# Leica DC Cameras

Image Acquisition

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# Leica DC Camera Image Acquisition

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Table of Contents

Table of Contents 1

Symbols 3

Introduction 4

Installation 5

Configuration 7

Source Control 11
- Control logic 14
- Control structure 17
- Automatic exposure 18
- Contrast 21
- Gamma 21
- Managing Configurations 23
- Image acquisition 24

Control function: Captured image 25
- White balance 26
- Shading correction 29
- Color depth 35
- Image type 37
- Scaling 39
- Sharpen 40
- Crop to ROI 42

Control function: Live image 45
- Format 46
- Mode 48
- Overexposure/underexposure 49
- Find focus 49
- Zoom Focus 51
- Color balance 52

Control Function: Extra 54
- Always live 54
- Flip Horizontal / Flip Vertical 54
- Color circle always visible 55
- Close after acquire 56
- About 56

Hidden Service Functions 57

# Symbols

Warning
This symbol indicates especially important information that, if not observed, can lead to malfunctional disturbances or and damage to the instruments.

Useful Information
This symbol indicates additional information or explanations that intend to provide clarity understanding.

Action
This symbol within the text indicates that certain operations actions must be carried out.

# Introduction

Dear Customer,

We are very pleased that you have chosen to purchase one of our Leica imaging products. The Image Acquisition Camera option is a module that supports a wide variety of cameras for image acquisition under Leica Image Manager.

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The user interface is designed such that the essential functions for controlling all supported cameras can be reached through the same user interface. This design means that you can operate all the cameras on your system without further expense after having worked through the user interface once.

# Installation

The user interface is bundled with all new camera options purchased. The standard procedure for a camera installation is therefore described below. This normally consists of the following four operations:

Connect Camera

- Connect your camera, with its specific interface, to the correct port on your computer.

There are many different interfaces on the market and your system may need a frame grabber card or special interface card (SCSI or Firewire). Follow the source's camera installation manual, or let your distributor take care of the installation.

Install Camera Driver

A driver is the communication interface between the camera and the computer. This driver can be obtained from your distributor. If required, your distributor will also install the driver.

- Install the Leica Camera Driver on your computer.

### Install Camera Software

The camera software is the interface between the camera driver and the image handling software. It contains all the control and display functions for the camera and follows the international TWAIN specification. (TWAIN is a standard interface between image sources and image processing software, see also www.twain.org).

- Install the Twain Software on your computer.

### Install Leica Image Manager

You can access and control the camera with Leica Image Manager software or any other image manipulation software. Such software must however incorporate TWAIN functionality. The camera is generally described as the TWAIN source, and the image handling software as the TWAIN client. Please follow your image handling software's instructions regarding the proper use of the TWAIN source.
If you want to use the Leica Image Manager software, proceed as follows:

- Install the Leica Image Manager Software on your computer.

If a Leica IM has already been installed, you do not have to remove it from the system, just start a new installation, which will update your system to the new licence with the camera driver. All existing settings will be retained in the new system installation.

# Configuration

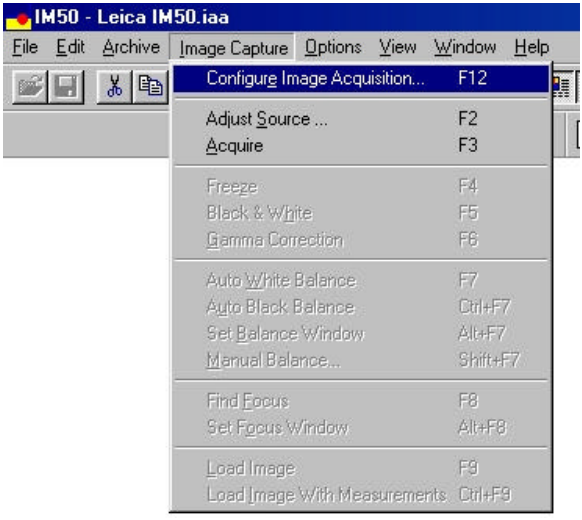
Once you have installed the camera, the appropriate driver and Leica Image Manager, you must configure the camera to the system.

New image source

- Start your Leica IM application and press the F12-key

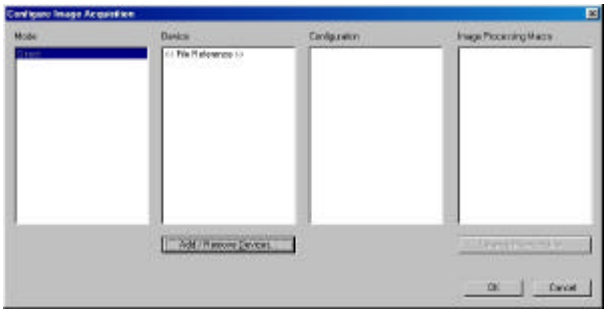
- or -

- Select "Configure Image Acquisition... " in the "Image Capture" menu.



A dialog pops up to show a list of all installed and configured image sources in a list.

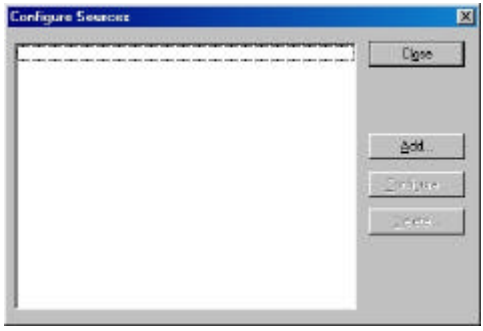
- Select the "Add/Remove Devices..." button.




List of installed image sources

All available image sources are displayed. The list may be empty if you call this feature for the first time.

- To add a new image source, click the "Add..." button in the dialog box.

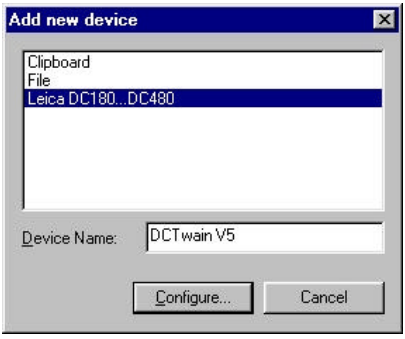



Configure image source

Configure image source

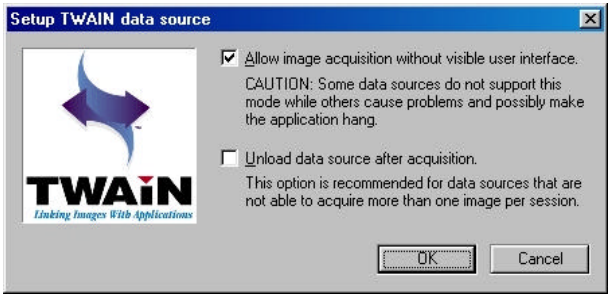
- ?Select the entry for your camera and click on "Configure".
- If the list does not contain your camera, click on "Add" .

A list of available image sources is displayed.




- Enter a suitable name for the image source and press the "Configure..." button.

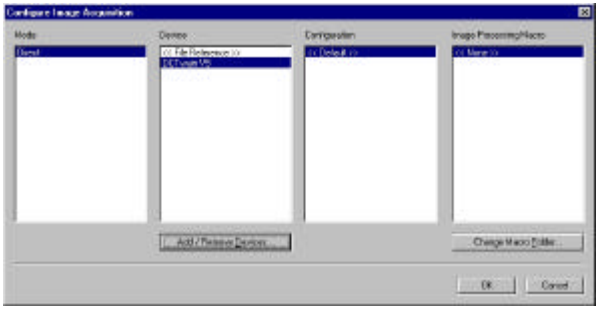
In future, you can select the image source using this name. Depending on the camera type selected, a dialog box is displayed in which you need to enter specific parameters for communication between the PC and the camera. Most camera types that use the TWAIN interface display the following configuration dialog box:



For optimum performance when using TWAIN image sources, allow image acquisition without visible user interface (first option checked) and do not unload the data source after image acquisition (second option not checked). Certain cameras, however, may need other settings.

