Mammo Tomosynthesis

User Guide

MDMG-5221

BARCO

Visibly yours

Mammo Tomosynthesis

User Guide

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TABLE OF CONTENTS

1. WELCOME!

1.1 About the product

Overview

Thank you for choosing this Mammo Tomosynthesis Display!

The Mammo Tomosynthesis Display is specifically designed for the unique requirements of medical imaging, delivering complete and uninterrupted diagnostic confidence and high-bright image quality, helping radiologists to make quick, accurate and confident diagnoses.

The Mammo Tomosynthesis Display supports several advanced features, resulting in the required high performance and diagnostic capabilities. Some of these features are listed below:

- I-LUMINATE ™: one push 'hot light' brightness boost for inspection of subtle details or comparing with film-based priors.
- RAPIDFRAME ™: rapid pixel refreshment, eliminating blurry artifacts and ghosting in multi-frame image sequences.
- ALC: A hemispherical illuminance sensor to control according the ambient light in the room.
- I-Guard: integrated sensor for monitoring and adjusting the luminance, ensuring DICOM P14 compliance.
- QAWeb: automatic Quality Assurance testing and remote assessment of the diagnostic area.
- PPU: Per Pixel Uniformity technology.
- DURALIGHT: superb luminance levels with an exceptionally long life span.
- SMOOTHGRAY: ultra-precise gray palette of Just Noticeable Differences.

To use the Mammo Tomosynthesis Display at its full capabilities you should make yourself familiar with these features and how to use them. Features with user interaction are explained in this guide. If you want more information on a specific feature refer to the Barco web site at http://www.barco.com/Healthcare or contact the Barco Healthcare Division.

This manual further guides you through the different steps needed to install and use the Mammo Tomosynthesis Display.

General approach

The Mammo Tomosynthesis Display system exists of two identical displays, mounted side by side on the dedicated system stand or on a custom VESA mount. Throughout the guide, instructions are applicable for both left and right display, unless a difference is specifically stated.

1.2 What's in the box

Overview

Your Mammo Tomosynthesis comes with:

- two displays
- a system tilt and swivel foot
- this Mammo Tomosynthesis user guide
- a system CD
- two DisplayPort cables
- two USB cables
- two sets of AC power cords
- two external power supplies
- a keyboard light
- a film clip

If you ordered a Barco display controller, it's also in the box together with its accessories. A dedicated user guide is available on the system CD.

> **Keep your original packaging. It is designed for this display and is the ideal protection during transport and storage.**

2. PARTS, CONTROLS AND CONNECTORS

2.1   Display front view

Overview
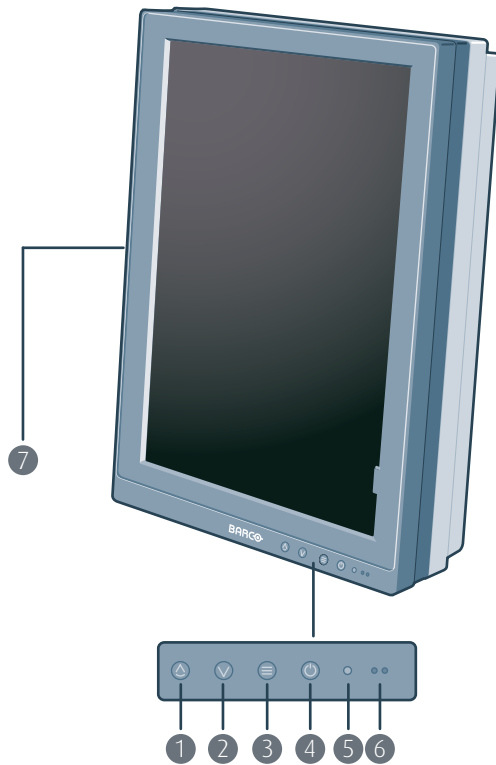
Image 2-1
Front view

①	I-Luminate/Left key	②	Right key
③	Menu key	④	Power on/off key
⑤	Ambient light sensor	⑥	Power LEDs
⑦	Side downstream USB 2 & 3		

2.2 Display rear view

Connector compartment cover closed
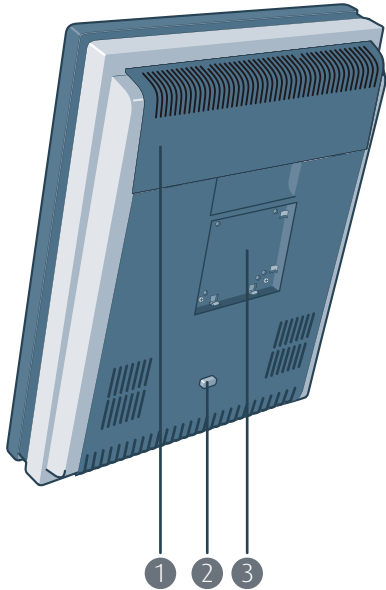
Image 2-2
Rear view cover closed

❶ Connector compartment cover   **❷** Display release button

❸ Mounting anchor

Connector compartment cover open
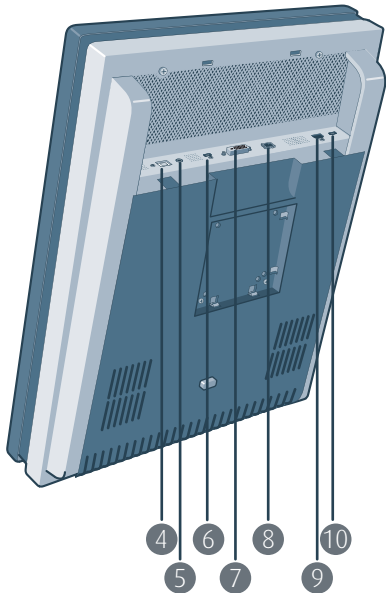
Image 2-3
Rear view cover open

❹ 24 Vdc power input   **❺** +5 Vdc, 0.5 A power output

❻ Display Port video input   **❼** DVI video input

❽ Ethernet connection (see note below)   **❾** USB upstream

❿ USB downstream 1

> **The Ethernet connection is used for maintenance purposes and is not supported for user application.**

2.3   Dual tilt & swivel foot

Overview
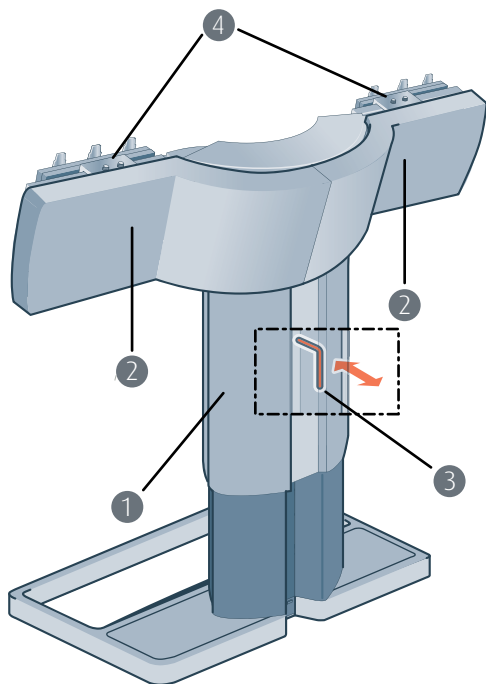
Image 2-4
Dual tilt and swivel foot

1 Cable cover   **2** Left & right arm cover

3 Foot lock clip (behind cable cover)   **4** Display positioning sliders

2.4   Accessories

Film clip
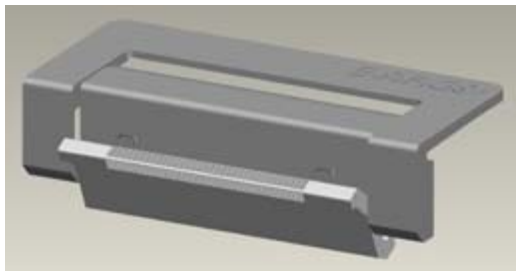
Image 2-5
Film clip

The film clip can be used to hold a radiological film when using the I-Luminate function as a light box.

Keyboard light
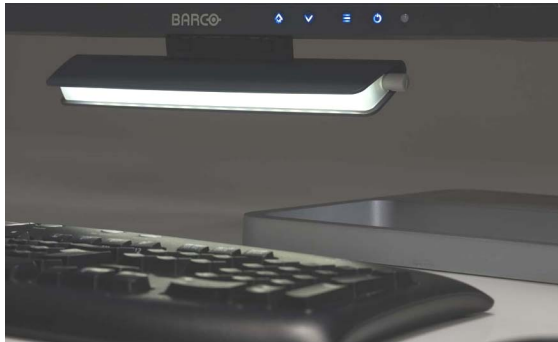
Image 2-6
Keyboard light

The keyboard light can be mounted under the display to provide a workspace light that is not interfering with the display image.

3. DISPLAY INSTALLATION

Prior to installing your Mammo Tomosynthesis and connecting all necessary cables, make sure to have a suitable display controller physically installed in your computer. If you are using a Barco display controller, please consult the user guide delivered with it to do this.

