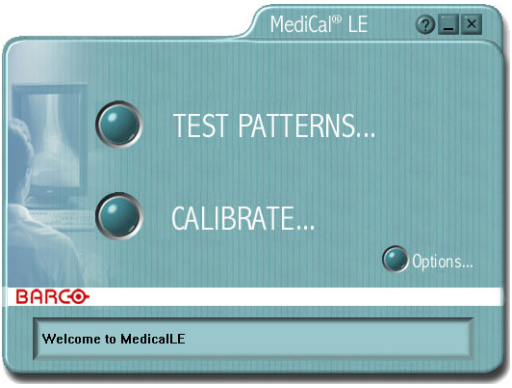
MediCal LE



Installation & User Manual

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Introduction

MediCal LE is a user-friendly and efficient tool for Q/A check and conformance calibration of medical displays and display systems.

With MediCal LE you can:

- Perform Q/A checks observing many kinds of test patterns.
  See § **“Performing quality checks with test patterns”**
- Calibrate the displays with the delivered optical sensor.
  See § **“Calibrating displays”**
- Select from a list of display functions.
  See § **“Options”**
- Choose to work calibrated or uncalibrated.
  See § **“Working uncalibrated”**

Installation

MediCal LE installation

Minimum System requirements

- Color or grayscale imaging board having gamma access
- Operating system: Windows 2000 Professional, Windows XP Professional
- Memory: 64 MByte
- Free disk space: 15 MByte

Before installing MediCal LE

1. You must have Administrator privileges to install the software.
2. If there are older versions of MediCal LE installed on the PC, remove them. Please refer to the § "Uninstalling MediCal LE", further in this chapter.
3. Set the resolution (desktop area) of all the displays in your system to at least 1024x768 (landscape displays) or 768x1024 (portrait displays). Set the resolution by selecting Start > Settings > Control Panel > Display. Select the Settings tab and adjust the screen size.

Installing MediCal LE

To install MediCal LE, follow these steps:

1. Exit all open programs.
2. Insert the CD-ROM containing the MediCal LE installer program in the CD-ROM drive.
3. The CD-ROM starts automatically. After a few seconds, the MediCal LE welcome window appears.
4. Click on **Install**. The Setup application starts.

5. Click on the **Next>** button.
6. Read the License agreement on the screen very carefully. Scroll down to read the complete text.
7. Click on **Yes** if you agree with the License agreement and wish to continue with the installation.
8. A window appears, indicating the directory where MediCal LE is going to be installed.

   Click on the **Browse...** button if you want to change this directory. Click on the **Next>** button to continue.
9. Select the program folder where you wish to add the program icons.

   Click on **Next>** to continue.
10. The installer program now starts to install the files at the appropriate place. **Note**: MediCal LE is installed in the System Tray
11. Click on **Finish** to complete the setup.
12. Restart the PC before you can use MediCal LE.

Uninstalling MediCal LE

To remove MediCal LE from your system, proceed as follows:

1. You must have Administrator privileges to uninstall the software.
2. Exit MediCal LE.
3. From the Start menu, select Settings > Control Panel.
4. Double-click on the Add/Remove Programs icon.
5. Select MediCal LE from the list box at the bottom of the Add/Remove Program Properties dialog.
6. Click on the Add/Remove... button.
7. Follow the instructions on the screen.

Optical sensor connection

Supported sensors:

MediCal LE 1.03 supports 2 types of sensors.

When sold as full package, MediCal LE 1.03 comes with the circular-shaped Barco LCD sensor.

MediCal LE 1.03 also supports the sensor that came with previous versions of MediCal LE (an oval sensor).

The Barco LCD sensor delivered with MediCal LE 1.03 comes with 2 different sensor head adapters: An adapter covered with *felt* and an adapter with *suction cups*.

Attention:

Do not put the sensor head adapter with the suction cups on the screen of an LCD display without protective front glass!

The suction cups might damage the LCD screen surface when you remove the sensor from the screen.

