Calibration Utility

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File Menu

The File Menu allows the user to load previously saved monitor information, save the current monitor information, and exit the application.

NEW

- allows the user to set the monitor's characteristics according to Manufacturer or factory defaults. These files (.MDM) are created by Sequel Imaging, Inc, and cannot be modified by the user.

OPEN

- allows the user to set the monitor's characteristics according to data that has been previously saved by the user using **Save** or **Save As**. This allow the user to quickly and easily change the monitor for different room conditions or for different types of images.

SAVE

- data is saved in the current .MDB file.

SAVE AS

- a dialog box allows the user to save the current information in a new or existing file. The new file becomes the current MDB file.

EXIT

- leave the application.

Options Menu

Show Current Settings

This option toggles the display of the current monitor settings. The current settings consist of combo boxes for Lighting Conditions, System Gamma, and Color Temperature. They also include the base monitor and phosphor and the description of the current .MDB file.

Show DAC Curves

This option toggles the display of the graphic adapter's DAC (Digital Analog Converter) curves in a separate window. You can see the curves throughout the Calibration Utility application. If the red, green, and blue curves are all the same, they are shown as black; otherwise they are displayed in their color.

The Preference dialog allows you to select a single combined display or three separate gamma curves.

Preferences

The Preferences Dialog allows the user to tailor the operation of Visual MonCal for the way he or she wants to work.

Dark Current Calibration

Allows the user to perform a dark current calibration for the sensor.

Startup Instructions

When the Calibration Utility starts up the user can determine if the monitor is in adjustment for the current settings or if calibration is required.

Step 1 - Check Settings.

If you have not already done so, select OPTION/SHOW CURRENT SETTINGS from the menu bar.

Base Monitor indicates the current selected display. When Description says DEFAULT, this indicates that it is an original manufacturer's (. MDM) file. If the Base Monitor does not match your display, select FILE/NEW from the menu bar for a list of currently available displays.

Adjust the following user selectable settings for your preference.

- Lighting Conditions should reflect the current room conditions used to view the monitor.

- System Gamma represents the gamma of the images you are going to be working with. The Discernability Target is remapped using this gamma.

Color Temperature enables the user to select a preset Color Temperature or define a value.

Step 2 - Check Go-NoGo Target.

You should be able to see a each of the smaller boxes in the larger boxes of the Go-NoGo Target. This indicates that the analog controls and the Monitor Gamma are properly adjusted.

Step 3 - Choose Exit or Calibrate.

If you choose Calibrate you will be guided through the steps necessary to calibrate your monitor.

See Also: What the Calibration Utility can do for me

Analog Adjustment Procedure

The goal of Analog Adjustment is to set the monitor controls at their best, most linear, state. This results in achieving the maximum dynamic range possible for your monitor without clipping in either the highlight or the shadow regions.

Monitors with ONE analog control:

If your monitor has only one control, make sure that you adjust the monitor such that all the small boxes in the larger boxes are visible in the dark row.

Monitors with TWO analog controls:

Identify the Gain (Brightness) and Offset (Contrast) controls.

Set both controls to the maximum settings.

Reduce the Offset (Contrast) control until the darkest steps of the Grayscale are indistinguishable.

At this point look at the Shadow Discernability Scale (3rd row). Continue raising the level until you can see all the boxes-within-a-box. When you have reached the point that you can JUST see all the smaller boxes, **STOP.**

If on your monitor you cannot adjust the Offset (Contrast) control to see all the boxes in the third row, leave the Offset control at the maximum setting.

Some users tape the monitor controls so they cannot be easily changed after they complete this process.

Looking at the Highlight Discernability Scale (1st row), you should be able to see the darker, small box within the light large box at the left end of the scale.

If you cannot see this, turn down the Gain (Brightness) control until you can.

If your monitor allows you to see all the boxes in the Highlight Discernability Scale with the Gain (Brightness) control at its maximum setting, then do not adjust it.