3.1   Mounting the displays

Using the dual tilt & swivel foot

1. Unpack the dual tilt & swivel foot and place it on a solid surface.

2. Unpack the first display.
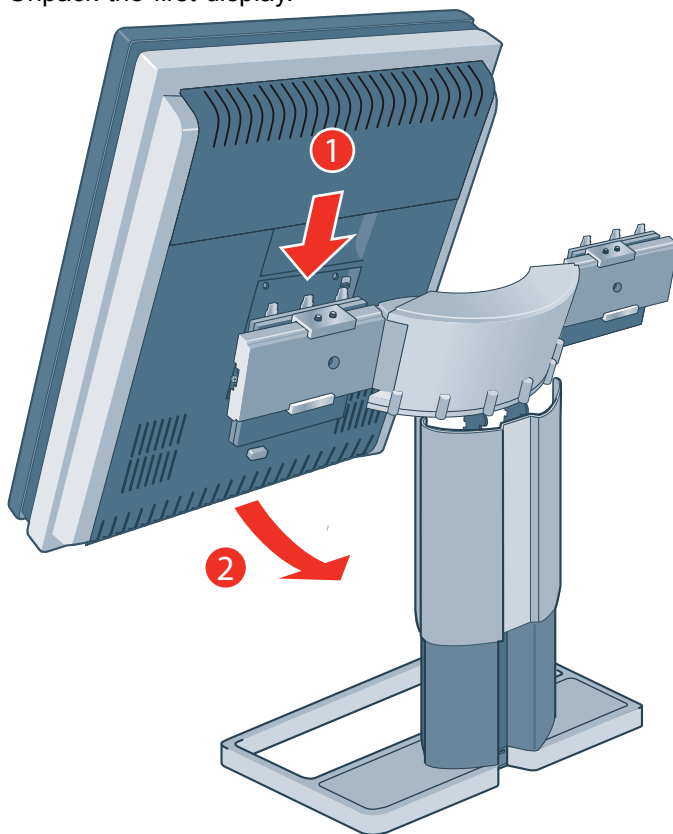
3. Hold the display slightly angled with the logo downwards and position the top of the mounting anchor, at the back of the display, perfectly aligned on the top of the mounting clamp of the foot.

4. Push the downside of the display gently backwards until the mounting clamp locks into the mounting anchor.

5. Verify that mounting clamp and mounting anchor are perfectly fitting and that the display is firmly mounted.

6. Repeat step 2 to 5 for the second display.
   Caution: Limit transportation distances of the mounted displays and foot system.

7. Pull out the foot lock clip.

8. Retain the clip for possible further transportations.

9. Now that the height-positioning is unlocked, you can adjust the position of the displays.
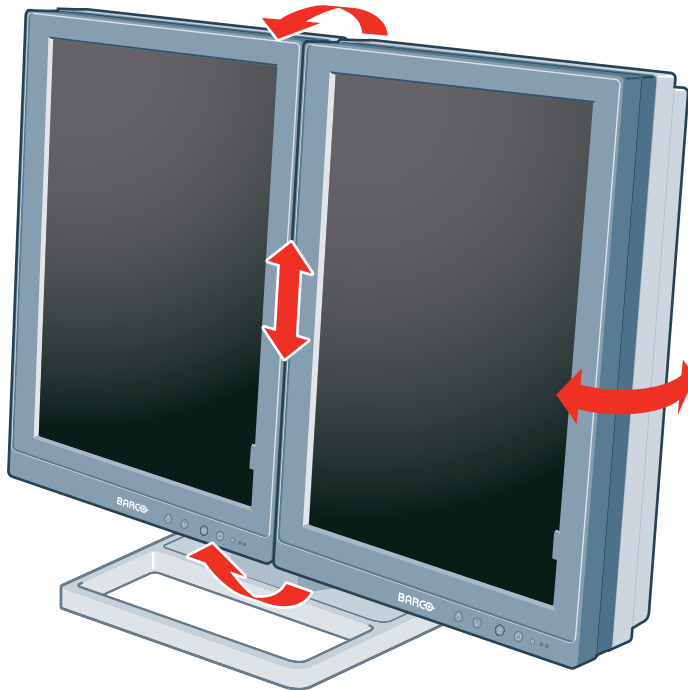
Note: When both displays are not correctly aligned, minor corrections are possible in relative height and relative angle, by loosening and tightening the opposite pairs of allen screws (opposite sides or opposite diagonals) of the positioning sliders.

3.2   VESA-mount installation

The display mounting anchor is compatible with the VESA 100 mm standard.

WARNING: Never move a display attached to an arm by pulling or pushing the display itself. Instead, make sure that the arm is equipped with a VESA approved handle and use this to move the display.

Please refer to the instruction manual of the arm for more information and instructions.

WARNING: Use an arm that is approved by VESA (according to the VESA 100 mm standard).

Use an arm that can support the weight of the display. Refer to the technical specifications of this display for the applicable weight.

Overview

The display mounting anchor is compatible with the VESA 100 mm standard.

1. Unscrew the four fixation screws in the mounting anchor.
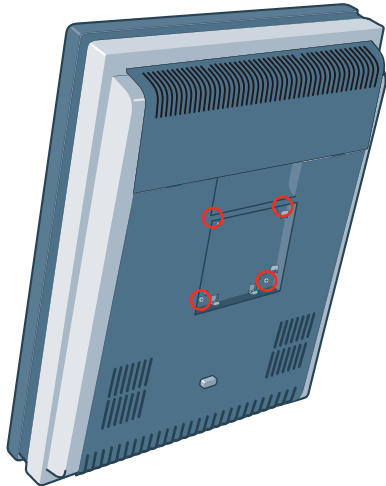
2. Attach the display **firmly** to the VESA mounting bracket with 4 screws M4 x 10 mm. You should mount the display in portrait position. Landscape position is not supported.

3.3   Connecting the signal cables

⚠️ **CAUTION: Only connect one of the two video links. Connecting both inputs simultaneously will result in driver errors.**

To connect the signal cables to the display:

You may connect the display to a display controller by using the DVI or the DP connection. The active input can be selected in the OSD menu.

1. Remove the cable cover. To remove this cover push the lock clips inside the top of the cover and gently slide the cover upwards on the shaft. It may be needed to tilt the displays if the arm is blocking the movement of the cover.
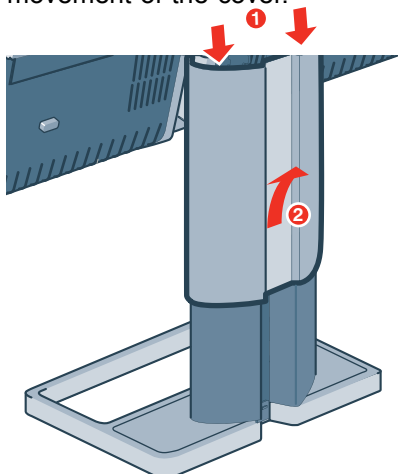
2. Remove the connector compartment cover. To remove the cover, gently push the two lips on top of the cover, pull the top of the cover slightly away from the display and lift the cover upwards.
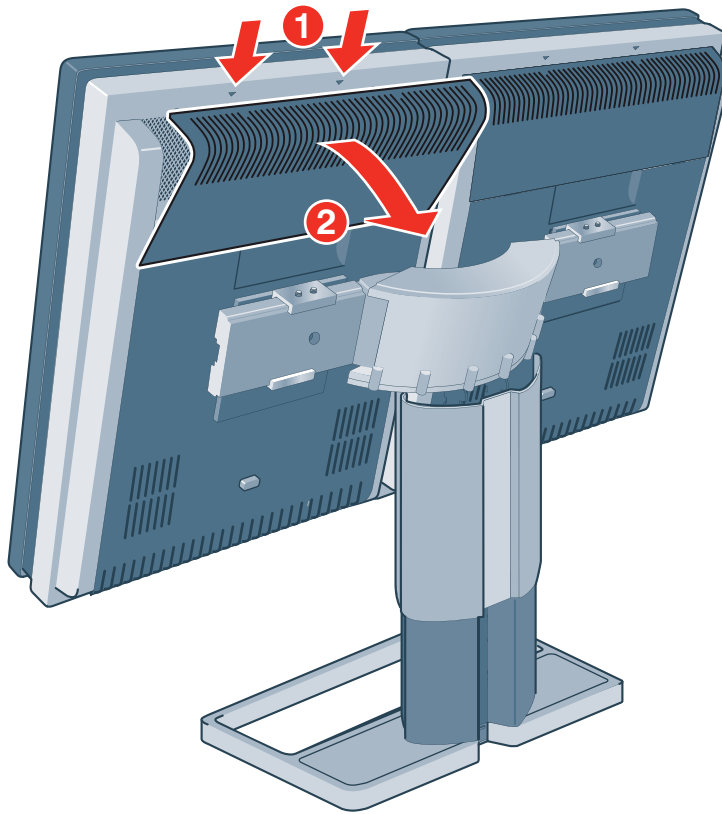
3. Connect the DVI or DP of the display controller to the DVI or DP connector of the display.
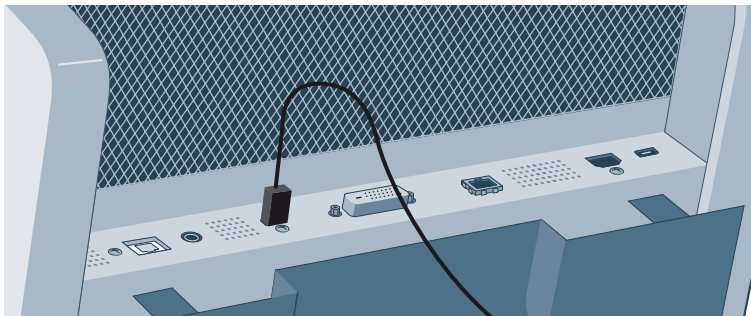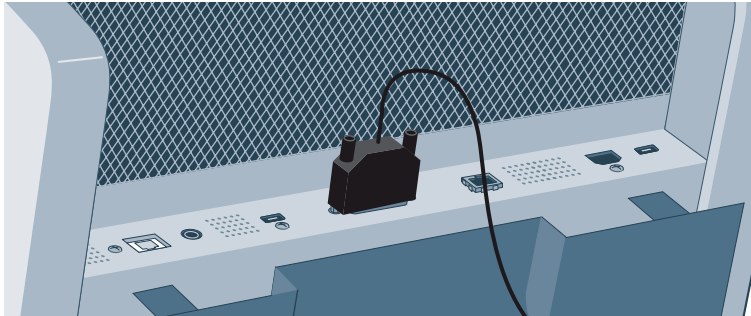
> ***Warning:*** *Be aware that the DP connector is equipped with a cable latch, locking the connector to the display.*
>
> *To unplug the connector, press the button on the connector during removal.*
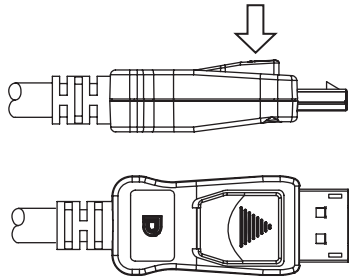
4. If you want to make use of the display's USB downstream connectors, connect a PC USB downstream connector to the display's USB upstream connector.
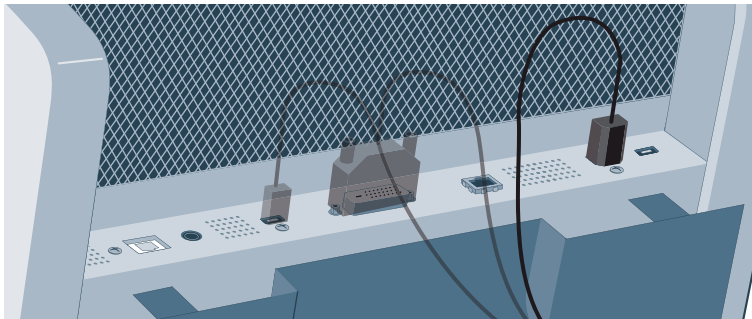
5. If you have chosen to use the display's USB downstream connectors, connect a USB device to one of the downstream connectors.