- Click on OK to complete the configuration of the image sources.

The camera selected is now ready for use. The camera you have just configured will appear in the list of image sources available to the system in this dialog box.



- Choose the newly configured camera.
- Close the dialog box to activate the image source.

The configuration procedure is now complete.

.

# Source Control

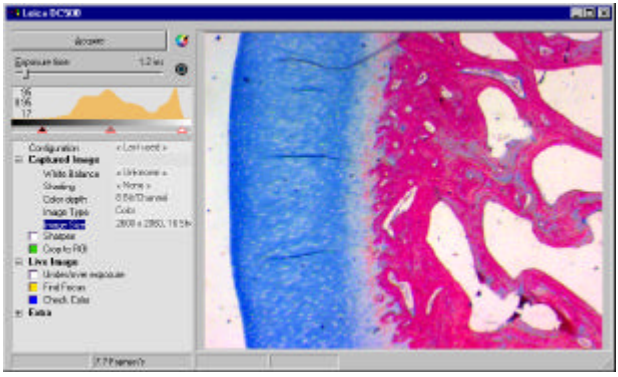
As the newly configured camera is now the active image source in your Leica IM system, you can initiate dialog with the source:

- Press the F2-key to activate the camera control interface.

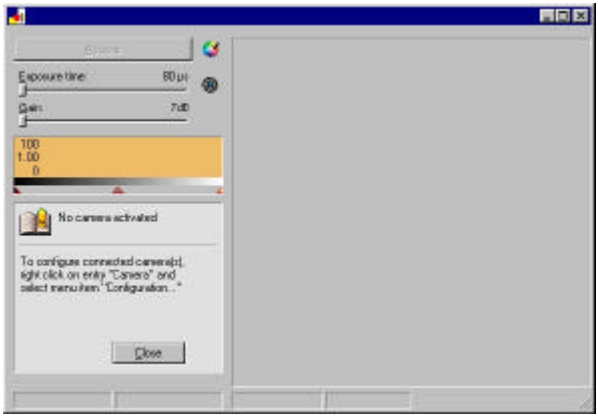
- or -

- Click on the “wrench” icon in the toolbar to initiate dialog with the camera.

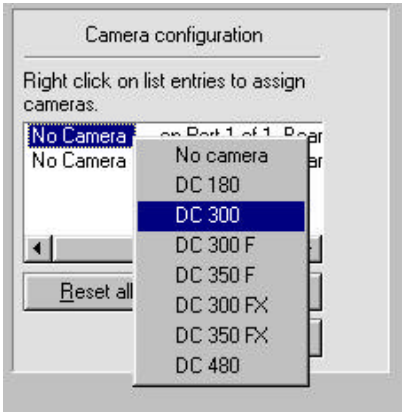
The image acquisition window appears with the name of the camera currently active in the title bar.



With some cameras, "No Camera activated" may appear in the user interface the first time you call the camera. In this event you should fist activate the current camera model.




- Close the message box and choose the camera model connected by right clicking on an entry.




This setting will be saved when you quit the image acquisition window so that you do not have to repeat this step in future.

If you use several cameras, you can switch between the different cameras by right clicking on “Active Camera” and selecting another previously activated camera..

When you later open the image acquisition window and your camera is connected and running, a live image is displayed in the dialog box, as shown below.

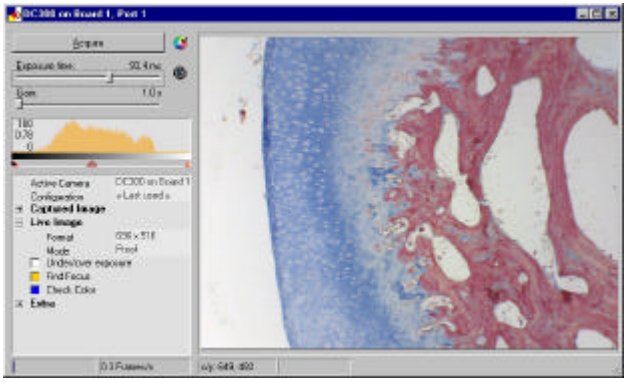


Image source control with live image and control panel

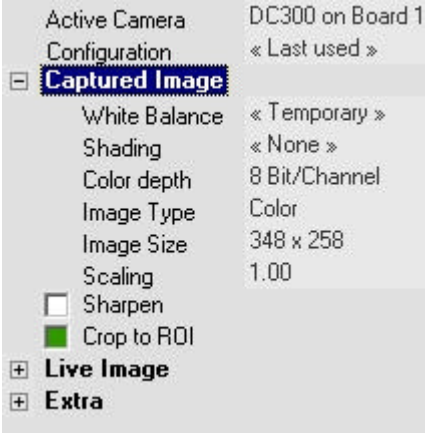
The live image from the camera may be seen on the right-hand side of the window, on the left side are the control functions. The various functions in this dialog box are described as follows.

## Control logic

The image acquisition module is controlled by means of an interface designed to be as easy to use as possible and which shows only the most frequently used functions and information.

The individual functions of an image source are accessible as branch entries in a tree structure and can be executed by double clicking. The status of functions, that can be switched on and off, is displayed in a check box.

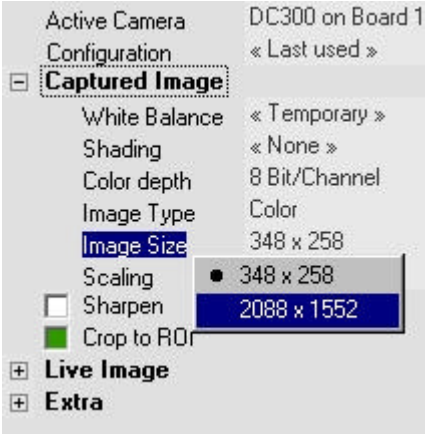
Tree structure with main branches (collapsed)




Tree structure with main branches and functions (partly expanded)

Popup menus

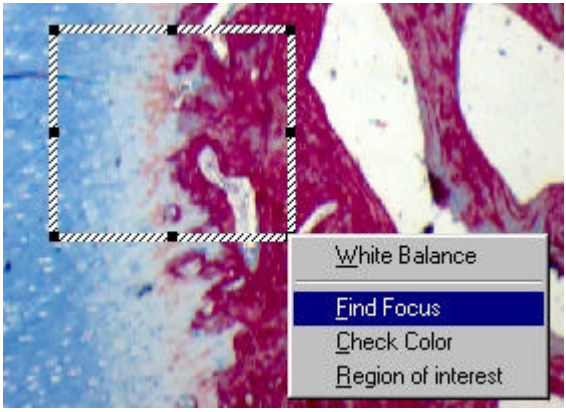
Many functions or status messages contain further sub-functions or settings. These sub-functions are generally hidden and can be accessed by clicking on the main function with the right mouse button.




Context menu with important functions

Control window on live image

The live image window also contains control elements always relating to a rectangular area.. The function to be executed on this cut-out may be selected from a context menu, which is activated after the rectangle has been drawn with the mouse.




Context menu shown after drawing rectangle

- Select a command from this popup menu

The rectangle window is drawn in the function-specific color. The corresponding function is automatically active until switched off again.

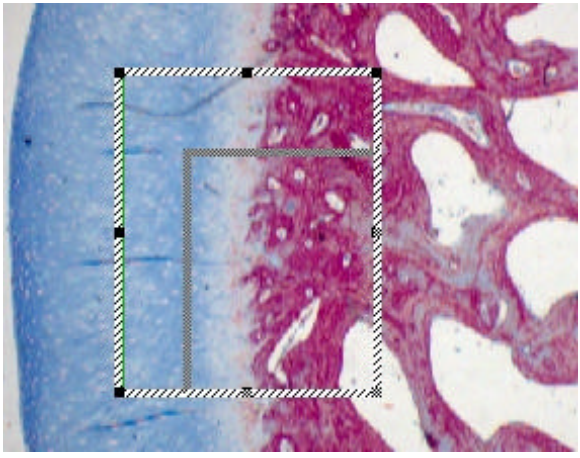
Rectangle control

The position and size of these rectangle windows can be changed at any time:

- Click on the window frame to activate it.

