mode.

Calculation results are automatically computed once all the Input Measurements have been completed.

You can customize the Application Measurements package to adapt it to your work-flow: the touchscreen will display only the set measurements.

Refer to 9 *Gynecologic Measurements* chapter for mother measurements not described here.

Refer to Appendices for formulas and bibliographic references.

Refer to “Obstetrics and Gynecology Tables Section” for tables used in Obstetric measurements.

Table 10–2 Measurement table legenda

Measurement	Description	FG Table Bibliography	FA Table Bibliography	Input Measurement (method)
This column contains the measurement name as it appears on the touchscreen and in the measurement configuration menu	This column contains a description of the measurement to be taken	This column contains the list of bibliographic references (if any) that can be selected in the obstetrics measurement configuration menu to estimate the Fetal Growth (FG)	This column contains the list of bibliographic references (if any) that can be selected in the obstetrics measurement configuration menu to estimate the Fetal Age (FA)	This column lists each single measurement you have to perform to get the final result and in brackets the procedure method to follow in order to take the related measurement. Refer to paragraph 1.3 <i>How to take measurements</i>

NOTE

In B-Mode both fetal age (FA) and fetal growth (FG) can be estimated while in Doppler fetal growth (FG) only can be estimated.

NOTE

For distance measurements in Obstetric application two different calipers can be used: +...+ caliper or >...< caliper. You can select your preference in the advanced section of the OB measure editor.

10. Obstetric Measurements

Table 10–3 Obstetric Measurements in B-Mode

Measurement	Description	FG Table Bibliography	FA Table Bibliography	Input Measurement (method)
BPD ^[1]	Biparietal Diameter	Hadlock84 CFEF Jeanty Chitty O-O Nicolaides JSUM 2001 Osaka U Merz Paladini CFEF 06 Intergrowth-21	Hadlock 84 Hadlock Jeanty Hansmann Chitty O-O Rempen Osaka U JSUM 2001 Merz	Distance
HC ^[1]	Head Circumference	Chitty Hadlock84 CFEF Jeanty Nicolaides Merz Paladini CFEF 06 Intergrowth-21	Hadlock 84 Hansmann Chitty Merz	Perim (Ellipse Axes) Perim (Trace)
AC ^[1]	Abdominal Circumference	Hadlock84 CFEF Jeanty Chitty Nicolaides JSUM 2001 Merz Paladini CFEF 06 Intergrowth-21	Hadlock 84 Hansmann JSUM 2001 Merz	Perim (Ellipse Axes) Perim (Trace)
FL ^[1]	Femur Length	Hadlock84 CFEF Jeanty Nicolaides Chitty JSUM 2001 Osaka U Merz Paladini CFEF 06 Intergrowth-21	Hadlock 84 Jeanty Hansmann Chitty JSUM 2001 Osaka U Merz	Distance
OFD	Occipit Frontal Diameter	Jeanty Nicolaides Chitty Merz Intergrowth-21	Hansmann	Distance
CRL ^[1]	Crown-Rump Length	Hadlock Osaka U Hansmann JSUM 2001 Robinson	Hadlock Osaka U Hansmann JSUM 2001 Rempen Robinson	Distance
GS	Gestational Sac Diameter	Rempen	Hansmann Rempen	Distance
HL ^[1]	Humerus Length	Jeanty Osaka U Merz Paladini	Jeanty Osaka U	Distance
UL ^[1]	Ulna Length	Jeanty Merz Paladini	Jeanty	Distance
TL ^[1]	Tibia Length	Jeanty Merz Paladini	Jeanty	Distance

Table 10–3 Obstetric Measurements in B-Mode (cont'd.)

Measurement	Description	FG Table Bibliography	FA Table Bibliography	Input Measurement (method)
EFW	Estimated Fetal Weight	Hadlock CPEF-15 Intergrowth-21	-	Formula Refer to 10.2.3 <i>Estimated Fetal Weight and Growth</i>
TCD	Transverse Cerebellum Diameter	Goldstein Nicolaidis	Goldstein Hill	Distance
AFI	Amniotic Fluid Index	Moore Cayle	-	Formula Refer to 10.2.4 <i>Amniotic Fluid Index</i>
Fib L ^[1]	Fibula Length	-	-	Distance
RL ^[1]	Radio Length	-	-	Distance
TAD	Transverse Adbominal Diameter	-	-	Distance
CM	Cisterna Magna	-	-	Distance
APTD×TTD	Anterior Posterior Trunk Diameter x Transverse Trunk Diameter	-	-	Formula Refer to 10.2.5 <i>AP×T</i>
FTA	Fetal Trunk Sect A	Osaka U	Osaka U	Area (Ellipse Axes) Area (Trace)
BOD	Binocular Distance	-	-	Distance
TTD	Transverse Trunk Diameter	-	-	Distance
APTD	Anterior Posterior Trunk Diameter	-	-	Distance
NT	Nuchal Translucency (manual)	-	-	Distance
APAD	Anterior-Posterior Adbominal Diameter	-	-	Distance
Clav L	Clavícula Length	-	-	Distance
Vert L	Vertebra Length	-	-	Distance
Foot L	Foot Length	-	-	Distance
NBL	Nose Bone Length	-	-	Distance
TC	Thoracic Circumference	-	-	Perim (Ellipse Axes) Perim (Trace)
NF	Nuchal Fold	-	-	Distance
Lat V	Lateral Ventricle	-	-	Distance
IOD	Interorbital Diameter	-	-	Distance
OOD	Outer Orbital Diameter	-	-	Distance
Max AD	Maximum Amniotic Diameter	-	-	Distance
Ear L	Ear Length	-	-	Distance
IT	Intracranial Translucency (manual)	-	-	Distance

10. Obstetric Measurements

Table 10–3 Obstetric Measurements in B-Mode (cont'd.)

Measurement	Description	FG Table Bibliography	FA Table Bibliography	Input Measurement (method)
AutoNT	Nuchal Translucency (automatic)	-	-	Auto NT Inner-Inner Auto NT Inner-Middle Refer to 10.2.6 <i>Nuchal Translucency</i>
AutoIT	Intracranial Translucency (automatic)	-	-	Auto IT Inner-Inner Auto IT Inner-Middle Refer to 10.2.7 <i>Intracranial Translucency</i>

- The input can be automatic or manual, refer to the Obstetric Measurement Set Up paragraph further in this chapter

Table 10–4 Obstetric Measurements in M-Mode

Measurement	Description	FG Table Bibliography	FA Table Bibliography	Input Measurement (method)
Fetal Heart Rate	Fetal Heart Rate	-	-	Fetal Heart Rate (Distance)

Table 10–5 Obstetric Measurements in Doppler

Measurement	Description	FG Table Bibliography	FA Table Bibliography	Input Measurement (method)
Mid Cerebral A	Middle Cerebral Artery VTI	RI – Bahlmann RI – JSUM 2001 PI – Bahlmann PI – Ebbing PI – JSUM	-	VTI ^[1]
Umbilical A	Umbilical Artery VTI	RI – JSUM 2001 RI – Kurmanavicius RI – Merz PI – Merz PI – JSUM 2001 PI – Ebbing	-	VTI ^[1]
Aorta	Aorta VTI	PSV – Rizzo	-	VTI ^[1]
TV	Tricuspid Vein VTI	-	-	VTI ^[1]
MV	Mitral Vein VTI	-	-	VTI ^[1]
Pulmonary A	Pulmonary Artery VTI	PSV – Rizzo	-	VTI ^[1]
R Renal A	Right Renal Artery VTI ^[2]	-	-	VTI ^[1]
Fetal Heart Rate	Fetal Heart Rate	-	-	Fetal Heart Rate (Distance)
R Middle Cerebral A	Right Middle Cerebral Artery VTI ^[2]	-	-	VTI ^[1]
Ductus Arteriosus	Ductus Arteriosus	-	-	VTI ^[1]
Ductus Venosus	Ductus Venosus	-	-	VTI ^[1]
Uterine	Uterine Artery VTI	RI – Merz PI – Merz PI – Gomez	-	VTI ^[1]
MCA RI	Middle Cerebral Artery RI	RI – Bahlmann RI – JSUM 2001	-	PSV ^[3] EDV ^[4]
R Uterine A VTI	Right Uterine Artery VTI ^[2]	-	-	VTI ^[1]
R Ovary A VTI	Right Ovary Artery VTI ^[2]	-	-	VTI ^[1]
R Ovary A	Right Ovary Artery ^[2]	-	-	PSV ^[3] EDV ^[4]

Table 10–5 Obstetric Measurements in Doppler (cont'd.)

Measurement	Description	FG Table Bibliography	FA Table Bibliography	Input Measurement (method)
R Uterine A	Right Uterine Artery ^[2]	-	-	PSV ^[3] EDV ^[4]
Spiral A	Spiral Artery VTI	-	-	VTI ^[1]

1. VTI = Velocity Time Integral
2. The measurement is bilateral.
3. PSV = Peak Systolic Velocity
4. EDV = End Diastolic Velocity

10.2.1. Touchscreen Layout in Fetal Age and Fetal Growth

The touchscreen displays the list of measurable parameters, correlated to their bibliographic references.



The bibliographic references associated to a parameter are indicated on the touchscreen key, below the parameter name: the first reference is for fetal growth, the second for fetal age.

Once the measurement has been completed, **MyLab** shows on the left side of the screen the following values:

- the Estimated Fetal Weight (EFW), when the required parameters have been measured,
- the diagnostic gestational age (GA) estimated according to the criteria set on the Patient ID page,
- the parameter under measure,
- when available, the gestational age based on the set reference,
- when available, the ranking (RK) based on the set reference.

FETUS allows the user to associate the measurement to different fetus.

SIDE selects the desired side.

The gestational age can be estimated basing on different bibliographic references that can be selected in the obstetrics measurement configuration menu.

10.2.2. Ratios

Both in fetal age and in fetal growth **MyLab** automatically calculates the following ratios, if the necessary parameters have been previously measured.

Table 10–6 Ratios in B-Mode Obstetric Measurements

Ratio
BPD/OFD (Cephalic Index)
FL/BPD
BPD/FL
FL/AC
HC/AC

10.2.3. Estimated Fetal Weight and Growth

MyLab can automatically estimate Fetal Weight when at least two parameters are measured.

Table 10–7 Parameters used for the estimation of the fetal weight and corresponding bibliographic reference

Parameter	Bibliography
AC, FL	Hadlock 1
HC, AC, FL	Hadlock 2
BPD, AC, FL	Hadlock 3
AC, FL, HC, BPD	Hadlock 4
BPD, TTD	Hansmann 86
BPD, MAD, FL	Persson 1
BPD, MAD	Persson 2
AC, BPD	Shepard 82

The estimated fetal weight growth is calculated basing on Hadlock reference.

10.2.4. Amniotic Fluid Index

In fetal growth the Amniotic Fluid Index (AFI) is calculated from **MyLab** when four quadrants are measured as distances; here below the bibliografic reference.

Table 10–8 Amniotic Fluid Index in B-Mode Obstetric Advanced Measurements

Parameter	Bibliography
AFI	Moore

10.2.5. APxT

If both APTD and TTD distances are performed, the **APxT** is calculated using the following formula:

$$APxX = APTD \cdot TTD$$

10.2.6. Nuchal Translucency

Both in fetal age and in fetal growth **MyLab** allows to measure the Nuchal Translucency (NT) both in manual and automatic way.

While manual NT is a simple measure of distance, the Automatic Nuchal Translucency (Auto NT) measurement is a semi-automated algorithm able to detect the Nuchal Borders lying inside a Region of Interest (ROI) and calculate the most suitable maximum vertical distance.

Detected NT borders are highlighted with an orange overlay only when **MyLab** evaluates a good level of confidence in terms of shape (regular,...).

If the automatic detection is good, the measurement can be added to the report pressing **ENTER**.

If the automatic detection is difficult, you can switch to the manual NT measurement pressing **MANUAL**.



WARNING

Automatic measurements should not be considered sufficient to make a diagnosis. Users are responsible for the results of automatic measurements and must inspect and approve the data that is being used before formulate a diagnosis.

Procedure

The following are the rules to obtain a good Auto NT measurement:

1. Follow AIUM/FMF guidelines: sagittal section, fetus spine on the far field, NT borders perpendicular to Ultrasound insonation.
2. Try to eliminate gray artifacts in the NT liquid (that must be as dark as possible).
3. Position the ROI only on areas where the NT borders are well displayed.
4. Compensate the effect of noise on border detection by **SENSITIVITY**.

A level of the resulting measurement is the average of both diameters.

Auto NT detection method is compliant with the following clinical guidelines:

- K. Nicolaides. The 11-13+6 weeks scan. (Fetal Medicine Foundation, London 2004).
- AIUM Practice Guideline for the Performance of Obstetric Ultrasound Examinations (2013).

and it can be performed following two methods that can be selected at the start of measurement:

- inner - inner
- inner - middle.

10.2.7. Intracranial Translucency

Both in fetal age and in fetal growth **MyLab** allows to measure the Intracranial Translucency (IT) both in manual and automatic way.

The manual IT is a simple measure of the distance between the anterior and posterior echogenic borders of the fourth cerebral ventricle.

The Automatic Intracranial Translucency (Auto IT) measurement is a semi-automated algorithm able to detect the Intracranial Borders lying inside a Region of Interest (ROI) and calculate the most suitable maximum vertical distance.

Detected IT borders are highlighted with an orange overlay only when **MyLab** evaluates a good level of confidence in terms of shape (regular,...).

If the automatic detection is good, the measurement can be added to the report pressing **ENTER**.

If the automatic detection is difficult, you can switch to the manual IT measurement pressing **MANUAL**.



WARNING

Automatic measurements should not be considered sufficient to make a diagnosis. Users are responsible for the results of automatic measurements and must inspect and approve the data that is being used before formulate a diagnosis.

Procedure

The following are the rules to obtain a good Auto IT measurement:

1. Take an image in mid-sagittal plane with fetus perpendicular to Ultrasound insonation.
2. Try to eliminate gray artifacts in the IT liquid (that must be as dark as possible).
3. Position the ROI only on areas where the IT borders are well displayed.
4. Compensate the effect of noise on border detection by **SENSITIVITY**.

A level of the resulting measurement is the average of both diameters.

10.3. Obstetric Worksheet Organization

Here are described the additional fields dedicated to the Obstetric Worksheet.

The obstetrical worksheet includes four folders: measurements, graphics, biophysical profile and survey.

FETUS selects the various fetus and displays the pertaining pages.

When **COMPARE** is set on **ON**, the data of the different fetuses are displayed in a grid-based layout in order to be compared.

10.3.1. Measure Folder

The Measure Folder contains the performed measurements and it is organized in different sub-folders: B-Mode, M-Mode and Doppler (both fetal and mother) sub-folders, the calculations sub-folder and the mother measurements sub-folders.

B-Mode

The Patient ID data are displayed in the first row followed by the estimated fetal weight, when available.

Subsequently the worksheet reports the list of measured parameters and the corresponding measurements. The last columns display the gestational age with its range of applicability and its reference and the percentage rank values with their reference.

When crossed, the AUA (Average Ultrasound Age) column includes the parameter for the computation of the average ultrasound age. The expected delivery date estimated from the AUA is displayed in the first row. The AUA value is displayed in the gestational age graph, available in the Graphics folder.

Calculations

The parameter ratios are displayed in this folder.

10.3.2. Graphics Folder

The performed measurements are displayed on graphs.

The left upper list indicates which parameters can be displayed and their bibliographic references both for gestational age and for fetal growth; you can select the desired one. The graphics of the selected parameter and the corresponding values, displayed below the list, are automatically updated.

The tabs displayed above the graphs allow the user to select the desired graphic, whether in gestational age or in fetal growth.

The weeks are displayed in the X axis and the selected parameter is in the Y axis. The continuous line indicates the reference average value, the dotted lines the standard deviation (or the centiles when in fetal growth).

The dotted vertical line represents the gestational age and the continuous vertical line represents the average ultrasound age, as indicated in the legenda shown in the lower right part of the screen. The gestational age is calculated starting from the set parameter (LMP or FDGA).

Fetal Charts can also be displayed on the touchscreen immediately after a measurement has been performed tapping **OB GRAPH** without the need to access the worksheet.

10.3.2.1. Fetal Trend

Fetal Trend is a graphic representation of the fetal growing along the whole gestational period by using measurements performed on different examinations.

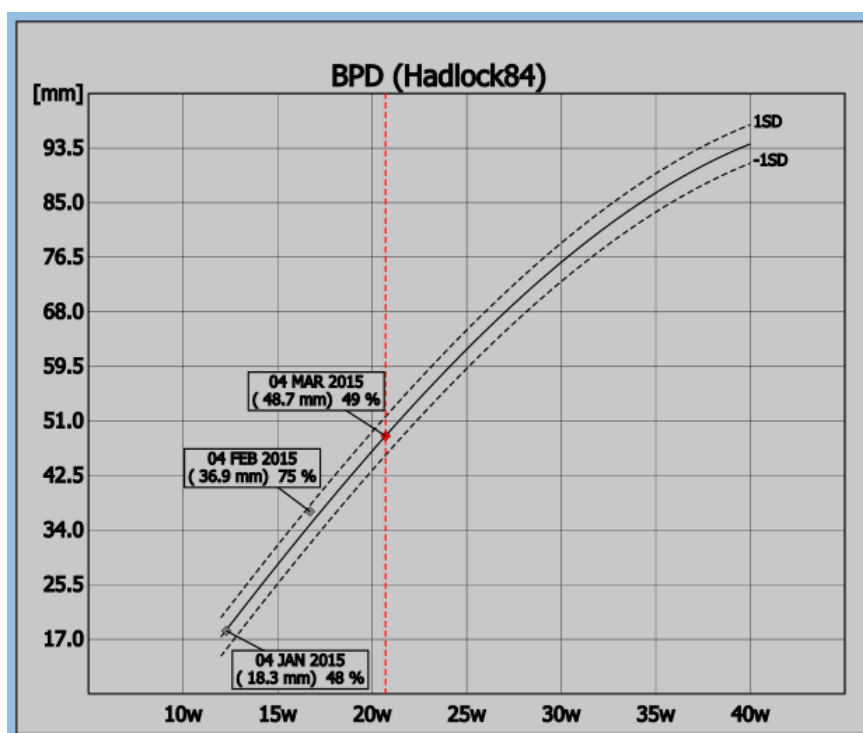
Press **TREND** to activate Fetal Trend, the examinations used for trend and belonging to the same patient are loaded and displayed to the bottom left of the screen in the **SELECTION** box.

The examinations are listed below with the following parameters:

- Patient name,
- Exam Date,
- LMP Date,
- EDD Date.

Each exam reference can be eliminated from the graph deselecting the related checkbox.

Fig. 10–2 OB Fetal trend



The X axis displays the weeks while the Y axis the parameter selected in the upper left part of the screen.

The continuous line indicates the reference average value, the dotted lines the standard deviation (or the percentiles when in fetal growth). The dotted vertical line represents the gestational age also displayed at the bottom-right; the gestational age is calculated starting from the set parameter (LMP or FDGA).

10.3.3. Biophysical Profile Folder

The biophysical profile allows the user to give a numeric evaluation of the following fetal characteristics:

- Fetal breathing movement,
- Fetal body movements,

- Fetal tone,
- Fetal reactivity,
- Qualitative AFV (amniotic flow volume) assessment.

The evaluation can be based on the Manning method or on the Vintzileos method.

10.3.4. Survey Folder

The Survey Folder contains a list of predefined observations for both fetuses and mother:

- Fetal Heart,
- Fetal Abdomen,
- Fetal Head Anatomy,
- Fetal Description,
- Maternal Anatomy.

Fig. 10–3 OB Fetal Survey

Category	Sub-category	Status
Fetal Heart	Four Chambers	Normal
	LVOT	Normal
	RV Outflow Tract	Abnormal
	Aortic Arch	Normal
	Ductal Arch	Normal
	Heart Rhythm	Unable to Evaluate
	Fetal abdomen	All normal
Fetal abdomen	Left Kidney	Normal
	Right Kidney	Normal
	Stomach	Unable to Evaluate
	Bladder Adnexa	Normal
	Bowel	Abnormal
	Fetal Spine	Unable to Evaluate
	Fetal head anatomy	Lateral Ventricle
Cerebellum		Normal
Cisterna Magna		Normal
Upper Lip		Normal
Fetal description		Clear
Fetal Position		Cephalic
Cord Insertion		Peripheral
Fetal description	Fetal Head	Midline
	Placenta Degree	2
	Placenta Location H	Anterior
	Placenta Location V	Fundus
	Maternal Anatomy	All normal
	Cervix	Normal
	Fundus	Normal
Maternal Anatomy	Left Adnexa	Unable to Evaluate
	Right Adnexa	Unable to Evaluate

Beside each observation a drop-down menu allows to select among:

- –, means observation field empty; the empty fields are not sent to the report;
- NORMAL;
- ABNORMAL;
- UNABLE TO EVALUATE.

In addition for each group:

- ALL NORMAL, sets all the observation blocks to normal;
- CLEAR, sets all the observation blocks to empty.

10.4. Obstetric Measurement Set Up

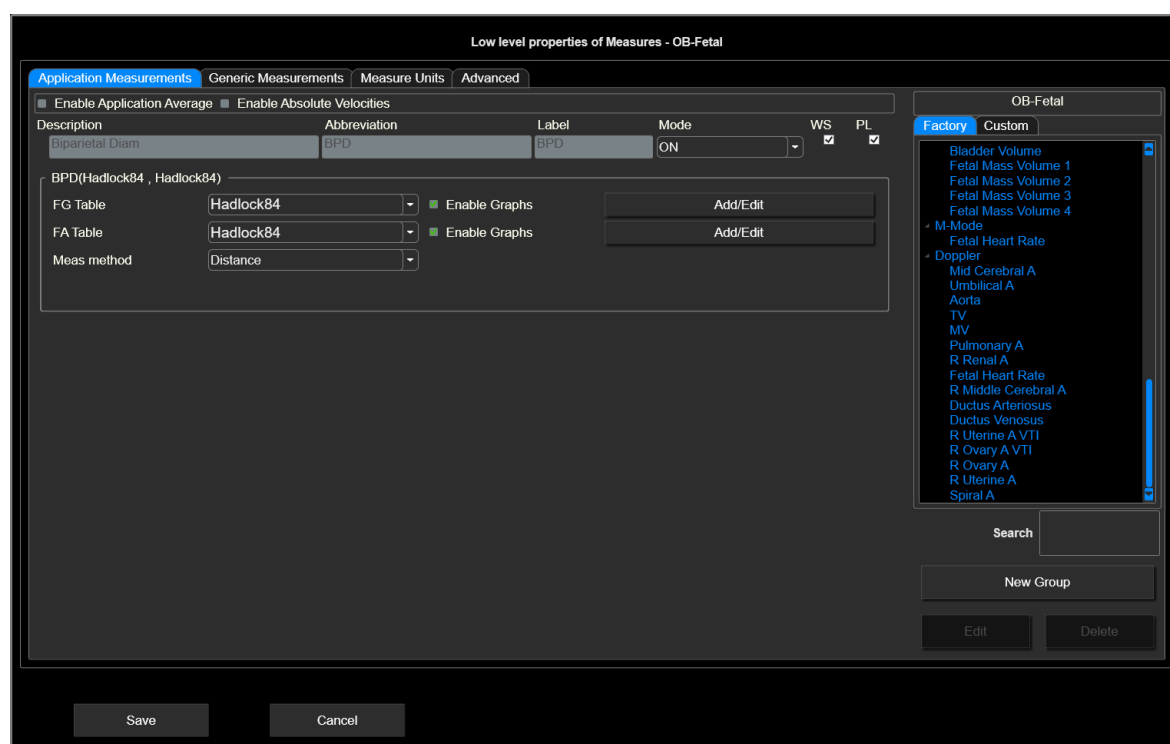
To access the Obstetric Measurement configuration menu press **MENU**, select **MEASURE**, and then double click on **OB-FETAL**. The **APPLICATION MEASUREMENTS** and **ADVANCED** tabs provide specific options for the selected application.

10.4.1. Application Measurements Folder

Here you can set:

- the bibliographic reference both in fetal growth (FG) and in fetal age (FA),
- whether to enable the measurement graphs or not,
- the measurement method,
- the measurement insertion type,
- **ADD/EDIT** custom tables.

Fig. 10-4 OB Custom Table Edit



The **MEASUREMENT METHOD** allows to choose between two different calipers + ... + (DISTANCE) or >...< (DISTANCE >...<) for measurements of distance.

The **MEASUREMENT INSERTION** type allows to choose between **MANUAL** or automatic (**AUTO**) insertion for measurement of AC, BPD, CRL, FIB, FL, HC, HL, RL, TL and UL.

**WARNING**

Automatic measurements should not be considered sufficient to make a diagnosis. Users are responsible for the results of automatic measurements and must inspect and approve the data that is being used before formulate a diagnosis.

NOTE

When AUTO is selected, the measure is not closed till you have confirmed it pressing **ENTER**.

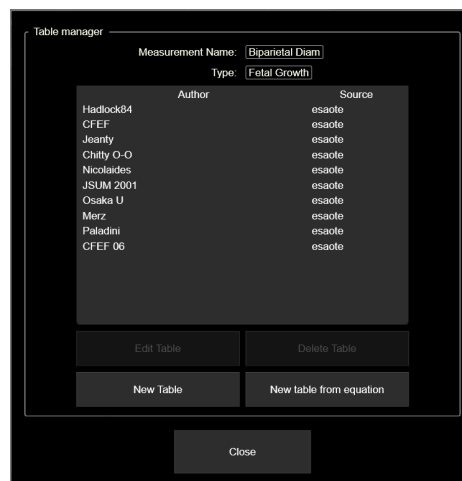
When ENABLE MEASUREMENT OF 3 DIAMETERS is selected, it enables the calculation of GS (gestational Sac) by 3 diameters, instead of a single distance.

10.4.1.1. Adding and Editing OB custom tables

When any B-Mode measurement based on table is selected, you can edit custom tables both in Fetal Growth and in Fetal Age pressing **ADD/EDIT**.

Once one of the buttons has been pressed, **MyLab** displays the following menu that allows to create a custom table:

Fig. 10–5 OB Custom Table Selection



Field	Action
MEASUREMENT NAME	Indicates the selected parameter.
TYPE	Indicates whether in Fetal Age or Fetal Growth.

The menu lists all the factory and custom tables.

EDIT TABLE and **DELETE TABLE** respectively allow to modify and delete the selected custom table.

NEW TABLE button allows to create a new custom table.

NEW TABLE FROM EQUATION button allows to create a new custom table.

CLOSE exits the menu.