6. Connect the supplied external DC power supply to the +24 VDC power input of the display.
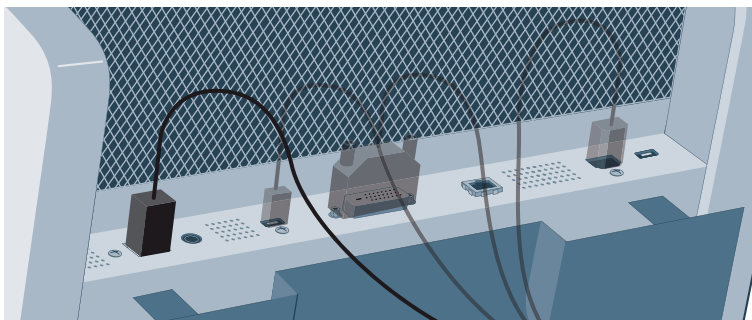
7. Plug the mains connector of the external DC power supply to a **grounded** power outlet by means of the supplied power cable.

8. Re-attach the connector compartment cover. Position the cover with all four bottom lips in the dedicated spaces on top of the lower back cover. Gently push the top of the cover towards the display while guiding both release lips into the dedicated spaces.

9. Connect the second display as detailed in steps 2 to 8.

10. Re-attach the cable cover by sliding it downwards on the foot shaft. Make sure that the displays are tilted forwards, leaving sufficient space to slide the cover straight down.

11. Attach both arm covers. Position the cover on the arm and gently push it in place.
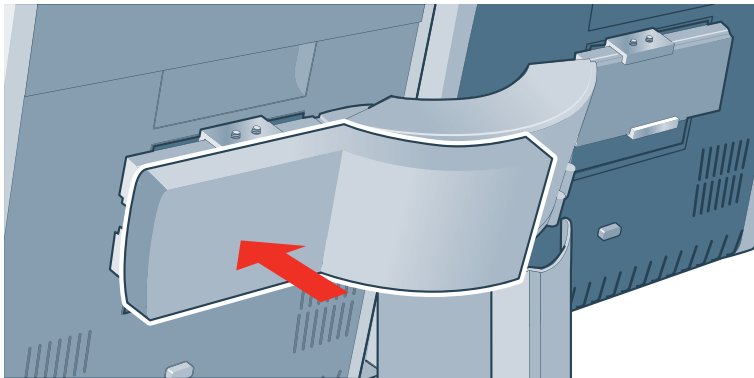
3.4   Routing the cables

To route the cables

If the display is mounted on the system dual tilt & swivel foot, cables are best routed behind the arms and through the cable channel in the foot shaft, as shown in the pictures below.
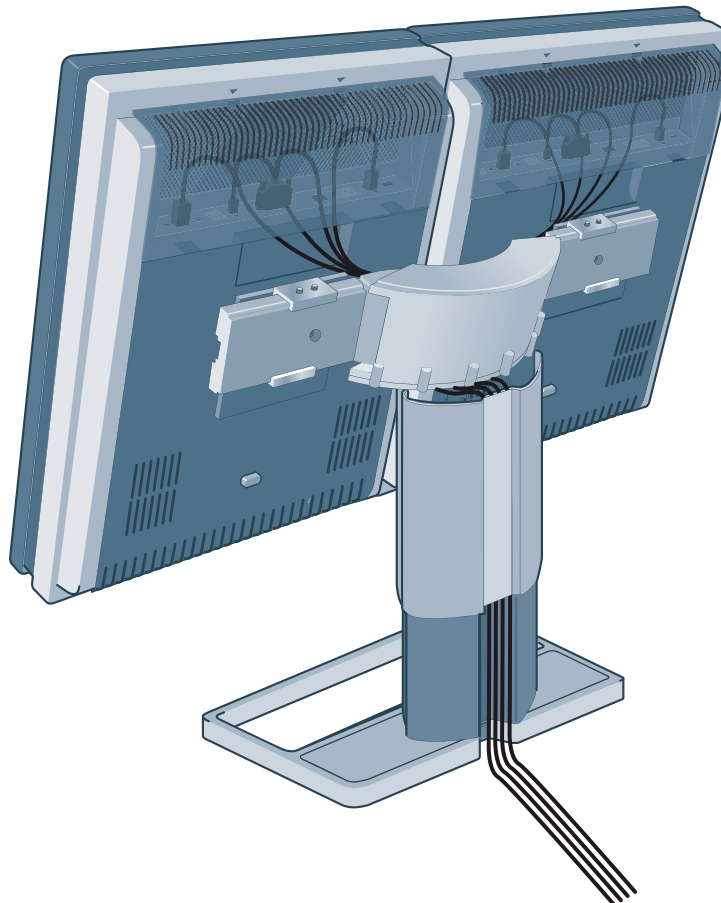
3.5 Positioning the displays angled

To position the displays

1. Remove the arm covers.

2. Loosen the allen screws of both the left and right positioning slider.

3. Slide both displays at maximum distance from one another, being careful not to slide a display off the arm.

4. Rotate the left and right display by pulling the arm in or out from the center shaft, until they make the required angle. Verify that the cables are still correctly routed and no connection is stressed.

5. Slide both displays to each other, until they are aligned and the brackets are on similar numbers.

6. Fasten the allen screws of both the left and right positioning sliders (minor deficiencies in alignment can be corrected by adjusting the relative depth of opposite screws).

7. Re-attach the arm covers.

3.6 Mounting the film clip

To mount the film clip

The film clip can be mounted on the top, left or right side of the display.