This activates the window which will be drawn with a dotted line.

- Move the window to any position by clicking on the frame with the mouse and dragging it while pressing the left mouse button.
- Change the size of the window by clicking on one of the square dots around the window frame and dragging the mouse with the left button depressed.



## Control structure

The graphic control elements laid out in the upper part of the interface are used to control the standard functions of your image source. The most important element is the live image histogram, i.e. a graphical representation of the current light conditions as seen by the image source.

### Dynamic range control

The live image display on the right-hand side of the window shows the current image and is mainly used for visualization and as a preview of the image to be captured.

The graphic shows the light distribution in the live image, from the darkest components on the left-hand side to the brightest components on the right-hand side, as indicated with the grayscale bar. A well-illuminated image should contain all components from dark to light.

Live image histogram

### Functions

In the lower section of the control interface the camera functions are available as tree entries which can be expanded and collapsed as required. The tree structure has the following three main branches:

## Automatic exposure

The control functions described in the paragraphs below essentially help to create the best conditions for image acquisition.

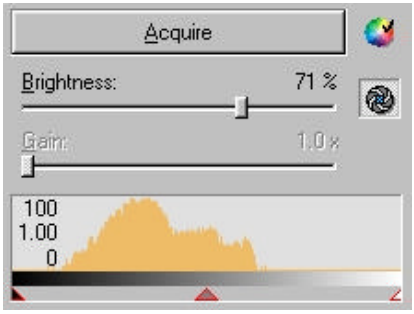
Any professional user will be pleased to have these functions available. In most cases, however, users will prefer to concentrate on the image content rather than the image acquisition technique.

Intelligent automated systems help you to do this. They analyze the current light conditions and control the image source in such a way that the resulting image is optimized for you. The control parameters these automated systems take into consideration are: exposure time, image amplification, image contrast and gamma value.

There are two controls above the live image histogram: a scroll bar for brightness and an automatic exposure icon.

- Activate the automatic function, by clicking on the icon above the histogram.

When automatic exposure is switched on, the image brightness is displayed as a percentage. This is a target value for the automatic system for adjusting the total brightness of the picture.

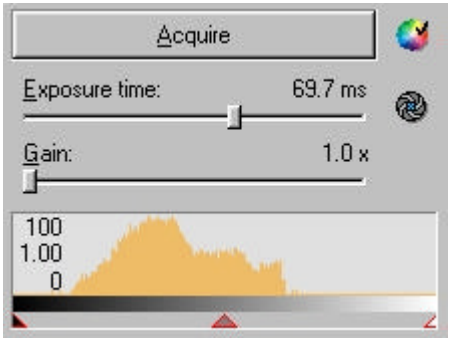



Activation of automatic exposure

Manual exposure

Automatic exposure offers the best possible combination of these four control parameters for most acquisition situations, allowing the user to concentrate on the image content. However, in situations with difficult light conditions, the professional user may wish to modify these control parameters.

If automatic exposure is switched off, the scroll bar control determines the absolute exposure time in milliseconds or seconds.

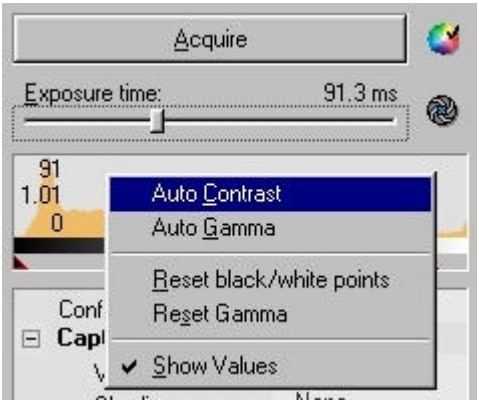



Exposure time with automatic exposure switched off

Manual contrast and gamma value

In addition to the manual exposure you can switch off the automatic contrast and gamma functions.

- Select the context menu by right-clicking in the histogram diagram and choose "auto contrast" or "auto gamma" to toggle the functions on or off individually.

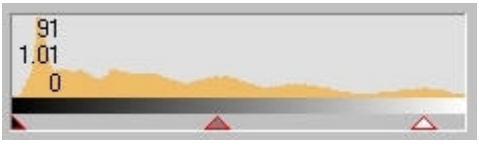



Activate contrast and gamma control

If the function is switched on, an activation symbol is shown in front of the command (small check-mark)

Please note that the position indicators (triangles) below the live image histogram are grayed out and will NOT respond to mouse commands when automatic contrast and gamma are switched on. When the automatic functions are switched off, the triangles are shown red and will respond to mouse commands.

Automatic functions on: Indicators are positioned automatically




Automatic functions off: Indicators can be moved with mouse

## Contrast

To obtain the best image, the contrast indicators (left and right) should be lined up with the limits of the brightness distribution histogram as shown in the example below. This is the operation that the automatic contrast control performs constantly on the live image.

## Gamma

The gamma value helps to brighten or darken specific light intensities within an image. Depending on the acquisition situation, dark areas in images often appear too dark for the human eye. The gamma value is displayed as a gray indicator between the two contrast indicators. Moving the gamma value allows selective brightening of these areas.

The gamma value depends on the position of the contrast indicators. A gamma value of 1.0 is set when the gamma indicator is exactly in the middle of the two contrast indicators. Moving it to the left reduces the gamma value, moving it to the right increases the gamma value.

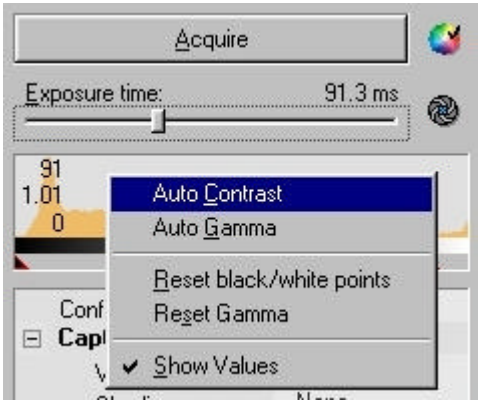
The automatic gamma value function calculates an optimum gamma value from the composition of the current brightness distribution.

Display values

The current values for the contrast indicators (black dot, white dot) and the gamma value can be displayed or hidden in the histogram. The values for the contrast indicators vary between 0 and 100, and those for the gamma value vary between 0.1 and 10.

- Select the context menu by right-clicking in the histogram diagram and select the "Show values" command.

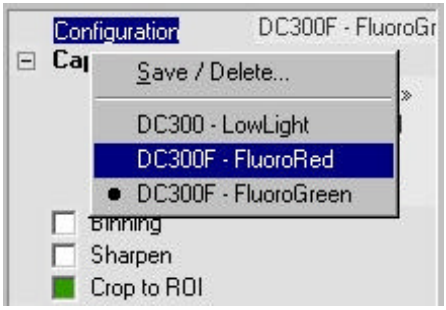
If the function is active, an activation symbol is displayed in front of the command .



## Managing Configurations

Once you have defined the best source settings for your specific environment, you can save them and retrieve them at any time. This feature is not only useful for different working and lighting conditions, but can also be used to create reproducible user-specific working conditions.

- To save a configuration, select the "Save/Delete…" command from the context menu for the "Configuration" tree entry.
- Give a name to the current settings.




configuration menu

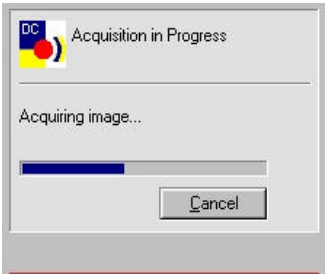
Once a configuration has been saved, it is automatically entered into the list of directly retrievable settings, as you can see in the example above, where several saved configurations are available for retrieval.

You can thus easily activate or deactivate setting combinations such as auto contrast, auto gamma and auto exposure.