You have now successfully adjusted the analog controls so that you can achieve the full dynamic range potential of your monitor.

System Gamma Adjustment

The goal of System Gamma Adjustment is to set the approximate gamma for the desired System Workspace before attempting Color Temperature Adjustment.

User Procedure

If you have already done an Instrument Calibration, **Do Not Adjust The Slider**. The initial position of the slider is set to the measured Monitor Gamma in the current MDB file. When a default file is used, it is an estimate of the current monitor's gamma. Select Continue to adjust the Color Temperature or Trim.

If you do not have a calibrator and are using a Manufacturer Default file, you may want to adjust the slider using the following procedure.

Move the **Slider** Control while looking at the Grayscale and Discernability Scale. Adjust the monitor so that the difference in intensity between each step is about the same. The goal of the adjustment is to make the Grayscale appear uniform from patch to patch while seeing all the smaller boxes in the larger boxes of the Discernability Scale.

Adjust the slider from left to right. Looking at the Grayscale, the brightness difference between each "Patch" should appear as consistent as possible. At the same time all the smaller boxes in the Discernability Scale should be visible.

For this adjustment as with all adjustments during visual calibration, realize that they are subjective judgements to your preference. You should choose the position on the slider that best suits your environment.

Controls

The **Monitor Gamma** slider changes the actual Monitor Gamma of the monitor. If a sensor is attached the color temperature values will be displayed below the slider.

The **RESET** button will change the Monitor Gamma to the value it was set to when the dialog was entered.

The **CANCEL** button will abort any changes you have made to the Monitor Gamma and return to the main Calibration Utility screen.

The **CONTINUE** button will proceed to Color Temperature Adjustment. Changes will not be saved until you complete the entire Visual Calibration process.

Color Temperature Adjustment

The white point or color temperature of the monitor should reproduce the conditions under which original images are viewed. Additionally, some monitors have a natural blue or red cast which can be eliminated by changing the color temperature.

User Procedure

Move the **Color Temperature Slider** Control until the Grayscale makes the closest match to the white of the paper stock to which you will be printing. Hold the white paper adjacent to the monitor, viewing the paper under the intended lighting conditions. The user can shift the color temperature setting to a more yellow white (warmer) by moving the slider to the left or to a bluer white (cooler) by moving the slider to the right.

Controls

The **COLOR TEMPERATURE** slider changes the Color Temperature of the monitor. If a sensor is attached the color temperature values will be displayed below the slider.

The **NATIVE** button will set the Color Temperature to a value without any correction for this monitor if an Instrument Calibration has been done or to the value in the default Monitor Data File (.MDM).

The **RESET** button will change the color temperature to the value it was set to when the dialog was entered.

The **SHOW USER IMAGE** button will replace the Grayscale with the image specified in the Preferences dialog. The user can control whether the image is tiled or centered on the screen under Preferences.

The **TRIM GAMMA TABLE** button calls the Trim Colors Dialog to allow fine shaping of the individual red, green, and blue gamma curves.

The **CANCEL** button will abort any changes you have made to Color Temperature and return to the main Calibration Utility screen.

The **CONTINUE** button will save the current settings and return to the main Calibration Utility screen. Visual Calibration is complete.

Trim Color Adjustment

This procedure allows the user to make fine adjustments of the gamma curve that has been downloaded to the DACs (Digital to Analog Converters) of the graphics card. It is intended to remove slight 'casts' that may appear in the Grayscale.

User Procedure

Observe the Grayscale and check each box for 'grayness' - meaning there should not be any hint of color. If there is a color cast throughout the Grayscale modify by Color, otherwise, modify by Tone in the specific area you see a cast.

Slider Functionality

There are two major ways in which the user may observe the TRIM changes, by color or by a portion of the gamma curve.

Change by Color

When you select one of the colors, **Red**, **Green**, **Blue**, to adjust. When a color is selected, five sliders affect a different portion of the gamma curve for that color.

Black changes the bottom.

Shadow changes next fifth of the curve.

Midtone changes the center fifth.