1. Position the film clip on the bezel at the desired location.

2. Push the clip at the front towards the bezel . The film clip will click in place.

3. Slide the clamp downwards (or sideways) over the screen.

4. To remove the film clip, lift the rear end of the clip out of the side frame.

3.7 Mounting the keyboard light

To mount the keyboard light

1. The text on the white plastic clip indicates the front side of the keyboard light. This side must be mounted at the front side (image side) of the display.
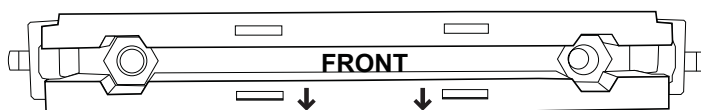
2. With the enclosed Allen key, loosen both screws at the bottom of the desktop light hinge. Loosen the screws until the thread start surface of the screws are at the same height as the bolts as shown in the drawing below.
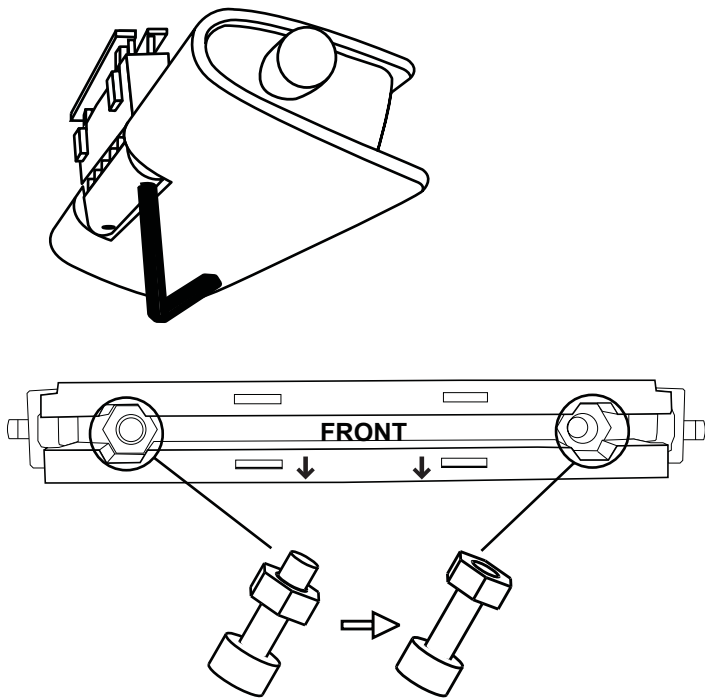
3. Hook the rear part of the white plastic clip in the display bezel gap.
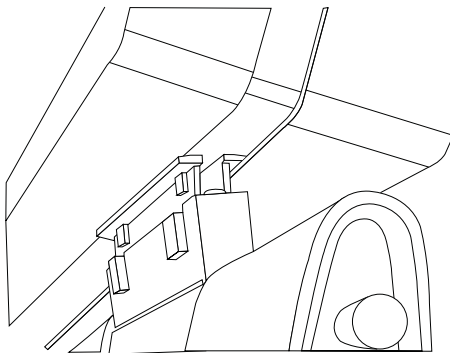
4. Push firmly against the front part of the white plastic clip so that the clip pops into the display bezel gap.
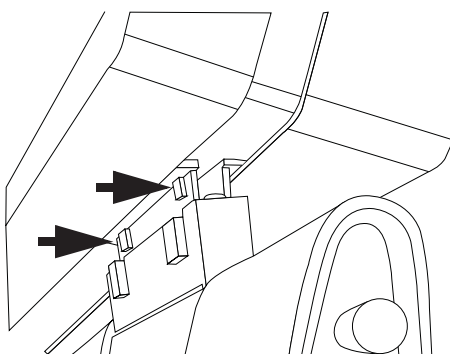
5. With the enclosed Allen key, tighten both screws at the bottom of the keyboard light hinge.
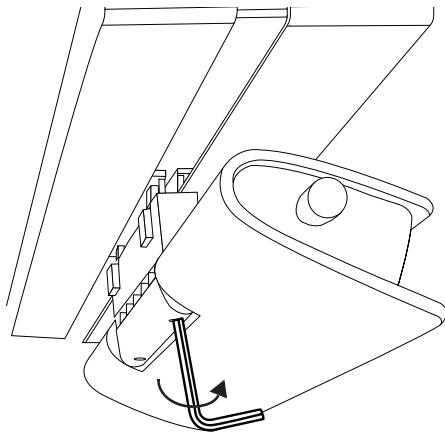
6. Plug the keyboard light mini-jack connector in the display's +5 VDC power output connector located next to the 24 VDC power outlet..

7. Adjust the light by means of the knob at the side of the keyboard light.
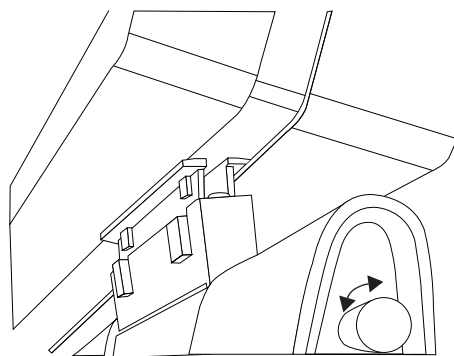
3.8   First time starting up

Overview

You are now ready to start up your Mammo Tomosynthesis for the first time.

1.   Switch on your Mammo Tomosynthesis as described in "Standby switching", page 20.

2.   Turn on the computer connected to your display.

If you have properly installed your display and display controller, the Windows start-up messages will appear once the boot procedure is finished.

Your Mammo Tomosynthesis will be running in a basic video mode at a default refresh rate when first time starting up. If you are using a Barco display controller, please consult the user guide delivered with it to install the drivers, software and documentation. When this is done, your display will automatically detect the connected video input signal(s) and apply the correct video mode and refresh rate.

4. DAILY OPERATION

4.1 Recommendations for daily operation

Optimize the lifetime of your display

Enabling the Display Power Management System (DPMS) of your display will optimize its diagnostic lifetime by automatically switching off the backlight when the display is not used for a specified period of time. By default, DPMS is enabled on your display, but it also needs to be activated on your workstation. To do this, go to "Power Options Properties" in the "Control Panel".

Barco recommends setting DPMS activation after 20 minutes of non-usage.

Use a screen saver to avoid image retention

Prolonged operation of an LCD with the same content on the same screen area may result in a form of image retention.

You can avoid or significantly reduce the occurrence of this phenomenon by using a screen saver. You can activate a screen saver in the "Display properties" window of your workstation.

Barco recommends setting screen saver activation after 5 minutes of non-usage. A good screen saver displays moving content.

In case you are working with the same image or an application with static image elements for several hours continuously (so that the screen saver is not activated), change the image content regularly to avoid image retention of the static elements.

Understand pixel technology

LCD displays use technology based on pixels. As a normal tolerance in the manufacturing of the LCD, a limited number of these pixels may remain either dark or permanently lit, without affecting the diagnostic performance of the product. To ensure optimal product quality, Barco applies strict selection criteria for its LCD panels.

To learn more about LCD technology and missing pixels, consult the dedicated white papers available at www.barco.com/healthcare.

Enhance user comfort

Every Barco multi-head display system is color matched with the highest specifications in the market.

Barco recommends keeping color-matched displays together. Furthermore, it is important to use all displays of a multi-head configuration at the same rate to preserve color matching throughout the economic lifetime of the system.

Maximize quality assurance

The 'MediCal QAWeb' system offers online service for high-grade Quality Assurance, providing maximum diagnostic confidence and uptime.

> **Barco recommends to install MediCal QAWeb Agent and apply the default QAWeb policy at least. This policy includes calibration on regular intervals. Connecting to MediCal QAWeb Server offers even more possibilities.**
>
> **Learn more and sign up for the free MediCal QAWeb Essential level at www.barco.com/healthcare/qa.**

4.2 Key indicator lights

About the key indicator lights

By default, the ⊻, ☰ and ⏻ keys will be dimmed which makes the keys unavailable at that moment. To make the keys illuminate and available for further actions touch one of the not illuminated keys. As a result, all keys will be illuminated and are now available for further actions. However, if no further actions are taken within the following 5 seconds, the keys will dim again.

> **The ◬ key is always lit and available for activation of the I-Luminate feature. Please refer to "I-Luminate", page 21 for more information.**

> **The key auto-dim function can be disabled in the OSD menus. Please refer to "Key indicator lights", page 24 for detailed instructions on how to do this.**

4.3 Standby switching

About standby switching

> **The connected power supply also provides a switch that can be used to turn the power completely off. To use the display, please make sure to switch on this power supply. This can be done by pushing the on/off switch on the power supply into the "│" position.**
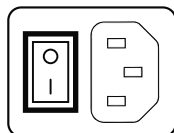
Switching the display to stand-by mode or vice versa can both be done as follows:

1. While the OSD is not on the screen, touch any touch key. As a result, the control panel illumination is switched on for a few seconds.
2. While the control panel illumination is on, touch the stand-by ⏻ key. A message appears on the screen.
3. Touch the stand-by ⏻ key once more to confirm.
4. To switch the display on while it is in stand-by, touch any touch key. Next, while the control panel illumination is on, touch the stand-by ⏻ key.

When the display is **switched on**, the power LED is **blue**. When the display is in **stand-by mode**, the power LED is **orange**.

> **The power LED can be disabled in the OSD menus. Please refer to "Power status indi-cator light", page 24 for detailed instructions on how to do this.**

> **In case of a power outage recovery, your display will always start-up in the power mode it was in before the power interruption (i.e. standby or on). This protects your display against inadvertent image retention problems.**

4.4   I-Luminate

About I-Luminate

When the display is in power on mode and the OSD menu is not shown, I-Luminate can be activated by touching the ⬆ key.

I-Luminate supports three modes:

•   Full-screen luminance boost.
•   Film 18 x 24 mode.
•   Film 24 x 30 mode.

For both film modes the position can be set to:

•   Left
•   Center
•   Right

When touching the I-Luminate key, the display will enter the default I-Luminate mode, according to the current setting, for approximately 1 minute. Touch the I-Luminate key again to immediately switch back to normal mode.

While activated, the I-Luminate mode can be changed by using the ⬇ key.

> **The default I-Luminate mode can be set in the OSD menu. Please refer to "I-Luminate default mode", page 27 for detailed instructions on how to do this.**

> **The I-Luminate film position can be set in the OSD menu. Please refer to "I-Luminate film position", page 27 for detailed instructions on how to do this.**

4.5   RapidFrame

About RapidFrame

The RapidFrame feature, eliminating blurry artifacts and ghosting in multi-frame image sequences, does not need any user interaction. After starting up, RapidFrame will reach full effectiveness after the display warms up.

4.6   Bringing up the OSD menus

How to bring up the OSD menus

The OSD menu allows you to configure different settings to make your Mammo Tomosynthesis fit your needs within your working environment. Also, you can retrieve general information about your display and its current configuration settings through the OSD menu.

Bringing up the OSD menus can be done by:

1. If not already done so, switch on the display as previously described.
2. Illuminate the keys as previously described.
3. While the keys are illuminated, touch the menu key.

As a result, the OSD main menu comes up in the center of the screen. However, if no further actions are taken within the following 90 seconds, the OSD will disappear again.

The OSD menu auto-exit function can be disabled in the OSD menu. Please refer to "OSD menu automatic close function", page 23 for detailed instructions on how to do this.

The OSD menu position can be modified in the OSD menu. Please refer to "OSD menu position", page 23 for detailed instructions on how to do this.