For LCD displays, you should use the sensor head with the felt. For CRT displays, you should use the head with the suction cups.

To change the sensor head adapter:

To remove the adapter from the optical sensor:

1. Take the sensor with its “eye” pointing towards you.
2. Turn the head adapter in counterclockwise sense.

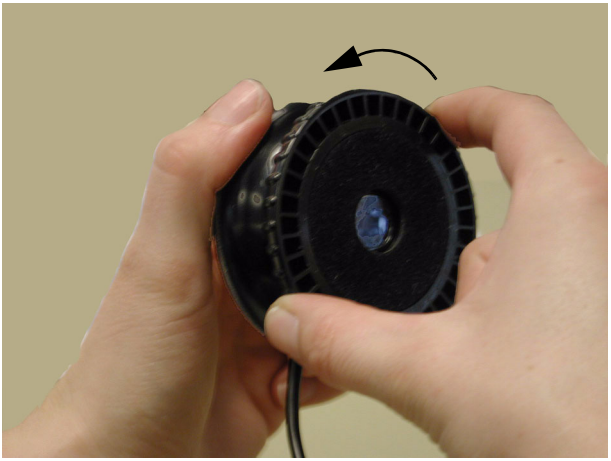

Figure 1: Head adapter removal

3. Pull the adapter from the sensor.

To apply the head adapter to the sensor:

1. Take the sensor with its “eye” pointing towards you.
2. Put the head adapter on the sensor.
3. Turn the sensor head adapter in clockwise sense.

To connect the sensor:

1. Put the MediCal LE CD-ROM in the CD-ROM drive. A screen will appear, but do NOT click on any button.
2. Plug the sensor in one of the USB connectors of your PC.
3. Windows pops up a message box "Found new hardware".
4. Select "Search for a suitable driver for my device
5. Select to search on the CD-ROM drives to find the proper drivers.
6. Click "Next" to install the BarcoView sensor drivers.

To use the sensor:

The Barco LCD sensor, standard delivered with MediCal LE 1.03, is provided with a metal counterweight around the sensor cable.

Thanks to this counterweight, you can let the sensor cable hang over the top of the display during calibration or measurement.

Figure 2: Counterweight

Attention:

When using the sensor with the felt-covered head adapter, take care that no light can enter between the edge of the adapter and the screen surface.

If necessary, slightly push the sensor to the screen.

Starting MediCal LE

After installing MediCal LE, its icon appears in the System Tray in the Task Bar.

The icon appears crossed out in case the display(s) are not calibrated yet. This is the initial situation after installing MediCal LE

The icon appears without the cross after calibration.

You can start MediCal LE by:

- Double-clicking on the icon in the System Tray
- Right-clicking on the icon in the System Tray and selecting Open MediCal LE.
- Starting MediCal LE from the Start > Programs > MediCal LE > menu in Windows.

The MediCal LE main window appears.

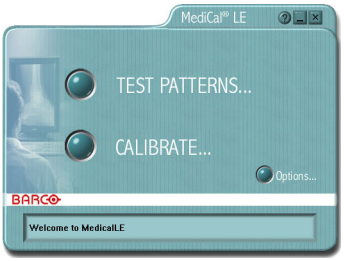

Figure 3: Main window

Performing quality checks with test patterns

Introduction

You can display test patterns to perform quality checks. You can use the patterns for visual checks and for measurements with the optical sensor.

Note:

In the Options section, you can select which displays in the system need or need not to be controlled. Test patterns will appear only on selected displays.

At least one display must be selected .

To display a pre-defined test pattern

1. Open MediCal LE.
2. Click on the **Test Patterns...** button.
3. Use the Next (**>**) and Back (**<**) buttons to scroll through the possible test patterns.
4. Double-click on the icon of one of the following patterns:
   - SMPTE
   - Briggs
   - Grid
   - Centered square
   - Bands with text
   - Browse
   - Character
   - Contrast noise
   - Geometry
   - Uniformity

To display a custom test pattern

1. Open MediCal LE.
2. Click on the **Test Patterns...** button.
3. Double-click on the **Browse** icon.
4. An explorer-like dialog appears. Browse to the location where the desired image is stored, select the image, and click **Open**.
   The selected image will appear.