## Image acquisition

- To acquire an image with the selected settings for your archive or the current application, simply click on "Acquire".

Depending on the camera type and the settings you have selected, this process may take anything from a few seconds to several minutes. Sometimes the image will be exposed several times, each color will be scanned separately, and a high resolution will be achieved using chip –offset techniques. These processes can take a long time to **execute**, even on fast computers. A progress bar indicates the operation currently being executed.

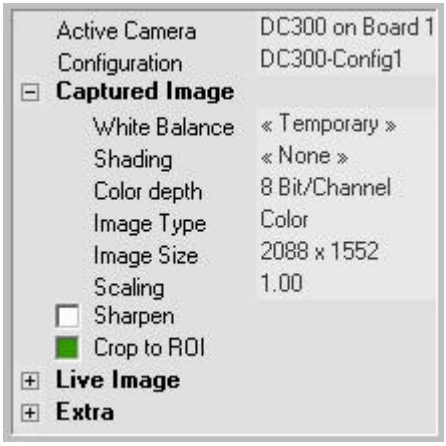



Once image acquisition is complete, the control dialog box will either be closed or the system will be ready for the next image acquisition, depending on the settings in the "Extra" area. The system is then ready for the next image acquistion.

In the case of automatic close and restart, the camera will be reinitialize, which can take some time depending on the type of camera and the image handling software involved.

# Control function: Captured image

The setting relating to the properties of the image acquired can be found in this command section. As the live image is not usually identical to the image finally acquired, the settings are listed as a quick overview of the anticipated result.



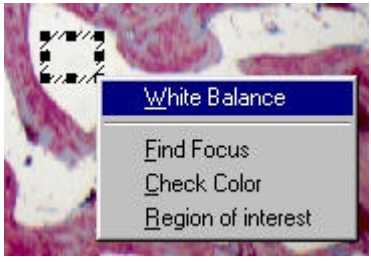

Properties of the image acquired

## White balance

The white balance function performs a color correction in the image source in order to display all neutral-colored components of the image (all gray tones, from black to white) without any color tone. Thus, the term white balance is not strictly correct, neutral balance would be more accurate. However, as the term white balance is used worldwide, we will continue to use it here.

The white balance procedure is one of the most important settings for the acquisition of a well-balanced color image. It can be applied either to a specific detail of the image or to the complete image.

- ? In order to define the region of interest (ROI) for the white balance, just click on one corner of the area to be defined and draw a window using the mouse with the left mouse button depressed. As soon as you release the mouse key, a context menu appears containing the white balance command




Live image with ROI for white balance

The white balance is now executed automatically and the live image displays the corrected color settings.

As mentioned before, the white balance may also be applied to the complete image. In this case, you do not need to draw a window, but only to click on the white balance icon at the top of the control dialog box.

Automatic white balance calculated on complete image

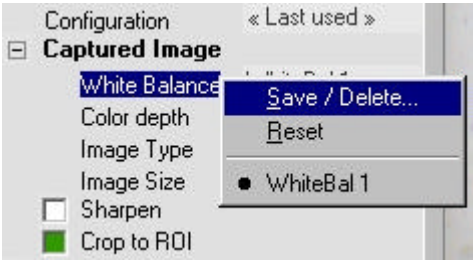
White balance functions

Once you have executed a white balance operation, you can save the settings in order to reactivate them at any time.

- Right-click on the WhiteBalance line to display the context menu so that you can call the white balance functions.
- Use saved white balance entries by clicking on the appropriate name.

Save / Delete

Use this command to save the current white balance settings under a name for retrieval or deletion at any time.




Saving a white balance

Reset

This function resets the image source to its default settings.

The reset command may cause the image to suffer a severe color tone shift. If this happens, you should execute another white balance operation.

White balance is not possible if there are too many under-exposed or over-exposed pixels in the measuring window . A message will inform you if this is the case and the white balance values will be reset. Change the brightness of the picture or select a different measuring window and repeat the white balance.

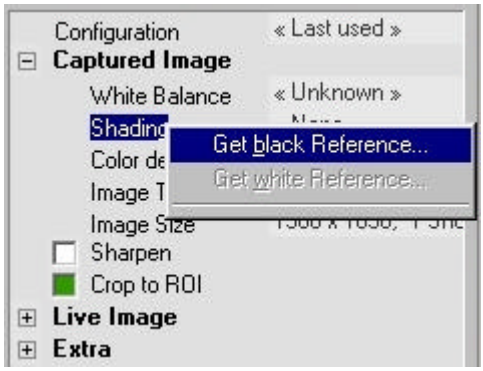
## Shading correction

The shading correction function allows an improvement of the overall image quality. The brightness distribution is seldom homogeneous over the whole picture in practically all situations because of the lighting conditions, optics, adapter, etc. To create a perfectly corrected, homogeneous image, a white image, ie an image of the exposure light only, is taken as reference and calculated into the original image during image acquisition.

Without shading correction

With shading correction

Some cameras require a black image to be acquired followed by a white image before shading correction can be activated.




Select black reference

Shading correction
Black Reference

- Select the "Get black reference" function and ensure that no light can fall on the camera. Cover the camera lens with its cap, for instance.
- Press the Start button.

Get black reference

A dialog box appears showing the progress of the "Get black reference" function.

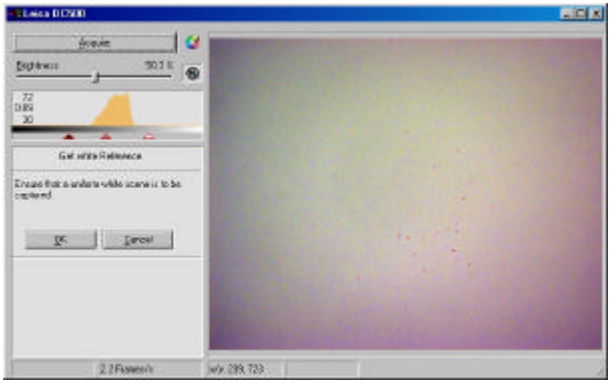
If the black reference function is successful, the following dialog box appears. An error message will be displayed if any light has entered the camera. You should repeat the process.

Shading correction White Reference

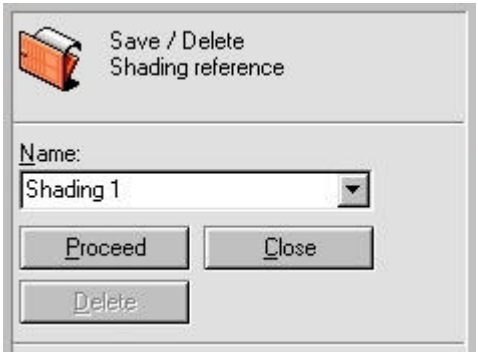
- ?Get the white reference in a similar way by selecting object illumination only without any objects in focus and calling the white reference function.

A message appears instructing you how to set the white reference. Avoid any under-exposed or over-exposed areas in the image. Change the exposure time or the illumination brightness if necessary.

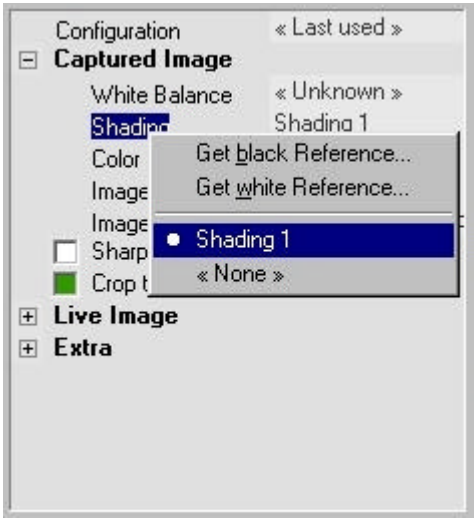
- ? Click the OK button.