4.7   Navigating through the OSD menus

How to navigate through the OSD menus

Navigating through the OSD menus can be done by:

*   Use the up/down keys to move through the (sub)menus, change values or make selections.
*   To go into a submenu or confirm adjustments and selections, use the menu key.
*   Us the standby key to cancel adjustments or exit a (sub)menu.
*   Exit all OSD menus at once by touching the standby key for approximately 2 seconds.

I-Luminate is not available while the OSD menu is activated.

5. ADVANCED OPERATION

5.1   OSD menu position

About the OSD menu position

By default, the OSD menu comes up in the bottom center position of the screen. This position can be modified however. There's choice from a number of predefined positions.

To change the position of the OSD menu:

1. Bring up the OSD main menu.

2. Navigate to the *Configuration > User Interface > Menu* menu.

3. Enter the *Position* submenu.

4. Select one of the available OSD menu positions and confirm.

5.2   OSD menu language

About the OSD menu language

By default, the OSD menu comes up in English. However, there's a wide range of other languages available for the OSD menu of your Mammo Tomosynthesis.

To change the language of the OSD menu:

1. Bring up the OSD main menu.

2. Navigate to the *Configuration > User Interface > Menu* menu.

3. Enter the *Language* submenu.

4. Select one of the available languages and confirm.

5.3   OSD menu automatic close function

About the OSD menu automatic close function

By default, the OSD menu will disappear automatically after approximately 90 seconds of inactivity. However, this function can be disabled so that the OSD menu remains on the screen until manually closed.

To enable/disable the OSD menu automatic close function:

1. Bring up the OSD main menu.

2. Navigate to the *Configuration > User Interface > Menu* menu.

3. Enter the *Automatic Close* submenu.

4. Select *Enabled/Disabled* as desired and confirm.

5.4   Power status indicator light

About the power status indicator light

By default, when the display is switched on, the power status indicator light is dimmed. This behavior can be changed so that the power status indicator light will be **blue** when the display is switched on.

> **When the display is in stand-by mode, the power status indicator light will always turn orange, even when the power status indicator light is disabled.**

To enable/disable the power status indicator light:

1. Bring up the OSD main menu.

2. Navigate to the *Configuration > User Interface > Indicator Lights* menu.

3. Enter the *Power Status* submenu.

4. Select *Enabled/Disabled* as desired and confirm.

5.5   Key indicator lights

About the key indicator lights

By default, after lighting up, the key indicator lights will dim again if no further actions are taken within the following 5 seconds. However, this behavior can be changed so that the key indicator lights are always on or always off.

To configure the key indicator lights

1. Bring up the OSD main menu.

2. Navigate to the *Configuration > User Interface > Indicator Lights* menu.

3. Enter the *Keys* submenu.

4. Select *Automatic/Always On/Always Off* as desired and confirm.

> **The I-Luminate key is always lit and cannot be turned off.**

5.6   Power lock function

About the power lock function

By enabling the power lock function, the Mammo Tomosynthesis is forced to remain switched on. This means that it can't be switched to stand-by mode until the power lock function is disabled again.

To enable/disable the power lock function:

1. Bring up the OSD main menu.

2. Navigate to the *Configuration > User Interface > Controls* menu.

3. Enter the *Power Lock* submenu.

4. Select *Enabled/Disabled* as desired and confirm.

5.7 Ethernet over USB

About Eth. over USB

By default, the Ethernet over USB will be disabled. This does not disable the USB hub and still allows to make use of the display's USB downstream connectors and any external devices connected to it (keyboard, mouse, ...).

Please note that a connection from a PC USB downstream connector to the display's USB upstream connector is required to be able to use this functionality.

By enabling the Ethernet over USB, you allow the internal Mammo Tomosynthesis processor to communicate directly over USB with the connected PC.

> **Enabling the USB endpoint is only recommended when you are using a non-Barco display controller. If you are using a Barco display controller, this communication will automatically be done over the connected video cable(s).**

To enable/disable the eth. over USB:

1. Bring up the OSD main menu.

2. Navigate to the *Configuration > Connectivity* menu.

3. Enter the *Eth. over USB* submenu.

4. Select *Enabled/Disabled* as desired and confirm.

5.8 USB

About USB

By default, USB will be enabled. This will allow the connected PC to communicate directly over USB with the internal Mammo Tomosynthesis processor.

By disabling USB, communication between the internal Mammo Tomosynthesis processor and the connected PC will not be possible. This does not disable the USB hub and still allows to make use of the display's USB downstream connectors and any external devices connected to it (keyboard, mouse, ...).

Please note that a connection from a PC USB downstream connector to the display's USB upstream connector is required to be able to use this functionality.

> **Enabling the USB endpoint is only recommended when you are using a non-Barco display controller. If you are using a Barco display controller, this communication will automatically be done over the connected video cable(s).**

To enable/disable USB:

1. Bring up the OSD main menu.

2. Navigate to the *Configuration > Connectivity* menu.

3. Enter the *USB* submenu.

4. Select *Enabled/Disabled* as desired and confirm.

5.9 DPMS mode

About DPMS mode

Enabling the Display Power Management System (DPMS) mode on your display will optimize its diagnostic lifetime by automatically switching off the backlight when the display is not used for a specified period of time. By default, DPMS mode is enabled on your display, but it also needs to be activated on your workstation. To do this, go to the "Power options properties" window of your workstation.

> **Barco recommends setting DPMS activation after 20 minutes of non-usage.**

> **When DPMS mode is enabled on your display, an additional OSD power saving function becomes available: hibernate. Please refer to "Hibernate", page 26 for more information on hibernation and how to enable this function.**

To enable/disable DPMS mode on your display:

1. Bring up the OSD main menu.

2. Navigate to the *Configuration > Power Management* menu.

3. Enter the *DPMS Mode* submenu.

4. Select *Enabled/Disabled* as desired and confirm.

5.10 Hibernate

About hibernate

Enabling hibernation will not only switch off the backlight but will also force the display to disable other functionalities so that power consumption is further reduced to a minimum. This happens after a specific period of time which can be manually adjusted.

> **Hibernate can only be enabled on your display when the DPMS mode is enabled first. Therefore, please refer to "DPMS mode", page 26 to do this.**

To enable/disable hibernation on your display:

1. Bring up the OSD main menu.

2. Navigate to the *Configuration > Power Management* menu.

3. Enter the *Hibernate* submenu.

4. Select *Enabled/Disabled* as desired and confirm.

To specify the hibernate timeout:

1. Bring up the OSD main menu.

2. Navigate to the *Configuration > Power Management* menu.

3. Enter the *Hibernate Timeout* submenu.

4. Set the timeout value as desired and confirm.

5.11 I-Luminate default mode

About the I-Luminate default mode

The I-Luminate mode defines the default activated mode during the I-Luminate boost. This mode can be:

Screen	The boost mode is applied on the screen display.
Film (large or small)	Film (large or small): the boost mode activates a high illuminated rectangle on top of the screen, simulating a light box for use with radiological film. The size of this rectangle is similar to a classic (large or small) radiological film.

To set the I-Luminate mode:

1. Bring up the OSD main menu.

2. Navigate to the *Configuration > I-Luminate* menu.

3. Enter the *Default mode* submenu.

4. Select *Screen/Small Film/Large Film* as desired and confirm.

5.12 I-Luminate film position

About the I-Luminate film position

By default, the I-Luminate rectangle comes up in the top/center of the screen. This position can be changed to top/left or top/right corner.

To set the I-Luminate film position:

1. Bring up the OSD main menu.

2. Navigate to the *Configuration > I-Luminate* menu.

3. Enter the *Film Position* submenu.

4. Select *Left/Center/Right* as desired and confirm.

5.13 Luminance target

About the luminance target

The luminance target of your Mammo Tomosynthesis is adjustable over a predefined range. When you change the luminance target, the display will adjust its backlight to reach the target.

To set the luminance target:

1. Bring up the OSD main menu.

2. Navigate to the *Configuration > Calibration* menu.

3. Enter the *Luminance Target* submenu.

4. Set a luminance target value as desired and confirm.

> **The default value is 1000 cd/m². The five year warranty is valid for this setting.**

5.14 Viewing modes

About viewing modes

The Mammo Tomosynthesis can be used in two viewing modes:

Diagnostic	This mode provides the full calibrated luminance and is intended for using the display for diagnostic purposes.
Text	In this mode, the luminance is reduced to approximately half of the luminance. This is intended for using the display with office applications such as word processing. Please note that text mode is not persistent, once powered off, the unit will restart in diagnostic mode.

As the Mammo Tomosynthesis is intended to be used in a diagnostic environment, the diagnostic mode should always be selected.

To select a viewing mode:

1. Bring up the OSD main menu.

2. Navigate to the *Configuration > Calibration* menu.

3. Enter the *Viewing Mode* submenu.

4. Select *Diagnostic/Text* as desired and confirm.

5.15 Display functions

About display functions

Native, uncorrected panels will display all grayscale/color levels with equal luminance increments. Studies have shown however, that in medical images certain grayscale/color parts contain more diagnostic information then others. To respond to these conclusions, display functions have been defined. These functions emphasize on these parts containing crucial diagnostic information by correcting the native panel behavior.

Native	If you select Native, the native panel behavior will not be corrected.
Dynamic Gamma 1.8 Dynamic Gamma 2.2	These are gamma functions that are shifted to take into account the non-zero luminance of an LCD panel when driven with a "black" signal. They are especially useful in CT applications to improve the perception of low Hounsfield values.
DICOM	DICOM (Digital Imaging and Communications in Medicine) is an international standard that was developed to improve the quality and communication of digital images in radiology. In short, the DICOM display function results in more visible grayscales in the images. Barco recommends selecting the DICOM display function for most medical viewing applications.