Pattern options

When you click with the right mouse button while the pattern is displayed, the pattern options appear:

Inverted:

The imaging board Look-Up Tables are inverted (white becomes black etc.)

Calibrated:

Disable this option to view the test pattern without the effect of the calibration. In this way, you can compare the calibrated and uncalibrated situations.

Enable the option again for normal, calibrated operation.

Quit:

Close the test pattern on this display.

On a system with multiple displays (multi-head system), the pattern will then appear on the next display.

You can also close the test pattern by left-clicking on the pattern or by hitting any key on the PC keyboard.

Pre-defined test pattern description

SMPTE

The SMPTE pattern is a universal pattern with which you can check geometry, focus, white luminance, bandwidth and display curve.

We suggest to check on display curve. Therefore, check the patches with the 5% gray square on black and the 95% white square on white. The gray squares should be visible if the system is calibrated according to the DICOM display function.

To measure the patches, put the optical sensor on a patch and check the measured luminance displayed in the Measure window.

Briggs

This pattern can be used to check if the display function is perceptually linear (calibrated according to the DICOM display curve). The pattern consists of rectangles including small squares that are 5% darker.

The small squares in each of the rectangles should be visible if the system is calibrated according to the DICOM display function.

Grid

This pattern can be used to check the image geometry (size, position, linearity) and focus.

Check if the lines of the pattern are:

- straight
- at an equal distance apart
- sharp

Centered Square

This pattern can be used to check the white luminance.

Put the optical sensor on the white square and check the measured luminance displayed in the Measure window.

Bands with text

This pattern can be used to check if the display function is perceptually linear (calibrated according to the DICOM display curve).

This is the case if the text in all of the bands is legible.

Browse

Browse and select your own test pattern. MediCal LE supports bmp, tif, jpg and gif files.

Character

This pattern can be used to check the image focus.

Check that the characters are sharp.

Contrast noise

This pattern can be used to check the video signal.

Check that there is no ghosting or smearing near the white squares.

Geometry

This pattern can be used to check the image geometry, especially linearity.

For linearity, check if the circles on the pattern are well-shaped and symmetrical.

Uniformity

This pattern can be used to check if the white and black levels are uniform all over the screen. Therefore, put the sensor on the different patches on the screen, and check the Measure window to see if the measured value is approximately the same all over the screen.

Note:

To see what the correction in MediCal LE does to your image, it may be a good idea to compare the SMPTE or Briggs pattern with the correction enabled and disabled. You can do this by clicking the right mouse button on the pattern and disabling the **Calibrated** option.

Calibrating displays

Note:

In the Options section, you can select which displays in the system need or need not to be controlled. Calibration is possible only on selected displays.

At least one display must be selected.

To calibrate displays:

1. Be sure to connect the optical sensor to the PC USB connector or a USB hub.
2. The Found New Hardware wizard may appear, asking you to search for a suitable driver.

   You can find the sensor drivers on the MediCal LE CD-ROM.

   For more information, see § "**"Optical sensor connection"**".
3. When done, open MediCal LE.
4. If necessary, click on the **Options** button to:

   • exclude displays from calibration

   • select the display function to which to calibrate the displays

   When done, click on **Back** to return to the main window.

   For more information, see § **"Options"**.
5. Click on the **Calibrate** button.
6. If you have a system with more than 1 display connected, a window appears asking if you wish to calibrate this display. Select **Yes** and click on the **Next** button.
   If you have just 1 display connected, the calibration starts immediately (see the following step).

7. Select what kind of display you are going to calibrate: LCD (flat panel display) or CRT (display with a picture tube).

   When done, click on **Next**.