When creating (**NEW TABLE**) or editing (**EDIT TABLE**) a custom table **MyLab** displays the following menu:

Fig. 10–6 OB Custom Table Insertion

The configuration menu shows:

- on the upper left side the fields to enter the author and the bibliographic references,
- on the upper right side the fields to set the format, the measure unit, the range and the gestational age,
- on the left side the table where entering values,
- on the right the graph corresponding to the table values.

The custom table can be composed of up to 256 rows each: press **INSERT** to add a new row below the selected one, press **REMOVE** to delete the selected row.

To add a table, follow the procedure below:

Procedure

- Using the alphanumeric keyboard, enter the **AUTHOR** and **BIBLIOGRAPHIC REFERENCE**.

NOTE

The AUTHOR field is mandatory.

- Set the fields:

Field	Values
FORMAT	MIN-MEAN-MAX, MEAN-DEV OR MEAN
MEASURE UNIT	cm or mm

Field	Values
RANGE	SD1, SD2, SD3, 3%-50%-97%, 5%-150%-95% OR 10%-50%-90%
GA	DAY, WEEK OR WEEK+DAY

- Place the cursor on the table column and press **ENTER** to activate the cell.
- Enter the values and press **ENTER** to confirm.
- Repeat the same operations to fill in the whole table.

OK saves the custom table.

NOTE

The custom table will be available for the measurement only after having set a bibliographic reference into the corresponding parameter.

CANCEL exits the menu without saving the custom table.

Identification of Measurements Taken with Custom Tables

Worksheet and Report

When measurements based on custom tables have been performed during the exam, the Author of these measurements is indicated with characters in *Italic*.

10.4.2. Advanced Folder

Here you can set the parameters described in the table below.

Table 10-9 Advanced fields

Field	Action
FETAL HR CYCLES AVERAGE	Sets the number of cardiac cycles to be averaged for fetal HR.
GESTATIONAL PERIOD	Sets the formula for EDD computation.
BIO PROFILE	Sets the method for the biophysical profile evaluation.
MEASUREMENT AREA - ROW 1 MEASUREMENT AREA - ROW 2	Sets the parameter to be displayed on the first and second rows of the measurement area. See below the description of drop-down menu options.
FOLLICLES MEASURED BY	Sets the method for the measurement of follicles by one distance or two distances.
INFO ON SCREEN CAPTION	When checked, it enables the presence of LMP/EDD/GA information on the screen caption.
ENABLE DERIVED HC	When checked, it enables the derived head circumference (HC* in the Report)
ENABLE DERIVED AC	When checked, it enables the derived abdominal circumference (AC* in the Report)

Table 10–9 Advanced fields (cont'd.)

Field	Action
SHOW AUTHOR'S NAME ON MEASURE BUTTON	When checked, it enables the presence of the author's name on the touchscreen button label for the reference Fetal Age/Growth table
ENABLE EDD IN PANEL	When checked, it enables calculated EDD (based on AUA) in measurement panel and worksheet/report.
ENABLE DERIVED OFD	When checked, it enables the derived OFD(HC) that is the measurement of Occipital Frontal Diameter calculated from HC.
OB MEASUREMENT SUGGESTION	When checked, it enables scan plane detection and measurement suggestion on touchscreen. Refer to paragraph 10.4.2.1 <i>Obstetric examination - A.I. guided workflow</i>
AUTOSTART SUGGESTED MEASUREMENTS	When checked, it enables the automatic launch of the suitable measurements for the detected plane. Refer to paragraph 10.4.2.1 <i>Obstetric examination - A.I. guided workflow</i>
REVERSE SCROLL MENU ITEM ORDER	When selected, the list of available measurements is displayed in a reversed order on the screen.

NOTE

HC* is calculated starting from BPD and OFD parameters; AC* is calculated starting from APAD and TAD. In both cases the circumference is drawn on an ellipse having the two measured parameters as axes: for this reason the two parameters have to be orthogonal.

In the Multiple Fetuses area you can select the Sections to be included in the Worksheet/Report Compare page when measurements from different fetuses have been taken.

Table 10–10 Multiple Fetuses Settings fields

Field	Action
INCLUDE 2D SECTION	Includes the related section in the report.
INCLUDE M SECTION	Includes the related section in the report.
INCLUDE PW SECTION	Includes the related section in the report.
INCLUDE CALCULATIONS SECTION	Includes the related section in the report.
INCLUDE BIOPHYSICAL SECTION	Includes the related section in the report.
INCLUDE OBSERV SECTION	Includes the related section in the report.
INCLUDE FETAL MASS SECTION	Includes the related section in the report.

Table 10–10 Multiple Fetuses Settings fields (cont'd.)

Field	Action
INCLUDE RATIO GRAPHS	Includes the related section in the report.
GRAPHICS	Sets the Graphs Compare Section in the Report. When SKIP COMPARAT GRAPHS is selected, the graphs are separated per fetus (each fetus will have his graph with the measurement reference), while when PRINT ONLY COMPAR GRAPHS is selected the same measurement for different fetus is reported on the same graph.

Table 10–11 Single Fetus Settings fields

Field	Action
INCLUDE CALCULATIONS SECTION	Includes the related section in the report.

10.4.2.1. Obstetric examination - A.I. guided workflow

When **OB MEASUREMENT SUGGESTION** is enabled, an Artificial Intelligence algorithm proposes to the operator the applicable measurements for the just acquired OB scan plane.

For easy selection, measurements suitable for the scanning plane detected are identified both on the touchscreen and on the main screen by a brain icon.

If **AUTOSTART SUGGESTED MEASUREMENTS** is enabled, identified measurements are automatically executed once you press **MEASURE**.

You can confirm or modify the automatic measurements.

Both **OB MEASUREMENT SUGGESTION** and **AUTOSTART SUGGESTED MEASUREMENTS** can be enabled in the OB Measurement Configuration Menu.



WARNING

Automatic measurements should not be considered sufficient to make a diagnosis. Users are responsible for the results of automatic measurements and must inspect and approve the data that is being used before formulating a diagnosis.

10. Obstetric Measurements

Table 10–12 Detected planes – suitable measurements table (both manual and automatic suitable measurements are involved)

Scan Plane Class	Measure
TransThalamic-TransVentricular	BPD
	HC
	OFD
	LAT V
TransCerebellar	TCD
	CM
	NF
Profile Crown Rump	CRL
Profile NT	NT
	IT
Fetal Bones	HL
	UL
	FL
	RL
	TL
	FIB

10.4.2.2. Measurement Area

When measurements are performed, the value under measure is displayed on the left side of the image (screen measurement area).

In Obstetrics application the first two rows of the screen measurement area can be set to display specific parameters. The parameters that can be displayed are:

- GA(LMP): gestational age based on LMP,
- GA(AUA): gestational age based on AUA,
- GA(DGA): gestational age based on DGA,
- GA(LMP/DGA): gestational age based on LMP/DGA,
- ESTIM FETAL WEIGHT: Estimated fetal weight,
- LAST MENSTRUAL PERIOD.

11. THYROID MEASUREMENTS

This chapter describes the Application Measurements available for Thyroid application and includes the following topics:

11.1 *Available Thyroid Measurements*

11.2 *Automatic lesions contour*

11.3 *Thyroid Worksheet Organization*

11.4 *Thyroid Measurement Set Up*

11.1. Available Thyroid Measurements

The tables below list the Application Measurements available for the Thyroid application in each mode.

Calculation results are automatically computed once all the Input Measurements have been completed.

You can customize the Application Measurements package to adapt it to your work-flow: the touchscreen will display only the set measurements.

Refer to Appendices for formulas and bibliographic references.

Table 11–1 Measurement table legenda

Measurement	Description	Input Measurement (method)
This column contains the measurement name as it appears on the touchscreen and in the measurement configuration menu	This column contains a description of the measurement to be taken	This column lists each single measurement you have to perform to get the final result and in brackets the procedure method to follow in order to take the related measurement. Refer to paragraph 1.3 <i>How to take measurements</i>

Table 11–2 Thyroid Measurements in B-Mode

Measurement	Description	Input Measurement (method)
Right Lobe	Right Lobe Volume	Antero-Posterior diameter (Distance) Transverse diameter (Distance) Sagittal diameter (Distance)
Left Lobe	Left Lobe Volume	Antero-Posterior diameter (Distance) Transverse diameter (Distance) Sagittal diameter (Distance)
Isthmus AP Thickness	Isthmus AP Thickness	Isthmus AP Thickness (Distance)
Nodule #	Nodule Volume	Antero-Posterior diameter (Distance) Transverse diameter (Distance) Sagittal diameter (Distance)

11. Thyroid Measurements

Table 11–2 Thyroid Measurements in B-Mode (cont'd.)

Measurement	Description	Input Measurement (method)
Parathyroid Gland #	Parathyroid Gland Volume	Antero-Posterior diameter (Distance) Transverse diameter (Distance) Sagittal diameter (Distance)
Lymph Node #	Lymph Node Volume	Antero-Posterior diameter (Distance) Transverse diameter (Distance) Sagittal diameter (Distance)

11.2. Automatic lesions contour

When the eDetect licence is enabled, an artificial intelligence algorithm supports the operator by autonomously detecting the lesion contour in thyroid measurements. At the end of the detection process the operator can confirm/ modify the proposed contour or redraw it completely.



WARNING

Automatic measurements should not be considered sufficient to make a diagnosis. Users are responsible for the results of automatic measurement and must check and approve the data used before making a diagnosis.

Check that the **AUTOMATIC CONTOUR** measurement is activated in the application's measurement configuration menu.

Procedure

1. Start a new thyroid exam, acquire an image and press **FREEZE** or open an image from the archive.
2. Press **MEASURE** to start the measurement.
3. Select **NODULE** as measurement.
4. Select **AUTOMATIC CONTOUR**, it is displayed a rectangular ROI, which can be resized and moved using the trackball and **ACTION**.
5. Press **ENTER** to fix the ROI: an automatic lesion contour is displayed and can be edited with the trackball or the **BACK** encoder.
6. Press **ENTER** again to close the tracking area: an automatic evaluation panel with the results is displayed on the touchscreen.
7. Press **APPROVE** or **DISCARD** to close the ratings and return to the main measurement menu. If approved, the assessments will be added to the worksheet where they can be edited later.

At any time press **MANUAL** or **UNDO** to switch to manual tracking.

11.3. Thyroid Worksheet Organization

Here are described the additional fields dedicated to the Thyroid Worksheet.

11.3.1. Structure Evaluation

The worksheet, besides displaying the single measurements, also allows the insertion of an evaluation of the structures under exam. The following evaluations are available with the measurements.

Table 11–3 Evaluations in Thyroid

Group	Parameter	Evaluation
R/L LOBE	Echotexture	Homogenous, Heterogenous
NODULES #	Location	Right Upper, Right Mid, Right Lower, Left Upper, Left Mid, Left Lower, Isthmus
	Composition	Mixed Cystic and Solid, Solid, Spongiform, Cystic
	Echogenicity	Anechoic, Hypoechoic, Hyperechoic, Very Hypoechoic, Isoechoic
	Shape	Wider than Tall, Taller than Wide
	Margins	Smooth, Lobulated Irregular, Ill-defined, Extrathyroidal Extension
	Echogenic Foci	L Comet Tail Art: Yes, No Periph Rim Calc: Yes, No Macrocalcification: Yes, No Punct Echo Foci: Yes, No
	TI-RADS Category	Benign, Not Suspicious, Mildly Suspicious, Moderately Suspicious, Highly Suspicious
PARATHYROID GLAND #	Location	Right Superior, Right Inferior, Left Superior, Left Inferior
	Echogenicity	Hypo, Iso, Hyper, Complex
	Vascularity	Polar Artery
LYMPH NODE #	Laterality	Left, Right, Central
	Location	VI, VII, III, IV, VA, VB, IA, IB, IIA, IIB
	Echogenicity	Hypo, Iso, Hyper, Complex
	Vascular	Avascular, Peripheral, Incr Intranod Vascularity
	Margins	Smooth, Irregular, Infiltrating
	Shape	Oval, Round
	Hilar Line	Absent, Normal, Thickened

Evaluations can also be added from Measurement environment tapping **EVALUATE** and then selecting the group.

11.4. Thyroid Measurement Set Up

To access the Thyroid Measurement configuration menu press **MENU**, select **MEASURE**, and then **THYROID**. The **APPLICATION MEASUREMENTS** and **ADVANCED** tabs provide specific options for the selected application.

11.4.1. Advanced Folder

Here you can set the parameters described in the table below.

Table 11-4 Advanced fields

Field	Action
ENABLE RADS	Enables the TI-RADS evaluation
CUTOFFS	Cut-off blood values to be filled according to laboratory conventions and desired measure unit. To the left-side you can select the desired fibrosis / cirrhosis index formulas to be calculated from biochemical analysis results.

12. UROLOGIC MEASUREMENTS

This chapter describes the Application Measurements available for Urologic application and includes the following topics:

- 12.1 *Application Data*
- 12.2 *Available Urologic Measurements*
- 12.3 *Urologic Worksheet Organization*
- 12.4 *Urologic Measurement Set Up*

12.1. Application Data

Fig. 12–1 Urologic Patient ID page

LAST NAME

FIRST NAME

MIDDLE NAME

REFERRING PHYSICIAN

PERFORMING PHYSICIAN

OPERATOR

HEIGHT

cm

(-)

WEIGHT

kg

g

(-)

IDENTIFICATION

BIRTH DATE

AGE

ADM DIAGNOSIS

ACCESSION NUMBER

DDMMYYYY

GENDER

CARDIAC

UROLOGIC

VASCULAR

GYNECOLOGY

OB.FETAL

PED CARD

PSA

ng/ml

START EXAM

WORKLIST

Table 12–1 Additional data in Urologic Patient ID page

Field	
PSA	Prostate Specific Antigen in ng/ml

12.2. Available Urologic Measurements

The tables below list the Application Measurements available for the Urologic application in each mode.

Calculation results are automatically computed once all the Input Measurements have been completed.

You can customize the Application Measurements package to adapt it to your work-flow: the touchscreen will display only the set measurements.

Refer to Appendices for formulas and bibliographic references.

Table 12–2 Measurement table legenda

Measurement	Description	Input Measurement (method)
This column contains the measurement name as it appears on the touchscreen and in the measurement configuration menu	This column contains a description of the measurement to be taken	This column lists each single measurement you have to perform to get the final result and in brackets the procedure method to follow in order to take the related measurement. Refer to paragraph 1.3 <i>How to take measurements</i>

Table 12–3 Urologic Measurements in B-Mode

Measurement	Description	Input Measurement (method)
Whole Gland Volume	Whole Gland Volume	Whole Gland Diameter 1 (Distance) Whole Gland Diameter 2 (Distance) Whole Gland Diameter 3 (Distance)
Trans Zone Prost Volume	Transitional Zone Prostate Volume	Trans Zone Diameter 1 (Distance) Trans Zone Diameter 2 (Distance) Trans Zone Diameter 3 (Distance)
Prostate	Prostate Volume	Length (Distance) Height (Distance) Width (Distance)
Focal Lesion #	Focal Lesion Volume	Length (Distance) Height (Distance) Width (Distance)
Bladder Volume	Bladder Volume	Diameter 1 (Distance) Diameter 2 (Distance) Diameter 3 (Distance)
Urinary Bladder Wall	Urinary Bladder Wall	Thickness (Distance)
Urethra	Urethra	Urethra (Distance)
Seminal Vesicle	Seminal Vesicle	Seminal Vesicle (Distance)
L Kidney Bi-Volume	Left Kidney Bi-Volume	Length (Distance) Height (Distance) Width (Distance)
R Kidney Bi-Volume	Right Kidney Bi-Volume	Length (Distance) Height (Distance) Width (Distance)
L Kidney Mono Volume	Left Kidney Mono Volume	Length (Distance) Height (Distance)
R Kidney Mono Volume	Right Kidney Mono Volume	Length (Distance) Height (Distance)

Table 12–3 Urologic Measurements in B-Mode (cont'd.)

Measurement	Description	Input Measurement (method)
L Testicle Bi-Volume	Left Testicle Bi-Volume	Length (Distance) Height (Distance) Width (Distance)
R Testicle Bi-Volume	Right Testicle Bi-Volume	Length (Distance) Height (Distance) Width (Distance)
L Testicle Mono Volume	Left Testicle Mono Volume	Length (Distance) Height (Distance)
R Testicle Mono Volume	Right Testicle Mono Volume	Length (Distance) Height (Distance)

Table 12–4 Urologic Measurements in Doppler

Measurement	Description	Input Measurement (method)
R Renal A	Right Renal Artery Velocity	PSV ^[1] EDV ^[2]
L Renal A	Left Renal Artery Velocity	PSV ^[1] EDV ^[2]
Dist Cavernous A	Distal Cavernous Arterial Velocities	PSV ^[1] EDV ^[2]
Prox Cavernous A	Proximal Cavernous Arterial Velocities	PSV ^[1] EDV ^[2]
Mid Cavernous A	Middle Cavernous Arterial Velocities	PSV ^[1] EDV ^[2]
R Renal A VTI	Right Renal Artery VTI	VTI ^[3]
L Renal A VTI	Left Renal Artery VTI	VTI ^[3]
Dist Cavernous A VTI	Distal Cavernous Arterial VTI	VTI ^[3]
Prox Cavernous A VTI	Proximal Cavernous Arterial VTI	VTI ^[3]
Mid Cavernous A VTI	Middle Cavernous Arterial VTI	VTI ^[3]

1. PSV = Peak Systolic Velocity — caliper measurement
2. EDV = End Diastolic Velocity — caliper measurement
3. VTI = Velocity Time Integral — profile measurement

12.3. Urologic Worksheet Organization

Here are described the additional fields dedicated to the Urologic Worksheet.

The worksheet, besides displaying the single measurements, shows the following calculated parameters:

- Predicted PSA Level by Whole Gland Volume,
- Predicted PSA Level by Transitional Zone Volume,
- PSA Density.

Fig. 12–2 Urologic Worksheet

PROSTATE AND BLADDER							
PARAMETER	VALUE	UNIT	MEASURE 1	MEASURE 2	MEASURE 3	MEASURE 4	MEASURE 5
✖ BLADDER VOLUME							
BLADDER DIAM 1	3.32	cm	3.32	✖			
BLADDER DIAM 2	3.40	cm	3.40	✖			
BLADDER DIAM 3	3.30	cm	3.30	✖			
BLADDER VOLUME	19.5	cm ³					
✖ WHOLE GLAND VOLUME							
WHOLE GLAND DIAM 1	3.47	cm	3.47	✖			
WHOLE GLAND DIAM 2	3.53	cm	3.53	✖			
WHOLE GLAND DIAM 3	3.76	cm	3.76	✖			
WHOLE GLAND VOLUME	24.1	cm ³					
✖ TRANS ZONE PROST VOL							
TRANS ZONE DIAM 1	4.55	cm	4.55	✖			
TRANS ZONE DIAM 2	2.78	cm	2.78	✖			
TRANS ZONE DIAM 3	2.69	cm	2.69	✖			
TRANS ZONE PROST VOL	17.8	cm ³					
PSA							
PSA SERUM	4.00	ng/ml					
PRED PSA LEVEL BY WG VOL	2.90	ng/ml			PSA CORRECTION FACTOR - WG	0.12	
PRED PSA LEVEL BY TZ VOL	2.85	ng/ml			PSA CORRECTION FACTOR - TZ	0.16	
PSA DENSITY	0.17	ng/ml/cc					

The correction factors displayed in the report can be modified as follows:

- place the cursor on the corresponding field and press **ENTER**;
- digit the new value using the alphanumeric keyboard.

MyLab automatically updates the relevant predicted PSA level.

The modified correction factor is not saved when the exam is closed: the next urologic exam will use the set default factors.

12.3.1. Structure Evaluation

The worksheet, besides displaying the single measurements, also allows the insertion of an evaluation of the structures under exam. The following evaluations are available with the measurements.

Table 12–5 Evaluations in Urology

Group	Parameter	Evaluation
PROSTATE	Category	Refer to table 12–6 <i>Assessment categories for prostate</i>
	Capsule	Continuous, Discontinuous Swollen, Discontinuous Extra Invasion, Discontinuous Hyperdense Echos
BLADDER	Urinary Bladder Wall	Normal, Abnormal

Table 12–5 Evaluations in Urology (cont'd.)

Group	Parameter	Evaluation
URETHRA	Morphology	Continuous, Discontinuous Swollen
SEMINAL VESICLE	Characteristics	Solid, Liquid, Dishomogeneous, Invasion

Table 12–6 Assessment categories for prostate

0 - Little or no zonal enlargement
1 - Bilateral lateral zone enlargement
2 - Retro urethral enlargement
2A - Mild enlargement without herniation
2B - Greater enlargement, elevation of the trigone without adenoma herniation
2C - Enlargement, elevation of the trigone with trapping of adenoma
2D - Greater enlargement with adenoma herniation
2E - Mild enlargement producing posterior bladder lip
3 - Bilateral and retro urethral enlargement
4 - Pedunculated
5 - Bilateral and pedunculated
6 - Subtrigonal
7 - Other combinations

Table 12–7 Evaluations for Focal Regions

Group	Parameter	Evaluation
Location	Side	Right, Left
	Zone	Peripheral, Transitional, Central, Anterior fibromuscular stroma
	Sector	Base, Midgland, Apex
	Region	Anterior, Posterior, Medial posterior, Lateral posterior
Cystic	Cystic	Simple Cyst, Multiple Cyst
Solid	Shape	Round, Oval, Lenticular, Lobulated, Irregular
	Margins	Regular, Irregular
	Echogenicity	Isoechoic, Hypoechoic, Hyperechoic
	Echotexture	Homogeneous, Heterogeneous
Solid 2	Calcification	Yes, No
	Vascularity	Intralesional, Perilesional, Both
	Contour Bulging	Yes, No
	Elasticity	Soft, Hard

Evaluations can also be added from Measurement environment tapping **EVALUATE** and then selecting the group.

12.4. Urologic Measurement Set Up

To access the Urologic Measurement configuration menu press **MENU**, select **MEASURE**, and then **UROLOGY**. The **APPLICATION MEASUREMENTS** and **ADVANCED** tabs provide specific options for the selected application.

12.4.1. Advanced Folder

Here you can set the parameters described in the table below.

Table 12–8 Advanced fields

Field	Action
PSA CORRECTION FACTOR - WG	Sets the correction factor for the PSA predicted level by whole gland volume.
PSA CORRECTION FACTOR - TZ	Sets the correction factor for the PSA predicted level by transitional zone volume.
INCLUDE CALCULATED VALUES IN THE REPORT	Includes the calculated values in the report, when checked.

The WG and TZ default values are 0,12 and 0,16 respectively.

13. VASCULAR MEASUREMENTS

This chapter describes the Application Measurements available for Vascular application and includes the following topics:

13.1 *Application Data*

13.2 *Available Vascular Measurements*

13.3 *Vascular Worksheet Organization*

13.4 *Vascular Measurement Set Up*

13.1. Application Data

Fig. 13–1 Vascular Patient ID page

The screenshot displays the 'Vascular Patient ID' form. It includes fields for LAST NAME, FIRST NAME, MIDDLE NAME, REFERRING PHYSICIAN, PERFORMING PHYSICIAN, OPERATOR, IDENTIFICATION, BIRTH DATE (DD/MM/YYYY), AGE, GENDER, ADM DIAGNOSIS, ACCESSION NUMBER, and DESCRIPTION. There are also input fields for HEIGHT (cm) and WEIGHT (kg). Below these are tabs for CARDIAC, UROLOGIC, VASCULAR (selected), GYNECOLOGY, OB-FETAL, and PED CARD. Under the VASCULAR tab, there are dropdown menus for QIMT TABLE (selected: HOWARD 1993) and QIMT ETHNICITY (selected: WHITE). At the bottom, there are input fields for SYSTOLIC PRESSURE and DIASTOLIC PRESSURE, both in mmHg.

Table 13–1 Additional data in Vascular Patient ID page

Field	
QIMT TABLE	Selection of the table for QIMT
QIMT ETHNICITY	Ethnicity for QIMT table
SYSTOLIC PRESSURE	in mmHg
DIASTOLIC PRESSURE	in mmHg

13.2. Available Vascular Measurements

The tables below list the Application Measurements available for the Vascular application in each mode.

Calculation results are automatically computed once all the Input Measurements have been completed.

You can customize the Application Measurements package to adapt it to your work-flow: the touchscreen will display only the set measurements.

Refer to Appendices for formulas and bibliographic references.