If the white shading reference was acquired successfully, a corresponding message is displayed. Click on Save to finish the white reference procedure. Choose a name for the shading reference and save it:




You can now choose and activate the shading correction you have just created from the Shading menu or record further shading references:




Activate shading correction

Please note that image acquisition using shading correction generally takes a little longer than normal image acquisition, as the black and white references must be calculated into the original image.

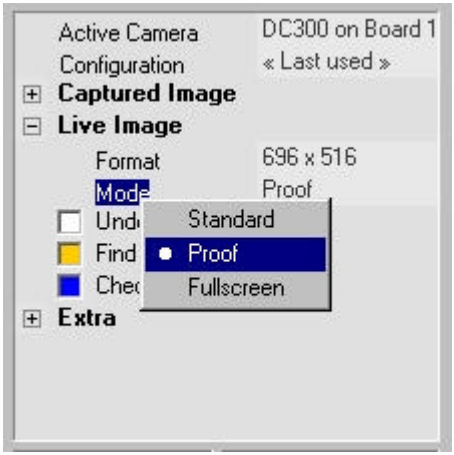
With some cameras, the shading correction is available only as long as the TWAIN application remains active in memory. Once you quit the application, you will have to repeat these steps to activate the shading function.

Shading corrections become invalid if you change illumination, objective, zoom position or focus! Once a shading is set, you should not change any of these parameters or recapture a shading.

Image needs shading correction

Improved by applying shading correction

If the shading reference is selected the shading correction is always applied to the captured image. With most cameras the shading correction is not applied to the live image. To check the shading correction on these cameras, select the “Proof Mode” in the live image section.

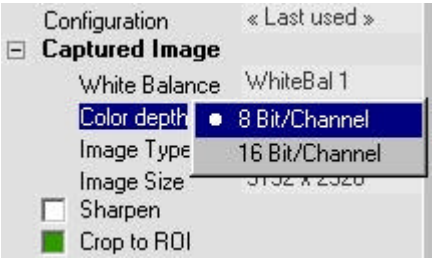



If the Proof Mode is activated all image correction and parameters are applied to the actual image. This mode is very slow but allows you to check crop, shading, sharpening etc.

## Color depth

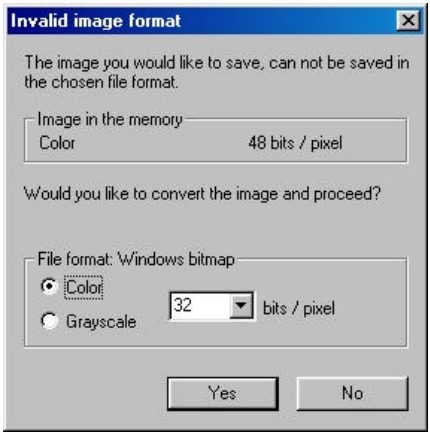
Depending on the camera type, an image can be acquired and saved at various color or grayscale resolutions. Most image sources only offer a color depth of 8 bits for grayscale images and 24 bits for color images. However, when using professional cameras, it is possible to acquire images with higher dynamic ranges, e.g. with 12, 14 or 16 bit resolution.

Selecting the color depth sets the image source to the corresponding image acquisition mode. The live image does not reflect these settings.




Color depth selection

Only a few image file formats, e.g. the well-known TIFF format, permit storage of dynamic ranges higher than 8 bits (B/W) or 24 bits (color). Other formats, e.g. JPEG, the compression format or the BMP format, do not support these dynamic ranges. If an image is acquired in a higher dynamic range and is saved in one of these formats, the following dialog box is displayed.

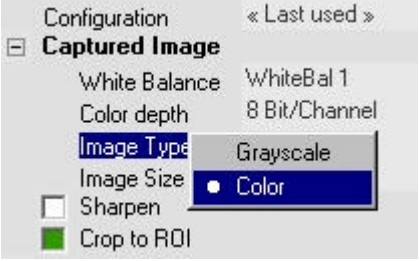



You must decide whether the color depth should be reduced to 8 or 24 bits, or whether to discard the image. Choose a compatible image data format or reduce the color depth in the image settings.

Only a few image manipulation software packages, such as Photoshop, are able to handle color depths greater than 8 bit or 24-bit respectively. If an image is acquired with a color depth greater than that acceptable to the image handling program, an error message may appear, the image acquired may be ignored or the software may even crash. It is not possible for the TWAIN software to detect whether or not the image manipulation software can handle higher color depths correctly.

## Image type

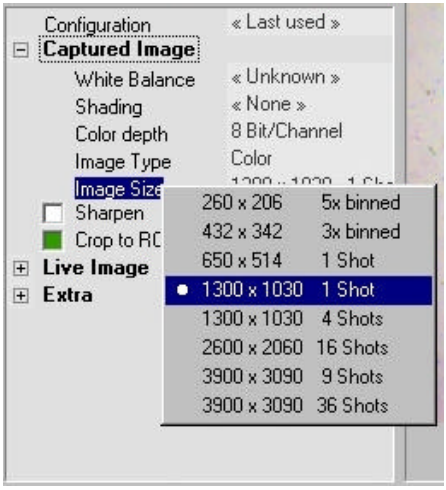
The image type command determines whether the image is acquired as a grayscale or color image.




Selection of image type

Image size

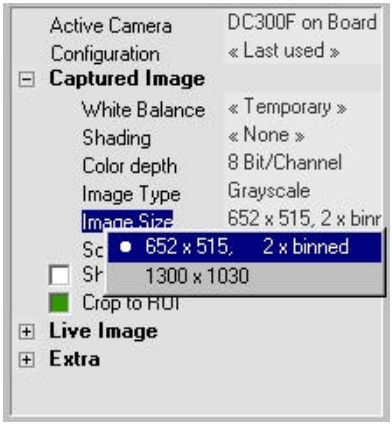
Depending on the image source, there may be one or many image resolutions available. Special cameras are capable of achieving true image sizes that are multiples of the actual chip size by means of CCD chip movement. Other cameras are able to combine several pixels to form a new pixel, thus increasing sensitivity but at a smaller image size (binning).




Selection of the target image resolution

Please note that higher image resolutions naturally mean that more memory is required and recording, reading and writing times are substantially longer.

Please note that the image size setting does not affect the live image.



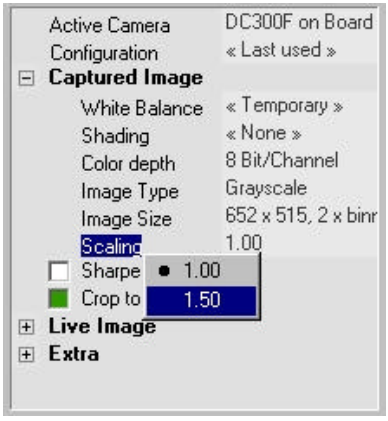

Depending on the type of camera, binning mode may be available when selecting Image Size. Binning is a special image acquisition technique in which several pixels are combined and thus a very fast data download is possible. However the color information is lost and the size of the live image is limited.

With short exposure times the live image refresh rate can be almost doubled by activating binning. With long exposure times, however, the faster read out of the sensor data allowed by binning does not affect the live image refresh rate very much.

If binning is activated, the image is acquired at reduced resolution and as a grayscale image.

## Scaling

Scaling allows you to scale or enlarge an image by a certain factor. Scaling should not be applied if some additional image manipulation will be applied to the captured image. If however the captured image is going to be printed or used in some other layout software, you may apply scaling and / or sharpening as it is convenient for you. Please note that scaling by a factor 1.5 enlarges the size of an image by factor two. An image of size 4 MB for example will become approx. 9 MB!



## Sharpen

Your image source type may give you access to a sharpening function. The image sharpening function is a sharpness filter that the software applies to the raw data to improve the overall picture impression. Pictures without sharpening are technically correct, but can give a rather dull impression. Resharpened pictures, however, often appear crisper and the viewer may find them more striking.

Select ROI

- ?Activate sharpen function by clicking on the appropriate check box.

The effects of sharpening are not visible in the live image, but only in a 1:1 scale reproduction of the image acquired. Each pixel in the image corresponds exactly to each pixel displayed on the monitor.