8. When you use the sensor that came with MediCal LE 1.03 (a circular-shaped sensor), you are asked to calibrate the sensor first.

   Therefore, carefully cover the "eye" of the sensor *completely* so that absolutely no light can enter the sensor "eye". E.g., you can hold the sensor with its "eye" down on a table surface.

   When done, click on **Next**.

   When you use the sensor that came with a previous version of MediCal LE (oval), this step is skipped.

9. In the next step, a test pattern with 4 patches on a black background and 4 patches on a white background appears.

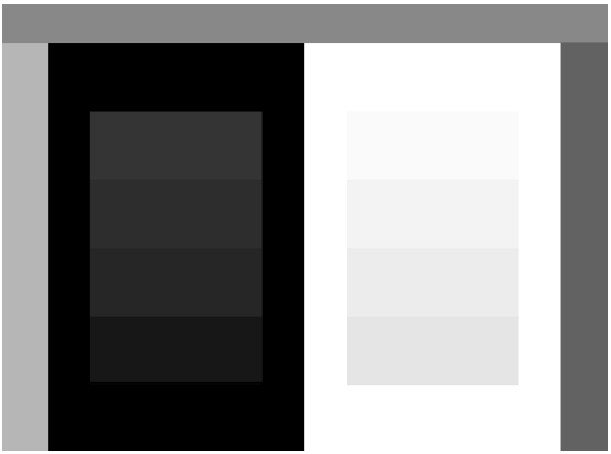

Figure 4: Calibration test pattern

10. When you have selected to calibrate an "LCD" display, check if geometry and phase are well-aligned.

    If they are well-aligned, the image is clear, crisp and stable. If they are not well-aligned, the image will show dark bands and/or vibrations, especially in the gray border of the image. In that case, align display geometry and phase until the image is crisp and stable (see **"Notes:"** below).

    When done, click on **Next**.

    When you have selected to calibrate a "CRT" display, this step is skipped.

11. Set the display brightness to minimum. Then increase the brightness until you can just distinguish all 4 patches on the *black* background (see **"Notes:"** below).
    When done, click on the **Next** button.
    In this way, you have determined the black luminance target value.

12. Now set the display contrast to maximum. Then decrease the contrast until you can just distinguish all 4 patches on the *white* background (see **"Notes:"** below).
    When done, click on the **Next** button.
    In this way you have determined the white luminance target value.

13. If the selected display function is DICOM, the ambient light compensation is determined now.

    Therefore, hold the sensor approximately 5 cm (2 inches) from the screen surface, as shown on the screen image.
    Then, click on the **Next** button.
    Hold the sensor like this until the next message appears.

14. An image of a sensor measuring head appears in the center of the image. Hold the optical sensor on the white patch on the screen until the end of the procedure.
    This may take about half a minute. Do not remove the sensor during this calibration period.

15. When the calibration is finished successfully, the Calibration Successful message appears and a 'happy' sound is played.
16. Click on the **Finish** button. The Calibration Wizard will start on the next display, in case of a multi-head system.

Notes:

- If you use a digital (DVI) video signal connection, the adjustments for brightness, contrast, geometry and phase may not be present in your display.
- Some LCD displays provide automatic adjustments for geometry and phase (e.g., auto-geometry, auto-phase etc.).

  You can use these automatic adjustments for geometry and phase adjustment during calibration (see step 10.)

Options

1. Open MediCal LE.
2. Click on the **Options** button.
3. Select the display function for all displays of the system. We recommend to select **DICOM** in almost any medical application. The DICOM curve, if calibrated, ensures that you can distinguish the highest possible number of gray levels. Select **CIE** if you need to comply to the DIN or IEC standard. Select **Gamma** to calibrate to a gamma 2.2 function. Click on the **Next** button.
4. Select the units in which you want all luminance values and measurements to be expressed: **cd/m²** (Candela per square meter) or **fl** (Footlambert). **Note**: Cd/m² is a metric unit and is synonymous with "nit". Click on the **Next** button.
5. On a multihead system, a graphical representation of the system appears. The rectangles in the “Select displays to be controlled” window represent the display controller heads in the system and the displays connected to them.