Table 13–2 Measurement table legenda

Measurement	Description	Input Measurement (method)
This column contains the measurement name as it appears on the touchscreen and in the measurement configuration menu	This column contains a description of the measurement to be taken	This column lists each single measurement you have to perform to get the final result and in brackets the procedure method to follow in order to take the related measurement. Refer to paragraph 1.3 <i>How to take measurements</i>

Table 13–3 Vascular Measurements in B-Mode

Measurement	Description	Input Measurement (method)
R CCA Stenosis Diam	Right Common Carotid Artery stenosis diameter ^[1]	True Diameter (Distance) Residual Diameter (Distance)
R ICA Stenosis Diam	Right Internal Carotid Artery stenosis diameter ^[1]	True Diameter (Distance) Residual Diameter (Distance)
R ECA Stenosis Diam	Right External Carotid Artery stenosis diameter ^[1]	True Diameter (Distance) Residual Diameter (Distance)
R CCA Stenosis Area	Right Common Carotid Artery stenosis area ^[1]	True Area (Contour) Residual Area (Contour)
R ICA Stenosis Area	Right Internal Carotid Artery stenosis area ^[1]	True Area (Contour) Residual Area (Contour)
R ECA Stenosis Area	Right External Artery stenosis area ^[1]	True Area (Contour) Residual Area (Contour)
Prox Aorta Diam	Aorta proximal diameter	Systolic Diameter (Distance) Diastolic Diameter (Distance)
Dist Aorta Diam	Aorta distal diameter	Systolic Diameter (Distance) Diastolic Diameter (Distance)
Mid Aorta Diam	Middle Aorta Diameter	Systolic Diameter (Distance) Diastolic Diameter (Distance)
Ao Dil Segm Length	Aorta dilatation segment length	Aorta dilatation segment length (Distance)
Ao Dil Segm Width	Aorta dilatation segment width	Aorta dilatation segment width (Distance)
Right QIMT	Right QIMT	Refer to QIMT section
Right CCA QAS	Right CCA QAS	Refer to QAS section

1. The measurement is bilateral.

Table 13–4 Vascular Measurements in Doppler

Measurement	Description	Input Measurement (method)
R Prox CCA	Right proximal common carotid velocities ^[1]	PSV ^[2] EDV ^[3]
R Prox CCA VTI	Right proximal common carotid VTI ^[1]	VTI ^[4]
R Mid CCA	Right middle common carotid velocities ^[1]	PSV ^[2] EDV ^[3]
R Mid CCA VTI	Right middle common carotid VTI ^[1]	VTI ^[4]
R Dist CCA	Right distal common carotid velocities ^[1]	PSV ^[2] EDV ^[3]
R Dist CCA VTI	Right distal common carotid VTI ^[1]	VTI ^[4]
R Bulb	Right bulb velocities ^[1]	PSV ^[2] EDV ^[3]
R Bulb VTI	Right bulb VTI ^[1]	VTI ^[4]
R ECA	Right external carotid velocities ^[1]	PSV ^[2] EDV ^[3]
R ECA VTI	Right external carotid VTI ^[1]	VTI ^[4]
R Prox ICA	Right proximal internal carotid velocities ^[1]	PSV ^[2] EDV ^[3]
R Prox ICA VTI	Right proximal internal carotid VTI ^[1]	VTI ^[4]
R Mid ICA	Right middle internal carotid velocities ^[1]	PSV ^[2] EDV ^[3]
R Mid ICA VTI	Right middle internal carotid VTI ^[1]	VTI ^[4]
R Dist ICA	Right distal internal carotid velocities ^[1]	PSV ^[2] EDV ^[3]
R Dist ICA VTI	Right distal internal carotid VTI ^[1]	VTI ^[4]
R Vertebral A	Right vertebral artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Vertebr A VTI	Right vertebral artery VTI ^[1]	VTI ^[4]
R Subclav A	Right subclavian artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Subclavian A VTI	Right subclavian artery VTI ^[1]	VTI ^[4]
R V Cava Reflux T	Right Vein Cava reflux time ^[1]	Reflux Time (Time) Thickness (Distance) Width (Distance)
R Com Iliac V Reflux T	Right Common iliac vein reflux time ^[1]	Reflux Time (Time) Thickness (Distance) Width (Distance)
R Ext Iliac V Reflux T	Right External iliac vein reflux time ^[1]	Reflux Time (Time) Thickness (Distance) Width (Distance)
R Int Iliac V Hypogastric Reflux T	Right internal iliac vein reflux time - Hypogastric ^[1]	Reflux Time (Time) Thickness (Distance) Width (Distance)
R Com Femoral V Reflux T	Right common femoral vein reflux time ^[1]	Reflux Time (Time) Thickness (Distance) Width (Distance)
R Sup Femoral V Reflux T	Right superficial femoral vein reflux time ^[1]	Reflux Time (Time) Thickness (Distance) Width (Distance)

13. Vascular Measurements

Table 13-4 Vascular Measurements in Doppler (cont'd.)

Measurement	Description	Input Measurement (method)
R Prof Femoris V Reflux T	Right profunda femoral vein reflux time ^[1]	Reflux Time (Time) Thickness (Distance) Width (Distance)
R Popliteal V Reflux T	Right popliteal vein reflux time ^[1]	Reflux Time (Time) Thickness (Distance) Width (Distance)
R Gemellary V Reflux T	Right gemellary vein reflux time ^[1]	Reflux Time (Time) Thickness (Distance) Width (Distance)
R Ant Tibial V Reflux T	Right anterior tibial vein reflux time ^[1]	Reflux Time (Time) Thickness (Distance) Width (Distance)
R Post Tibial V Reflux T	Right posterior tibial vein reflux time ^[1]	Reflux Time (Time) Thickness (Distance) Width (Distance)
R Saf-Fem Junct Reflux T	Right saphenous-femoral anastomosis reflux time ^[1]	Reflux Time (Time) Thickness (Distance) Width (Distance)
R Saf-Popl Junct Reflux T	Right saphenous-popliteal anastomosis reflux time ^[1]	Reflux Time (Time) Thickness (Distance) Width (Distance)
R Great Saphenous V Reflux T	Right great saphenous vein reflux time ^[1]	Reflux Time (Time) Thickness (Distance) Width (Distance)
R Small Saphenous V Reflux T	Right short saphenous vein reflux time ^[1]	Reflux Time (Time) Thickness (Distance) Width (Distance)
R Hunterian Reflux T	Right Hunterian vein reflux time ^[1]	Reflux Time (Time) Thickness (Distance) Width (Distance)
R Boyd Reflux T	Right Boyd vein reflux time ^[1]	Reflux Time (Time) Thickness (Distance) Width (Distance)
R Cockett Reflux T	Right Cockett vein reflux time ^[1]	Reflux Time (Time) Thickness (Distance) Width (Distance)
R Superficial Reflux T	Right Superficial ^[1]	Reflux Time (Time) Thickness (Distance) Width (Distance)
R Deep Reflux T	Right Deep ^[1]	Reflux Time (Time) Thickness (Distance) Width (Distance)
R Prox Com Iliac A	Right proximal common iliac velocities ^[1]	PSV ^[2] EDV ^[3]
R Prox Com Iliac A VTI	Right proximal common iliac VTI ^[1]	VTI ^[4]
R Mid Com Iliac A	Right middle common iliac velocities ^[1]	PSV ^[2] EDV ^[3]
R Mid Com Iliac A VTI	Right middle common iliac VTI ^[1]	VTI ^[4]
R Dist Com Iliac A	Right distal common iliac velocities ^[1]	PSV ^[2] EDV ^[3]
R Dist Com Iliac A VTI	Right distal common iliac VTI ^[1]	VTI ^[4]
R Prox Ext Iliac A	Right proximal external iliac velocities ^[1]	PSV ^[2] EDV ^[3]
R Prox Ext Iliac A VTI	Right proximal external iliac VTI ^[1]	VTI ^[4]

Table 13–4 Vascular Measurements in Doppler (cont'd.)

Measurement	Description	Input Measurement (method)
R Mid Ext Iliac A	Right middle external iliac velocities ^[1]	PSV ^[2] EDV ^[3]
R Mid Ext Iliac A VTI	Right middle external iliac VTI ^[1]	VTI ^[4]
R Dist Ext Iliac A	Right distal external iliac velocities ^[1]	PSV ^[2] EDV ^[3]
R Dist Ext Iliac A VTI	Right distal external iliac VTI ^[1]	VTI ^[4]
R Iliac A Bif	Right iliac artery bifurcation velocities ^[1]	PSV ^[2] EDV ^[3]
R Iliac A Bif VTI	Right iliac artery bifurcation VTI ^[1]	VTI ^[4]
R Prox Int Iliac A	Right proximal internal iliac artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Prox IIA VTI	Right proximal internal iliac artery VTI ^[1]	VTI ^[4]
R Prox Com Femoral A	Right proximal common femoral artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Prox Com Femoral A VTI	Right proximal common femoral artery VTI ^[1]	VTI ^[4]
R Mid Com Femoral A	Right middle common femoral artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Mid Com Femoral A VTI	Right middle common femoral artery VTI ^[1]	VTI ^[4]
R Dist Com Femoral A	Right distal common femoral artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Dist Com Femoral A VTI	Right distal common femoral artery VTI ^[1]	VTI ^[4]
R Prof Femoral A	Right profunda femoral artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Prof Femoral A VTI	Right profunda femoral artery VTI ^[1]	VTI ^[4]
R Prox Sup Femoral A	Right proximal superficial femoral artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Prox Sup Femoral A VTI	Right proximal superficial femoral artery VTI ^[1]	VTI ^[4]
R Mid Sup Femoral A	Right middle superficial femoral artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Mid Sup Femoral A VTI	Right middle superficial femoral artery VTI ^[1]	VTI ^[4]
R Dist Sup Femoral A	Right distal superficial femoral artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Dist Sup Femoral A VTI	Right distal superficial femoral artery VTI ^[1]	VTI ^[4]
R Above Knee Popliteal A	Right above knee popliteal artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Above Knee Popliteal A VTI	Right above knee popliteal artery VTI ^[1]	VTI ^[4]
R Below Knee Popliteal A	Right below knee popliteal artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Below Knee Popliteal A VTI	Right below knee popliteal artery VTI ^[1]	VTI ^[4]
R Prox Post Tibial A	Right proximal posterior tibial artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Prox Post Tibial A VTI	Right proximal posterior tibial artery VTI ^[1]	VTI ^[4]

13. Vascular Measurements

Table 13–4 Vascular Measurements in Doppler (cont'd.)

Measurement	Description	Input Measurement (method)
R Mid Post Tibial A	Right middle posterior tibial artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Mid Post Tibial A VTI	Right middle posterior tibial artery VTI ^[1]	VTI ^[4]
R Dist Post Tibial A	Right distal posterior tibial artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Dist Post Tibial A VTI	Right distal posterior tibial artery VTI ^[1]	VTI ^[4]
R Prox Ant Tibial A	Right proximal anterior tibial artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Prox Ant Tibial A VTI	Right proximal anterior tibial artery VTI ^[1]	VTI ^[4]
R Mid Ant Tibial A	Right middle anterior artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Mid Ant Tibial A VTI	Right middle anterior tibial artery VTI ^[1]	VTI ^[4]
R Dist Ant Tibial A	Right distal anterior tibial artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Dist Ant Tibial A VTI	Right distal anterior tibial artery VTI ^[1]	VTI ^[4]
R Prox Peroneal A	Right proximal peroneal artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Prox Peroneal A VTI	Right peroneal artery VTI ^[1]	VTI ^[4]
R Mid Peroneal A	Right middle peroneal artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Mid Peroneal A VTI	Right middle peroneal artery VTI ^[1]	VTI ^[4]
R Dist Peroneal A	Right distal peroneal artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Dist Peroneal A VTI	Right distal peroneal artery VTI ^[1]	VTI ^[4]
R Dorsalis Pedis A	Right dorsalis pedis artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Dors Pedis A VTI	Right dorsalis pedis artery VTI ^[1]	VTI ^[4]
R Prox Sup Cerebr A	Right proximal superior cerebella artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Prox Sup Cerebr A VTI	Right proximal superior cerebella artery VTI ^[1]	VTI ^[4]
R Mid Sup Cerebr A	Right middle superior cerebella artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Mid Sup Cerebr A VTI	Right middle superior cerebella artery VTI ^[1]	VTI ^[4]
R Dist Sup Cerebr A	Right distal superior cerebella artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Dist Sup Cerebr A VTI	Right distal superior cerebella artery VTI ^[1]	VTI ^[4]
R Axillary A	Right axillary artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Axillary A VTI	Right axillary artery VTI ^[1]	VTI ^[4]
R Prox Brachial A	Right proximal brachial artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Prox Brachial A VTI	Right proximal brachial artery VTI ^[1]	VTI ^[4]
R Mid Brachial A	Right middle brachial artery velocities ^[1]	PSV ^[2] EDV ^[3]

Table 13-4 Vascular Measurements in Doppler (cont'd.)

Measurement	Description	Input Measurement (method)
R Mid Brachial A VTI	Right middle brachial artery VTI ^[1]	VTI ^[4]
R Dist Brachial A	Right distal brachial artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Dist Brachial A VTI	Right distal brachial artery VTI ^[1]	VTI ^[4]
R Prox Radial A	Right proximal radial artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Prox Radial A VTI	Right proximal radial artery VTI ^[1]	VTI ^[4]
R Mid Radial A	Right middle radial artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Mid Radial A VTI	Right middle radial artery VTI ^[1]	VTI ^[4]
R Dist Radial A	Right distal radial artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Dist Radial A VTI	Right distal radial artery VTI ^[1]	VTI ^[4]
R Prox Ulnar A	Right proximal ulnar artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Prox Ulnar A VTI	Right proximal ulnar artery VTI ^[1]	VTI ^[4]
R Dist Ulnar A	Right distal ulnar artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Dist Ulnar A VTI	Right distal ulnar artery VTI ^[1]	VTI ^[4]
R Palmar Arch	Right palmar artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Palmar Arch VTI	Right palmar artery VTI ^[1]	VTI ^[4]
R Digital A	Right digital artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Digital A VTI	Right digital artery VTI ^[1]	VTI ^[4]
Prox Aorta	Proximal aorta velocities	PSV ^[2] EDV ^[3]
Prox Ao VTI	Proximal aorta VTI	VTI ^[4]
Mid Aorta	Middle aorta velocities	PSV ^[2] EDV ^[3]
Mid Aorta VTI	Middle aorta VTI	VTI ^[4]
Dist Aorta	Distal aorta velocities	PSV ^[2] EDV ^[3]
Dist Ao VTI	Distal aorta VTI	VTI ^[4]
Post Prandial Sup Mesenteric A	Post prandial superior mesenteric artery velocities	PSV ^[2] EDV ^[3]
Post Prandial Sup Mesenteric A VTI	Post prandial superior mesenteric artery VTI	VTI ^[4]
Post Prandial Celiac	Post prandial celiac artery velocities	PSV ^[2] EDV ^[3]
Post Prandial Celiac VTI	Post prandial celiac artery VTI	VTI ^[4]
Prox Sup Mesenteric A	Proximal superior mesenteric artery velocities	PSV ^[2] EDV ^[3]
Prox Sup Mesenteric A VTI	Proximal superior mesenteric artery VTI	VTI ^[4]
Mid Sup Mesenteric A	Middle superior mesenteric artery velocities	PSV ^[2] EDV ^[3]
Mid Sup Mesenteric A VTI	Middle superior mesenteric artery VTI	VTI ^[4]

13. Vascular Measurements

Table 13–4 Vascular Measurements in Doppler (cont'd.)

Measurement	Description	Input Measurement (method)
Dist Sup Mesenteric A	Distal superior mesenteric artery velocities	PSV ^[2] EDV ^[3]
Dist Sup Mesenteric A VTI	Distal superior mesenteric artery VTI	VTI ^[4]
Celiac Tripod	Celiac tripod artery velocities	PSV ^[2] EDV ^[3]
Celiac Tripod VTI	Celiac tripod artery VTI	VTI ^[4]
Inf Mesenteric A	Inferior mesenteric artery velocities	PSV ^[2] EDV ^[3]
Inf Mesenteric A VTI	Inferior mesenteric artery VTI	VTI ^[4]
Prox Splenic A	Proximal splenic artery velocities	PSV ^[2] EDV ^[3]
Prox Splenic A VTI	Proximal splenic artery VTI	VTI ^[4]
Mid Splenic A	Middle splenic artery velocities	PSV ^[2] EDV ^[3]
Mid Splenic A VTI	Middle splenic artery VTI	VTI ^[4]
Dist Splenic A	Distal splenic artery velocities	PSV ^[2] EDV ^[3]
Dist Splenic A VTI	Distal splenic artery VTI	VTI ^[4]
Hepatic A	Hepatic artery velocities	PSV ^[2] EDV ^[3]
Hepatic A VTI	Hepatic artery VTI	VTI ^[4]
R A Art Vessel	Right inflow arterial vessel velocities ^[1]	PSV ^[2] EDV ^[3]
R Art Vessel VTI	Right inflow arterial vessel VTI ^[1]	VTI ^[4]
R Prox A Art Anast	Right proximal arterial anastomosis velocities ^[1]	PSV ^[2] EDV ^[3]
R Prox Art Anast VTI	Right proximal arterial anastomosis VTI ^[1]	VTI ^[4]
R Prox A Graft	Right proximal graft velocities ^[1]	PSV ^[2] EDV ^[3]
R Prox Graft VTI	Right proximal graft VTI ^[1]	VTI ^[4]
R Mid A Graft	Right middle graft velocities ^[1]	PSV ^[2] EDV ^[3]
R Mid Graft VTI	Right middle graft VTI ^[1]	VTI ^[4]
R Dist A Graft	Right distal graft velocities ^[1]	PSV ^[2] EDV ^[3]
R Dist Graft VTI	Right distal graft VTI ^[1]	VTI ^[4]
R Dist A Art Anast	Right distal arterial anastomosis velocities ^[1]	PSV ^[2] EDV ^[3]
R Dist Art Anast VTI	Right distal arterial anastomosis VTI ^[1]	VTI ^[4]
R A Outflow Vessel	Right outflow arterial vessel velocities ^[1]	PSV ^[2] EDV ^[3]
R Ven Vessel VTI	????????????????????????????????	VTI ^[4]
R D Inflow Vessel	Right inflow arterial vessel velocities ^[1]	PSV ^[2] EDV ^[3]
R Art Vessel VTI	Right inflow arterial vessel VTI ^[1]	VTI ^[4]

Table 13-4 Vascular Measurements in Doppler (cont'd.)

Measurement	Description	Input Measurement (method)
R Prox D Art Anast	Right proximal arterial anastomosis velocities ^[1]	PSV ^[2] EDV ^[3]
R Prox Art Anast VTI	Right proximal arterial anastomosis VTI ^[1]	VTI ^[4]
R Prox D Graft	Right proximal graft velocities ^[1]	PSV ^[2] EDV ^[3]
R Prox Graft VTI	Right proximal graft VTI ^[1]	VTI ^[4]
R Mid D Graft	Right middle graft velocities ^[1]	PSV ^[2] EDV ^[3]
R Mid Graft VTI	Right middle graft VTI ^[1]	VTI ^[4]
R Dist D Graft	Right distal graft velocities ^[1]	PSV ^[2] EDV ^[3]
R Dist Graft VTI	Right distal graft VTI ^[1]	VTI ^[4]
R Dist D Art Anast	Right distal arterial anastomosis velocities ^[1]	PSV ^[2] EDV ^[3]
R Dist Art Anast VTI	Right distal arterial anastomosis VTI ^[1]	VTI ^[4]
R Puncture 1	Right puncture 1 velocities ^[1]	PSV ^[2] EDV ^[3]
R Puncture 1 VTI	Right puncture 1 VTI ^[1]	VTI ^[4]
R Puncture 2	Right puncture 2 velocities ^[1]	PSV ^[2] EDV ^[3]
R Puncture 2 VTI	Right puncture 2 VTI ^[1]	VTI ^[4]
R Puncture 3	Right puncture 3 velocities ^[1]	PSV ^[2] EDV ^[3]
R Puncture 3 VTI	Right puncture 3 VTI ^[1]	VTI ^[4]
R Venous Vessel	Right venous vessel velocities ^[1]	PSV ^[2] EDV ^[3]
R Ven Vessel VTI	Right venous vessel VTI ^[1]	VTI ^[4]
R Venous Junction	Right venous junction velocities ^[1]	PSV ^[2] EDV ^[3]
R Venous Junction VTI	Right venous junction VTI ^[1]	VTI ^[4]
Aorta	Aorta velocities	PSV ^[2] EDV ^[3]
Aorta VTI	Aorta VTI	VTI ^[4]
R Renal A Ostium	Right renal artery ostium velocities ^[1]	PSV ^[2] EDV ^[3]
R Renal A Ost VTI	Right renal artery ostium VTI ^[1]	VTI ^[4]
R Prox Renal A	Right proximal renal artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Prox Renal A VTI	Right proximal renal artery VTI ^[1]	VTI ^[4]
R Mid Renal A	Right middle renal artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Mid Renal A VTI	Right middle renal artery VTI ^[1]	VTI ^[4]
R Dist Renal A	Right distal renal artery velocities ^[1]	PSV ^[2] EDV ^[3]
R Dist Renal A VTI	Right distal renal artery VTI ^[1]	VTI ^[4]

13. Vascular Measurements

Table 13–4 Vascular Measurements in Doppler (cont'd.)

Measurement	Description	Input Measurement (method)
R Segm1 Upper	Right upper arterial segment 1 ^[1]	PSV ^[2] EDV ^[3]
R Segm1 Upper P VTI	Right upper arterial segment 1 VTI ^[1]	VTI ^[4]
R Segm2 Upper	Right upper arterial segment 2 ^[1]	PSV ^[2] EDV ^[3]
R Segm2 Upper P VTI	Right upper arterial segment 2 VTI ^[1]	VTI ^[4]
R Segm1 Lower	Right lower arterial segment 1 ^[1]	PSV ^[2] EDV ^[3]
R Segm1 Lower P VTI	Right lower arterial segment 1 VTI ^[1]	VTI ^[4]
R Segm2 Lower	Right lower arterial segment 2 ^[1]	PSV ^[2] EDV ^[3]
R Segm2 Lower P VTI	Right lower arterial segment 2 VTI ^[1]	VTI ^[4]
R Hilar Acc Time	Right hilar acceleration time ^[1]	Acceleration Time (Time)

1. The measurement is bilateral.
2. PSV = Peak Systolic Velocity – Caliper measurement
3. EDV = End Diastolic Velocity – Caliper measurement
4. VTI = Velocity Time Integral – Profile measurement

13.3. Vascular Worksheet Organization

Here are described the additional fields dedicated to the Vascular worksheets.

13.3.1. Velocities Ratio and Vessels Evaluation

The Vascular worksheet looks like the other report, except in the “Carotid Velocities” and “Lower Limbs” groups.

In the “Carotid Velocities” group the internal carotid/common carotid velocity and mesenteric/aorta ratios are automatically calculated and displayed in the report when the corresponding flow measurements have been performed.

In the “Lower Limbs” group the worksheet, besides displaying the single measurements and the average (if enabled), also allows the insertion of an evaluation of the vessel status:

Status	Evaluation
Patency	Yes, No, Partial
Compressibility	Yes, No, Partial
Reflux	Light, Moderate, Severe
Thrombus	Yes, No, Partial

13.4. Vascular Measurement Set Up

To access the Vascular Measurement configuration menu press **MENU** then select **MEASURE**, and then **VASCULAR**. The **APPLICATION MEASUREMENTS** and **ADVANCED** tabs provide specific options for the selected application.

13.4.1. Advanced Folder

Here you can set the parameters described in the table below.

Table 13–5 Advanced fields

Field	Action
ICA/CCA	Sets which velocity measurements (PROX , MID , DIST) use for both Internal Carotid Artery and Common Carotid Artery for their ratio calculation when the corresponding flow measurements have been performed.
SMA/AORTA	Sets which velocity measurements (PROX , MID , DIST) use for both Superior Mesenteric Artery and Aorta for their ratio calculation when the corresponding flow measurements have been performed.

In both cases when the **AUTO MAX** field is checked, the ratio is calculated using the maximum velocities values among all performed measurements of the same parameters.

14. LUNG ULTRASOUND

Lung Ultrasound (LUS) protocol is referred to the quantification of the pulmonary disease through B-Mode acquisitions. A visual protocol has been integrated to mark up the regions with US signs associated to pneumonia and give a score manually.

This chapter includes the following topics:

14.1 *Forewords*

14.2 *Executing a LUS protocol*

14.3 *Bibliographic references*

14.1. Forewords

Lung ultrasound (LUS) has consolidated its role as a point-of-care technique in different clinical settings, from the emergency department to the intensive care unit, from cardiology to pulmonology and nephrology wards. It can provide immediate diagnosis of common lung conditions like pleural effusion, pneumothorax, pulmonary edema and pneumonia in critically ill patients.

Diagnostic value of LUS was further confirmed during COVID pandemic outbreak, where it allows quick and bedside detection and monitoring of interstitial pneumonia.

Several protocols and scoring systems have been proposed for extensive evaluation of lung via LUS [1,2,3,4,5] and so far, there's no a general consensus about a single internationally recognized protocol [6].

In order to help the physician in adopting a structured approach to the ultrasound investigation of the lungs in Covid-19 patients, it has been implemented one of the most recent acquisition and scoring protocol proposed by the University of Trento as part of the ICLUS - Italian Covid-19 Lung Ultrasound project [7]. Our implementation operates as step-by-step image acquisition protocol and results in structured report. At a moment, B-Lines scores are manually inserted into the report by the physician and the operator can skip any of the proposed acquisition step. Overall the protocol foreseen the acquisitions and scoring of 14 B-mode Thorax Projections.

14.2. Executing a LUS protocol

To enable LUS, press **MENU** then **GENERAL SETUP** then access the **CONTROL PANEL** folder and check **LUNG ULTRASOUND**.

You can also associate **ETOUCH** to LUS selecting **LUNG ULTRASOUND** from the drop-down menu **ETOUCH BUTTON**.

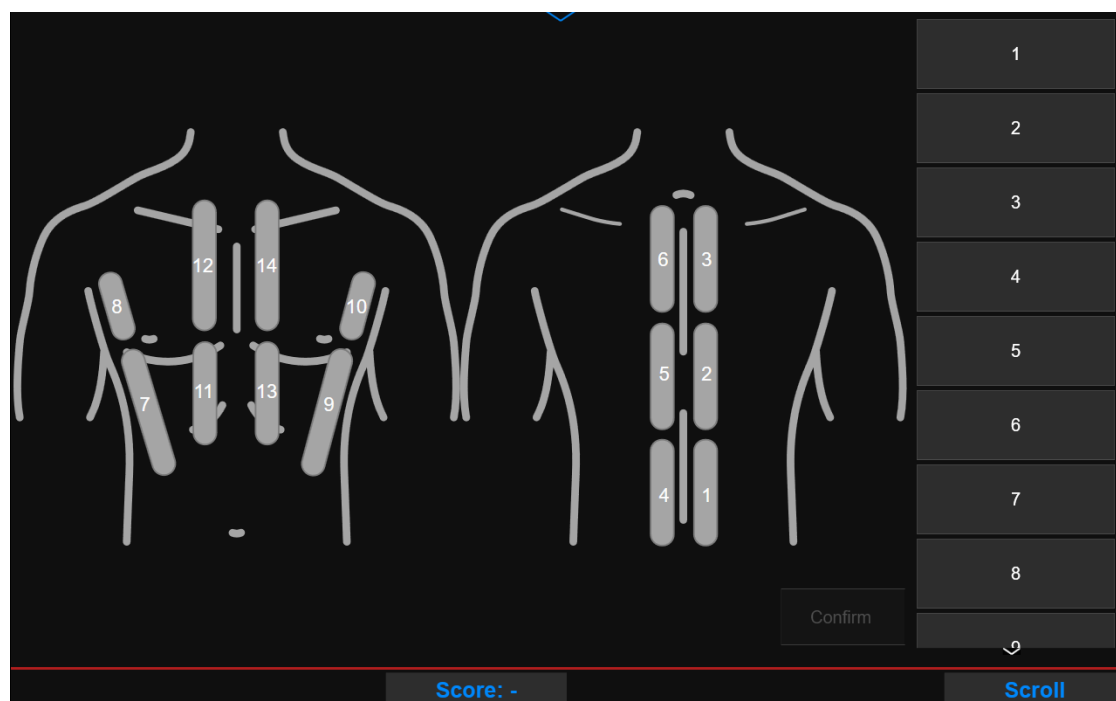
14. Lung Ultrasound

LUS protocol requires the acquisition of up to 14 lung scans clips in 14 different positions as described below. Clips can be acquired both prospectively and retrospectively. Clip duration is automatically set to 5 seconds.