User	This display function will be automatically selected when display functions are defined by MediCal QAWeb.
Gamma 1.8	Select one of these display functions in case the display is to replace a CRT display with a gamma of 1.8 or 2.2 respectively.
Gamma 2.2	

To select a display function:

1. Bring up the OSD main menu.

2. Navigate to the *Configuration > Calibration* menu.

3. Enter the *Display Function* submenu.

4. Select one of the available display functions and confirm.

5.16 Ambient Light Compensation (ALC)

About ALC

Ambient Light Compensation (ALC) can only be enabled on your display when the DICOM display function is selected. Therefore, please refer to "Display functions", page 28 to correctly set the display function.

When ALC is enabled, the DICOM display function will be recalculated taking a preset ambient light correction value into account. This value is determined by the selected reading room. Therefore, it is also important to select a realistic reading room when enabling ALC. This can be done by following the instructions in "Reading rooms", page 29.

To enable/disable ALC:

1. Bring up the OSD main menu.

2. Navigate to the *Configuration > Calibration > Ambient Light* menu.

3. Enter the *Ambient Light Compensation* submenu.

4. Select *Enabled/Disabled* as desired and confirm.

5.17 Reading rooms

About reading rooms

Reading rooms can only be selected when the DICOM display function is selected. Therefore, please refer to "Display functions", page 28 to correctly set the display function.

The American Association of Physicists in Medicine (AAPM) composed a list of pre-defined reading rooms. Each of these reading rooms are defined by following parameters:

• the maximum light allowed in this type of room
• the preset ambient light correction value for this reading room

These parameters are stored in your display and determine the preset ambient light correction value to take into account to recalculate the DICOM display function when Ambient Light Compensation (ALC) is enabled. Please refer to "Ambient Light Compensation (ALC)", page 29 to enable ALC.

The available reading rooms for your Mammo Tomosynthesis are:

CR/DR/ MAMMO	Corresponds to light conditions in diagnostic reading rooms for computed radiology, digital radiology or mammography. This setting has the lowest maximum ambient light.
CT/MR/NM	Corresponds to light conditions in diagnostic reading rooms for computed tomography, magnetic resonance or nuclear medicine scans.
Staff Office	Corresponds to light conditions in office rooms.
Clinical Viewing Room	Corresponds to light conditions in diagnostic reading rooms for clinical viewing.
Emergency Room	Corresponds to light conditions in emergency rooms.
Operating Room	Corresponds to light conditions in operating rooms. This setting has the highest maximum ambient light.

To select a reading room:

1. Bring up the OSD main menu.

2. Navigate to the *Configuration > Calibration > Ambient Light* menu.

3. Enter the *Reading Room* submenu.

4. Select one of the available reading rooms and confirm.

5.18 Continuous ALC

About Continuous ALC

Continuous ALC can only be selected when the DICOM display function is selected. Therefore, please refer to "Display functions", page 28 to correctly set the display function.

Enabling continuous ALC will continuously recalculate the DICOM display function taking the averaged ambient light into account.

To select continuous ALC:

1. Bring up the OSD main menu.

2. Navigate to the *Configuration > Calibration > Ambient Light* menu.

3. Enter the *Continuous ALC* submenu.

4. Select *Enabled/Disabled* as desired and confirm.

5.19 Image scaling

About image scaling

Enabling image scaling will multiply each individual pixel to one or more adjacent pixels so that the size of the displayed image will be a multiple of the original image source video input signal.

> **Image scaling is only possible when the resolution of your display's video input signal is less than or equal to half the maximum resolution of the display.**

To enable/disable image scaling:

1. Bring up the OSD main menu.

2. Navigate to the *Configuration > Image Source* menu.

3. Enter the *Scaling* submenu.

4. Select *Enabled/Disabled* as desired and confirm.

5.20 Video input signals

About input signals

The available input signals for your display are:

DisplayPort 1	The input corresponding to the DisplayPort connector.
DVI 1	The input corresponding to the DVI connector.
Automatic Selection	The input is automatically selected.

To manually select a video input signal:

1. Bring up the OSD main menu.

2. Navigate to the *Configuration > Image Source* menu.

3. Enter the *Input Signal* submenu.

4. Select one of the available input signals and confirm.

5.21 Video encoding modes

About video encoding modes

Video encoding modes specify how the color and luminance information is encoded in the video signal. In consumer displays, this is usually done by a limited 8-bit encoding mechanism. Your Mammo Tomosynthesis however, features 10-bit encoding enabling it to better match the DICOM defined grayscale range. Such an extensive range is necessary to comply with the guidelines set forward by the latest medical guidelines.

The available video encoding modes for your display are listed below.

> **Please note that the display controller connected to your display might not always support all these video encoding modes.**

Standard	This mode uses the standard 8 bit encoding mechanism.
HDR1	This mode features 10-bit video encoding following the High Dynamic Range (HDR) standard, usually used on color displays.

HDR2	HDR2 is a Barco specific mode featuring 10-bit video encoding following the High Dynamic Range (HDR) standard but allowing full refresh rate (which is not always possible with HDR1). This mode is usually used on color displays.
Dual 10 (only with Barco display controller)	Dual 10 is a Barco specific 10-bit video encoding mode which is usually used on grayscale displays and which allows full refresh rate.
Automatic	When selecting this option, your Mammo Tomosynthesis will automatically assign the correct video encoding settings to the connected video input signals.

To manually select a video encoding mode:

1. Bring up the OSD main menu.

2. Navigate to the *Configuration > Image Source* menu.

3. Enter the *Video Encoding* submenu.

4. Select one of the available video encoding modes and confirm.

5.22 Grayscale conversion modes

About grayscale conversion modes

Grayscale conversion modes specify how color generated on the display controller is converted to grayscale in your display.

The available grayscale conversion modes are:

No Conversion	
Use Red Channel	This mode is intended for grayscale displays where gray is sent over the red channel.
Use Green Channel	This mode is intended for grayscale displays where gray is sent over the green channel.
Use Blue Channel	This mode is intended for grayscale displays where gray is sent over the blue channel.
Use All Channels	This mode is intended for grayscale displays where gray is sent over the red, green and blue channel. This is done by means of a standard conversion mechanism where 30% red, 59% green and 11% blue are used to generate gray.

To manually select a grayscale conversion mode:

1. Bring up the OSD main menu.

2. Navigate to the *Configuration > Image Source* menu.

3. Enter the *Grayscale Conversion* submenu.

4. Select one of the available color conversion modes and confirm.

5.23 EDID timings

About EDID timings

Following EDID timings are available for your Mammo Tomosynthesis:

Refresh Rate	Allows to manually select the refresh rate of the image source video input signal depending on the maximum refresh rate of the display controller connected to your display.
Preferred Orientation	Allows to change the orientation of the image source video input signal to landscape, portrait or to let the display automatically assign the correct orientation.
Color Depth	Allows to change the color depth to 8 or to 10 bit.

To manually set EDID timings:

1. Bring up the OSD main menu.

2. Navigate to the *Configuration > Image Source* menu.

3. Enter the *Timings* submenu.

4. Select *Refresh Rate, Preferred Orientation* or *Color Depth*.

5. Select one of the available settings and confirm.

5.24 Display info

About display info

Your display serial number, color type, native resolution, firmware versions, etc. are available in a dedicated submenu of the OSD menu.

To retrieve info about your display:

1. Bring up the OSD main menu.

2. Navigate to the *About this Display* menu.

3. Enter the *Display* or *Firmware* submenu as desired.

5.25 Display status

About display status

The Status submenu of the OSD menu provides info on the current status of your display (runtimes, temperatures, etc.), the status of the connected image sources (video encoding mode, timings, etc.), the current calibration status of your display (display function, luminance, ALC, etc.) and the status about activated connections.

To retrieve the status of your display:

1. Bring up the OSD main menu.

2. Navigate to the *Status* menu.

3. Enter the *Display, Image Sources, Calibration* or *Connectivity* submenu as desired.

6. MAINTENANCE

General maintenance information

The Mammo Tomosynthesis Display does not require any scheduled maintenance activities. In case of a defect, return the display to a Barco approved maintenance organization. In any case of doubts, contact the Barco Healthcare Division

6.1   Front glass

Cleaning of the front glass

Clean the front glass using a sponge, cleaning cloth or soft tissue, **lightly** moistened with one of the following tested products:

- Flux
- Windex Glass Plus
- Bohle glass cleaner
- Mr. Proper
- Pril
- Ajax glass cleaner
- Sidolin glass cleaner

In case none of the above cleaning products is available, use plain water.