   By default, all the displays are selected (showing a check mark in the corresponding rectangle). To deselect displays (meaning they will not be calibrated nor controlled), click the corresponding rectangles. As a result, a cross appears in these rectangles.
6. If you want all displays from the system to have the same black and white reference values after calibration, check the **Equalize after Calibration** option (multihead systems only).
7. Click on the **Finish** button to enter the selected options. To cancel any changes made to the options, click on the Back button to return to the main window.

Working uncalibrated

You can ignore the corrections you have performed on the display system with MediCal LE.

Therefore, right-click on the MediCal LE icon in the Windows Task Bar (the MediCal LE application must be closed).

Select **Disable Calibration**. The selected menu item changes to "Enable calibration".

To activate the corrections again, select Enable calibration.

Troubleshooting

The following problems may occur:

The sensor is connected, but the system does not find it

This may be the case when you unplugged the sensor, and plugged back in while MediCal LE resided in the system tray.

Solve this by rebooting your computer.

Display window or test patterns appear dithered

Ensure that the selected color palette in the display properties is set to True Color.

Solve this by selecting a True Color palette.

Patterns or calibration does not appear on all displays of the system

- You may have added displays to your system while the MediCal LE window was still open.

  Close the application window and restart MediCal LE.

- You may have deselected displays in the Options section.

Patterns or calibration has disappeared

- Probably you have one or more imaging boards in your PC to which no display is connected, while the board is still activated in the display properties control panel.

  Another possibility is that you have a multi-head imaging board in the PC, while one of the heads is not connected to a display.
  De-activate these imaging board heads in the control panel or connect a display to them.

- You may have deselected displays in the Options section.

Glossary

Frequently-used terms:

Calibration

In many cases, calibration is the remedy for a display that is no longer conform to its target working point, which is defined by the black and white luminance and the display function.

The calibration routine restores the black luminance, the white luminance and the display function.

Calibrating a display results in changing the PC imaging board's LUT.

Display Function

A Display Function describes how a display device converts the voltages at the inputs into light.

In the context of a medical viewing station, a display device is the combination of imaging board and display.

The display function is a graph that shows how the light from the picture tube evolves from minimum to maximum luminance while the data levels at the input of the imaging board go from 0 to maximum.

Gamma

The Gamma function is a kind of display function, characterizing an apparatus that converts voltages into light or ink or vice versa.

Displays, printers, scanners, ... all have their own, unique Gamma function.

In a display, this function is exponential. The Gamma value is the exponent that determines the shape of the function.

Gamma 2.2

This is a gamma function with a gamma value of 2.2, which is approximately the natural gamma of most CRT displays.

Imaging board head

An imaging board or graphics board converts the digital data from the computer into analog video voltages.

Most of the common imaging boards contain just one set of video and sync outputs. However, some high-end boards, like some of the BarcoMed boards, contain two sets of video and sync outputs. This is called a dual head imaging board. It is like two complete imaging boards implemented on one single unit.

A dual head board in the computer behaves exactly as if two separate boards were installed.

DICOM

DICOM stands for Digital Imaging and Communications in Medicine. It is a standard developed by the American College of Radiology (ACR) and the National Electrical Manufacturers Association (NEMA).

The standard specifies how digital image data can be moved from system to system.

In addition, Supplement 28 Part 14 specifies a function that relates pixel values to displayed Luminance levels and is called Grayscale Display Function Standard.

CIE

CIE stands for Commission Internationale d'éclairage (International commission on illumination), an organization devoted to international cooperation and exchange of information on all matters relating to the science and art of lighting.

The CIE display curve in MediCal LE is based on the CIE 1976 standard.

About MediCal LE

MediCal LE 1.03 version

More information?

http://www.barco.com/medical/

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