Procedure

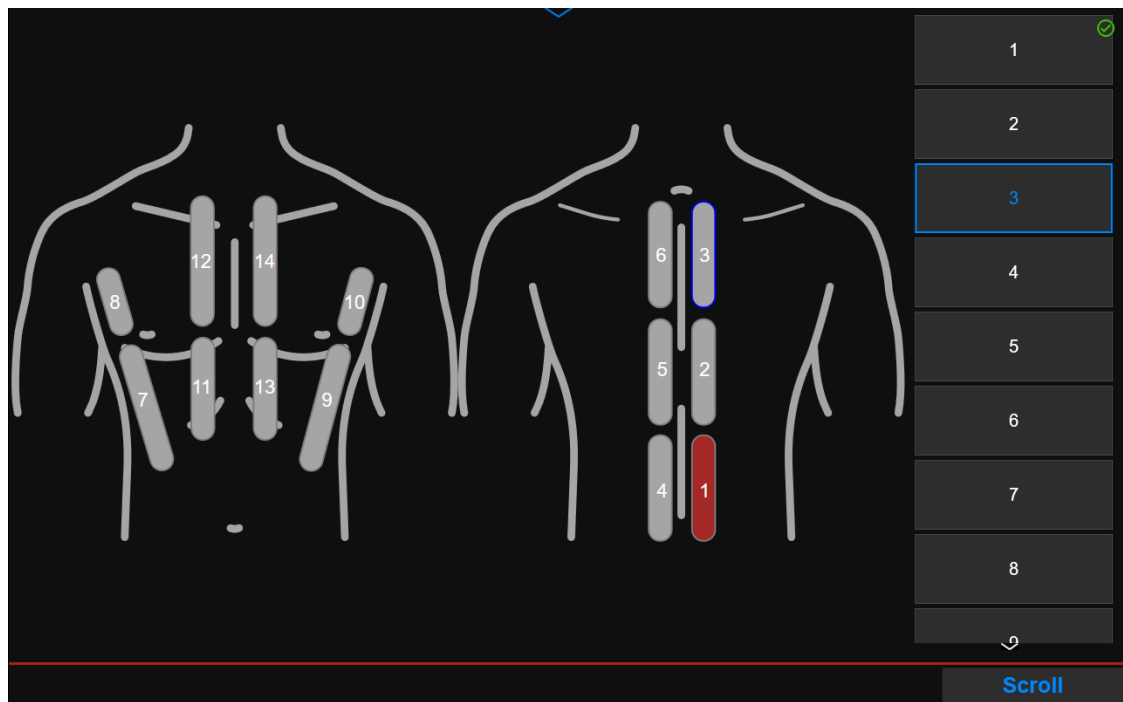
1. Connect a probe with Abdominal application.
2. Start a new exam in Abdominal application.
3. Acquire a clip. When the acquisition ends, lung ultrasound thorax projections are displayed on the touchscreen (refer to the image below).

Fig. 14–1 Lung Ultrasound Thorax Projections



4. Referring to the image on the touchscreen, associate the acquired clip to the corresponding thorax projection. Corresponding projection is selected touching the projection number in the column on the right part of the screen; afterward selected projection is highlighted. Rotate **SCROLL** to scroll the projection index list.
5. Rotate **SCORE** to select the proper score value for the acquired clip: as the score is selected, the corresponding area is colored with respect to a predefined palette. Four different values are available.

Fig. 14–2 Lung Ultrasound Score



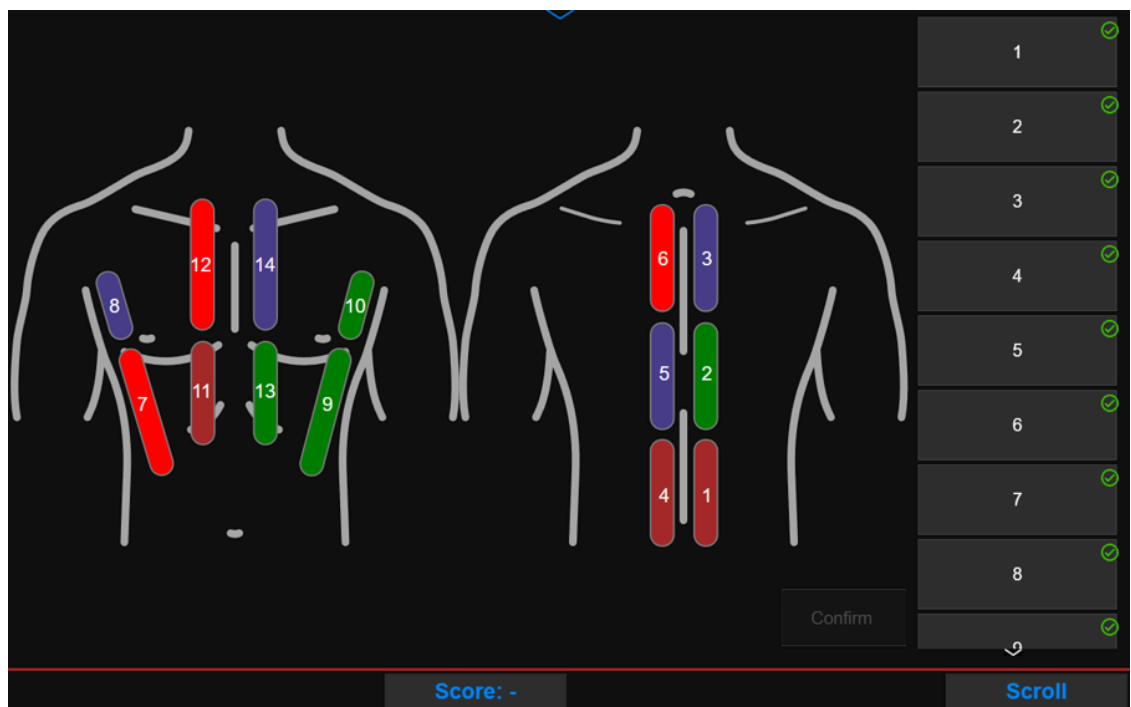
6. Tap **CONFIRM** to confirm your selection: **MyLab** returns in real time and the icon of acquired clip present in thumbnails changes to lung icon with the index of selected projection.

Fig. 14–3 Lung Ultrasound thumbnail icon



7. Acquire other clips for many different projections and assign a score value to them repeating the steps above. When all 14 projections are scored, all the areas will have an assigned score.

Fig. 14-4 Lung Ultrasound Protocol



Press **ETOUCH** at any time of the procedure to recall scores on touchscreen layout for review purposes.

Score and projection data are added in the dedicated **LUNG EVALUATION** report section where the map with all thorax projections is shown (refer to the image below).

Fig. 14–5 Lung Ultrasound Report

Patient Data			
Last Name	TEST LUNG	Age	62 y
Birth Date	12/03/1958		
Gender	M		
Exam Date	23/02/2021		
Report Date	23/02/2021		
Abdominal			
Lungs Evaluation			
Landmark	Score		
1	2		
2	1		
3	3		
4	0		
5	-		
6	2		
7	-		
8	3		
9	0		
10	1		
11	-		
12	2		
13	-		
14	-		
Total Score	14		
Observations			
Abdominal remarks			
Conclusions			
SIGNATURE			

Score 0: Score 2:
 Score 1: Score 3:

Scoring can be modified manually from worksheet after confirmation: tap **WORKSHEET** and select the new score from the drop-down beside each thorax projection landmark.

Fig. 14–6 Lung Ultrasound Worksheet

TEST LUNG, 12/03/1958, M

23/02/2021 10:40:15 AM
23/02/2021 10:22:25 AM

Abdominal

Lung Ultrasound

Measure

Landmark	Score
1	2
2	1
3	3
4	0
5	-
6	2
7	-
8	3
9	0
10	1
11	-
12	2
13	-
14	-

Total Score 14

Score 0: Score 2:
 Score 1: Score 3:

14.3. Bibliographic references

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- [2] Jambrik Z, Monti S, Coppola V, Agricola E, Mottola G, Miniati M, Picano E: Usefulness of ultrasound lung comets as a nonradiologic sign of extravascular lung water. *Am J Cardiol* 2004, 93:1265–1270.
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- [4] Eugenio Picano, Patricia A. Pellikka, Ultrasound of extravascular lung water: a new standard for pulmonary congestion, *European Heart Journal*, Volume 37, Issue 27, 14 July 2016, Pages 2097–2104, <https://doi.org/10.1093/eurheartj/ehw164>.
- [5] Francesco Mojoli, Belaid Bouhemad, Silvia Mongodi, and Daniel Lichtenstein: Lung Ultrasound for Critically Ill Patients, *American Journal of Respiratory and Critical Care Medicine* Volume 199 Number 6 | March 15 2019.
- [6] Piscaglia F, Stefanini F, Cantisani V, Sidhu PS, Barr R, Berzigotti A, Chammas MC, Correias JM, Dietrich CF, Feinstein S, Huang P, Jenssen C, Kono Y, Kudo M, Liang P, Lyshchik A, Nolsøe C, Xie X, Tovoli F: Benefits, Open questions and Challenges of the use of Ultrasound in the COVID-19 pandemic era. The views of a panel of worldwide international experts. *Ultraschall Med.* 2020 Jun;41(3):228-236. English. doi: 10.1055/a-1149-9872. Epub 2020 Apr 15. PMID: 32294795.
- [7] Soldati G, Smargiassi A, Inchingolo R, Buonsenso D, Perrone T, Briganti DF, Perlini S, Torri E, Mariani A, Mossolani EE, Tursi F, Mento F, Demi L.: Proposal for International Standardization of the Use of Lung Ultrasound for Patients With COVID-19: A Simple, Quantitative, Reproducible Method. *J Ultrasound Med.* 2020 Jul;39(7):1413-1419. doi: 10.1002/jum.15285. PMID: 32227492; PMCID: PMC7228287.



A. FORMULA AND REFERENCES IN B-MODE

A.1. Volume in abdominal and breast

Formula

Volume [ml] or [cm³]

$$Vol = \frac{4}{3} \cdot \pi \cdot \frac{L}{2} \cdot \frac{H}{2} \cdot \frac{W}{2}$$

A.2. Volume in thyroid

Formula

Volume [ml] or [cm³]

$$Vol = \frac{\pi}{6} \cdot AP \cdot Transv \cdot Sag$$

A.3. Diameter Reduction

Formula
$\%ST =$
$100 \cdot \left[1 - \frac{D_1}{D_0} \right]$
D_1 : Residual diameter
D_0 : True diameter
Accuracy $\pm 10\%$

Reference

W.Robert Felix Jr., "Noninvasive diagnosis of peripheral vascular disease". In: Raven Press, p.121

A.4. Length by Vertex

Formula
$L = \sum(L_n)$
L_n : Umpteenth length

A.5. Area by Ellipse Axes

Formula
$A = \pi \cdot a \cdot b$
a: Major semi axis
b: Minor semi axis

A.6. Area Reduction

Formula
$\%ST = 100 \cdot \left[1 - \frac{A_1}{A_0} \right]$
A_1 : Residual diameter
A_0 : True diameter
Accuracy $\pm 16\%$

Reference

W.Robert Felix Jr., "Noninvasive diagnosis of peripheral vascular disease". In: Raven Press, p.122

A.7. Volume by Ellipse

Formula
$V =$
$\frac{4}{3} \cdot \pi \cdot a \cdot b^2$
a: Major semi axis
b: Minor semi axis

A.8. Volume by Trace and by Area-Length

Formula
$V =$
$0,85 \cdot \frac{A^2}{D}$
A: Area
D: Diameter

A.9. Bi-Plane Volume

Formula
$V =$
$\frac{\pi}{6} \cdot D_1 \cdot D_2 \cdot D_3$
D ₁ : First diameter
D ₂ : Second diameter
D ₃ : Third diameter

A.10. Uterus, Fibroma, Ovary and Mass Volumes

Formula
$\text{Vol (cm}^3\text{)} =$
$\frac{4}{3} \cdot \pi \cdot \frac{L}{2} \cdot \frac{H}{2} \cdot \frac{W}{2}$
L: Length

Formula
H: Height
W: Width
Accuracy $\pm 15\%$

Reference

Barry B. Goldberg, Alfred B. Kurtz, "Atlas of Ultrasound Measurements", Year Book Medical Publisher, 1990, pp. 192-194.

A.11. Bladder Volume

Formula
Volume (ml or cm^3) =
$D_0 \cdot D_1 \cdot D_2 \cdot \frac{\pi}{6}$
D_0 : First diameter
D_1 : Second diameter
D_2 : Third diameter
Accuracy $\pm 15\%$

Reference

Griffiths, et al., "Measuring Bladder Volume and Residual Urine" In: *The Journal of Urology*, Vol. 136, 808-812, 1986

A.12. Whole Gland and Transitional Zone Prostate Volume

Formula
Volume (cm^3) =
$D_0 \cdot D_1 \cdot D_2 \cdot \frac{\pi}{6}$
D_0 : First diameter
D_1 : Second diameter
D_2 : Third diameter
Accuracy $\pm 15\%$

Reference

Peter J, Littrup, M.D., et al., "Determination of Prostate Volume with Transrectal US for Cancer Screening" In: *Radiology*, Vol. 179, 49-53, 1991.

A.13. Kidney and Testicle Volume - Biplane Method

Formula
Volume (cm ³) =
$\frac{4}{3} \cdot \pi \cdot \frac{D_0}{2} \cdot \frac{D_1}{2} \cdot \frac{D_2}{2}$
D ₀ : First diameter
D ₁ : Second diameter
D ₂ : Third diameter
Accuracy $\pm 15\%$

A.14. Kidney and Testicle Volume - Monoplane Method

Formula
Volume (cm ³) =
$\frac{\pi}{6} \cdot D_0^2 \cdot D_1$
when D ₀ < D ₁
Volume (cm ³) =
$\frac{\pi}{6} \cdot D_1^2 \cdot D_0$
when D ₁ < D ₀
D ₀ : First diameter
D ₁ : Second diameter
D ₂ : Third diameter
Accuracy $\pm 15\%$

A.15. Predicted PSA Level

Formula
Predicted PSA (ng/ml) = $A \cdot B$
A: Volume
B: Correction factor
Accuracy $\pm 15\%$

Reference

Fred Lee, M.D., et al., "Predicted Prostate Specific Antigen Results Using Transrectal Ultrasound Gland Volume" In: *Cancer Supplement*, Vol. 70, No. 1, July 1992.

Mitchell C. Benson, et al., "Prostate Specific Antigen Density: A means of Distinguishing Benign Prostatic Hypertrophy and Prostate Cancer" In: *The Journal of Urology*, Vol. 147, 815-816, March 1992.

Mitchell C. Benson, et al., "The Use of Prostate Specific Antigen Density to Enhance the Predictive Value of Intermediate Levels of Serum Prostate Specific Antigen" In: *The Journal of Urology*, Vol. 147, 817-821, March 1992.

A.16. Predicted PSA Density

Formula
Predicted PSA (ng/ml/cc) = $\frac{A}{B}$
A: PSA serum
B: Volume

Reference

Fred Lee, M.D., et al., "Predicted Prostate Specific Antigen Results Using Transrectal Ultrasound Gland Volume" In: *Cancer Supplement*, Vol. 70, No. 1, July 1992.

Mitchell C. Benson, et al., "Prostate Specific Antigen Density: A means of Distinguishing Benign Prostatic Hypertrophy and Prostate Cancer" In: *The Journal of Urology*, Vol. 147, 815-816, March 1992.

Mitchell C. Benson, et al., "The Use of Prostate Specific Antigen Density to Enhance the Predictive Value of Intermediate Levels of Serum Prostate Specific Antigen" In: *The Journal of Urology*, Vol. 147, 817-821, March 1992.

A.17. Stenosis Diameter

Formula
$\%ST =$ $100 \cdot \left[1 - \frac{D_1}{D_0} \right]$
D_1 : Residual diameter
D_0 : True diameter
Accuracy $\pm 10\%$

Reference

W. Robert Felix Jr., “Noninvasive Diagnosis of Peripheral Vascular Disease”, Raven Press, p. 121.

A.18. Stenosis Area

Formula
$\%ST =$ $100 \cdot \left[1 - \frac{A_1}{A_0} \right]$
A_1 : Residual diameter
A_0 : True diameter
Accuracy $\pm 16\%$

Reference

W. Robert Felix Jr., “Noninvasive Diagnosis of Peripheral Vascular Disease”, Raven Press, p. 121.

A.19. Cardiology

A.19.1. Left Ventricle Simpson Volume - Biplane

Formula
$\text{Volume (ml)} =$ $\frac{\pi}{4} \cdot \frac{h}{20} \cdot \sum_{1-20} d_h D_h$
h: Long axis
d_h : A2C diameter

Formula
D_h : A4C diameter
Accuracy $\pm 15\%$

Reference

Schiller N.B. et al. "Two-Dimensional Echocardiographic Determination of Ventricular Volume, Systolic Function and Mass". In: *Summary and Discussion of the 1989 Recommendations of the American Society of Echocardiography*

A.19.2. Left Ventricle/Left Atrium/Right Atrium Simpson Volume - Single Plane

Formula
Volume (ml) =
$\frac{\pi}{4} \cdot \frac{h}{20} \cdot \sum_{1-20} D^2$
h: Long axis
D: Left ventricle diameter
Accuracy $\pm 15\%$

Reference

LV Volume: A.J.Camm, T.F.Luscher et al. "The ESC Textbook of Cardiovascular Medicine", 2008, pag.53-53

LA and RA Volume: Lang R, Bierig M, Devereux R et al. "Recommendations for chamber quantification: a report from the American Society of Echocardiography's Guidelines and Standards Committee and the Chamber Quantification Writing Group, developed in conjunction with the European Association of Echocardiography, a branch of the European Society of Cardiology" In: *J Amer. Soc. Echocardiography*, 2005, Vol.18; N.12; pp1440-1463

A.19.3. Left Ventricle/Right Atrium Volume - Area Length

Formula
Volume (ml) =
$\frac{8 \cdot A^2}{3 \cdot \pi \cdot D}$
A: Area
D: Long axis
Accuracy $\pm 21\%$

Reference

Schiller N.B. et al. "Two-Dimensional Echocardiographic Determination of Ventricular Volume, Systolic Function and Mass" In: *Summary and Discussion of the 1989 Recommendations of the American Society of Echocardiography*

A.19.4. Left Ventricle Diastolic/Systolic and Left Atrium Systolic Volume Index

Formula
Index =
$\frac{A}{BSA}$
A: LV diastolic volume or LV systolic volume or LA systolic volume

Reference

Lang R, Bierig M, Devereux R et al. "Recommendations for chamber quantification: a report from the American Society of Echocardiography's Guidelines and Standards Committee and the Chamber Quantification Writing Group, developed in conjunction with the European Association of Echocardiography, a branch of the European Society of Cardiology" In: *J Amer. Soc. Echocardiography*, 2005, Vol.18; N.12; pp1440-1463

A.19.5. Ejection Fraction (Simpson and Area-Length)

Formula
EF=
$\frac{(A - B) \cdot 100}{A}$
A: Diastolic volume
B: Systolic volume
Accuracy $\pm 42\%$

Reference

Feigenbaum H., Echocardiography, 4th Ed., Lea & Febiger, Philadelphia, 1986, pp. 153-155

A.19.6. Stroke Volume

Formula
$SV \text{ (ml)} =$ $A - B$
A: Diastolic volume
B: Systolic volume
Accuracy $\pm 42\%$

Reference

Weyman A., Principles and Practice of Echocardiography, Lea & Febiger, 1994, p. 605

A.19.7. Stroke Index

Formula
$SI =$ $\frac{A}{B}$
A: Stroke volume
B: BSA

Reference

Oh J, Seward J, Tajik A The echo manual-Second edition, Lippincott Williams &Wilkins

A.19.8. Cardiac Output

Formula
$CO \text{ (l/min)} =$ $(A - B) \cdot HR$
A: Diastolic volume
B: Systolic volume
Accuracy $\pm 45\%$

Reference

Weyman A., Principles and Practice of Echocardiography, Lea & Febiger, 1994, p. 605

A.19.9. Cardiac Index

Formula
$CI = \frac{A}{B}$
A: Cardiac Output
B: BSA

Reference

Oh J, Seward J, Tajik A The echo manual-Second edition, Lippincott Williams &Wilkins

A.19.10. Left Ventricle/Right Ventricle Area Fractional Shortening

Formula
$FAC = \frac{(A - B) \cdot 100}{A}$
A: Left ventricle or right ventricle diastolic area
B: Left ventricle or right ventricle systolic area
Accuracy $\pm 16\%$

A.19.11. Diameter Fractional Shortening

Formula
$FS = \frac{(A - B) \cdot 100}{A}$
A: Diastolic diameter
B: Systolic diameter
Accuracy $\pm 10\%$

Reference

Quinones M.A., Gaasch W.H., Alexander J.K., "Echocardiographic Assessment of Left Ventricular Function with Special Reference to Normal Velocities" In: *Circulation*, 1974, 50, p. 42.

A.19.12. Ejection Fraction (Left Ventricle)

	Derived Parameter
EF= $\frac{(A - B) \cdot 100}{A}$	A: $\frac{7 \cdot D^3}{2,4 + D}$ D: Diameter in diastole
	B: $\frac{7 \cdot D^3}{2,4 + D}$ D: Diameter in systole

A.19.13. Left Ventricle Mass

Formula
LVM (g) = $0,8 \cdot \{1,04 \cdot [(A + B + C)^3 - A^3]\} + 0,6$
A: Left ventricle internal diameter in diastole
B: Posterior wall in diastole
C: Intraventricular septum in diastole
Accuracy $\pm 15\%$

Reference

Lang R, Bierig M, Devereux Ret et al. "Recommendations for chamber quantification: a report from the American Society of Echocardiography's Guidelines and Standards Committee and the Chamber Quantification Writing Group, developed in conjunction with the European Association of Echocardiography, a branch of the European Society of Cardiology" In: *J Amer. Soc. Echocardiography*, 2005, Vol.18; N.12; pp1440-1463.

A.19.14. Outflow Tract Area

Formula
OTA (cm ²) = $\Pi \cdot \left(\frac{D}{2}\right)^2$
D: Outflow tract diameter

A.19.15. Aortic Area

Formula
AOA (cm ²) =
$\Pi \cdot \left(\frac{D}{2}\right)^2$
D: Aortic diameter

A.19.16. Left Atrium/Aorta Ratio

Formula
Ratio =
$\frac{A}{B}$
A: Left atrium diameter
B: Aortic diameter

A.19.17. Right Ventricle Volume

Formula
Volume (ml) =
$A \cdot D \cdot \frac{2}{3}$
A: Area
B: Long axis
Accuracy $\pm 21\%$

A.19.18. Pulmonary Artery/RVOT Area

Formula
Area (cm ²) =
$\Pi \cdot \left(\frac{D}{2}\right)^2$
D: Pulmonary artery/RVOT diameter

A.19.19. Left Atrium Volume

Formula
Volume (ml) =
$\frac{0,85 \cdot A \cdot B}{C}$
A: Area in 4AC
B: Area in 2AC
C: Length
Accuracy $\pm 24\%$

Reference

Oh J, Seward J, Tajik A The echo manual-Second edition, Lippincott Williams &Wilkins

A.19.20. Indexed IVC Size

Formula
Size =
$\frac{A}{B}$
A: Maximum IVC diameter
B: BSA

Reference

J.M.Brennan, A.Ronan. et al. "Handcarried Ultrasound Measurement of the Inferior Vena Cava for Assesment of Intravascular Volume Status in the Outpatient Hemodialysis Clinic" In: *Clin J Am Soc Nephrol* 1:749-753, 2006

A.19.21. IVC Collapsibility Index

Formula
Index =
$\frac{(A - B) \times 100}{A}$
A: Maximum IVC diameter
B: Minimum IVC diameter
Accuracy $\pm 16\%$

Reference

J.M.Brennan, A.Ronan. et al. “Handcarried Ultrasound Measurement of the Inferior Vena Cava for Assesment of Intravascular Volume Status in the Outpatient Hemodialysis Clinic” In: *Clin J Am Soc Nephrol* 1:749-753, 2006

A.19.22. Relative Wall Thickness

Formula
$RWT = 2 \times LVPWd / LVIDd$
LVPWd: LV Posterior wall - Diastole
LVIDd: LV diameter - Diastole

Reference

Marwick et al., “Recommendations on the Use of Echocardiography in Adult Hypertension: A Report from the European Association of Cardiovascular Imaging (EACVI) and the American Society of Echocardiography (ASE)”, *Journal of the American Society of Echocardiography* July 2015

B. FORMULA AND REFERENCES IN M-MODE

B.1. Left Ventricle Ejection Fraction

	Derived Parameter
EF= $\frac{(A - B) \cdot 100}{A}$	A: $\frac{7 \cdot D^3}{2, 4 + D}$ D: Diameter in diastole
	B: $\frac{7 \cdot D^3}{2, 4 + D}$ D: Diameter in systole
Accuracy $\pm 30\%$	

Reference

Teichholz L.E., et al. "Problems in Echocardiographic Volume Determinations: Echocardiographic/Angiographic Correlations in the Presence or Absence of Asynergy" In: *American Journal of Cardiology*, 37, January 1976.1986, pp. 153-155

B.2. Left Ventricle Volume

Formula
Volume (ml) = $\frac{7 \cdot D^3}{2, 4 + D}$
D: Left ventricle diameter
Accuracy $\pm 15\%$

Reference

Teichholz L.E. et al. "Problems in Echocardiographic Volume Determinations: Echocardiographic/Angiographic Correlations in the Presence or Absence of Asynergy" In: *American Journal of Cardiology*, 37, January 1976.1986, pp. 153-155.