> ⚠ **WARNING: Take care not to damage or scratch the front glass. Be careful with rings or other jewelry and do not apply excessive pressure on the front glass.**

> ⚠ **WARNING: Do not apply or spray liquid directly to the front glass as excess liquid may cause damage to internal electronics. Instead, apply the liquid to the cleaning cloth.**

> ⚠ **WARNING: Do not use following products:**
>
> **Alcohol/solvents at higher concentration > 5%**
>
> **Strong alkalis lye, strong solvents**
>
> **Acid**
>
> **Detergents with fluoride**
>
> **Detergents with ammonia**
>
> **Detergents with abrasives**
>
> **Steel wool**
>
> **Sponge with abrasives**
>
> **Steel blades**
>
> **Cloth with steel thread**

6.2   Cabinet

Cleaning of the cabinet

1. Clean the cabinet using a soft cotton cloth, lightly moistened with a recognized cleaning product for medical equipment.
   The cabinet has been tested for resistance to the following products:

   - Cidex, Betadine
   - Alcohol (isopropyl and Ethyl)
   - Ammonia-based cleaners (Windex)
   - Aquasonic Gel

   In case none of the above cleaning products is available, use plain water.
   Caution: *Do not apply or spray liquid directly to the cabinet as excess liquid may cause damage to internal electronics. Instead, apply the liquid to the cleaning cloth.*

2. Repeat with water only.

3. Wipe dry with a dry cloth.

7. IMPORTANT INFORMATION

7.1   Safety information
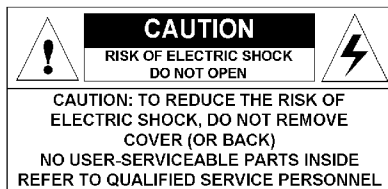
General recommendations

Read the safety and operating instructions before operating the device.

Retain safety and operating instructions for future reference.

Adhere to all warnings on the device and in the operating instructions manual.

Follow all instructions for operation and use.

Electrical Shock

```
⚠        CAUTION        ⚡
   RISK OF ELECTRIC SHOCK
        DO NOT OPEN
  CAUTION: TO REDUCE THE RISK OF
 ELECTRIC SHOCK, DO NOT REMOVE
          COVER (OR BACK)
  NO USER-SERVICEABLE PARTS INSIDE
 REFER TO QUALIFIED SERVICE PERSONNEL
```

- Do not modify this equipment without authorization of the manufacturer.
- No user-serviceable part inside. The equipment should be opened only by qualified service personnel.

Type of protection (electrical):

Display with external power supply: Class I equipment.

Degree of safety (flammable anesthetic mixture):

Equipment not suitable for use in the presence of a flammable anesthetic mixture with air or with oxygen or nitrous oxide.

Non-patient care equipment

- Equipment primarily for use in a health care facility that is intended for use where contact with a patient is unlikely (no applied part).
- The equipment may not be used with life support equipment.
- The user should not touch the equipment and the patient at the same time.

Power connection – Equipment with external 24 VDC power supply

- Power requirements: The equipment must be powered using the delivered medical approved 24 VDC ($\overline{===}$) SELV power supply.
- The medical approved DC ($\overline{===}$) power supply must be powered by the AC mains voltage.
- The power supply is specified as a part of the ME equipment or combination is specified as a ME system.
- To avoid the risk of electric shock, this equipment must only be connected to a supply mains with protective earth.
- The equipment should be installed near an easily accessible outlet.
- The equipment is intended for continuous operation.

Transient over-voltage

If the device is not used for a long time, disconnect it from the AC inlet to avoid damage by transient over-voltage.

To fully disengage the power to the device, please disconnect the power cord from the AC inlet.

Power cords:

- Utilize a UL-listed detachable power cord, 3-wire, type SJ or equivalent, 18 AWG min., rated 250 V min., provided with a hospital-grade type plug 5-15P configuration for 120V application, or 6-15P for 240V application.
- Do not overload wall outlets and extension cords as this may result in fire or electric shock.
- Mains lead protection (U.S.: Power cord): Power cords should be routed so that they are not likely to be walked upon or pinched by items placed upon or against them, paying particular attention to cords at plugs and receptacles.
- The power supply cord should be replaced by the designated operator only at all time.

Water and moisture

Never expose the display to rain or moisture.

Never use the display near water - e.g. near a bathtub, washbasin, swimming pool, kitchen sink, laundry tub or in a wet basement.

Ventilation

Do not cover or block any ventilation openings in the cover of the set. When installing the device in a cupboard or another closed location, heed the necessary space between the set and the sides of the cupboard.

Installation

Place the device on a flat, solid and stable surface that can support the weight of at least 3 devices. If you use an unstable cart or stand, the device may fall, causing serious injury to a child or adult, and serious damage to the device.

This apparatus conforms to:

CE0120 (MDD 93/42/EEC; A1:2007/47/EC class IIb product), CE - 2004/108/EC, CE - 93/42/EEC; A1:2007/47/EC class II b, IEC 60950-1:2005 + A1:2009 (2ND EDITION), IEC 60601-1:2005 + A1:2012, ANSI/AAMI ES 60601-1:2005 + C1:2009 + A1:2012, CAN/CSAC22.2 No. 60601-1-08:2008, DEMKO - EN 60601-1:2006, EN 60601-1-2:2007, CCC - GB9254-2008 + GB4943.1-2011 + GB17625.1-2012, KC, VCCI, FCC class B, ICES-001 Level B, FDA 510K, RoHS.

National Scandinavian Deviations for CL. 1.7.2:

Finland: "Laite on liitettävä suojamaadoituskoskettimilla varustettuun pistorasiaan"

Norway: "Apparatet må tilkoples jordet stikkontakt"

Sweden: "Apparaten skall anslutas till jordat uttag"

7.2   Environmental information

Disposal information (Waste Electrical and Electronic Equipment)

This symbol on the device indicates that, under European Directive 2002/96/EC governing waste from electrical and electronic equipment, this device must not be disposed of with other municipal waste. Please dispose of your waste device by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. To prevent possible harm to the environment or human health from uncontrolled waste disposal, please separate these devices from other types of waste and recycle them responsibly to promote the sustainable reuse of material resources.

For more information about recycling of this device, please contact your local city office or your municipal waste disposal service. For details, please visit the Barco website at: http://www.barco.com/en/About-Barco/weee.

Mercury Notice

Hg **LAMP CONTAINS MERCURY, DISPOSE ACCORDING TO STATE/LOCAL LAW.** This Barco product consists of materials that may contain mercury, which must be recycled or disposed of in accordance with local, state, or country laws:

• Within this system, the lamps in the device contain mercury

Turkey RoHS compliance

Republic of Turkey: In conformity with the EEE Regulation

Türkiye Cumhuriyeti: EEE Yönetmeliğine Uygundur

中国大陆 RoHS

Chinese Mainland RoHS

根据中国大陆《电子信息产品污染控制管理办法》(也称为中国大陆RoHS),以下部分列出了Barco产品中可能包含的有毒和/或有害物质的名称和含量。中国大陆RoHS指令包含在中国信息产业部MCV标准："电子信息产品中有毒物质的限量要求"中。

According to the "China Administration on Control of Pollution Caused by Electronic Information Products" (Also called RoHS of Chinese Mainland), the table below lists the names and contents of toxic and/or hazardous substances that Barco's product may contain. The RoHS of Chinese Mainland is included in the MCV standard of the Ministry of Information Industry of China, in the section "Limit Requirements of toxic substances in Electronic Information Products".

零件项目(名称) Component name	有毒有害物质或元素 Hazardous substances and elements					
	铅 Pb	汞 Hg	镉 Cd	六价铬 Cr6+	多溴联苯 PBB	多溴二苯醚 PBDE
印制电路配件 Printed Circuit Assemblies	x	o	o	o	o	o
液晶面板 LCD panel	x	x	o	o	o	o
外接电(线)缆 External Cables	x	o	o	o	o	o
內部线路 Internal wiring	o	o	o	o	o	o
金属外壳 Metal enclosure	o	o	o	o	o	o
塑胶外壳 Plastic enclosure	o	o	o	o	o	o
散热片(器) Heatsinks	o	o	o	o	o	o
电源供应器 Power Supply Unit	x	o	o	o	o	o

零件项目(名称)	有毒有害物质或元素					
Component name	Hazardous substances and elements					
	铅 Pb	汞 Hg	镉 Cd	六价铬 Cr6+	多溴联苯 PBB	多溴二苯醚 PBDE
风扇 Fan	O	O	O	O	O	O
文件说明书 Paper Manuals	O	O	O	O	O	O
光盘说明书 CD manual	O	O	O	O	O	O
O: 表示该有毒有害物质在该部件所有均质材料中的含量均在 SJ/T 11363-2006 标准规定的限量要求以下. O: Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006.						
X: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T 11363-2006 标准规定的限量要求. X: Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in SJ/T11363-2006						

在中国大陆销售的相应电子信息产品（EIP）都必须遵照中国大陆《电子信息产品污染控制标识要求》标准贴上环保使用期限（EFUP）标签。Barco产品所采用的EFUP标签（请参阅实例，徽标内部的编号使用于制定产品）基于中国大陆的《电子信息产品环保使用期限通则》标准。

All Electronic Information Products (EIP) that are sold within Chinese Mainland must comply with the "Electronic Information Products Pollution Control Labeling Standard" of Chinese Mainland, marked with the Environmental Friendly Use Period (EFUP) logo. The number inside the EFUP logo that Barco uses (please refer to the photo) is based on the "Standard of Electronic Information Products Environmental Friendly Use Period" of Chinese Mainland.

7.3 Regulatory compliance information

Indications for use

The Mammo Tomosynthesis Display (MDMG-5221) device is intended to be used in displaying and viewing digital images, including standard and multi-frame digital mammography, for review, analysis, and diagnosis by trained medical practitioners. It is specially designed for breast tomosynthesis applications. CAUTION: Federal law restricts this device to sale by or on the order of a physician. (Details & exemptions are in the Code of Federal Regulations Title 21, 801 Part D)

FCC class B

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This device has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This device generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this device does cause harmful interference to radio or television reception, which can be determined by turning the device off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the device and receiver.
- Connect the device into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Canadian notice

This Class B digital device complies with Canadian ICES-003.