2:1 representation of an unsharpened image

2:1 representation of the same image, with sharpening

## Crop to ROI

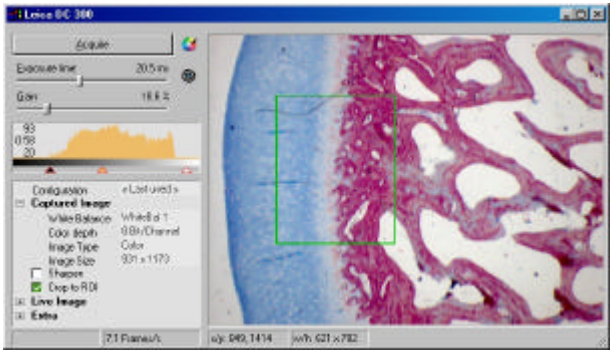
Every image source has different aspect ratios for image acquisition. The Crop function allows you to acquire any image size or format.

Select ROI

- Activate the Crop function by checking the box on the menu.

You will see a window on the live image, this is the part of the image that will be acquired.

Deactivating this function results in the full image being selected.

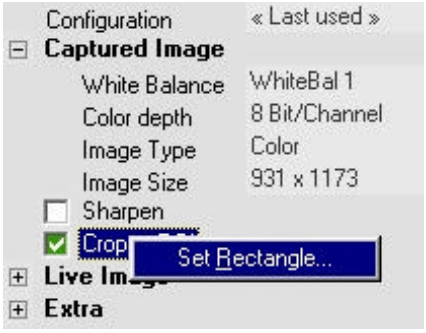



ROI for image acquisition

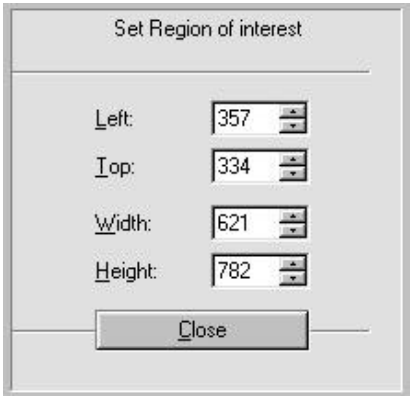
There are several ways of selecting the size and position of the Crop window:

Manual ROI definition

- ? Select the context menu for the function.




- Enter the values for the position (left, top) and size (width, height) in the appropriate fields.




Manual ROI definition

The ROI window display is updated automatically on the live image.

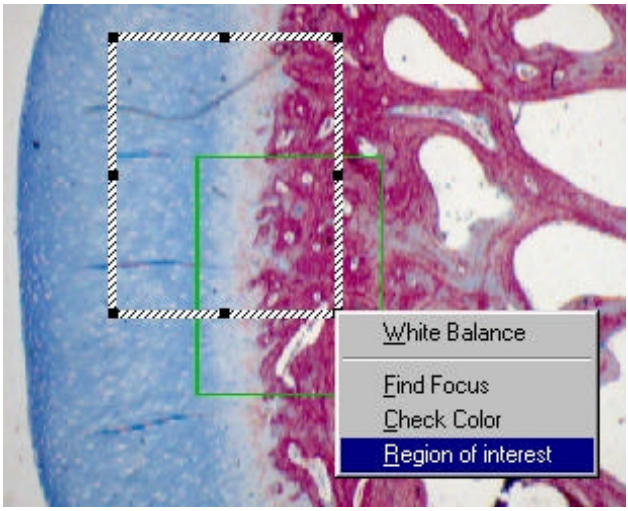
Graphic ROI definition

The Crop area may also be drawn directly on the live image using the mouse.

- Click on the frame of the Crop area, this marks it so that it can be moved.

or

- Draw a new rectangle at the position required using the mouse and select the "Crop" command from the context menu.



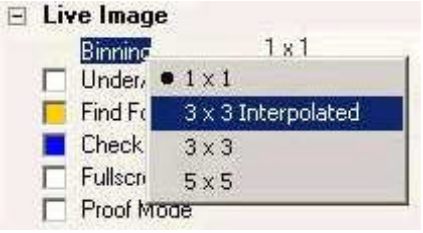

Draw new ROI windows using mouse

# Control function: Live image

The live image shows the image as supplied by the image source. Depending on the type of camera, the live image can differ from the target image significantly, e.g. if the camera supports various different resolutions. The main task of the live image is a visual check on the image quality, i.e. focussing, framing, etc.

The quality of the live image display is heavily dependent on the image source's specification and can not be identical for all image sources.

Some cameras offer a binning menu inside the Live Image Control section:




Select among 4 Live video binning modes and frame rates. The 3x3 binned and interpolated video mode was up to version 4.1.8 the only available video mode. Note that the frame rate of the live video is faster or slower depending on the size of the live video frame:

1x1:
No binning is applied. Live video in full resolution (1:1) but at moderate frame rate.

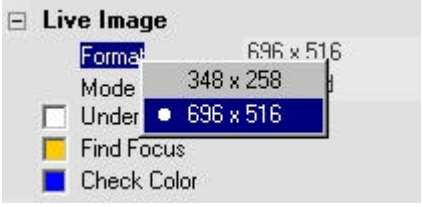
3x3 Interpolated:
3x3 binning is applied to live video. Image is resized to actual user interface window border. Normal frame rate.

3x3:
3x3 binning is applied to live video. Image is not resized so a gray border may become visible around the live video.

5x5:
5x5 binning is applied to live video, which is now quite small. A large border is visible, but live video has fast frame rate.

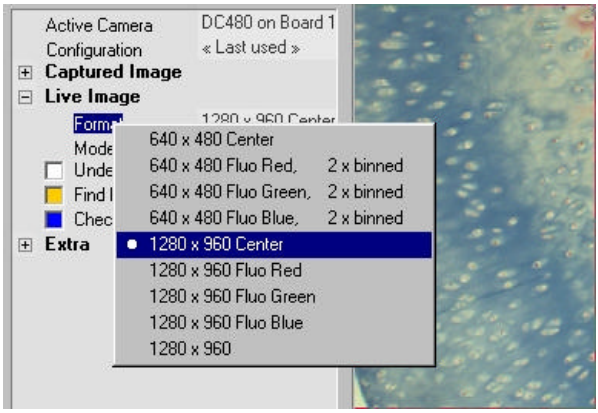
## Format

This function lets you select the format of the live video which does not need to be the same format as the captured image. Some cameras may even offer several live image format that are not available for capturing! On the other side, some image capture formats are only available for capturing and not for live video viewing.




On some cameras, the brightness of live image and capture image may be different. In such cases make sure to select the same image format in live and in capture image, eg. 2 x binned for live and for capture image.

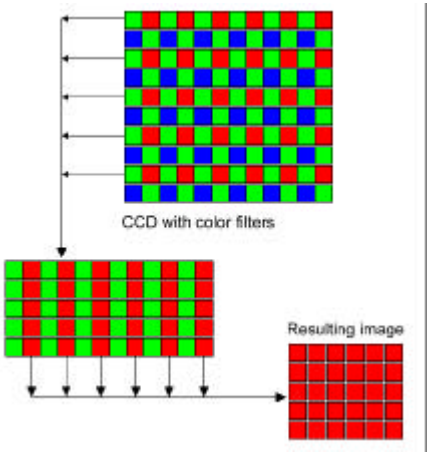
Special Image Formats




Some cameras offer special image formats for live and / or for capture images:

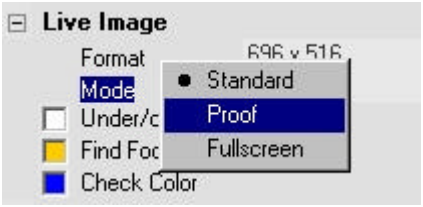
Center Modes: display only the center of the CCD for better focussing. When live image is set to center modes crop rectangles are not displayed and cannot be changed.

Fluo Modes: The fluo modes only display pixels with a certain color filter. The Fluo Red mode for example discards all the green and blue pixels of a CCD and combines the remaining red pixels to form a grayscale image.