B.3. Stroke Volume

Formula
$SV \text{ (ml)} =$ $A - B$
A: Diastolic volume
B: Systolic volume
Accuracy $\pm 42\%$

Reference

G Kronik, J Slany et al. "Comparative Value of Eight M-Mode Echocardiographic Formulas for Determining Left Ventricular Stroke Volume" In: *Circulation* 1979;60;1308-1316

B.4. Stroke Index

Formula
$SI =$ $\frac{A}{B}$
A: Stroke volume
B: BSA

Reference

G Kronik, J Slany et al. "Comparative Value of Eight M-Mode Echocardiographic Formulas for Determining Left Ventricular Stroke Volume" In: *Circulation* 1979;60;1308-1316

B.5. Cardiac Output

Formula
$CO \text{ (l/min)} =$ $(A - B) \cdot HR$
A: Diastolic volume
B: Systolic volume
Accuracy $\pm 45\%$

Reference

G. de Simone, R. B. Devereux et al. "Stroke Volume and Cardiac Output in Normotensive Children and Adults: Assessment of Relations With Body Size and Impact of Overweight" In: *Circulation*. 1997;95:1837-1843

B.6. Cardiac Index

Formula
$CI = \frac{A}{B}$
A: Cardiac Output
B: BSA

Reference

G. de Simone, R. B. Devereux et al. "Stroke Volume and Cardiac Output in Normotensive Children and Adults: Assessment of Relations With Body Size and Impact of Overweight" In: *Circulation*. 1997;95:1837-1843

B.7. Left Ventricle Fractional Shortening

Formula
$FS = \frac{(A - B) \cdot 100}{A}$
A: Diastolic diameter
B: Systolic diameter
Accuracy $\pm 10\%$

Reference

Feigenbaum H., Echocardiography, 4th Ed., Lea & Febiger, Philadelphia, 1986, pp. 153-155

B.8. Septum Thickening

Formula
$S\% = \frac{(A - B) \cdot 100}{A}$
A: Intraventricular septum in systole
B: Intraventricular septum in diastole
Accuracy $\pm 10\%$

Reference

Feigenbaum H., Echocardiography, 4th Ed., Lea & Febiger, Philadelphia, 1986, pp. 153-155

B.9. Posterior Wall Thickening

Formula
$PW\% = \frac{(A - B) \cdot 100}{A}$
A: Posterior wall in systole
B: Posterior wall in diastole
Accuracy $\pm 10\%$

Reference

Feigenbaum H., Echocardiography, 4th Ed., Lea & Febiger, Philadelphia, 1986, pp. 153-155

B.10. Left Ventricle Mass

Formula
$LVM (g) = 1,04 \cdot [(A + B + C)^3 - B^3] - (13,6)$
A: Intraventricular septum in diastole
B: Diameter in diastole
C: Posterior wall in diastole
Accuracy $\pm 15\%$

Reference

Devereux R.B., Reichek N. et al. "Echocardiographic Determination of Left Ventricular Mass in Man - Anatomic Validation of the Method". In: *Circulation*, n.55, 1977, pp. 613-8

B.11. Left Ventricle Mass Index

Formula
$\text{Index} = \frac{A}{B}$
A: Left ventricle mass

Formula
B: BSA
Accuracy $\pm 15\%$

Reference

Devereux R.B., Reichek N. et al. "Echocardiographic Determination of Left Ventricular Mass in Man - Anatomic Validation of the Method". In: *Circulation*, n.55, 1977, pp. 613-8

B.12. LA/Aorta Diameters Ratio

Formula
Ratio =
$\frac{A}{B}$
A: Left atrium diameter
B: Aortic diameter
Accuracy $\pm 10\%$

B.13. Excentricity Index

Formula
Index =
$\frac{A}{B}$
A: Aortic diameter
B: Aortic coaptation line
Accuracy $\pm 10\%$

Reference

Nanda N.C., Gramiak R. et al. "Evaluation of Bicuspid Valves by Two-Dimensional Echocardiography" In: *American J. Cardiol.* 1987, 11 p.372



C. FORMULA AND REFERENCES IN DOPPLER

C.1. Gradient

Formula
$G \text{ (mmHg)} = 4 \cdot V^2$
V: Velocity
Accuracy $\pm 16\%$

Reference

Weyman A, "Principles and Practice of Echocardiography", Lea & Febiger, 1994. p.516

C.2. Peak Gradient

Formula
$\text{Gradient (mmHg)} = 4 \cdot V^2$
V: Peak velocity
Accuracy $\pm 16\%$

Reference

Weyman A., Principles and Practice of Echocardiography, Lea & Febiger, 1994, p. 605

C.3. Flow Velocity Integral

Formula
$FVI \text{ (cm)} = \sum(V_i \cdot \Delta T)$
V_i : Instant velocity
ΔT : Time interval
Accuracy $\pm 8\%$

C.4. Mean Velocity

Formula
$V_{mn} \text{ (m/s)} = \frac{\overline{FVI}}{t}$
t: Flow duration
Accuracy: $\pm 11\%$

C.5. Mean Gradient

Formula
$G_{mn} \text{ (mmHg)} = \frac{[4 \cdot (V_1^2 + V_2^2 + \dots + V_n^2)]}{n}$
V_i : Instant velocity
Accuracy: $\pm 11\%$

Reference

Weyman A, "Principles and Practice of Echocardiography", Lea & Febiger, 1994. p.605

C.6. Pulsatility Index

Formula
$PI = \frac{V_p - V_{TD}}{V_{mn}}$
Applicable where the flow doesn't go through the baseline
$PI = \frac{V_p - V_{rev}}{V_{mn}}$
Applicable where the flow goes through the baseline
V_p : Peak velocity
V_{TD} : Telediastolic velocity
V_{rev} : Reverse velocity
V_{mn} : Mean velocity
Accuracy $\pm 27\%$

Reference

Bardelli, Cominotto, Carretta, “High Blood Pressure & Cardiovascular Prevention” In: *The Official Journal of the Italian Society of Hypertension*, 6: 48-63 1997

C.7. Resistive Index

Formula
$RI = \frac{V_p - V_{TD}}{V_p}$
Applicable where the flow doesn't go through the baseline
$RI = \frac{V_p - V_{rev}}{V_p}$
Applicable where the flow goes through the baseline
V_p : Peak velocity
V_{TD} : Telediastolic velocity
V_{rev} : Reverse velocity
Accuracy $\pm 16\%$

Reference

Bardelli, Cominotto, Carretta, “High Blood Pressure & Cardiovascular Prevention” In: *The Official Journal of the Italian Society of Hypertension*, 6: 48-63 1997

C.8. Flow by Trace and by Ellipse

Formula
$\text{Flow (ml/s)} = V_{MT} \cdot A$
T_{AV} : Time average velocity
A: Area by Trace or by Ellipse

C.9. Flow by Diameter

Formula	Derived Parameters
$FS \text{ (ml/s)} = A \cdot V_{MT}$	$A = \Pi \cdot \left(\frac{D}{2}\right)^2$
T_{AV} : Time average velocity	D: Vessel diameter
Accuracy $\pm 21\%$	

Reference

Nichols W., O'Rourke M., McDonald's, "Blood Flow in Arteries", Edward Arnold London, p. 204

C.10. Pressure Half-Time

Formula
$PHT \text{ (ms)} = \frac{V_{Max} \cdot (1 - 0,707)}{Slope}$
Accuracy $\pm 28\%$

Reference

Hatle L., Angelsen B et al. "Noninvasive Assesment of Atrioventricular Pressure Half-Time by Doppler Ultrasound" In: *Circulation* 60, n.5, 1979, pp 1096-1104

C.11. Cardiology

C.11.1. Mitral Valve Area

Formula
$Area \text{ (cm}^2\text{)} = \frac{220}{PHT}$
Accuracy $\pm 28\%$

Reference

Weyman A., Principles and Practice of Echocardiography, Lea & Febiger, 1994, p. 605

C.11.2. E Wave/A Wave

Formula
$E/A =$
$\frac{A}{B}$
A: E wave peak velocity
B: A wave peak velocity
Accuracy $\pm 10\%$

C.11.3. Miocardiac Performance Index

Formula
Index =
$\frac{A + B}{C}$
A: Isovolumetric contraction time
B: Isovolumetric relation time
C: Ejection time
Accuracy $\pm 6\%$

Reference

C.Bruch, A.Schmermund et al. "TEI-index in patients with mid-to-moderate congestive heart failure" In: Eu. H.J. 2000, n.21 pp.1888-1895

C.11.4. dP/dt Ratio

Formula
Ratio =
$\frac{32}{t}$
t: time elapsed between -1m/s to -3m/s velocity values
Accuracy $\pm 3\%$

Reference

Bargiggia GS, Bertucci C. et al. "A new method for estimating left ventricular dP/dt by continuous wave Doppler echocardiography. Validation studies at cardiac catheterisation" In: *Circulation* 1989; 80; 1287-1292

C.11.5. Regurgitation Flow (PISA)

Formula
Flow (ml/s)= $628 \cdot R^2 \cdot V$
R: Radius
V: Aliasing velocity
Accuracy $\pm 14\%$

Reference

Bargiggia G.S., Tronconi L., Sahn D.J. et al. "A New Method for Quantitation of Mitral Regurgitation Based on Color Flow Doppler Imaging of Flow Convergence Proximal to Regurgitant Orifice" In: *Circulation*, 1991, 84: pp. 1481-1489

C.11.6. Effective Regurgitation Orefice (PISA)

Formula
O (ml)= $\frac{628 \cdot R^2 \cdot V_1}{V_2}$
R: Radius
V_1 : Aliasing velocity
V_2 : Regurgitation velocity
Accuracy $\pm 22\%$

Reference

Oh J, Seward J, Tajik A, The echo manual-Second edition, Lippincott Williams &Wilkins

C.11.7. Mitral Regurgitation Volume (PISA)

Formula
Volume (ml)= $\frac{6,28 \cdot R^2 \cdot V}{3,25}$
R: Radius
V: Aliasing velocity
Accuracy $\pm 14\%$

Reference

Rossi A., Dujardin K.S. et al. "Rapid Estimation of Regurgitant Volume by the Proximal Isovelocities Surface Area Method in Mitral Regurgitation: Can Continuous-Wave Doppler Echocardiography Be Omitted?" In: *Journal of the American Society of Echocardiography*. Volume 11, Number 2, pp. 138-148

C.11.8. Aortic Regurgitation Volume (PISA)

Formula
Volume (ml)=
$\frac{6,28 \cdot R^2 \cdot V_1 \cdot FVI}{V_2}$
R: Radius
V_1 : Aliasing velocity
FVI: Flow velocity integral
V_2 : Regurgitation peak velocity
Accuracy $\pm 30\%$

Reference

Shiota T., Jones M., Yamada I. et al. "Effective Regurgitant orifice Area by the Color Doppler Flow Convergence Method for Evaluating the Severity of Chronic Aortic Regurgitation. An Animal Study" In: *Circulation*, 1996; 93; pp. 594-602

C.11.9. E' Wave/A' Wave

Formula
$E'/A' =$
$\frac{A}{B}$
A: E' wave peak velocity
B: A' wave peak velocity
Accuracy $\pm 16\%$

C.11.10. E Wave/E' Wave

Formula
$E/E' =$
$\frac{A}{B}$
A: E wave peak velocity
B: E' wave peak velocity
Accuracy $\pm 16\%$

C.11.11. Intraventricular Mechanical Delay

Formula
IMD (ms) =
$A - B$
A: Aorta pre-ejection time
B: Pulmonary pre-ejection time
Accuracy $\pm 9\%$

Reference

F.Knebel, R.K.Reibeis et al. "Tissue Doppler Echocardiography and Biventricular Pacing Heart Failure: Patient Selection, Procedural Guidance, Follow up, quantification of Success" In: *Card Ultr* 2004, n.2-17

C.11.12. Effective Aortic Valve Area

Formula	Derived Parameters
Area (cm ²) =	A =
$\frac{A \cdot FVI_1}{FVI_2}$	$\Pi \cdot \left(\frac{D}{2}\right)^2$
A: LVOT area	D: LVOT diameter
VTI ₁ : LVOT flow velocity integral	
VTI ₂ : Aortic flow velocity integral	
Accuracy ± 28	

Reference

Huntsman L., Stewart D. et al. "Noninvasive Doppler Determination of Cardiac Output in Man" In: *Circulation* 67, n. 3, March 1983

C.11.13. Maximal Aortic Valve Area

Formula	Derived Parameters
Area (cm ²)= $\frac{A \cdot V_1}{V_2}$	A = $\Pi \cdot \left(\frac{D}{2}\right)^2$
A: LVOT area	D: LVOT diameter
V ₁ : Aortic peak velocity in LVOT	
V ₂ : Aortic peak velocity	
Accuracy $\pm 22\%$	

Reference

Zaghbi WA, Farmer KL et al. "Accurate non-invasive quantification of stenotic aortic valve area by Doppler echocardiography" In: *Circulation* 1986; 73; 452-459

C.11.14. Systolic Pressure

Formula
Pressure (mmHg)= $4 \cdot V^2 + \text{Set pressure gradient}$
V: Regurge velocity
Accuracy $\pm 16\%$

Reference

Currie P.J. et al. "Continuous Wave Doppler Determination of Left Ventricular Pressure: a Simultaneous Doppler Catheterization Study in 127 Patients" In: *J. Amer. College Cardiol.* 1985, 6, p.750

C.11.15. Systolic Velocity/Diastolic Velocity

Formula
V _s /V _d = $\frac{A}{B}$
A: Systolic velocity
B: Diastolic velocity
Accuracy $\pm 10\%$

C.11.16. Heart Rate

Formula
HR (bpm) =
$\frac{60}{T}$
T: R-R interval
Accuracy $\pm 3\%$

C.11.17. Stroke Volume

Formula	Derived Parameters
SV (ml) = $A \cdot FVI$	A = $\Pi \cdot \left(\frac{D}{2}\right)^2$
A: LVOT area	D: Diameter
FVI: Flow velocity integral	
Accuracy $\pm 19\%$	

Reference

Huntsman L., Stewart D. et al. "Noninvasive Doppler Determination of Cardiac Output in Man" In: *Circulation*, 67, n. 3, March 1983

C.11.18. Stroke Index

Formula
SI =
$\frac{A}{B}$
A: Stroke volume
B: BSA
Accuracy $\pm 19\%$

Reference

Huntsman L., Stewart D. et al. "Noninvasive Doppler Determination of Cardiac Output in Man" In: *Circulation* 67, n. 3, March 1983; Skjaerpe T, Hegrenaes L et al. "Non invasive estimation of valve area in patients with aortic stenosis by Doppler ultrasound and two-dimensional echocardiography" In: *Circulation* 1985; 72; 810-818

C.11.19. Cardiac Output

Formula	Derived Parameters
$CO \text{ (l/min)} = A \cdot FVI \cdot HR$	$A = \Pi \cdot \left(\frac{D}{2}\right)^2$
A: LVOT area	D: Diameter
FVI: Flow velocity integral	
HR: Heart rate	
Accuracy $\pm 21\%$	

Reference

Huntsman L., Stewart D. et al. “Noninvasive Doppler Determination of Cardiac Output in Man” In: *Circulation*, 67, n. 3, March 1983

C.11.20. Cardiac Index

Formula
$CI = \frac{A}{B}$
A: Cardiac output
B: BSA
Accuracy $\pm 19\%$

Reference

Huntsman L., Stewart D. et al. “Noninvasive Doppler Determination of Cardiac Output in Man, In: *Circulation* 67, n. 3, March 1983; Skjaerpe T, Hegrenaes L et al. “Non invasive estimation of valve area in patients with aortic stenosis by Doppler ultrasound and two-dimensional echocardiography” In: *Circulation* 1985; 72; 810-818

C.11.21. Qp/Qs

Formula
$Qp/Qs = \frac{A}{B}$
A: Pulmonary artery stroke volume
B: LVOT stroke volume
Accuracy $\pm 42\%$

Reference

Sanders S.P. et al. "Measurement of Systemic and Pulmonary Blood Flow and Qp/Qs Ratio using Doppler and Two-Dimensional Echocardiography" In: *Am. J. Cardiol.* 1983, 51, p.952

C.11.22. Coronary Reserve

Formula
Reserve =
$\frac{A}{B}$
A: Post LAD prox/mid/distal
B: Rest LAD prox/mid/distal
Accuracy $\pm 10\%$

Reference

P. Guarini, G Scognamiglio et al. "La valutazione non invasiva della riserva di flusso coronarico mediante ecocardiografia transtoracica: fisiopatologia, metodologia e valenza clinica" In: *Ital Heart J supp Vol 4 Marzo 2003* F. Rigo et al. "Transthoracic echocardiography imaging of coronary arteries: tips, traps, pitfalls" In: *Cardiovascular Ultrasound* 2008, 6:7

C.11.23. Pulmonary Capillary Wedge Pressure

Formula
PCWP = $1.24 [E/e'] + 1.9$
E: Mitral peak velocity - E wave
e': Lateral E' Wave

Reference

Nagueh et al., "Doppler Tissue Imaging: A Noninvasive Technique for Evaluation of Left Ventricular Relaxation and Estimation of Filling Pressures", *JACC* Vol. 30, No. 6 November 15, 1997:1527–33

C.11.24. Formulas of Automatic Doppler Measurements

This paragraph lists when applicable, the formulas of the automatic Doppler measurements.

Table C-1 Flow Velocity Integral

Formula
$FVI \text{ (cm)} = \sum(V_i \cdot \Delta T)$
V_i : Instant velocity
ΔT : Time interval
Accuracy $\pm 8\%$

Table C-2 Mean Velocity

Formula
$V_{mn} \text{ (m/s)} = \frac{FVI}{t}$
t: Flow duration
Accuracy: $\pm 11\%$

ARCHIVING

1	Digital Archiving	1-1
1.1	Archive Overview	1-1
1.2	Archive Icons.....	1-3
1.3	Saving and Exporting Configuration	1-4
1.3.1	Saving Options.....	1-4
1.3.2	Multimedia Export.....	1-5
2	How to Review Archived Exams.....	2-1
2.1	Access to the Archive.....	2-1
2.1.1	Exams Archive Icons	2-2
2.1.2	Exam Patient List.....	2-2
2.1.3	Archive Management Touchscreen Controls	2-3
2.2	How to Select Exams	2-6
2.3	Exam Exported on CD/DVD	2-7
2.4	Import Exams from the DICOM Database	2-7
2.4.1	Query/Retrieve from PACS	2-8
2.4.2	Retrieving DICOM exams from CD/USB	2-9
2.5	How to Review Archived Exams.....	2-10
2.5.1	Review Touchscreen.....	2-10
2.6	Image Post Processing (Raw Data from Archive)	2-12
3	Visual Comparison	3-1
3.1	How to Activate Visual Comparison	3-1
3.2	Display Organization in Visual Comparison.....	3-1
3.3	How to Compare Images and Clips.....	3-2
3.3.1	Visual Comparison Touchscreen	3-3
3.3.2	Measurements in Visual Comparison.....	3-3
4	Archive Media Menus	4-1
4.1	Accessing the Contextual Menus	4-1
4.2	Description of the Contextual Menus.....	4-2
4.2.1	Operations Menu	4-2
4.2.2	Retry Failed Operations.....	4-3
4.2.3	Properties.....	4-3
4.2.4	Delete Temporary Directories	4-3
4.2.5	Show IP Address Info	4-3
4.2.6	Erase Device	4-3
4.2.7	Erase CD/DVD.....	4-4
4.2.8	Eject.....	4-4
4.2.9	Export Log File to USB	4-4
5	DICOM Configuration.....	5-1
5.1	How to Configure DICOM Profile	5-1
5.1.1	General Folder	5-2
5.1.2	Storage and MPPS Folders	5-2
5.1.3	Worklist Folder.....	5-5
5.1.4	Quality Folder	5-8
5.1.5	Printers Folder	5-9
5.1.6	QUERY/RETRIEVE Folders	5-11
5.1.7	MyLabTablet Folder	5-12
5.2	Management of DICOM Printers.....	5-13
5.2.1	Page Preview	5-14
5.2.2	Print Now	5-14

5.2.3	Reset Page.....	5-14
5.2.4	Print Operations.....	5-14
6	Network Configuration.....	6-1
6.1	Special Cautions When Connecting the Ultrasound Scanner to a Network.....	6-1
6.1.1	Network Characteristics	6-1
6.2	How to Configure the Network.....	6-2
6.2.1	IP Configuration Folder	6-3
6.2.2	Network Directories Folder.....	6-4
6.3	Wireless Folder.....	6-5
6.3.1	How to Set a Wireless Network.....	6-5
6.3.2	CONNECTED Field.....	6-6
6.3.3	CONNECT Button	6-6
6.3.4	AUTOCONN Button	6-6
7	Printer Management	7-1
7.1	How to Configure a Printer Profile	7-1
7.1.1	Printer Remote Control.....	7-2
7.1.2	Printing Profiles	7-3
7.1.3	Configure printer.....	7-4
7.2	Printer Installation.....	7-5
7.2.1	How to install an USB printer	7-6
7.2.2	How to install a Network printer.....	7-7
7.3	Management of Remote-Controlled Printers	7-8
7.3.1	Page Preview	7-8
7.3.2	Print Now	7-9
7.3.3	Reset Added Images.....	7-9
7.3.4	Layout Options	7-9

1. DIGITAL ARCHIVING

This chapter introduces the archiving capabilities of **MyLab**.

This chapter includes the following topics:

1.1 *Archive Overview*

1.2 *Archive Icons*

1.3 *Saving and Exporting Configuration*

1.1. Archive Overview

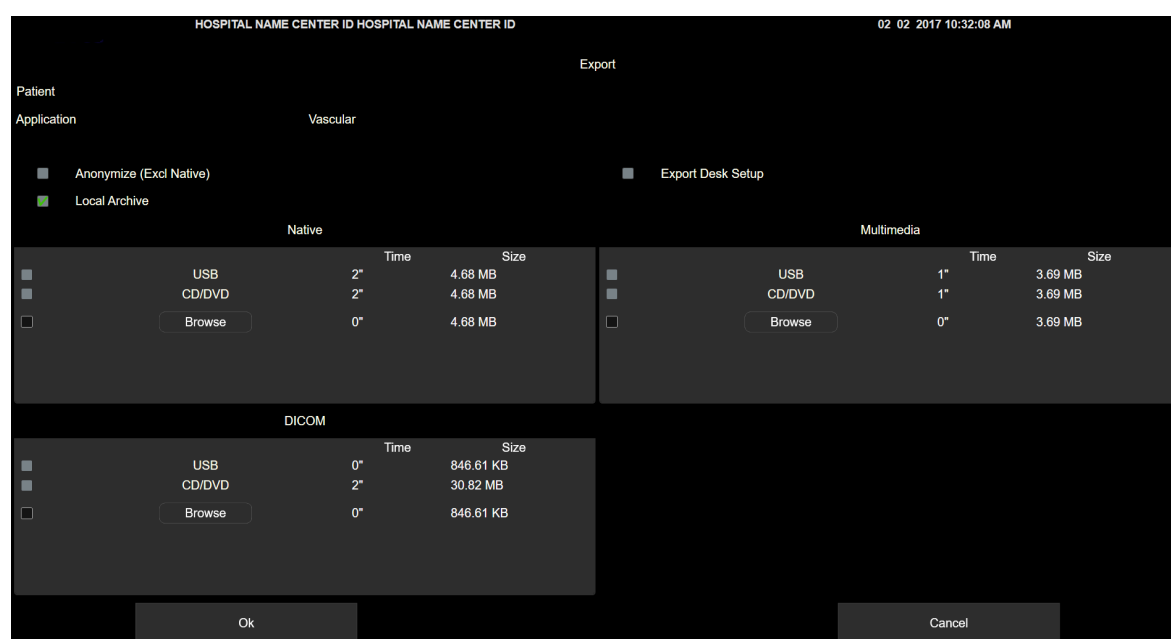
MyLab is equipped with an internal hard disk (local archive) where exams can be archived.

During the exam, acquired still images and clips are temporarily saved into the local archive and listed as thumbnails at the right side of the screen.

At the end of the exam, when **END EXAM** is pressed, they can be definitively stored both on the local archive itself and on external memories (DVDs, CDs, USB devices, or sent over a network to an archive server).

At the end of the exam, unless **AUTO SAVE** is enabled (see further in this chapter), at **END EXAM** pressure the following screen is displayed.

Fig. 1-1 End Exam Screen



NOTE

The above screen is displayed also when **MyLab** is switched on if the machine was switched off without first closing the exam underway.

Here you can select the destination(s) where data will be stored: **LOCAL ARCHIVE** to save in **MyLab** internal hard disk, **USB** to save into an external USB device, **CD/DVD** to burn a removable disk and **BROWSE** to send over a network to a selected destination. As alternative you can tap the related buttons on the touchscreen.

Beside each destination the **TIME** field shows the estimated time for the operation while the **SIZE** field shows the estimated size of data.

The exam can be:

- archived in native format in the local archive and on an external medium (**NATIVE** area),
- exported in multimedia formats on an external medium (**MULTIMEDIA** area),
- exported in DICOM format on an external medium (**DICOM** area).

Still images can be exported on external media with full (BMP format) or compressed resolution (PNG and JPEG formats); clips are compressed. The **MyLab** menu allows to set the clip duration.

Data can be archived both in native format, in DICOM format (for **MyLab** equipped with a DICOM license) and exported as single frames and AVI files (refer to the “Getting Started” manual for information on supported images and clip formats). Exported data cannot be reviewed by **MyLab**.

The corresponding report can be simultaneously saved on an external medium in pdf format.

The following media can be selected for archiving and exporting operations:

Table 1–1 Archiving Media

Medium	Native Format	Other Formats	Notes
Internal Hard Disk	Yes	No	-
CD (R and RW)	Yes	Yes	Empty disks must be used. If the disk already contains data it cannot be written. Rewritable CDs can be used to archive data as far as they are empty.
DVD (+R, -R, single layer)	Yes	Yes	Empty disks must be used. If the disk already contains data it cannot be written. Double Layers DVDs are NOT supported by MyLab .
USB Media	Yes	Yes	USB archiving media devices are managed as multi-session: data can be added to the ones already available.
Network directory	Yes	Yes	
DICOM Storage Server	No	Yes	Data are saved in DICOM format only

Selection can be made either by checking the desired destinations in the End Exam screen using the trackball or by pressing the buttons in the touchscreen.

MyLab allows to manage many USB media devices; you can select the destination you prefer in the combo box. Different USB devices can be selected for saving in Native, Multimedia or DICOM format.

When the exam is archived on CD or DVD in DICOM format, the DVLite^[1] viewer is automatically stored in the medium, allowing the user to review the exams on any PC.

Before archiving, you can also select **ANONYMIZE**, to made anonymous the patient's data.

NOTE

The native format of the exam can not be made anonymous.

Selecting **EXPORT DESK SETUP MyLabDesk** will be exported on the external media with data.

Once all the options have been selected, press **OK** to start the saving procedure. Instruction messages will open if there are any user or system errors. Archiving is always carried out in background, therefore real time can be reactivated almost immediately. While data are being transferred, the icon is filled with color; when color disappears the archiving procedure is over.

NOTE

If no option is selected in the End Exam screen, all stored data are deleted.

NOTE

When wireless connection is active, the exams ought to be archived in a network directory only when the Signal Strength level is higher than 80%: the operation could fail when the signal level is below this threshold. Refer to “Network Configuration” chapter on this manual for further information on wireless connection.

When the free disk space is lower than 10GB, **MyLab** displays a warning message to alert the user. In this case, back the archive up and then delete exams from the internal data base.