Highlight changes next fifth of the curve.

White changes the top of the gamma curve.

Change by Tone

When you select one of the tones, **Black**, **Shadow**, **Midtone**, **Highlight**, or **White**, to adjust, there will be three sliders. Each slider affects the selected tone's portion of the **Red**, **Green**, or **Blue** gamma curves.

Controls

Each **TRIM** sliders changes tone or color values as described above.

The **Adjust All** checkbox makes all the sliders work as one. Note that none of the sliders may move past an end point and this will stop all the sliders from moving in that direction.

The **ZERO** button sets all trim values to zero, even if they were set to other than zero when the dialog was entered.

The **REVEAL \ RETURN** button toggles hiding the rest of the Calibration Utility application to reveal the Window's desktop. The user may continue to adjust the Trim Sliders while observing images that may be loaded by other applications.

The **RESET** button will set all the sliders to their starting positions when the Trim Dialog was started.

The **CANCEL** button will abort any changes you have made to TRIM and return to Color Temperature Adjustment.

The **CONTINUE** button will save the current settings and completes calibration.

Lighting Conditions

This control establishes the ambient lighting conditions under which you will be viewing the monitor. Before starting a calibration, be sure to set the room conditions to be the same as when you are working on images. Choices are : Bright, Light, Normal, Subdued, and Dark. These conditions can be characterized as follows:

Bright

A bright room is an office with overhead light and sunlight.

Light

A Light room is an office with overhead lighting only.

Normal

A Normal room is one which has lighting adjusted so that there is no apparent glare from overhead lighting, but there is enough light to easily read a piece of paper.

Subdued

A Subdued room is one which has indirect lighting and the light level in the Work Space is too low to comfortably read.

Dark

A Dark room has no lighting other than the light generated by the monitor.

System Gamma

The System Gamma represents the gamma value through which the user wants to view images.

There are several gamma curves used and produced by The Calibration Utility.

The native gamma response of your monitor is **Monitor Gamma**.

To linearize or correct your monitor, the colors shown on your monitor are remapped through the inverse of the Monitor Gamma. This is the **Correction Gamma**.

A corrected linear response may not be appropriate for the images being viewed. Images captured with a video camera or scanner typically have a gamma response different than a monitor. To make them look like the original, the **System Gamma** is applied to the Correction Gamma. It is the user's responsibility to specify the System Gamma. This value should change each time the user works on a image with a new source. It represents the manner in which the image was brought into the system.

The effect of Lighting Conditions is to add an emphasis or de-emphasis to the System Gamma.

When the System Gamma is set, the color values used to display the Discernability Target are remapped and redisplayed. The Discernability target will look the same at all System Gamma values, while all other images will change. This allows the Discernability target to be used as a reference to check your calibration.

Preferences

The Preferences Dialog allows the user to tailor the Calibration Utility to his or her working habits.

Image File is the name and path to the image file that will be used to display as an alternate to a Sequel Imaging Target during calibration. If the image is smaller than the display it will be tiled to fill the display area.

Separate Gamma Curves displays the gamma curves in either one box or in three separate boxes.

Tile User Image toggles between tiling or centering the selected user image when SHOW USER IMAGE is enabled in the Visual Calibration sequence.

AutoSave Abobe CCSD is not enabled in this release.

Port allows you to specify on which serial port a SuperMatch Calibrator Pro is connected.

Discernability Target

The Discernability target is used to judge the current linearization of the monitor. It contains a discernability section and a Grayscale section. 

- The three rows of boxes within a box are called the **Discernability Scales**(tm). The top row is the Highlight Discernability Scale, the middle row is the Midtone Discernability Scale, the bottom row is the Shadow Discernability Scale. The brightness value of an inside box is equal to the outside brightness of the adjacent box to the right in any row.

The difference in brightness between the inside box and the outside box is two Just Noticeable Differences (JNDs) for the Highlight and Midtones and 4 JND's for the Shadows. This portion of the target effectively allows you to see the entire dynamic range of your monitor with visual feed back.