## Mode

This function lets you select different live viewing modes:




Standard: default setting which should be used most times. In standard mode, live image is fast but no shading is applied.

Proof: If the Proof Mode is activated all image correction and parameters are applied to the actual image. This mode is slow but allows you to check crop, shading, sharpening etc.

Fullscreen: Displays the live video in fullscreen on the monitor, without any windows user interface elements like taskbar or scrollbars. Press ESC to return to the standard mode.

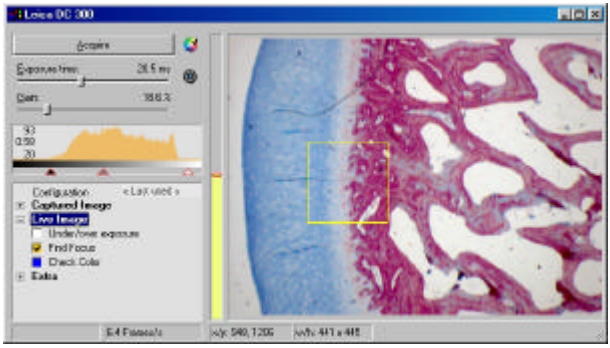
## Overexposure/underexposure

This function helps to find a perfect output from your image source by indicating the extent to which a part of the image is underexposed or overexposed. In conjunction with the live histogram, this function assists in adjusting the image source lighting conditions to values ensuring a perfect dynamic range for the image source from the darkest regions to the brightest.

Activation of over- / under-exposure display

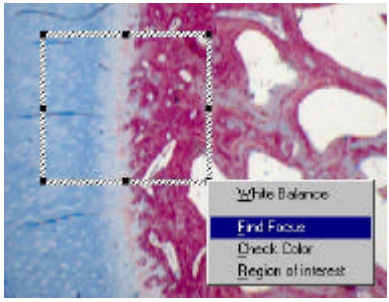
## Find focus

This function helps you find the best focus at a point in the image. It uses a user-defined window to find the optimum focus and displays the focus in the form of a bar. The better focus in the area selected, the higher the mark. A maximum level indicator helps you return to an optimum focus previously established.



Focus window with activated focus finder

- Define position and size of the focus-measuring window, as for all windows in the live image, by drawing a rectangle and selecting the Focus entry from the context menu.



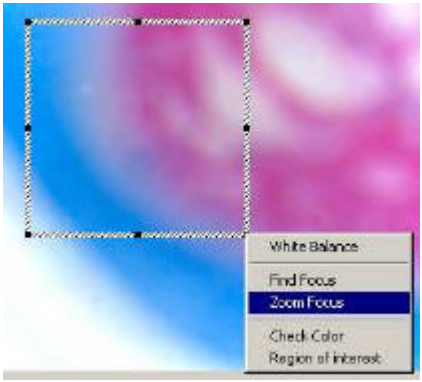

Focus window, created with the mouse

Focus measurement and its measuring window can be switched on and off at any time by clicking on the appropriate check box.

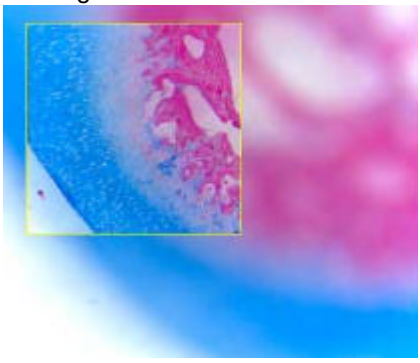
## Zoom Focus

The Zoom Focus allows to set a region of interest for fast focussing: Draw a rectangle and select the menu item "Zoom Focus". The actual live video will be frozen and the selected rectangle will get all the processing power for fastest focussing.

Note that activating the zoom focus will also activate the yellow focus bar and that the live video resolution is set to 1x1 binning (full resolution)! This change of resolution may result in a temporary grey screen until the live video gets refreshed, especially if long exposure times are set! Return to normal viewing mode by removing the checkmark in the "Find focus" control:




Draw a region and select “Zoom Focus”

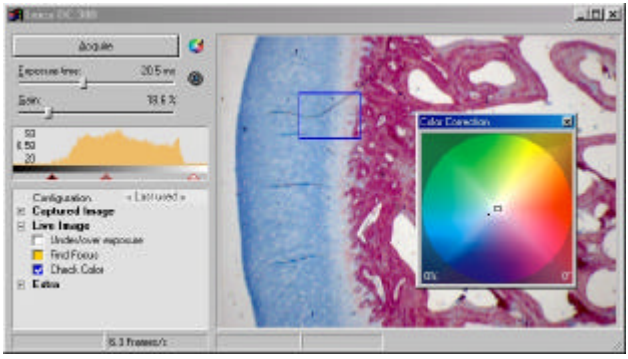


Set the best focus inside the region

## Color balance

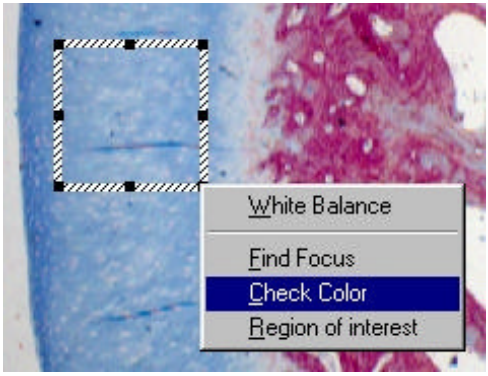
This function is used for fine-tuning the white balance. Depending on the light conditions and the camera characteristics, fine correction of the image may be necessary after a white balance to compensate for a red color shift, for instance. If this occurs, select the color balance function. You can use the mouse to drag the small square in the color wheel displayed towards the color balance you require .

- Switch on the color wheel and the measuring window on or off at any time by clicking on the check box.
- Drag the small square to a color value and intensity observe the small dot. The dot represents the current color distribution within the section of image selected.




Color fine-tuning after white balance

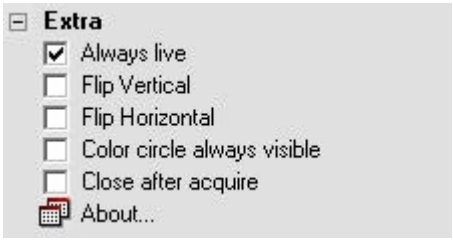
Adjust the measuring window for the color fine-tuning by drawing a rectangle in the live image and then selecting the Color distribution command.




Measuring window for color fine-tuning

# Control Function: Extra

Functions that support specific camera model properties are listed under in the Extra main branch.




## Always live

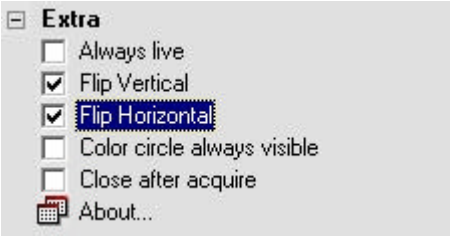
This function allows you to display the live image even if the TWAIN software is running in the background. This may be useful when other software applications need to be running in the foreground on the computer while the live image is still displayed. In most cases however this function is not necessary and can be switched off. This means that the software running in the foreground is automatically allocated the main resources of the computer.

- Activate or deactivate the function by clicking on the check box.

## Flip Horizontal / Flip Vertical

Depending on the installation conditions, it may not be possible to connect an image source to a microscope stand in a way that results in the correct image orientation. With these two functions, which can be combined, any camera position can be corrected by flipping the image horizontally or vertically as it is acquired.