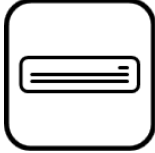
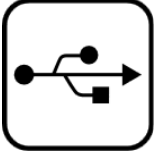


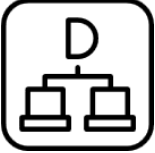
Exported exams are organized in folders: each exam is included in a specific folder with its images, clips and report.

1.2. Archive Icons

The icons identifying archiving media are displayed on the left of the footer bar.

1. DVLite is a DICOM viewer developed by Esaote.

Table 1–2 Archive Icons

Hard Disk	USB Medium	Burner	Network	DICOM
				

When background operations are running, the corresponding icon is filled with color and the screen indicates the remaining time. The color disappears once the operation is over.



The icon marked with a red “X” indicates that there are problems in the management of that specific archiving medium. When this occurs, check the “OPERATIONS” menu (see next chapters for further information).

NOTE

During burning procedures, the burner icon turns yellow to inform the operator that **MyLab** might be slowed down during the burning initial phase. This phase lasts a few seconds.

Refer to next chapters for further details on how to check each operation status.

When clicking on the icon, **MyLab** displays the status of the operations.

NOTE

Do not switch **MyLab** off or remove the archiving medium while saving; this could cause damages to data or to the hard disk.

Before removing the archiving medium, check that the remaining time is over.

1.3. Saving and Exporting Configuration

1.3.1. Saving Options

Refer to the “Getting Started” manual for information on the configuration procedure.

Saving Options allows to configure the settings to save the data at the end of the exam.

Press **MENU** then **SAVING OPTIONS** to enter in the Saving Options Configuration Menu. It is organized in two main areas: the left side shows the list of all saved saving data profiles and the right side the configuration menu.

Here you can create a new profile (**NEW** or **CLONE**), modify (**EDIT**) or delete (**CANCEL**) an existing one.

Table 1–3 Saving Options

Parameter	Action
LOCAL ARCHIVE	When checked, the exam is saved on the MyLab internal Hard disk Drive in native format.
AUTO SAVE	When checked, it allows to automatically save the exam at the end without displaying the End Exam window.
VERIFY BURN CD/DVD	When checked, it allows to automatically verify the burned CD/DVD.
PAUSE EXAM	When checked, it allows to temporarily suspend an exam.

Procedure

1. Select to save exams in the internal archive and/or external destinations as USB, CD/DVD or network (BROWSE) and in which exam format (NATIVE, DICOM or MULTIMEDIA).

NOTE

When more than one USB media is connected, you can select the desired one in the combo box.

2. fill the NAME field with the desired name for the saving option and add an optional description in the NOTES field,
3. **SAVE** or **CANCEL**.

1.3.2. Multimedia Export

Refer to the “Getting Started” manual for information on the configuration procedure.

These options allow to set the compression format of single images and clips. The defined formats will be used each time images and clips are exported.

You can assign specific export configurations to different **MyLab** configurations: refer to the “Getting Started” manual and within this section for further information on **MyLab** configuration.

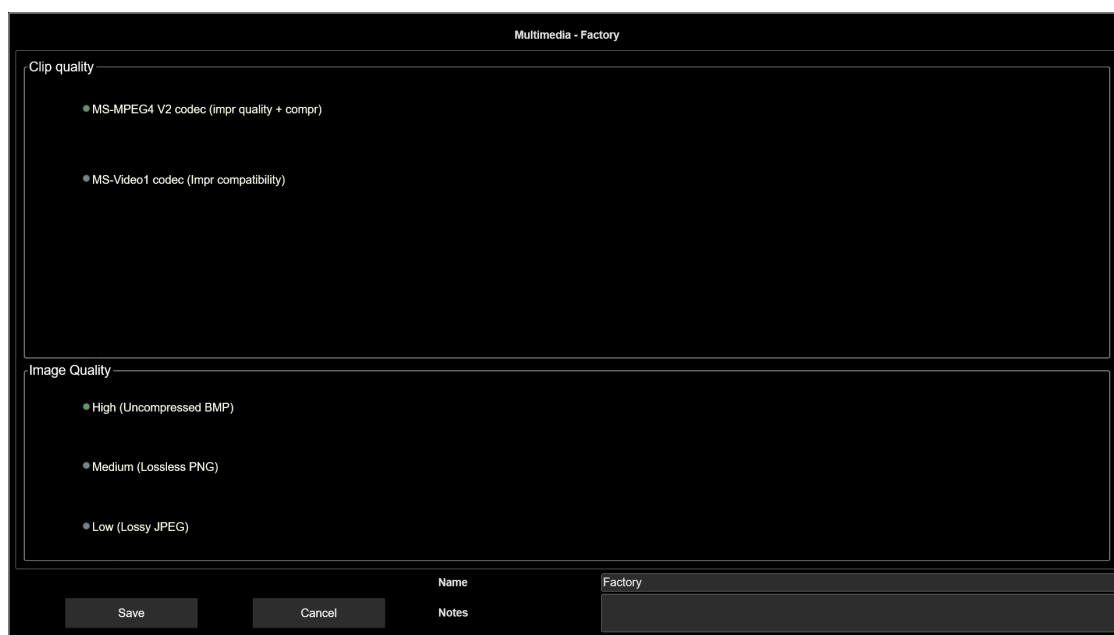
Press **MENU** then **MULTIMEDIA** to enter in the Multimedia Export Configuration Menu. It is organized in two main areas: on the left side the list of configured export profiles and on the right side the configuration menu.

Here you can create a new profile (**NEW** or **CLONE**), modify (**EDIT**) or delete (**CANCEL**) an existing one.

Procedure

1. Select the desired Clip and Image Quality that are the compression characteristics that can be set both for clips and single images.

Fig. 1–2 Export Configuration Menu



1.3.2.1. Clip Quality

The following formats are available:

- MPEG-4 AVC (H.264) CODEC, ensuring the best image quality and compression, compatible with Windows and Linux software programs for clip management;
- MS-VIDEO1 CODEC, ensuring the best compatibility with Mac OS and other software programs for clip management.

1.3.2.2. Image Quality

The following formats are available:

- HIGH (UNCOMPRESSED BMP) ensuring the high image quality;
- MEDIUM (LOSSLESS PNG) ensuring a medium image quality;
- LOW (LOSSY JPEG), with low image quality.

2. HOW TO REVIEW ARCHIVED EXAMS

This chapter describes how to use the archive.

This chapter includes the following topics:

2.1 *Access to the Archive*

2.2 *How to Select Exams*

2.3 *Exam Exported on CD/DVD*

2.4 *Import Exams from the DICOM Database*

2.5 *How to Review Archived Exams*

2.6 *Image Post Processing (Raw Data from Archive)*

2.1. Access to the Archive

Archived data can be accessed by pressing **ARCHIVE**.

Once the button is pressed **MyLab** displays the screen below and at the same time the touchscreen displays dedicated key for Archive controls.

Fig. 2–1 Main Archive Menu

Patient's Name	Patient ID	Application	Exam Date	Exam time
		Vascular	02 02 2017	10:31AM
		Vascular	02 02 2017	10:27AM
		Abdominal	02 02 2017	10:09AM
		Vascular	01 02 2017	04:40PM
		Vascular Abdominal Musculo-Sk	01 02 2017	02:54PM
		Vascular Musculo-Skeletal Gene	01 02 2017	02:03PM
		Vascular	01 02 2017	01:59PM
		Vascular	01 02 2017	11:01AM
		Abdominal	01 02 2017	11:00AM
		Vascular Abdominal OB-Fetal	01 02 2017	10:50AM
		Abdominal	01 02 2017	10:37AM
		Abdominal Musculo-Skeletal	01 02 2017	10:27AM
		Vascular Abdominal	01 02 2017	10:05AM
		Abdominal General	31 01 2017	04:11PM
		Abdominal	31 01 2017	03:48PM
		Abdominal General	31 01 2017	03:37PM
		Abdominal	31 01 2017	03:07PM
		Abdominal	31 01 2017	02:15PM
		Abdominal	31 01 2017	02:13PM
		Abdominal	31 01 2017	02:12PM
		Abdominal	31 01 2017	02:09PM
		Abdominal	31 01 2017	01:35PM
		Abdominal	31 01 2017	12:08PM

Local Archive. Page 1. Number of selected exams: 1. Use the ACTION key for multiple selection.



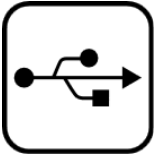

2. How to Review Archived Exams

- (1) Exam Archive Icons
- (2) Exam Patient List
- (3) Thumbnails preview

2.1.1. Exams Archive Icons

When **MyLab** accesses the archive, the header bar shows on the right the following icons.

Table 2-1 Exam Archive Icons

Hard Disk	Burner	USB Medium	Network
			

The selected archive is displayed on a brighter background, available archives on a darker background. Select the icon to see the list of the archived exams stored in the related media.

When more than one USB media is connected, you can select the desired origin by right clicking on the USB Medium icon and selecting the device you want from the list. At the end of the exam list it is displayed the selected origin.

As alternative selecting **SELECT ARCHIVE** tab on the touchscreen displays the buttons to select the available archiving media (for example local archive, DVD) and the button to browse directories: **LOCAL ARCHIVE**, **DVD**, **USB** or **BROWSE**.

2.1.2. Exam Patient List

Images can be reloaded for each patient and a specific exam can be reviewed. Specific measurements can be taken and saved on the reloaded images.

The current exam is displayed on the top of the list of archived exams. Archived exams follow in alphabetic order.



The folder symbol, when shown on the archived exams list, indicates that the corresponding exam contained images/clips.

The thumbnail of the selected exam is displayed on the right side of the screen: when more exams are selected, the thumbnail corresponds to the last selected exam.



This icon is displayed on the footer area whenever a read-only exam is selected. An exam could be read-only either because it is archived on CD/DVD or because an operation is still in progress on the selected exam. In the latter case click on the corresponding icon to display the status of the operations.

2.1.3. Archive Management Touchscreen Controls

Once **ARCHIVE** has been tapped, the touchscreen, within **ARCH MANAGER** tab, provides two control levels containing the following buttons and knobs:

2.1.3.1. Basic Controls

DEL EXAMS

deletes the selected exams from the archive.

EXPORT

saves the selected exams both in native and in other formats (BMP, PNG or JPEG for single frames and AVI for clips in Multimedia option and in DICOM format) on external media. Media can be selected directly on the touchscreen or by checking the desired boxes on the screen with the trackball and the **ENTER** key. Data can be made anonymous in both formats.

Before exporting the selected exams, **MyLab** estimates the files size and the time necessary for the transfer. The displayed estimation allows the user to check whether there is enough space on the destination medium. Exam reports are exported in pdf format.

IMPORT DICOM DB

imports exams from the DICOM Database. Refer to the related paragraph for further information.

ITEM

If the list is longer than one page this knob scrolls down exam by exam.

LATEST DICOM DB

opens the more recently accessed DICOM Database. Refer to the related paragraph for further information.

NO SELECTION

deselects the selected exams.

OPEN

automatically displays the selected exam(s). Refer to the paragraph “How to Review Archived Exams” for further information.

PAGE

If the list is longer than one page this knob scroll down the entire page.

QUERY

allows the user to selectively review the exams by setting search criteria such as patient's name or date of birth. Use the trackball and the alphanumeric keyboard to enter search criteria in the fields and press **ENTER** to activate the search. A list of exams satisfying the set criteria appears on the screen at the end of the search.

RESET

deletes the set search criteria.

ROW

This knob scrolls down the page row by row.

SELECT ALL EXAMS

selects all the exams included in the archive.

2. How to Review Archived Exams

SELECT INTERVAL

selects more than one exam: using the trackball position the cursor on the first exam and press **ENTER**. Place then the cursor on the last exam and press **ENTER** again. Alternatively, if possible, move the cursor using the trackball, press **↑Shift** and **ENTER** key simultaneously.

SELECT PAGE

selects the exams displayed in the current page.

TODAY

lists the exams archived today.

YESTERDAY

lists the exams archived yesterday.

2.1.3.2. Advanced Controls

EVENT VIEWER

opens a dedicated menu where the operations done on the exams, saved in the local archive, can be sorted according to advanced searching criteria.

The viewer menu is organized with internal folders, selectable either using the tabs displayed on the top/left of the screen or by pressing the corresponding buttons on the touchscreen.

Press either **ARCHIVE** or **BACK TO EXAM LIST** to exit from the viewer menu.

All Events Folder

ALL EVENTS

This folder displays the list of all the exams where at least one operation (for instance modifying the report or printing an image) has been done.

The exams are listed with additional information compared with main archive menu. Information on the type of operation, the status and the final destination are added. These parameters offer additional searching criteria as listed in the table below.

Field	Searching criteria
TYPE	Sets the type of exams to be searched (for example all DICOM exams, all printed exams).
STATUS	Sets the status of the performed operations to be searched (for example all completed operations, all failed operations).
DESTINATION	Sets the destination to be searched.

Set the searching criteria in the corresponding field; multiple criteria can be used for the exams selection.

History of Selected Exams Folder

HISTORY OF SEL EXAMS

The history of the exams, selected in the main archive menu, is displayed in this folder.

Back Up Reminder**BACK UP REMINDER**

This folder displays the list of all the exams where no operation has been done according to the set searching criteria.

Set the searching criteria in the corresponding field; multiple criteria can be used for the exams selection.

EXAMS NOT ARCHIVED

shows the list of exams that have been performed and not archived into the local database. From this window, the user can select the exams to be saved on the local hard disk (**RESTORE** button) and delete not saved exams.

NOTE

The available memory size for the exams which have not been archived depends upon the archive size. When the memory is full, the list is updated by deleting the oldest exams. Typically, about 100 exams can be kept on this list.

REBUILD ARCH IDX

allows rebuilding the index of the archive, if the archive is corrupted. The archive index can be rebuilt both for the internal and for external archive, such as external USB hard disk.

**CAUTION**

Do not switch the unit off while performing this procedure. The hard disk could be permanently damaged.

2.1.3.3. Controls during real-time session

While performing an examination of a patient in real-time and accessing the archive to load data from a previous examination of the same patient, the following keys are displayed on the archive touchscreen:

GO TO ACQUISITION

exits from the archive menu going back to real-time and leaving displayed the thumbnails belonging to the exam selected in archive.

The thumbnails coming from archive are grouped next to the real-time image in a tab labelled with the date of the exam, while the thumbnails belonging to the current exam are grouped in a tab labelled as current.

GO TO TOUCHSCREEN

exits from the archive menu going back to real-time and displaying on the touchscreen the first image belonging to the exam selected in archive. Images on the touchscreen can be scrolled by swiping left or right.

FOLLOW UP

opens the image selected from the archive next to the real-time image for comparison.

GO TO VNAV

once a series is selected from the archive it loads the selected series directly into the environment set in Navigator Configuration as Navigator Tool: VNav, Breast Nav, MR Breast Nav or Uro Fusion.

2.2. How to Select Exams

Once the proper archive has been selected, the listed exams contain the following data:

- The patient's name,
- The exam number (PATIENT ID),
- The exam type (for example cardiology, vascular),
- The exam date and time.

The exams to be reviewed can be directly selected either by placing the cursor on them (or on the corresponding thumbnails) and by pressing **ENTER** to confirm or by using advanced searching criteria. Selected exams are highlighted.

MyLab allows the multiple selection of exams: the **ACTION** key can be used both to select single exams and to select groups of exams.

Selection of Single Exams

Place the cursor on the exam and press **ACTION**. Move the cursor on the next exam to be selected and press **ACTION** again. Repeat the operation to select all the desired exams.

Alternatively, if possible, move the cursor using the trackball, press the **Ctrl** and **ENTER** key simultaneously to select single exams.

Selection of Groups of Exams

Place the cursor on the first exam and press **ACTION**. By keeping this key pressed, move the cursor on the last exam of the interval and release then the **ACTION** key: all the exams located between the first and the last one will be automatically selected.

Alternatively, if possible, move the cursor using the trackball, press the **↑Shift** and **ENTER** key simultaneously to select groups of exams.

Advanced Searching Criteria

When the EXAM DESCRIPTION field in the Patient ID page has been filled, **MyLab** offers a quick search criteria for the corresponding exams: by typing the first description letters, **MyLab** automatically lists all the exams matching the criteria.

2.3. Exam Exported on CD/DVD

CD/DVD are not managed in multi-session: only one burning operation at a time can be activated.

When the exam is exported to a CD/DVD disk, **MyLab** will be inoperative during the burning procedure and it will display the following message:

Warning:
One of selected destinations is CD/DVD; during CD/
DVD operations, the user interaction will be stopped.
Do you want to continue?

The duration of the burning procedure corresponds to the estimated time for the selected CD/DVD operation.

Press **NO** to end the procedure.

The burning procedure starts as soon as the **YES** button is pressed. **MyLab** displays a waiting icon and the following message:

A burning procedure is in progress.
Pressing CANCEL the operation stops.
Warning: the CD/DVD may be unusable.

The procedure can be stopped at any time by pressing the **CANCEL** button. In this case the CD/DVD is unusable.

2.4. Import Exams from the DICOM Database

IMPORT DICOM DB allows to import into the local archive exams saved in DICOM format from USB, CD/DVD, Temporary Storage, Network folders and PACS when it has been configured. Refer to *DICOM Configuration* chapter for further information on DICOM configuration.

If the source you are importing from, does not contain the DICOM DIR, **RECURSE FOLDERS TO GET THE DICOM FILES** is automatically enabled and the DICOM DIR is created during the import operation.

Temporary Storage is a temporary archive where DICOM exams are sent from external devices when the option **ENABLE STORE SCP SERVER** is enabled. Refer to *DICOM Configuration* chapter for further information.

MyLab allows to import multi-modality DICOM exams; when loaded from archive, multi-modality imported DICOM files have some restriction compared to the exams done with **MyLab**: no measurements are allowed, no sending to PACS is allowed, no multimedia export is allowed. Those files are recognizable by a grey text on the exam list.

NOTE

Before importing exams archived on other **MyLabs**, verify that DICOM data have been exported with specific DICOM settings (header and report) from Esaote devices. Contact Esaote personnel for all information on compatible Esaote devices and on how to correctly import these databases.

NOTE

Imported DICOM exams can be reviewed and XStrain analyzed (contact Esaote personnel for more information on the Esaote devices that are compatible with the Strain analysis). A cross is displayed in the exam list to indicate that the corresponding exam has been DICOM imported.

The image quality of the imported DICOM data is strictly correlated to the compression level set on **MyLab** devices. Esaote recommends to use at least high-level quality and, for XStrain processing, mandatory uncompressed.

2.4.1. Query/Retrieve from PACS

When the importing procedure from PACS is selected, **MyLab** displays the list of all the patients and the details of the exam, study and series.

Fig. 2-2 Query/Retrieve screen

21 02 2017 06:08:27 PM

Patient
Last Name: [] First Name: []
ID: [] Acc#: []

Exam
Date: [] / [] / [] - [] / [] / [] Modality: []

Ref Physician
Last Name: []

Query [] Reset query []

Patient Name	Patient ID	Study date	Study time	Modalities	Instances
MOLLA E	B20374280	31 03 2015	12:45:42 PM	CT;	
MARIS C	78866	20 01 2014	11:24:50 AM	MR;	
Carothyd	SL1543; AL2442	02 04 2012	01:30:49 PM	US; DOC	
	859	14 10 2016	11:31:04 AM	US;	
	856	14 10 2016	10:17:30 AM	DOC;	
	863	14 10 2016	11:34:56 AM	US;	

Modality: [] Series number: [] SeriesDate: [] SeriesTime: [] Instances: []

US 2 02 04 2012 00:00:00 AM 4
US 13 02 04 2012 00:00:00 AM 1
DOC 2001 02 04 2012 00:00:00 AM 1

Study details Series details
Modality: US
Series number: 2
Instances: 4
SeriesDescription: Vascular

Vascular strain analysis graph showing strain values and a color-coded strain map.

Retrieve study [] Retrieve series [] Cancel []

The following controls are available both on screen and touchscreen:

QUERY	allows the user to selectively review the exams by setting search criteria such as patient's name, date of birth or modality. Use the trackball and the alphanumeric keyboard to enter search criteria in the fields and press QUERY to activate the search. A list of exams satisfying the set criteria appears on the screen at the end of the search. Select an exam from the list to view its details. It will be displayed in two tabs STUDY DETAILS and SERIES DETAILS to the right of search result box.
RESET QUERY	resets the query parameters.
RETRIEVE SERIES	loads the selected exam into the MyLab local archive from PACS.
RETRIEVE STUDY	
TODAY	lists the exams archived today.
YESTERDAY	lists the exams archived yesterday.

At the end of the copy, **CANCEL** has to be pressed in order to exit from Query/Retrieve.

NOTE

Only ultrasound images can be downloaded from PACS and it is not possible to perform measurements on them.



WARNING



This symbol is displayed on the screen when the loaded image size is slightly bigger than the display area, for this reason part of the original image is not shown. Use the **PAN** key to display the missing part.

2.4.2. Retrieving DICOM exams from CD/USB

When retrieving a DICOM exam from a CD or USB medium, the message **EXAM RETRIEVE IN PROGRESS** is displayed at the start of the retrieval, which can be closed by clicking the **OK** button.

During the retrieval, the icon at the bottom of the screen turns blue and the number of series retrieved is updated to show the progress of retrieval.

If an exam is started during retrieval and the retrieved exams belong to the same patient, thumbnails of the retrieved exams appear progressively next to current exam thumbnails as soon as they are retrieved.

2.5. How to Review Archived Exams

OPEN automatically displays the selected exam (s). **MyLab** automatically displays the first exam, showing its related thumbnails. The selected image or sequence is shown on the screen and its thumbnail is contoured by a frame. Clips are played in motion.

When more exams have been selected, the tabs displayed above the thumbnails columns allows to browse the data of the reviewed exams. To display a thumbnail full screen, place the cursor on the desired thumbnail and press **ENTER**.

Reloaded images can be printed.

Any performed annotation (adding both text and bodymark) on the reviewed exam is automatically saved with it. To remove the annotation press **DELETE ALL** button before closing the archived exam revision.

See the “Measurements” section for information on taking measurements.

Measures can be done on the archived images and sequences. The performed measurements are saved on the report, they are not stored on the image itself.

2.5.1. Review Touchscreen

The **REVIEW** menu includes the controls described below.

ATTACH	attaches the selected image to the report; in this case this icon is displayed in the footer area of the screen, whenever the user reviews an image attached to the report.
BACK TO ACQUISITION	exits from revision displaying a frozen image of the current exam.
CLOSE EXAM	closes the selected exam.
DELETE IMAGES	deletes the selected images and sequences.
EDIT	enables post processing operations. Refer to the paragraph <i>Image Post Processing (Raw Data from Archive)</i> for further information.
EXAM	scrolls the exams (when more exams are reviewed).
EXPORT	exports the selected image/clip in multimedia formats on an external medium.
FIRST FRAME	positions the scroll memory cursor at the begin of the selected sequence.

FOLLOW UP	shows the selected multi-modality image in the main screen with the ultrasound image live for real time comparison. Multi-modality follow-up includes US, CT, MRI, RX, PET/CT. The multi-modality archived image can be displayed on the touchscreen instead of the main screen, allowing you to have even more detail while performing the ultrasound exam. Swipe down on the blue arrow on top center of the touchscreen to access this layout. Swipe left/right to scroll the images. Swipe up to close.
FRAME	scrolls the memory frame by frame.
ITEM	scrolls the thumbnails.
LAST FRAME	positions the scroll memory cursor at the end of the selected sequence.
MULTIVIEW	Rotate the knob to display 2, 4, 9 or 16 images full screen. Press it to go back to single view. The selected number of images is maintained when reviewing other exams. Once in Multiview, click once to select an image or click twice to open an image. Multiselection is possible with ACTION .
OPENED EXAMS	shows the buttons to scroll the opened exams: each button is named with the patient name and exam date.
PAGE	scrolls the thumbnails if the selected exam has more than 16 stored images or clips: when pressing this button, MyLab skips to the next 16 thumbnails. Alternatively, the trackball can be used.
PLAY	activates the sequence playing presentation.
ROW	scrolls a row of the thumbnails list.
SPEED	shows the sequence at different speeds.
STOP	de-activates the playing presentation and allows the sequence to be scrolled image-by-image, using the trackball.

When in archive review, both still frames and clips can be saved following the same procedures used in real time and Freeze.

NOTE

When an image/clip has been saved from an archived image/clip, the date for this saved image/clip starts with * to identify it from the original one.

Multiple Selection of Images and Clips

To speed up exporting and deleting operations, **MyLab** allows the multiple selection of images and clips using the same procedures described for multiple selection of exams in Archive Review.

2. How to Review Archived Exams

Selection of Single Thumbnails

Place the cursor on the first thumbnail and press **ACTION**. Move the cursor on the next thumbnail to be selected and press **ACTION** again. Repeat the operation to select all the desired thumbnails.

Alternatively, if possible, move the cursor using the trackball, press the **Ctrl** and **ENTER** key simultaneously to select single thumbnails.

Selection of Groups of Thumbnails

Place the cursor on the first thumbnail and press **ACTION**. By keeping this key pressed, move the cursor on the last thumbnail in the interval and the release the **ACTION** key: all images located between the first and the last thumbnail will be automatically selected.

Alternatively move the cursor using the trackball, press the **↑ Shift** and **ENTER** key simultaneously to select groups of thumbnails.

SELECT ALL selects all thumbnails.

REPORT button can be pressed at any time to display the archived report.

Press either **ARCHIVE** or **BACK TO ACQUISITION** to exit from the review menu.

2.6. Image Post Processing (Raw Data from Archive)

Clips acquired in Retrospective mode, clips of trace and single image can be post processed both in Exam Review and in Archive Review when saved in raw data format.

NOTE

Raw Data from Archive is an optional feature requiring a specific licence that allows to save clips/images in raw data format.

Clips acquired in retrospective mode, clips of trace and single images can be post processed only if acquired through a MyLab were the licence Raw Data from Archive is installed.

The thumbnails of the clips/images saved in raw data format are identified by the green counter, displayed on the right bottom side of the thumbnail. All the other thumbnails have a white counter.

EDIT, active only when a clip/image saved in raw data has been selected, enables post-processing operations that are related to the mode in which the image/clip has been saved (B-Mode, CFM or Doppler).

NOTE

The controls available in Post Processing are a subset of those available in every mode.

Measurements are available in Post Processing while annotations, bodymarks, print and export are disabled.

IMAGE and **CLIP** respectively allow to save the post processing changes as single image and clip. The image/clip is not saved in raw data format. The modifications done on the image/clip are lost if they are not saved through the **IMAGE** and **CLIP** buttons.