- The **Grayscale** is based on even steps of visual difference between black and white. This means that when the system is operating linearly the apparent difference in brightness will be equal for all steps.

Identifying the Gain (Brightness) and Offset (Contrast) Analog Controls.

Monitor manufacturers sometimes mislabel the brightness and contrast controls. The following steps will ensure that you use the correct control when using The Calibration Utility. The Calibration Utility will refer to Gain (Brightness) and Offset (Contrast) controls instead of Brightness and Contrast controls to ensure the user is aware of this possibility.

Adjust both controls to their maximum settings.

One at a time, turn down each control while observing the Grayscale on Discernability Target. You should notice that when one control is turned down the overall brightness of the screen decreases, but the steps of the Grayscale are still distinguishable. This is the "Gain" control.

The other control should affect the Grayscale step tablet such that the darker steps become indistinguishable. This is the "Offset" control.

Color Temperature

Color Temperature is based on the chromaticity coordinates of a black body or Plankian radiator when heated to an absolute temperature (in degrees Kelvin). Varying the temperature of the radiator describes a locus of chromaticity points referred to as the Plankian locus.

In the general case when measuring a monitor Color Temperature, the chromaticities do not fall on the Plankian locus. Then we develop a `Correlated Color Temperature'. This is the nearest point on the Plankian locus which is perceived as visually closest to the measured point.

The Daylight Color Temperature is a particular locus that the chromaticities of Daylight fall on. Particular points on this locus are referred to as D as in D5000 or D6500.

NOTE: Correlated color temperatures only describes a chromaticity point and its relationship to the Plankian locus. A variety of sources can have different chromaticity coordinates and have the same correlated color temperature. In addition, a correlated color temperature does not describe the spectral power distribution of a source. Different sources having different spectral power distribution can have the same correlated color temperature.

*.MDM Files

The files which contain the default monitor information end with the extension .MDM. MDM files cannot be saved or overwritten in the Calibration Utility. When the MDM file is loaded, the initial name becomes UN-NAMED.MDB. This file needs to be renamed in order to save it in the application.

Gamma

gamma is defined as slope of the straight line portion of a curve when the log of the output is plotted against the log of the input. For monitors this can include input vs. output voltages or color values.

Discernability Box

A 'box within a box' for which the brightness levels have been calculated to show a fine differences in adjustment. The difference in brightness between the inside box and the outside box is two Just Noticeable Differences (JNDs) for the Highlight and Midtone Scales and four JND's for the Shadow Scale.

Just Noticeable Difference

A difference in brightness levels such that the average human eye can just see a difference. This also corresponds to an L* difference of 1 in LAB space.

White Point

The White Point of a monitor is based on a Daylight or Correlated color temperature of the chromaticities of the monitor when the red, green, and blue phosphors are at their maximum intensities.

Setting Your Color Temperature

Select a Color Temperature, in degrees Kelvin, that corresponds to the approximate viewing conditions for the material you are working with. For example, if the anticipated viewing condition will be daylight or a daylight viewing booth select D5000. If the anticipated viewing condition are a supermarket under mercury vapor lamps select D9000.

Luminance

Luminance is the objective measure of brightness. Its units are Foot Lambert (FtL) in the english system or Nits in the metric system. The Calibration Utility displays luminance in Foot Lamberts.

Monitor Gamma

The Monitor Gamma is the native gamma of the display system. The measurement of this gamma is made with a linear look-up-table (LUT) in the DAC's (Digital to Analog Converters) of the graphics card.

The Calibration Utility Startup Options

The Calibration Utility can be started with several command line options that will help the user maintain control of his working environment.

The "X" Option - Load and Quit

The X option runs the Calibration Utility application to the point where the DACS of your graphics card are set and then terminates. This option is typically used in the Program Manager Startup Group. Hold down the CTRL-key and Utility icon to the Startup group. Edit the command line to add "X" after mcalsmac.exe.