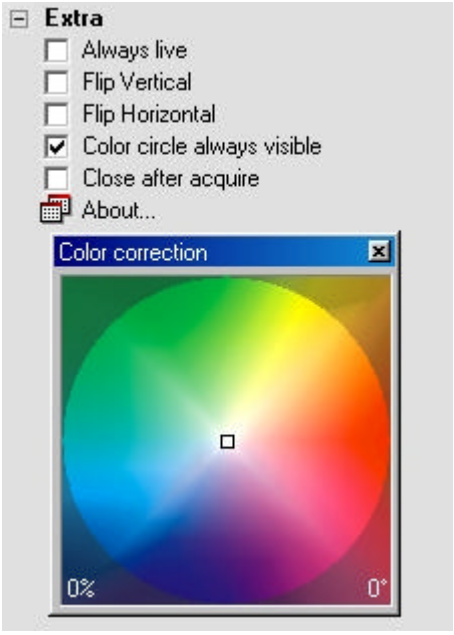
- Activate or deactivate the function by clicking on the appropriate check box.




## Color circle always visible

This allows you to switch the color wheel function permanently on or off, depending on how frequently the color wheel is required for color correction.

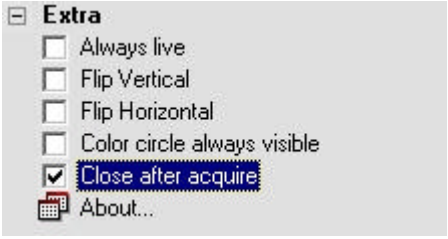
- Activate or deactivate the function by clicking on the check box.



## Close after acquire

Use this function to define whether or not the TWAIN user interface should close automatically after an image is acquired. This may be of advantage if you would like to add database information for the image immediately after image acquisition.

- Activate or deactivate the function by clicking on the check box.




## About

This function displays information about software used and its copyright holders.

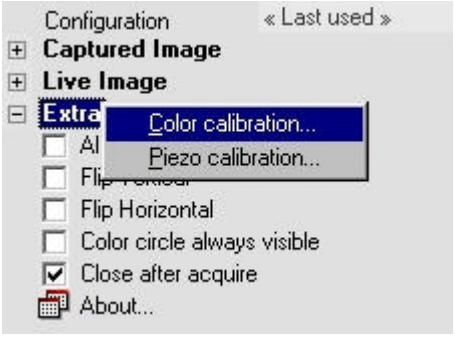
# Hidden Service Functions

Depending on the camera, seldom-used functions may be available in a hidden menu. These functions are usually only required for service purposes and mainly contain calibration functions for which special maintenance accessories are needed. These functions should only be accessed by trained personnel.

## Color calibration

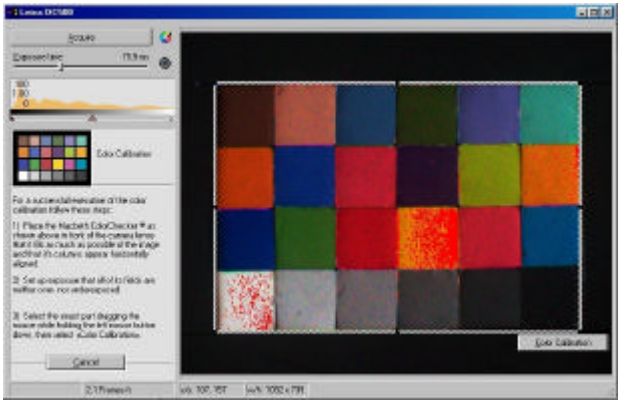
The color calibration function allows perfect color tuning of your image source by using a Macbeth color table as a reference for color fine-tuning within the camera.

- Activate this function by pressing the CTRL and SHIFT keys and simultaneously right-clicking on the word “Extra”. The popup menu with the hidden service functions appears. Select the desired calibration function.




Color calibration command

The following dialog box containing a description of the procedure for color checking appears. Proceed as follows:



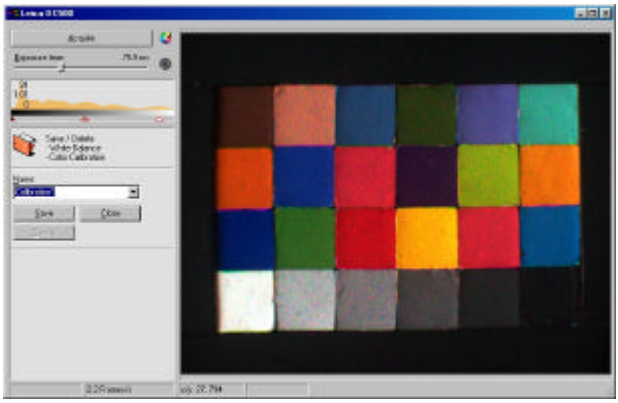
Macbeth ColorChecker

– Place the Macbeth ColorChecker in front of the lens of your camera so that it fills the image as far as possible.

– Set the exposure values so that no part of the image is either overexposed or underexposed. Do NOT perform a white balance manually as automatic color balance incorporates a white balance.

– Draw a rectangle in the live image covering the 24 color fields precisely, then click on the color balance button to start automatic color balance.

Once color balance is completed, you can name the color balance and save it. This setting can be activated or deactivated in the white balance menu for the image acquisition parameters (see white balance functions).

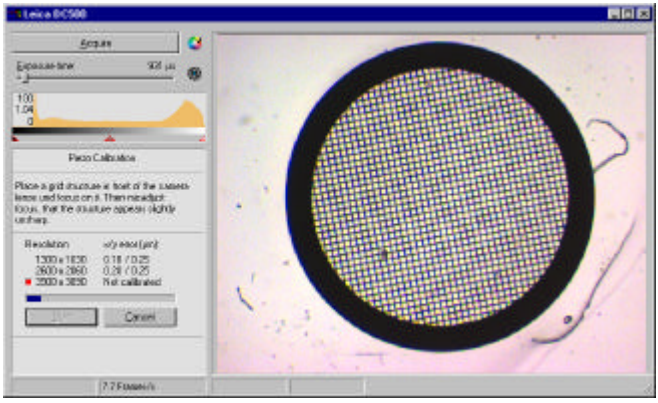


## Piezo calibration

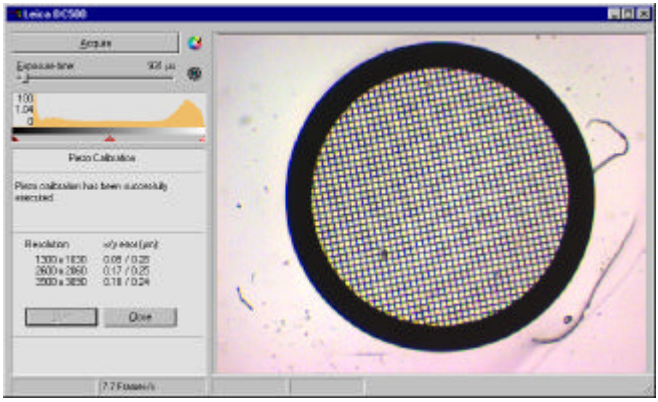
Some cameras with chip shift technology for achieving the highest resolutions need piezo calibration. This function needs to be executed only in exceptional cases (for example, after the camera has been dropped).

- Activate this function by pressing CTRL and SHIFT and simultaneously right-clicking on the word "Extra". Select the function required.

- Follow the instructions in the dialog box. Please note that only a small square of approximately 100 pixels in the center of the live image is used for the calibration and that there should be at least 8 bright–dark transitions in this window.



During the piezo calibration, a progress bar is displayed



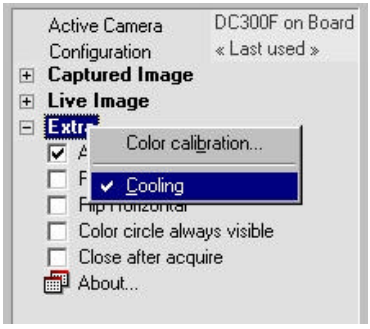
After the piezo calibration a success message is displayed.

## Cooling

Some cameras have the ability to turn off the cooling device inside the camera. This may become necessary if you are working in a very humid enviromental situation and condensation occurs on the CCD.

If the cooling is turned off, it remains off until it is turned on again.

- Activate this function by pressing CTRL and SHIFT and simultaneously right-clicking on the word "Extra". Select the function desired.



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