3. VISUAL COMPARISON

This chapter explains how to compare archived exams.

This chapter includes the following topics:

3.1 *How to Activate Visual Comparison*

3.2 *Display Organization in Visual Comparison*

3.3 *How to Compare Images and Clips*

3.1. How to Activate Visual Comparison

Saved images and clips can be simultaneously compared both with each other and with archived images and clip of the same patient or of other patients. Up to four different images and clips from different exams can be compared.

When in Exam Review and Archive Review, **COMPARE**, displayed on the tools menu to the touchscreen left side, activates and de-activates the visual comparison modality.

3.2. Display Organization in Visual Comparison

In Visual Comparison the screen is divided in two (Dual format) or four (Quad format) boxes. The boxes are organized in clockwise order: in Dual format the left box is in the first; in the Quad format the upper left box is the first.

The box of the selected image or clip is highlighted by a yellow frame. The related patient data are displayed at the top of each box.

1X2 and **2X2** buttons respectively select to the Dual or the Quad displaying format.

Depending on the selected displaying format, additional tabs are added to the Visual Comparison touchscreen (**VIS COMP** tab). The first tab (indicated as **1**) selects the first box and so on.

Fig. 3–1 Touchscreen Organization



To select the desired image or clip, press the relevant tab or, alternatively, place the cursor on the image and press **ENTER**.

3.3. How to Compare Images and Clips

Different modalities have to be followed to compare images and clips. These modalities depend both whether the compared images/clips belonged to the same patient or to different patients and whether the images and clips are archived in the internal data base or not.

Images and clips of the same patient

Images and clips to be compared can belong to the same exam or to previously saved exams that can be archived locally or on external media. In this latter case the procedure to be followed is exactly the same of the comparison among different patients (see further).

Once Visual Comparison modality has been activated, follow the procedure below to add new images or clips:

1. If necessary, select the desired displaying format.
2. If the images/clips to be added belonged to the same exam:
 - Scroll the thumbnails.
 - Select the desired image or clip: the selected thumbnail is contoured by a white frame.
 - Place the cursor on the desired box in the image area and press **ENTER** to confirm.
3. If the images/clips to be added are archived in the internal data base:
 - Press **QUERY** button.
 - **MyLab** shows the list of all the archived exams of the same patient.
 - Using the trackball and the alphanumeric keyboard select the exams to be added.
 - Press **OK** to confirm.
 - Scroll the thumbnail columns to select the desired exam.
 - Scroll the thumbnails.
 - Select the desired image or clip.
 - Place the cursor on the desired box in the image area and press **ENTER** to confirm.

Images and clips of the different patients

In this case the images and clips to be compared have to be opened before activating the Visual Comparison modality.

1. Press **ARCHIVE**.
2. Select the exams to be compared and open them.
3. Press **COMPARE** to activate the Visual Comparison modality.
4. If necessary, select the desired displaying format.
5. Scroll the thumbnail columns to select the desired exam.

6. Scroll the thumbnails.
7. Select the desired image or clip.
8. Place the cursor on the desired box in the image area and press **ENTER** to confirm.
9. Repeat the operation.

The thumbnails of the displayed images and clips are contoured by an orange frame and are marked with the corresponding tab number.

The selected image/clip on the main display is contoured by a yellow frame.

3.3.1. Visual Comparison Touchscreen

The menu of both the Visual Comparison tab and the additional tabs includes the following buttons:

1X2	respectively select to the Dual or the Quad displaying format.
2X2	
BEST SIZE	acts on both panned and zoomed image/clip canceling all modifications.
PAN	moves the selected image or clip.
PLAY ALL	respectively display in cine mode and stop all clips shown on the screen.
STOP ALL	
ZOOM	activates the zoom function on the selected image: use the trackball to adjust the enlargement factor. Refer to the previous paragraphs for information on all other controls.

3.3.2. Measurements in Visual Comparison

Generic measurements (+...+ key) on single frames can be done on the 1x2 format: **MyLab** automatically activates the generic measures available for the application of the selected image.

NOTE

The performed measurements can not be added to the report.

4. ARCHIVE MEDIA MENUS

This chapter describes the archive contextual menus and their functions.

This chapter includes the following topics:

4.1 *Accessing the Contextual Menus*

4.2 *Description of the Contextual Menus*

4.1. Accessing the Contextual Menus

To access the contextual menus simply right-click on the Archive Media (Devices) icons displayed in the footer area, a subset of the following controls is displayed:

- Operations,
- Retry failed operations,
- Properties,
- Delete temporary directories,
- Show IP address info,
- Erase device,
- Erase CD/DVD,
- Eject,
- Export log file to USB.

Select the desired control to open the related menu.

The following media can be selected for archiving and exporting operations:

Table 4–1 Menu available on Archiving Media

	Hard Disk	USB	DVD/CD	Network	DICOM
Operations	Yes	Yes	Yes	Yes	Yes
Retry failed operations	Yes	Yes	-	Yes	Yes
Properties	Yes	Yes	Yes	-	-
Delete temporary directories	Yes	-	-	-	-
Show IP address info	Yes	-	-	-	-
Erase device	-	Yes	-	-	-
Erase CD/DVD	-	-	Yes	-	-

Table 4–1 Menu available on Archiving Media (cont'd.)

	Hard Disk	USB	DVD/CD	Network	DICOM
Eject	-	-	Yes	-	-
Export log file to USB	-	Yes	-	-	-

NOTE

When more than one USB media is connected, right clicking on the USB icon you can select the desired USB media and the controls listed will act only on the selected USB media.

4.2. Description of the Contextual Menus

4.2.1. Operations Menu

The Operations menu can be directly displayed by positioning the pointer on the icon and by pressing **ENTER**.

The dialogue window displays the list of exams (in the **EXAM DESCRIPTION** column), the type of operation, the destination, the operation status (completed, in progress or failed) and the date and time of the operation.

The operations can be sorted by checking the different criteria boxes:

The Operations touchscreen displays the following buttons.

ABORT	interrupts the operation selected with the trackball.
ALL	displays all operations. Also available on screen.
DELETE	deletes the operation selected with the trackball.
DETAILS	gives information on the error of the operation selected with the trackball.
EXCLUDE DONE TASKS	displays all operations, except the ones already completed. Also available on screen.
FAILED	selects failed operations. Also available on screen.
RETRY	repeats the operation selected with the trackball.
TO BE COMPLETED	selects operations which still have to be completed. Also available on screen. TIME LEFT indicates the time necessary to complete all pending operations. DONE indicates the percentage of completed operations.



If one or more operations have failed, the icon is marked with a red “X”. Select the failed operation(s) and either retry it or delete it; the cross will disappear when no failed operation is listed.

4.2.2. Retry Failed Operations

MyLab automatically repeats all failed operations. Position the cursor on the option and press **ENTER** to repeat or delete.

4.2.3. Properties

This option shows the free space available in the internal hard disk, the whole disk space and the used memory.

For USB devices, it indicates the size of the inserted medium and the amount of still free space on it.

For CD/DVD, it shows the properties of the disk inserted into the burner.

NOTE

When the free space is between 20 and 60% and, in any case, when it is lower than 20%, make a copy of the archive and then delete all copied exams to free space on the hard disk.

4.2.4. Delete Temporary Directories

Temporary directories are automatically created to be used as extra memory for archiving operations such as DICOM conversion or exams copies. When the archiving operations are particularly slow, the temporary directories can be deleted to improve the performances.

NOTE

To avoid dealing with a slow archive, make periodical copies of it and free some space in the internal hard disk by deleting the copied exams.

4.2.5. Show IP Address Info

This option shows the set IP configuration both for wired and wireless connections.

4.2.6. Erase Device

This option is used to delete all data stored on the USB medium. Insert the USB medium, select the option from the menu, place the cursor on field Yes and press **ENTER** to begin the erasing procedure.

4.2.7. Erase CD/DVD

This option is used to delete all data stored on rewritable CD/DVDs. Insert the CD/DVD in the burner, select the option from the menu, place the cursor on Yes field and press **ENTER** to begin the erasing procedure.

4.2.8. Eject

This option is used to eject CD/DVD from the burner.

For all the other options apply the same instructions as the ones given for the hard disk.

4.2.9. Export Log File to USB

This option allows the user to save the log files onto a USB key. To save the log files, insert a USB medium into one of the two connectors and activate the procedure.

For all the other options the same instructions apply as the ones given for the hard disk.

5. DICOM CONFIGURATION

This chapter explains how to configure DICOM capabilities.

This chapter includes the following topics:

5.1 *How to Configure DICOM Profile*

5.2 *Management of DICOM Printers*

5.1. How to Configure DICOM Profile

Press **MENU** then **DICOM** to enter in the DICOM Configuration Menu. It is organized in two main areas: the left side shows the list of all saved DICOM profiles and the right side the DICOM configuration menu.

Here you can create a new profile (**NEW** or **CLONE**), modify (**EDIT**) or delete (**CANCEL**) an existing one.

NOTE

These options are available if **MyLab** is DICOM licensed.

NOTE

Refer to the site www.esaote.com for the supported DICOM classes.

The configuration menu is organized with internal folders, selectable using the tabs displayed on the top of the menu.

Fig. 5-1 DICOM Configuration Menu

DICOM - Factory

General Storage Worklist MPPS Quality Printers Query Retrieve MyLabTablet

Local AE Title LION-01

TCP listen Port 11112

Enable Store SCP Server ☒

Empty Temporary Area

Save Cancel

Name Factory

Notes

To create a customized profile follow the procedure below:

Procedure

1. select the folder you want configure,
2. select the desired class.

5.1.1. General Folder

This option sets the LOCAL AE TITLE for **MyLab**. The factory setting is “MyLab”.

The TCP LISTEN PORT field relates to the SC DICOM class and defines the port used by **MyLab** for Storage Commitment.

When the option ENABLE STORE SCP SERVER is checked, **MyLab** can receive unsolicited DICOM exams. Those images are saved in a temporary storage and can be imported though **IMPORT DICOM DB**; once taken they are deleted from the temporary storage.

Pressing **EMPTY TEMPORARY AREA**, the entire content of the temporary storage is deleted.

5.1.2. Storage and MPPS Folders

The configuration menus of these DICOM classes are similar and each menu shows:

- in the center the list of all set DICOM configurations,
- on the bottom the fields to **ADD**, **EDIT**, **REMOVE** a DICOM configuration.

Procedure

To create a customized profile follow the procedure below:

1. press the **ADD** button to add a new DICOM configuration;
2. to change an existing configuration, select the desired configuration using the trackball and press **EDIT**;
3. the figure below shows the configuration menu:

Fig. 5–2 MPPS Folder

Description	<input type="text"/>
AE Title	<input type="text"/>
Host Name / IP Address	<input type="text"/>
Port number	0
Enabled	<input checked="" type="checkbox"/>
Verification	
<input type="button" value="Ok"/> <input type="button" value="Cancel"/>	

This option allows the user to set the configuration **DESCRIPTION**, its **AE TITLE**, the **HOST NAME** (or **IP ADDRESS**), the number of the port used to communicate with **MyLab** (**PORT NUMBER**).

NOTE

To use DICOM functions, a static IP address is recommended.

The set DICOM class is used only when the **ENABLED** field is selected.

Selecting **TLS ENABLED** enables encrypted and authenticated transmission. For the correct configuration the PACS administrator has to supply three configuration files (for certificate, private key and server certificate) and the password to fill the field in the configuration windows displayed after pressing **CONFIGURE**. File can be loaded with a USB drive.

TLS can be enabled for each single host.

VERIFICATION checks the connection status.

5.1.2.1. Storage Folder

In this folder it is possible to enable the sending of DICOM image/clip during the exam and to configure the Storage Commitment.

When the field **SEND IMAGE AS SOON AS ACQUIRED** is checked, both in real time and in Exam Review any saved image and clip (respectively by pressing **IMAGE** and **CLIP**) are sent to the set DICOM Storage Server as soon as they are created.



WARNING

When the sending of DICOM image/clip during the exam has been enabled, it is not possible:

- to modify the patient data during the exam;
- to modify the bodymark and the annotations on the saved image/clip in Exam Review.

When **AUTOMATIC RETRY** is checked **MyLab**, in case of unsuccessful sending, repeats many attempts up to the maximum number defined in **MAX RETRIES** field. **DELAY (S)** field sets the time between two successive attempts.

NOTE

To be enabled only in the event of occasional communication problems and after the DICOM Storage configuration has been completed and you have verified that it is working.

The report and the saved images and clips of Stress echo protocol are sent at the end of the exam.

STC SERVER button opens the menu where the configuration description, the AE Title, the Host name (or IP address), the number of the port used to communicate have to be set together with the Response Time (in minutes).

5.1.2.2. MPPS

When the MPPS DICOM class is enabled, **MyLab** displays a warning message whenever an exam is started without any patient data inserted.

ABANDONED PROCEDURE button is added to the End Exam window. When this button is pressed, the exam is abandoned.

5.1.2.3. How to Delete a DICOM Configuration

To delete a DICOM configuration, follow this procedure:

1. select the desired class with the trackball;
2. select the DICOM configuration to be deleted and press **REMOVE**.

5.1.3. Worklist Folder

The configuration menu of the Worklist class allows the user to set the configuration description, its AE Title, the Host name (or IP address), the number of the port used to communicate with **MyLab**.

NOTE
To use DICOM functions, a static IP address is recommended.

Fig. 5–3 Worklist Folder

Description	<input type="text"/>		
AE Title	<input type="text"/>		
Host Name / IP Address	<input type="text"/>		
Port number	<input type="text" value="0"/>		
Enabled	<input checked="" type="checkbox"/>		
Narrow Query	<input type="checkbox"/>		
Automatic Query	<input type="checkbox"/>		
Enable background query	<input checked="" type="checkbox"/>	Refresh Period (minutes)	<input type="text" value="15"/>
Force Details	<input type="checkbox"/>		
		<input type="button" value="Configuration"/>	
		<input type="button" value="Verification"/>	
<input type="button" value="Ok"/>		<input type="button" value="Cancel"/>	

The Worklist class is used only when the **ENABLED** field is selected.

The same configuration menu allows to configure query parameters for the Worklist.

Field	Action
NARROW QUERY	When enabled, MyLab automatically runs a control on the scheduled exam before starting it to detect eventual modifications.
AUTOMATIC QUERY	MyLab automatically executes the last run query whenever the WORKLIST button is pressed from the Start Exam page.
ENABLE BACKGROUND QUERY	The configured query is automatically run every set refresh period.
FORCE DETAILS	When checked MyLab verifies that at least one among Patient Last Name, Patient ID and Accession number in the worklist panel contains a string. In case all these three attributes are empty, an error message appears and the query is not done.
REFRESH PERIOD	Sets the refresh period. To change the period, place the cursor on the field, press ENTER and set the desired value.

CONFIGURATION button allows to configure the search criteria for the background query.

Fig. 5-4 Worklist configuration

Modality

US

This one

All

Specific

Performing Phys

Last Name

First Name

Ok

Field	Action
MODALITY	Sets the default modality for the Worklist exam. To change the modality, place the cursor on the field, press ENTER and set the desired one.
THIS ONE	The query searches the exams having the same AETitle.
ALL	The query searches all the exams in the Worklist.
SPECIFIC	The query searches the exam having the entered criteria. To do it, place the cursor on the field, press ENTER and set the desired one.
PERFORMING PHYSICIAN	Sets the LAST NAME and FIRST NAME of the performing physician.

VERIFICATION checks the connection status.

5.1.3.1. Start Exam Page

The **WORKLIST** button is displayed in the Start Exam window when the Worklist DICOM class is enabled. When pressed the menu below is displayed:

Fig. 5–5 Worklist at start exam

The screenshot shows the 'Worklist at start exam' interface. It features three main input sections: 'Patient' (Last Name, First Name, ID, Acc#), 'Exam' (Req Proc, Modality, Date, Unit), and 'Performing Phys' (Last Name, First Name, and a table with Patient, Gender, Date, ID, Acc#, and Status). On the right, there are tabs for 'Patient', 'Exam', and 'Record status'. At the bottom, there are 'Select exam' and 'Cancel' buttons, and a checkbox for 'Perform procedure as requested'. A status bar at the bottom right indicates 'Last successful query 18 Days ago' and 'Result Transmission error'.

The PATIENT, EXAM and PERFORMING PHYS sections of the menu allow to configure and change the search criteria for the query.

MyLab displays the following controls:

CANCEL exits the menu without loading any patient.

QUERY refreshes the patient list.

RESET PARAMETERS resets the query parameters.

SELECT EXAM loads the patient in the Start Exam page.

When the field **PERFORM PROCEDURE AS REQUESTED** is checked, the exam is run exactly as the Worklist server requires.

Place the cursor on the desired listed patient and press **ENTER** to select it. The **PATIENT**, **EXAM** and **RECORD STATUS** right tabs are updated and respectively display the patient data, the exam data and any warning related to the selected exam.

5.1.3.2. How to Delete a Worklist Configuration

To delete a Worklist configuration follow this procedure:

1. select the desired class with the trackball;
2. select the Worklist configuration to be deleted and press **REMOVE**.

5.1.4. Quality Folder

Here for each archiving media (USB, CD, DVD, mapped network directories...) you can set different options. Select on the Device box on the left the media you want, then set its option on the boxes on the right.

Clip Quality

The following quality values can be set for clips:

- **HIGH (LOSSY JPEG)**, when this option is selected, the clip quality is affected by a minimum compression;
- **MEDIUM (LOSSY JPEG)**, when this option is selected, the clip quality is affected by a medium compression;
- **LOW (LOSSY JPEG)**, when this option is selected, the clip quality is affected by a maximum compression;
- **MAX (UNCOMPRESSED)**, clips can be left uncompressed but this option has to be set only when the compression algorithm is not compatible with other DICOM environments, as explained in the following warning, displayed on the screen.

NOTE

The MAX (UNCOMPRESSED) option should be used just in case of compatibility problems. Please note that it heavily affects the converted clip size and the conversion time.

The **MATRIX SIZE** option allows to resize the clip frames selecting the size from small to full.

When the option **SKIP CLIP** is checked, every DICOM clip exporting operation is disabled.



WARNING

When this option is enabled, the acquired clips will not be sent to the DICOM server, or any media performing DICOM export.

Image Quality

The following quality values can be set for images:

- **HIGH (UNCOMPRESSED)**, when this option is selected the image is not compressed;
- **MEDIUM (LOSSLESS RLE)**, when this option is selected the image quality is compressed without loss of information;
- **LOW (LOSSY JPG)**, when this option is selected, the image quality is compressed with a minimum compression.

The set qualities for clips and images are used for any DICOM archiving operation (on server or on any other medium).

Report

The report can be set as:

- **STRUCTURED REPORT**, when this option is enabled, the **ADD MEASUREMENTS FILE** field allows to send measurements file to SuiteEstensa^[1];
- **DICOM VIEWER COMPATIBLE IMAGE**;
- **NONE**.

When DICOM viewer compatible image is enabled, the **MODALITY** field allows to set whether to send the report in DOC modality or in US modality.

Calibration

When **ADD PIXEL SPACING** is enabled, the Pixel Spacing tag will be added whenever an image is DICOM converted.

Image Caption

When **INCLUDE CAPTION IN IMAGE** is enabled, all data displayed in **MyLab** header area will be inserted into the pixels of the DICOM image.

5.1.5. Printers Folder

The configuration menu of the DICOM printer shows:

- on the top the combos allowing to associate the printers to the dedicated panel keys (**PRINTER MODEL** field) and to set the printing layout (**PROFILE** field); additional options allow the automatic printing while saving images (**AUTOMATIC PRINTING OF ACQUIRED IMAGES**) and automatic saving of all printed images (**STORE PRINTING IMAGE**); **BUTTON 1** configures the printer controlled by button **1**, **BUTTON 2** the one controlled by button **2** and so on;

NOTE

The same printer key can manage both an USB and a DICOM printer at the same time. When both printers are configured on the same key, **MyLab** will print two printings each time this key is pressed.

- in the center the list of the available printing profiles;
- on the bottom the fields to **ADD**, **EDIT**, **REMOVE** a DICOM printer profile and to add a new DICOM printer model.

SAVE saves and activates the settings.

CANCEL exits the menu without saving the new settings.

NEW MODEL button allows to add a new DICOM printer model. Contact Esaote personnel for further information.

1. SuiteEstensa is an Esaote Software for CIS/RIS/PACS systems. Refer to www.esaote.com for further information.

Procedure

To create a customized profile follow the procedure below:

1. press the **ADD** button to add a new DICOM printer profile;
2. to change an existing profile, select the desired configuration using the trackball and press **EDIT**;
3. the figure below shows the configuration menu:

Fig. 5–6 Add DICOM Printer

The screenshot shows a configuration window for adding a DICOM printer. It contains the following elements:

- Description:** A text input field.
- AE Title:** A text input field.
- Host Name / IP Address:** A text input field.
- Port number:** A text input field containing the value '0'.
- Enabled:** A checkbox that is currently checked.
- Models:** A dropdown menu with 'Agfa_Drystar_2000' selected.
- Verification:** A button located below the Models dropdown.
- Ok:** A button at the bottom left.
- Cancel:** A button at the bottom right.

4. set the configuration description, its AE Title, the Host name (or IP address), the number of the port used to communicate with **MyLab**. Every DICOM printer connected to **MyLab** has to be selected among the available ones (MODELS field).

NOTE

If the DICOM printer model to be configured is not listed, select the option “Generic_Printer” and verify that the configuration is working. If not, please contact the Esaote personnel.

The DICOM printer is available only when the **ENABLED** field is selected.

- if necessary, verify the connection status by pressing the **VERIFICATION** button;
- select the printer model and the printing profile in the **BUTTON 1** fields.

5.1.5.1. Printing Profile

Each DICOM printer can have different printing profiles.

Highlight the desired printer and press **SHOW PROFILES**: the menu lists the set printer profiles.

To create a printing profile follow this procedure:

1. press the **ADD** button to add a new profile;
2. to change an existing profile, select the desired configuration using the trackball and press **EDIT**;
3. the figure below shows the printing profile menu:

Field	Action
PRINTER MODEL	Indicates the selected DICOM printer.
DESCRIPTION	Modifies the printer description.
LAYOUT	Sets the printing layout.
ROWS	Indicates the number of rows for the selected printing layout.
COLUMNS	Indicates the number of columns for the selected printing lay-out.
FILM ORIENTATION	Sets the orientation of the film.
FILM SIZE	Sets the size of the film.
MEDIUM TYPE	Sets the medium type (for example sheet, film).
COLOR CAPABILITIES	Sets the color scale.
NUMBER OF COPIES	Sets the number of copies.

REMOVE deletes the selected printing profile.

5.1.6. QUERY/RETRIEVE Folders

When the QUERY/RETRIEVE DICOM class is configured, **MyLab** archive is able to retrieve data from a PACS.

NOTE

Only ultrasound images can be retrieved from the PACS.

Procedure

To create a customized profile follow the procedure below:

1. press the **ADD** button to add a new DICOM configuration;
2. to change an existing configuration, select the desired configuration using the trackball and press **EDIT**;
3. the figure below shows the configuration menu:

Fig. 5-7 Query/Retrieve configuration menu

Description	ORTHANC-PCPAMPANA-DICOM
AE Title	ORTHANC
Host Name / IP Address	192.168.105.160
Port number	4242
Enabled	<input checked="" type="checkbox"/>
Verification	

Ok Cancel

This option allows the user to set the configuration description, its AE Title, the Host name (or IP address), the number of the port used to communicate with **MyLab**.

NOTE

To use the DICOM functions, a static IP address is recommended.

The set DICOM class is used only when the ENABLED field is selected.

VERIFICATION checks the connection status.

5.1.7. MyLabTablet Folder

MyLabTablet allows to remotely access the **MyLab** archive to review images and clips. Data transfer uses a DICOM protocol. The **MyLabTablet** application communicates with the Web server to fetch and represent images on your mobile device.

From this folder you can enable **MyLabTablet**.

NOTE

MyLabTablet requires a dedicated App to be installed on your tablet + licence.

Fig. 5–8 MyLabTablet configuration menu

DICOM - Factory

General Storage Worklist MPPS Quality Printers Query Retrieve **MyLabTablet**

New Password

Confirm new password

☒ Enable

IP Address 192.168.109.41

Save Cancel

Name Factory

Notes

Procedure

To enable creating a customized profile, follow the procedure below:

1. Here, in order to establish the connection, the **ENABLED** field should be checked and a password set;
2. Write down the IP ADDRESS value to be used on **MyLabTablet** in order to set up the connection;
3. Configure the App on your tablet.

After the connection has been established, you can access the **MyLab** images/clips and enjoy all the features of **MyLabTablet**. Please refer to the complete user manual for operation guidance. We hope you have a great experience with **MyLabTablet**!

5.2. Management of DICOM Printers

Positioning the trackball pointer on the DICOM printer icons displayed in the footer area and pressing **UNDO** give access to a contextual menu with the following controls:

- Page Preview,
- Print now,
- Reset added images,
- Layouts.

5.2.1. Page Preview

This option shows the print preview.

UP and **DOWN** buttons respectively allow to move up and down the selected image.

REMOVE button deletes the selected image.

OK saves the modifications and **CANCEL** exits the menu without saving.

5.2.2. Print Now

To print before formatting is complete, select the **PRINT NOW** option to start printing.

5.2.3. Reset Page

The option cancels all images sent to be printed: the printing counter is automatically reset.

5.2.4. Print Operations

The dialogue window displays the list of exams (in the **DESCRIPTION** column), the type of operation, the destination, the operation status (completed, in progress or failed) and the date and time of the operation.

The operations can be sorted by checking the different criteria boxes:

- **ALL** displays all operations;
- **FAILED** selects failed operations;
- **TO BE COMPLETED** selects operations which still have to be completed;
- **EXCLUDE DONE TASKS** displays all operations, except the ones already completed;

TIME LEFT indicates the time necessary to complete all pending operations.

DONE indicates the percentage of completed operations.

The touchscreen displays the following additional keys:

ABORT	interrupts the operation selected with the trackball.
DELETE	deletes the operation selected with the trackball.
DETAILS	gives information about the error of the operation selected with the trackball.
RETRY	repeats the operation selected with the trackball.

If one or more operations have failed, the printer icon is marked with an “X”. Select the failed operation(s) and either retry it or delete it; the cross will disappear when no failed operation is listed.

6. NETWORK CONFIGURATION

This chapter explains how to configure the networking functionality.

This chapter includes the following topics:

6.1 *Special Cautions When Connecting the Ultrasound Scanner to a Network*

6.2 *How to Configure the Network*

6.3 *Wireless Folder*

6.1. Special Cautions When Connecting the Ultrasound Scanner to a Network

Special cautions have to be taken when **MyLab** is connected to a network for data exchanging.