Load an Alternate MDB file

If a command line parameter contains ".MDB", The Calibration Utility will interpret it as an alternate MDB file to load and will load that file instead of LAST.MDB. If the command fails, you will be warned and LAST.MDB will be used instead.

How To Order the SuperMatch Calibrator Pro

If you are doing this calibration visually, then you are only doing half the job.

To achieve the color confidence required by true color publishing professionals, you need the accuracy and assurance only available through an instrumented calibration.

Call SuperMac at **408-245-2202** to inquire about the SuperMatch Calibrator Pro, the only true colorimetric monitor calibration instrument available to the Windows user.

What The Calibration Utility Can Do For Me

Provides a consistent view of images

Allows images to be viewed in their gamut

Throughout the creation process, there are many times when the color reproduction of an image may be modified:

Video cameras remap color through a gamma curve around 2.2.

Image Processing software and scanner software may remap an image to an assumed monitor gamma of 1.8.

The Calibration Utility allows the user to determine the current gamma of an image and modify his monitor to view the image at that gamma. The response of the monitor will be linear to the image data.

Records information about your monitor

Once you set your monitor for certain lighting and image conditions, they become easy to restore by loading a file from disk.

Future software will use information concerning your monitor in order to make the image produced by your printer look the same as it did on your monitor.

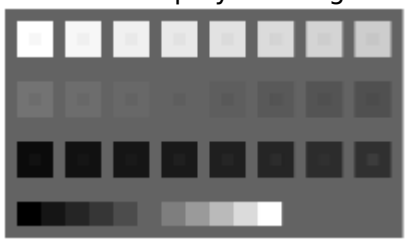
Tour of The Calibration Utility - the Monitor Calibration Software

This section of HELP is designed to give an understanding of how The Calibration Utility operates and how you can best use The Calibration Utility. If you are a first time user, don't worry about details, read this section, use the application and then re- read this section.

The Calibration Utility supports both visual calibration and Instrument calibration with the SuperMatch Calibrator Pro. Calibration procedures only available with the instrument are headed in **RED**. Procedures available for both visual and instrument calibration are headed in **BLUE**.

The Discernability Scales

The Discernability Target is the main basis for the user to make judgements about the condition of the monitor. The color values used to display the target are chosen to match the gamma of images you want to view.



The Calibration Utility works by changing the way your graphics card responds to the color information sent to it.

The above target was mapped to a gamma of 1.80.

The left target was mapped for a gamma of 1.00 and the bottom target was mapped for a gamma of 2.40. The target that looks "best" on your monitor has been mapped to the gamma that is the closest to your monitor. As you use The Calibration Utilities' calibration procedure you will be able to make the target appear linear. At this point you will have adjusted your monitor to respond in the desired way.

Current Settings

Before starting the calibration process the user must establish the conditions under which he will be viewing images. Lighting Conditions reflect the ambient lighting conditions that will be used to view images. The System Gamma reflects the gamma of the images the user wants to view.

Adjusting the monitor

The next step in calibration is to set the analog controls, usually brightness and contrast, of your monitor to the proper settings. You will do this by making changes while observing the Discernability Target.

System Gamma Adjustment

Before continuing, we want to set the monitor to the approximate gamma condition that satisfies the selected System Gamma. A slider allows the user to quickly establish this condition.

Setting Color Temperature

The Calibration Utility allows the user to change color temperature or white point. Adjusting the color temperature can remove red or blue casts that can occur with some monitors. This function is also used to make the monitor respond in the same manner as photographs when viewed under special lights.

Instrument Calibration

Both the System Gamma adjustment and setting and verifying the Color Temperature as specified by the Current Settings are done accurately and automatically with the SuperMatch Calibrator Pro . In addition the calibrator allows you to adjust the luminance of your monitor and match the luminance, system gamma, and color temperature of multiple monitors in the same or remote sites.

Fine Tuning the monitor - The Trim Function

A set of sliders will allow the skilled user to change the gamma response of the monitor at various points along the individual red, green, and blue gamma curves.