Cet appareil numérique de la Classe B est conforme à la norme NMB-003 du Canada.

7.4 EMC notice

General information

No specific requirement on the use of external cables or other accessories except power supply.

With the installation of the device, use only the delivered power supply or a spare part provided by the legal manufacturer. Using another can result in a decrease of the immunity level of the device.

Electromagnetic emissions

The Mammo Tomosynthesis is intended for use in the electromagnetic environment specified below. The customer or the user of the Mammo Tomosynthesis should assure that it is used in such an environment.

Emissions test	Compliance	Electromagnetic environment – Guidance
RF emissions CISPR 11	Group 1	The Mammo Tomosynthesis uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class B	The Mammo Tomosynthesis is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class D	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	

This Mammo Tomosynthesis complies with appropriate medical EMC standards on emissions to, and interference from surrounding equipment. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Interference can be determined by turning the equipment off and on.

If this equipment does cause harmful interference to, or suffer from harmful interference of, surrounding equipment, the user is encouraged to try to correct the interference by one or more of the following measures:

• Reorient or relocate the receiving antenna or equipment.
• Increase the separation between the equipment and receiver.
• Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
• Consult the dealer or an experienced technician for help.

Electromagnetic immunity

The Mammo Tomosynthesis is intended for use in the electromagnetic environment specified below. The customer or the user of the Mammo Tomosynthesis should assure that it is used in such an environment.

Immunity test	IEC 60601 Test levels	Compliance level	Electromagnetic environment – guidance
Electrostatic discharge (ESD) IEC 61000-4-2	± 6kV contact ± 8kV air	± 6kV contact ± 8kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%
Electrical fast transient/burst IEC 61000-4-4	± 2kV for power supply lines ± 1kV for input/ output lines	± 2kV for power supply lines ± 1kV for input/ output lines	Mains power quality should be that of a typical commercial or hospital environment
Surge IEC61000-4-5	± 1 kV line(s) to line(s) ± 2 kV line(s) to earth	± 1 kV line(s) to line(s) ± 2 kV line(s) to earth	Mains power quality should be that of a typical commercial or hospital environment
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	< 5% U_T [1] (> 95% dip in U_T) for 0.5 cycle 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles < 5% U_T (>95% dip in U_T) for 5s	< 5% U_T (> 95% dip in U_T) for 0.5 cycle 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles < 5% U_T (>95% dip in U_T) for 5s	Mains power quality should by that of a typical commercial or hospital environment. If the user of the Mammo Tomosynthesis requires continued operation during power mains interruptions, it is recommended that the Mammo Tomosynthesis be powered from an uninterruptible power supply or a battery.

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1. is the a.c. mains voltage prior to application of the test level.

Immunity test	IEC 60601 Test levels	Compliance level	Electromagnetic environment – guidance
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	Not applicable	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
Conducted RF IEC 61000-4-6 Radiated RF IEC 61000-4-3	3 Vrms 150 kHz to 80 MHz 3 V/m 80 MHz to 2.5 GHz	3 V 3 V/ m	Portable and mobile RF communications equipment should be used no closer to any part of the Mammo Tomosynthesis, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance **d = 1.2√P** **d = 1.2√P** 80 MHz to 800 MHz **d = 2.3√P** 800 MHz to 2.5 Ghz Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,[2] should be less than the compliance level in each frequency range.[3] Interference may occur in the vicinity of equipment marked with symbol:

Immunity test	IEC 60601 Test levels	Compliance level	Electromagnetic environment – guidance

> **At 80 MHz and 800 MHz, the higher frequency range applies.**

> **These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.**

Recommended separation distance

The Mammo Tomosynthesis is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer of the user of the Mammo Tomosynthesis can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the Mammo Tomosynthesis as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter [4] W	Separation distance according to frequency of transmitter		
	150kHz to 80MHz $d=1.2\sqrt{P}$	80MHz to 800MHz $d=1.2\sqrt{P}$	800MHz to 2.5GHz $d=2.3\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

> **At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.**

> **These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection form structures, object and people.**

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2. Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the Mammo Tomosynthesis is used exceeds the applicable RF compliance level above, the Mammo Tomosynthesis should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the Mammo Tomosynthesis.
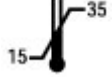3. Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.
4. For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter. Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

7.5 Explanation of symbols

Symbols on the device

On the device or power supply, you may find the following symbols (nonrestrictive list):

CE	Indicates compliance with the Directive 93/42/EEC as Class I device
CE 0120	Indicates compliance with the Directive 93/42/EEC as Class II device
FC	Indicates compliance with Part 15 of the FCC rules (Class A or Class B)
CLASSIFIED UL	Indicates the device is approved according to the UL regulations
CLASSIFIED c UL us	Indicates the device is approved according to the UL regulations for Canada and US
D	Indicates the device is approved according to the UL Demko regulations
CCC	Indicates the device is approved according to the CCC regulations
VCI	Indicates the device is approved according to the VCCI regulations
KC	Indicates the device is approved according to the KC regulations
	Indicates the device is approved according to the BSMI regulations
	Indicates the USB connectors on the device
P	Indicates the DisplayPort connectors on the device
	Indicates the manufacturing date
35 15	Indicates the temperature limitations for the device to safely operate within specs

SN	Indicates the device serial no.
	Consult the operating instructions
	Indicates this device must not be thrown in the trash but must be recycled, according to the European WEEE (Waste Electrical and Electronic Equipment) directive
	Indicates Direct Current (DC)
	Indicates Alternating Current (AC)

7.6　Legal disclaimer

Disclaimer notice

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Patent information

This product is covered under the following intellectual property rights:

US Patent RE43,707

US Patent 7,038,186

US Patent 7,166,829

US Patent 6,950,098

European Patent 1 650 730

European Patent 1 274 066.

7.7   Technical specifications

Overview

Product acronym	MDMG-5221
Screen technology	TFD AM LCD Dual Domain IPS
Active screen size (diagonal)	540.9 mm (21.3")
Active screen size (H x V)	377,9 mm x 422,4 mm (14.9" x 16.6")
Aspect ratio (H:V)	4:5
Resolution	5MP (2048 x 2560)
Pixel pitch	0.165 mm
Color imaging	No
Gray imaging	Yes
Number of grayscales (LUT in/LUT out)	1024 gray levels (10/12)
Viewing angle (H, V)	170°
Uniform Luminance Technology (ULT)	Yes
Per Pixel Uniformity (PPU)	Yes
Ambient Light Compensation (ALC)	Yes
Backlight Output Stabilization (BLOS)	Yes
I-Guard	Yes
Maximum luminance	2100 cd/m² typical
DICOM calibrated luminance (ULT off)	1000 cd/m²
Contrast ratio (typical)[5]	950:1
Response time (Tr + Tf)	15 ms typical
Scanning frequency (H; V)	30-150 kHz; 15-80 Hz
Housing color	Gray
Video input signals	DVI-D Dual Link / DisplayPort (per display)
Video inout terminals	NA
USB ports	1 upstream (endpoint), 3 downstream
USB standard	2.0
Power requirements (nominal)	100-240V
Power consumption (nominal)	125W
Power save mode	Yes
Power management	DVI-DMPM / DP-DMPM
Dot clock	280 MHz
OSD languages	English, German, French, Dutch, Spanish, Italian, Portuguese, Polish, Russian, Swedish, Chinese (simplified), Japanese, Korean, Arabic
Dimensions with stand (W x H x D)	NA
Dimensions w/o stand (W x H x D)	392 x 484 x 122 mm
Dimensions packaged (W x H x D)	780 x 550 x 261 mm
Net weight with stand	NA

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5. In dark reading room conditions (0 lux)

Net weight w/o stand	10.9 kg
Net weight packaged with stand	NA
Net weight packaged w/o stand	17.3 kg
Height adjustment range	100 mm
Tilt	-5° / +30°
Swivel	-45° / +45°
Pivot	90°
Mounting standard	VESA (100 mm)
Screen protection	Protective, non-reflective glass cover
Recommended modalities	Mammography, Breast Tomosynthesis, CT, MR, US, DR, CR, NM, Film
Certifications	CE0120 (MDD 93/42/EEC; A1:2007/47/EC class IIb product), CE - 2004/108/EC, CE - 93/42/EEC; A1:2007/47/EC class II b, IEC 60950-1:2005 + A1:2009 (2ND EDITION), IEC 60601-1:2005 + A1:2012, ANSI/AAMI ES 60601-1:2005 + C1:2009 + A1:2012, CAN/CSAC22.2 No. 60601-1-08:2008, DEMKO - EN 60601-1:2006, EN 60601-1-2:2007, CCC - GB9254-2008 + GB4943.1-2011 + GB17625.1-2012, KC, VCCI, FCC class B, ICES-001 Level B, FDA 510K, RoHS.
Supplied accessories	User Guide
	Quick Installation Sheet
	Video cables (2x DisplayPort)
	Two sets of main cables (UK, European (CEBEC/KEMA), USA (UL/ CSA; adaptor plug NEMA 5-15P), Chinese (CCC))
	Two USB 2.0 cable
	Two external power supply
	Film clip
	Keyboard light
Optional accessories	Additional film clip (V622784)
	Additional keyboard light (B4100574)
QA software	MediCal QAWeb
Units per pallet	NA
Pallet dimensions (W x H)	NA
Warranty	5 years
Operating temperature	0°C to 35°C (20°C to 30°C within specs)
Storage temperature	-20°C to 60°C
Humidity	90% (0°C to 40°C)
Operation altitude	3000 m
Storage altitude	7500 m

7.8   Open source license information

Open source license information

Open source license usage

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