Esaote personnel or your network administrator must configure the **MyLab** for network connectivity taking in account any safety issue.

Be advised that on the network are transferred confidential data about patients and their health, so, when changing network configuration, you must take in account to protect the network safety.

Network connection stability depends on many factors. Unreliable connection may later lead to failure and cause hazardous situations, like data leakage of the patients, operators or third parties. It is recommended to set up the device in a secure network and behind the firewall. You must evaluate and identify all potential risks as well as prepare suitable countermeasures before connecting the equipment to an uncontrolled network.

Even when the connection to a network is trusted, any change of the network settings might introduce new risks and require additional analysis. Subsequent changes include:

- any modification to the network configuration (IP address, router, proxy, and so on),
- any new connection of additional devices,
- any disconnection of device,
- any update or upgrade of any connected device.

6.1.1. Network Characteristics

MyLab should be connected only to a carefully managed data network.

MyLab can be connected both to a Local Area Network (LAN) using the connector placed in the rear panel and to a Wi-Fi network using the native wireless capabilities.

The network connection enables:

- to use network shared printers,
- to use network directories,
- to use the supported DICOM Classes (for example worklist, SC).

MyLab uses the TCP/IP network protocol.

In using the network remember that:

- data might be damaged or not sent at all if the network is unstable or is not correctly set,
- data might be lost by disconnecting the network,
- data might be sent to a wrong destination if the network is not correctly configured.

6.2. How to Configure the Network

Press **MENU** then **NETWORK** to enter in the Network Configuration Menu. It is organized in two main areas: the left side shows the list of configured network profiles and the right side the network configuration menu.

Here you can create a new profile (**NEW** or **CLONE**), modify (**EDIT**) or delete (**CANCEL**) an existing one.



WARNING

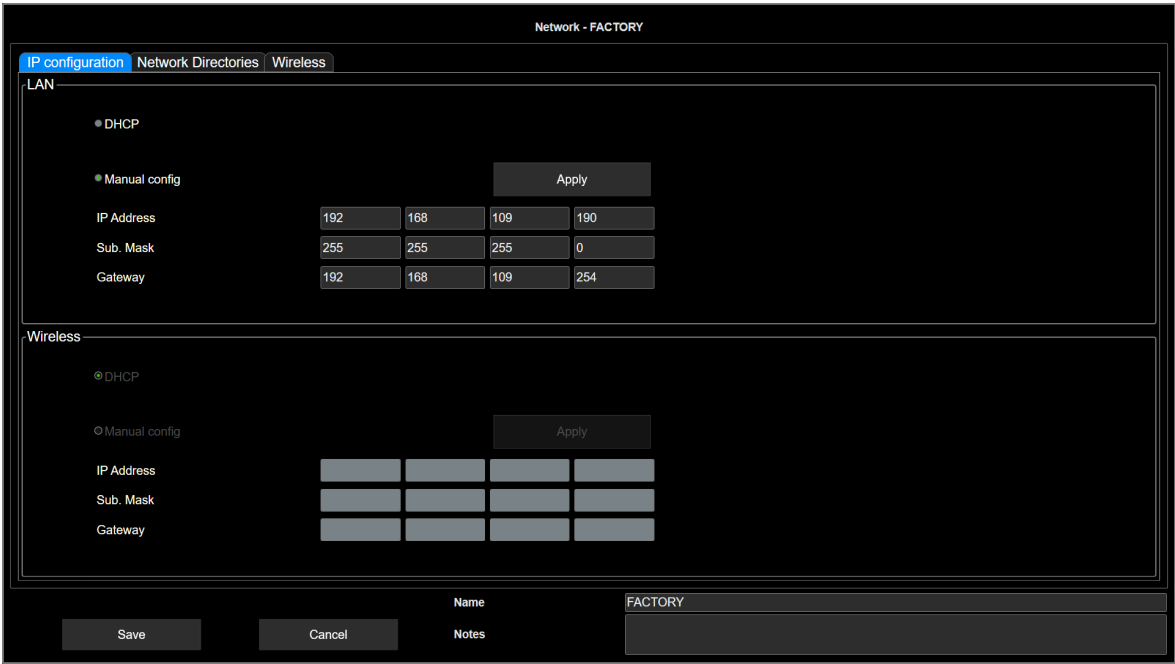
MyLab must be used only within a safe network.

NOTE

The user is responsible for the protection of the network from malware.

The network configuration menu is organized in folders, selectable using the tabs displayed on the top of the menu.

Fig. 6-1 Network configuration



Procedure

To create a customized network profile follow this procedure:

1. select the desired tab option with the trackball.

6.2.1. IP Configuration Folder

The menu allows the user to set, for both the LAN and the wireless networks, a dynamic (DHCP box checked) or static (MANUAL CONFIG box checked) address.

NOTE

The wireless address can be set only after the wireless connectivity has been enabled (box available in the WIRELESS folder).

The static address configuration requires to set the following parameters:

- IP address;
- subnet mask address;
- gateway address.

The **APPLY** button immediately saves the network configuration allowing the user to set network directories and to configure the wireless connection without saving the configuration and entering again the menu.

6.2.2. Network Directories Folder

The directory configuration menu shows:

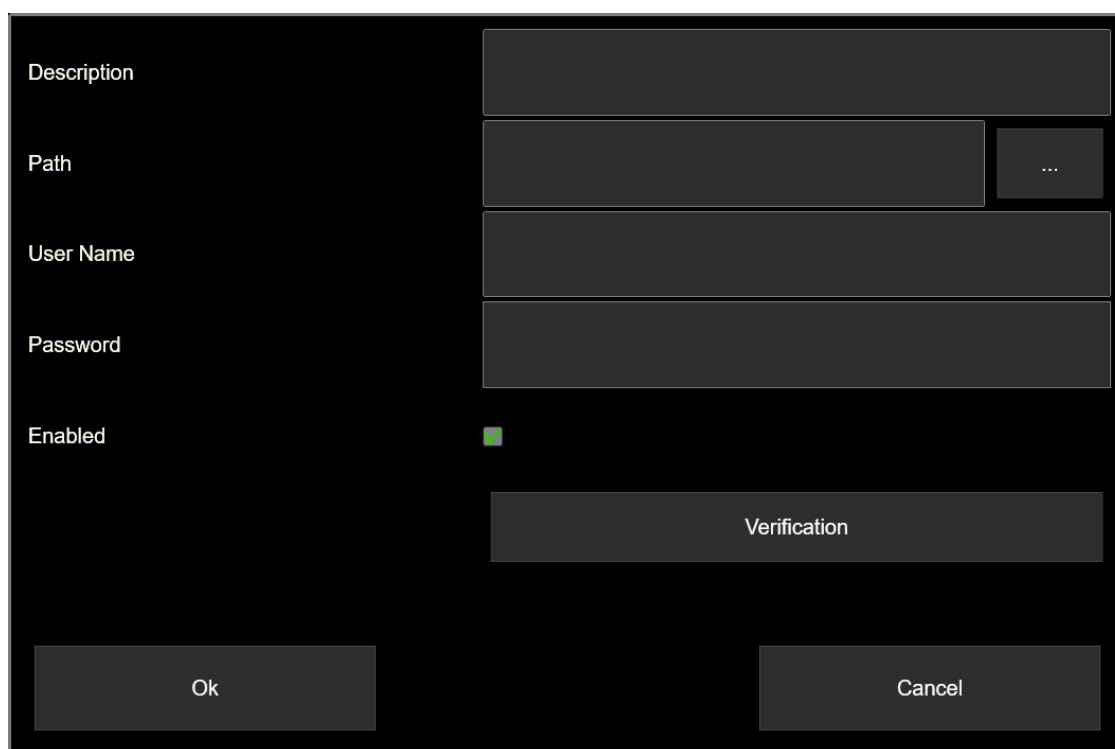
- in the center the list of all set network directories;
- on the bottom the fields to add, modify, remove a network directory.

Procedure

To create a network directory follow this procedure:

1. if necessary, select the **IP CONFIGURATION** folder and set the network IP configuration;
2. press the **ADD** button to add a new network directory;
3. the network directory configuration window is displayed:

Fig. 6–2 Network Directory Configuration



4. enter a folder description in the **DESCRIPTION** field;
5. enter the folder path in the **PATH** field. If necessary browse the network to enter the path;
6. enter the user ID and password parameters in the **USER NAME** and **PASSWORD** fields;
7. check the **ENABLED** option to use it as network directory;
8. press **OK** to confirm.

When a network drive is configured and enabled, it will appear in the list of the media available for archiving and exporting exams.

Network directories can be browsed through the Network Archive icon displayed on the right side of the header bar when **MyLab** accesses the archive.

6.2.2.1. Modifying and Deleting Existing Directories

The network directory menu allows to modify or delete existing folders, listed in the configuration menu.

EDIT allows to modify the directory selected with the trackball.

REMOVE deletes the directory selected with the trackball.

6.3. Wireless Folder

The wireless configuration menu shows:

- on the top the box to activate the wireless connectivity;
- in the center the list of all available, configured and connected wireless networks;
- at the bottom the fields to manage wireless connection.

NOTE

MyLab can be connected only to secured wireless network.

Data ought to be exchanged through wireless network only when the Signal Strength level is higher than 80%: the operation could fail when the signal level is below this threshold.

MyLab is compatible with WPA Personal or PSK (TKIP, AES) and WPA2 Personal or PSK (AES); Open and WEP networks are not allowed for security reasons, WPA Enterprise (Radius server, 802.1x) is not supported.

6.3.1. How to Set a Wireless Network

To create a wireless network configuration follow the procedure below:

- select the **WIRELESS** folder and enable the wireless connection by checking the corresponding box (**ENABLE WIRELESS**). When enabled, the wireless led on the right side of the control panel is on;
- if necessary, select the **IP CONFIGURATION** folder and set the wireless IP configuration;
- select the **WIRELESS** folder again and configure the wireless connection. The table below lists and explains the available fields.

When setting up a wireless network, it may be necessary to select a certificate to connect to certain Wi-Fi networks and, in some cases, the certificate may require a password. Both the certificate and password will be provided by the administrator of the network you wish to connect to.

Field	Action
NETWORK ID	Indicates the name of the network.
AUTO CONNECTION	Indicates the status of the auto-connection (YES or NO).

Field	Action
SECURED	Indicates if the network is protected (YES or NO).
CONNECTED	Indicates the status of the connection.
SIGNAL STRENGTH	Indicates the level of the signal.
REFRESH	When pressed, it refreshes the list of available wireless networks.
CONNECT	When pressed, it allows the connection to the selected network.
DISCONNECT	When pressed, it disconnects the selected network.
ENABLE/DISABLE AUTOCONN	Enables or disables the auto-connection.
CERTIFICATE PASSWORD	Fill this field with the password provided for the selected certificate. The field is always shown, even when password is not required.
SELECT CERTIFICATE	Press SELECT CERTIFICATE then browse to the location where the certificate is. The button is always shown, even when certificate is not required.

6.3.2. CONNECTED Field

Depending on the network configuration this field displays the following status:

- **CONNECTED**, when **MyLab** is connected to this network. Any device (printer, network directory) connected to this network can be used;
- **AVAILABLE**, when the network is available;
- **NOT AVAILABLE**, when the network is not detectable and it is configured on **MyLab**.

6.3.3. CONNECT Button

When pressed, **MyLab** displays the menu allowing to enter the network key and to enable the auto-connection.

NOTE

The field where the password is entered is case sensitive.

6.3.4. AUTOCONN Button

When enabled, **MyLab** automatically connects to the wireless network as soon as it is available.

If more wireless connections have been configured with auto-connection, **MyLab** connects to the network listed in the upper position.

UP and **DOWN** buttons allow the user to change the network priority for auto-connection.

7. PRINTER MANAGEMENT

This chapter explains how to configure and manage printers.

This chapter includes the following topics:

7.1 *How to Configure a Printer Profile*

7.2 *Printer Installation*

7.3 *Management of Remote-Controlled Printers*

7.1. How to Configure a Printer Profile

Printer Management allows to set remote control for printers and to set the printing profiles.

Press **MENU** then **PRINTERS** to enter in the Printer Management Menu. Here you can create a new profile (**NEW** or **CLONE**), modify (**EDIT**) or delete (**REMOVE**) an existing one.

NOTE

Remote control can be configured only for printers which are already installed.

MyLab manages a wide range of printers, visit the Esaote website or contact your Esaote sales representative to know the supported models.

From Printer Management Menu you can select an existing profile to modify it (pressing **EDIT**) or to create a copy of it (pressing **CLONE**). You can also create a new profile (pressing **NEW**). Whatever action is taken opens the Printer Configuration Menu where are displayed:

- on the top the combos allowing to associate the printers to the dedicated panel keys (MODEL field) and to set the printing layout (PROFILE field);
- on the top-right the **CONFIGURE PRINTER** key providing controls to install and configure printers;
- in the center the list of the available printing profiles and the related controls to **ADD**, **EDIT** or **REMOVE** them;
- on the bottom the fields used to name and describe the customized configuration.

Fig. 7-1 Printer Configuration Menu

Printers - FACTORY

Button 1

Model

Profile

☐ *AUTOMATIC PRINTING OF ACQUIRED IMAGES

☐ *STORE IMAGE PRINTING

Button 2

Model

Profile

☐ *AUTOMATIC PRINTING OF ACQUIRED IMAGES

☐ *STORE IMAGE PRINTING

Button 3

Model

Profile

☐ *AUTOMATIC PRINTING OF ACQUIRED IMAGES

☐ *STORE IMAGE PRINTING

Button 4

Model

Profile

☐ *AUTOMATIC PRINTING OF ACQUIRED IMAGES

☐ *STORE IMAGE PRINTING

Configure Printer

Profiles

Description	Format	Orientation
LAYOUT 1x1 PORTRAIT	1 x 1	Portrait
LAYOUT 2x1	2 x 1	Portrait
LAYOUT 2x2	2 x 2	Landscape
LAYOUT 3x3	3 x 3	Landscape
LAYOUT 3x2	3 x 2	Portrait
LAYOUT 1x1 LANDSCAPE	1 x 1	Landscape
LAYOUT 1x1 PHOTO	1 x 1	Landscape
THERMAL PRINTER - LANDSCAPE	1 x 1	Landscape
*MAXIMIZE	1 x 1	Landscape

Add

Edit

Remove

Factory

Save

Cancel

Name

FACTORY

Notes

Procedure

To edit a printer configuration follow this procedure:

1. if necessary modify the printing profiles as described in the *Printing Profiles* paragraph further in this chapter;
2. select the printer model and the printing profile in the **BUTTON #** fields. If the printer is not present you can install it, refer to the *Printer Installation* paragraph further in this chapter;
3. if you want to set the automatic printing of all printable images, select **AUTOMATIC PRINTING OF ACQUIRED IMAGES**;
4. if you want to set the automatic saving of all printed images, select **STORE PRINTING IMAGE**;
5. if you want to see a preview of the printing, select **PREVIEW BEFORE PRINTING**;
6. fill the **NAME** field with the desired name and description (**NOTES** field) for the profile;
7. press **SAVE** to save and activate the configuration or **CANCEL** to exit without saving.

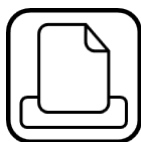
7.1.1. Printer Remote Control

Printers can be remotely controlled through the buttons **1, 2, 3, 4**.

In the Printer Configuration Menu, **BUTTON 1** configures the printer controlled by button **1**, **BUTTON 2** the one controlled by button **2** and so on.

NOTE

The same printer key can manage both an USB and a DICOM printer at the same time. When both printers are configured on the same key, **MyLab** will print two printings each time the key is pressed.



When at least one button is configured, the icon of the set printer is displayed on the bottom of the screen.

The icon provides a counter where:

- the left number counts the images sent to the printer. This number is updated as images are sent;
- the right number indicates the number of images set in each page.

Printing takes place when the left number matches the right number unless **PREVIEW BEFORE PRINTING** has been selected in the configuration menu. In this latter case to start the printing you have to access the preview right clicking on the icon, check the preview, then click **PRINT NOW**.

7.1.2. Printing Profiles

For each printer which can be remote-controlled, different printing profiles can be set.

You can create a new profile pressing **ADD** or you can change an existing profile, selecting it from the list and pressing **EDIT**.

Fig. 7–2 Printer Profile Menu

The screenshot shows a 'Printer Profile Menu' with the following fields and controls:

- Description:** LAYOUT 2x2
- Print Layout:** Short header on the left (dropdown menu)
- Rows:** 2
- Columns:** 2
- Orientation:** Landscape (dropdown menu)
- Margins (mm):** 1
- BackgroundColor:** A color selection bar with a slider and a value of 220.
- Include logo:** A checked checkbox.
- Buttons:** 'Ok' and 'Cancel' at the bottom.

The printing profile menu contains the fields described below.

Field	Action
DESCRIPTION	Defines the name of the profile.
PRINT LAYOUT	Positions the header. If no header is selected in the drop-down menu, the header is not printed and the images and the measurements, if present, are enlarged. NOTE: It may happen that enlarged measurement text goes on the left side of the image.
ROWS and COLUMNS	Sets the number of images (printing format) in the page: the number is defined by the number of rows and columns.
ORIENTATION	Defines whether portrait or landscape.
MARGINS	Defines the print margins.
BACKGROUND COLOR	The slider allows to change the background color of the printed image from black (0) to white (255).
INCLUDE LOGO	When selected the Esaote logo is included on printing.

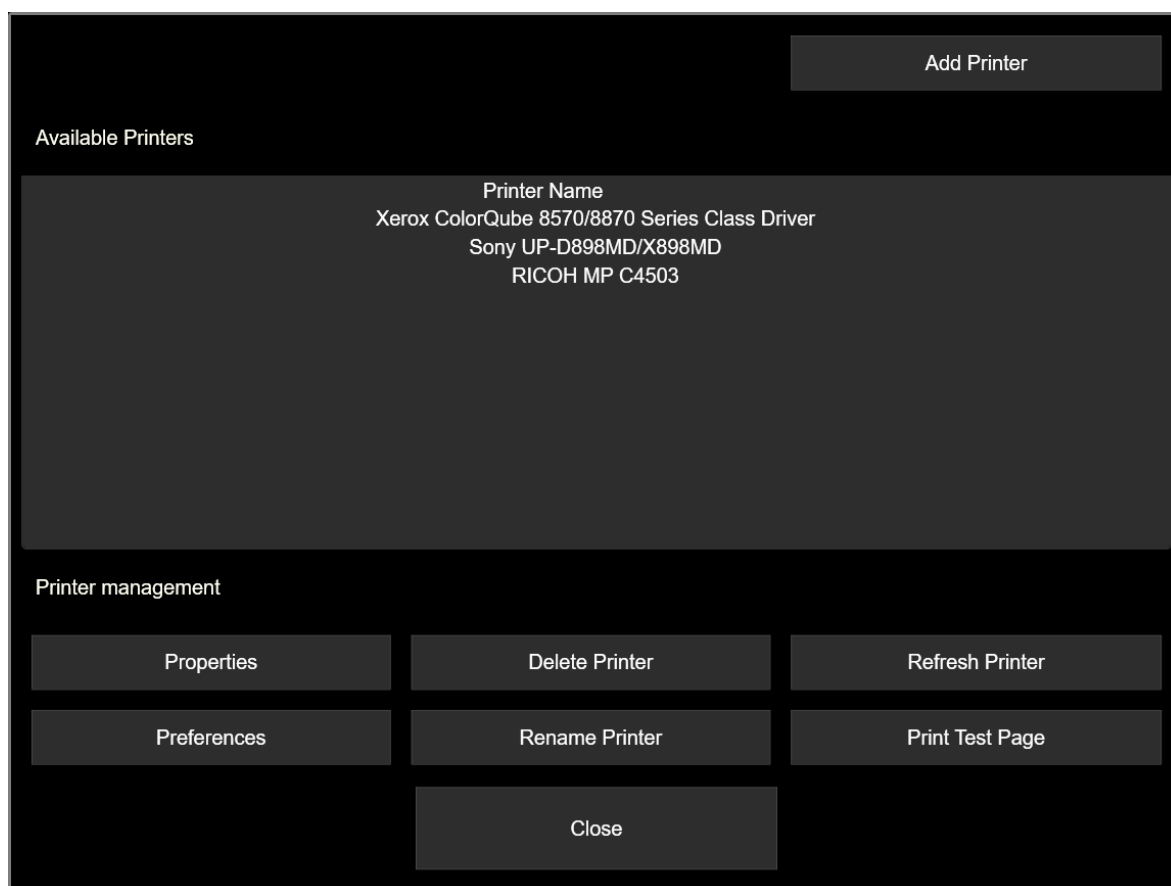
OK saves and activates the settings and **CANCEL** exits the menu without saving the new settings.

7.1.3. Configure printer

Press **CONFIGURE PRINTER** to set printing preferences or to install new printers.

After pressure the following menu is displayed.

Fig. 7-3 Configure Printer Menu



Select a printer from the list of **AVAILABLE PRINTERS**, then press:

PROPERTIES to set the printers properties like paper type, format and so on.

DELETE PRINTER to delete the selected printer.

REFRESH PRINTER to refresh the list of available printers.

PREFERENCES to set the printing preferences entering in the printers internal menu.

RENAME PRINTER to rename the selected printer.

PRINT TEST PAGE after changes to verify the correct working.

CLOSE to exit the menu.

If the printer is not listed you can install it pressing **ADD PRINTER**; refer to the Printer Installation paragraph further in this chapter for additional information.

7.2. Printer Installation

You can connect to your **MyLab** both USB and Network printers.

NOTE

For the supported printers, visit the Esaote website or contact your Esaote sales representative.

Refer to Getting Started manual for additional information on safe connection and positioning of peripherals, printers included.

7.2.1. How to install an USB printer

1. Press **MENU**.
2. Select **PRINTERS**, then **EDIT**.
3. Press **CONFIGURE PRINTER**.
4. Connect a standard USB cable between the USB port on the printer and a USB port on **MyLab**.
5. Connect the printers to an appropriate power source.
6. Turn on the printer.
7. Ignore any message requiring the installation of the drivers.
8. Press **ADD PRINTER**.
9. Press **SELECTED PRINTER NOT IN LIST**.
10. Insert the driver CD.
11. Select **ADD A LOCAL PRINTER OR NETWORK PRINTER WITH MANUAL SETTINGS**. Press **NEXT** to continue.
12. Select **USE AN EXISTING PORT** and set **USB001 (VIRTUAL PORT FOR USB)** from the drop-down menu. Press **NEXT** to continue.
13. When **MyLab** asks to install the printer driver, select **SEARCHING...**

NOTE

It is suggested to require the driver CD to the Esaote Service Department.

14. Press **BROWSE** to select the proper driver to be installed and proceed with the installation. Please note that only the printer driver has to be installed! Any other printer program which might be listed or proposed during the installation phase has to be deactivated.

NOTE

Select the folder **Win10_systems**.

15. Press **NEXT** several times to continue the installation.

16. When the system displays the message WOULD YOU LIKE TO INSTALL THIS DEVICE SOFTWARE? press **INSTALL**.

17. Select **DO NOT SHARE THIS PRINTER**.

18. Press **FINISH** to install the printer.

The printer is now listed among the available printers. Select it, then press **PROPERTIES** to correctly configure the printer settings, correct paper type, format and so on...

Press **PRINT TEST PAGE** to verify the correct working.

7.2.2. How to install a Network printer

The printer installation requires a basic knowledge of networking environments: it is suggested to contact the network administrator before proceeding with the configuration. During the installation the printer IP address is required: ask the administrator for assigning the proper IP address to the printer.

NOTE

The printer has to be set with a fix IP address: DHCP configuration can not be set.

Do not install the printer as a shared printer.

1. Press **MENU**.
2. Select **PRINTERS**, then **EDIT**.
3. Press **CONFIGURE PRINTER**.
4. Connect the printer to the network.
5. Connect the printer to an appropriate power source.
6. Turn on the printer.
7. Manually set the IP address of the printer from the printer's control panel. Refer to the printer user manual for operating instructions.
8. Press **ADD PRINTER**.
9. Press **SELECTED PRINTER NOT IN LIST**.
10. Insert the driver CD.
11. Select **ADD A LOCAL PRINTER OR NETWORK PRINTER WITH MANUAL SETTINGS**. Press **NEXT** to continue.
12. Select **CREATE A NEW PORT** and set **STANDARD TCP/IP PORT** from the drop-down menu. Press **NEXT** to continue.
13. Insert the previously configured IP address of the printer in the **HOST NAME OR IP ADDRESS** field. The **PORT NAME** field will be filled automatically; if you want, you can change the description for this port. Leave checked the field **QUERY THE PRINTER AND AUTOMATICALLY SELECT THE DRIVER TO USE**. Press **NEXT** to continue.
14. **MyLab** detects the TCP/IP port. **MyLab** could ask additional information, if it happens press **NEXT** to continue.

15. **MyLab** detects the driver model.
16. When **MyLab** asks to install the printer driver, select **SEARCHING...**

NOTE

It is suggested to require the driver CD to the Esaote Service Department.

17. Press **BROWSE** to select the proper driver to be installed and proceed with the installation. Please note that only the printer driver has to be installed! Any other printer program which might be listed or proposed during the installation phase has to be deactivated.

NOTE

Select the folder **Win10_systems**.

18. Press **NEXT** several times to continue the installation.
 19. Select **DO NOT SHARE THIS PRINTER**. Press **NEXT** to continue.
 20. Press **FINISH** to install the printer.
- The printer is now listed among the available printers. Select it, then press **PROPERTIES** to correctly configure the printer settings, correct paper type, format and so on...
- Press **PRINT TEST PAGE** to verify the correct working.

7.3. Management of Remote-Controlled Printers

Positioning the trackball pointer on the printer icons displayed in the footer area and pressing **UNDO** give access to a contextual menu with the following controls:

- Page Preview,
- Print now,
- Reset added images,
- Layouts.

Select the desired controls and press **ENTER** to open the menu.

7.3.1. Page Preview

This option shows the print preview.

UP and **DOWN** buttons respectively allow to move up and down the selected image.

REMOVE button deletes the selected image.

OK saves the modifications and **CANCEL** exits the menu without saving.

7.3.2. Print Now

To print before formatting is complete, select the **PRINT NOW** option to start printing.

7.3.3. Reset Added Images

The option cancels all the images sent to be printed: the printing counter is automatically reset.

7.3.4. Layout Options

This option allows to change the printing layout during the exam. **MyLab** shows all available printing layouts. Using the trackball select the desired format and press **ENTER** to confirm.