Saving your settings.

As a last step, the user should save each different working condition he will be using. This will make it easy to change from one condition to another without having to repeat the calibration process.

Visual Calibration Button

The visual calibration button initiates the visual calibration process.

Instrument Calibration

The instrument calibration button initiates the instrument calibration process. The user is prompted for each step. Current Settings should be set prior to starting the process.

Help

Context sensitive help at any screen. Select Contents for an overview of the application.

Exit

This will exit the application. If you have made changes you will be asked if you want to save them prior to exiting.

Set Luminance

This uses the SuperMatch Calibrator Pro to measure the monitor's Luminance continuously, allowing the user to adjust it with the monitors's Gain (Brightness) control.

With the sensor mounted on the screen, select SET LUMINANCE. The luminance value will be continuously be displayed. Adjust the luminance with the Gain (Brightness) control. Set the luminance to a value 1 unit down from the maximum setting. Adjusting the luminance down allows you flexibility for later adjustment (up or down) as your monitor changes over time. This allows you to maintain the same luminance level.

When you select SET LUMINANCE, the control text changes to STOP LUMINANCE. Select the control again in order to stop taking measurements. Each measurement will take about 2 seconds.

Get Dark Current

Allows the user to measure the dark current of the SuperMatch Calibrator Pro

Get Dark Current

The dark current measurement calibrates the calibrator. Do not move the calibrator while the dark current is being taken. If you do, you will get erroneous calibration information. Dark Current is a measurement without any light. Wait until the Ready To Calibrate dialog appears before moving the calibrator.

Accept Calibration Results

Selecting OK means that you are accepting the calibration results. You should then save the information. For more information see Save.

Go-NoGo Target

This is an abbreviated version of the Discernability Target. It represents the brightest four boxes of the highlight scale and the darkest four boxes of the shadow scale. It allows you to make a quick judgement of the status of the controls.

See Analog Adjustment or Identifying Analog Controls for more information.

Gamma Curves

The gamma curves show the actual tables sent the display card. You can select to show three separate graphs or one graph in the preferences .

Monitor Name

This is the monitor that selected by either OPEN or NEW under FILE on the menu bar. If this is not your current monitor, select FILE/NEW and load your current monitor.

Phosphor Type

The information is specified for the monitor that you selected under FILE/NEW.

User Description

When a Calibration file is saved with a FILE/SAVE AS the user can enter a description that appears here when the file is loaded with a FILE/OPEN.

Start Instrument Calibration

Prior to commencing the calibration process, you may want to adjust the luminance of your monitor. This is especially important when matching images on multiple monitors. To adjust luminance, see Setting Luminance.

You are now ready to begin Instrument Calibration.

As part of the calibration process, a verification of the luminance level is done, if you SET LUMINANCE. If the level deviates more then .5 FtL from the level set an informational dialog appears and you are given an opportunity to reset the luminance level.

Additionally, the current color temperature will be verified at the completion of calibration. If the color temperature cannot be verified you will be notified.

Multiple Monitor Setup

If you are adjusting multiple monitors which you plan on using in a network environment, it is important that you set the luminance level of each monitor to the same value. To do so, you may have to reduce the brighter monitors to a level that can be matched by less bright monitors. You may have to perform the calibration process a few times before you find the ideal level. If you find in your network environment that you have one monitor that is half as bright as the others, you may want to replace it, rather then reduce the luminance of all the brighter monitors.

Gain Control

The Gain of the monitor controls the luminance of the monitor. It is properly refered to as the Brightness of the monitor, however, many monitors are not labeled this way.

As the Gain control is turned down, all the colors on the monitor will darken at the same rate.

Offset Control

The Offset control of the monitor shifts the response of the color guns in the monitor while maintaining the same basic gamma curve. It is properly refered to as the Contrast of the monitor, however, many monitors are not labeled this way.

> As the Offset control is turned down, the dark colors move toward black faster than the lighter colors on the monitor.