



Color Control

User Manual

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Introduction

The *ELSA ColorControl* application permits the optimal adjustment of the color and brightness of your monitor.

The midrange tones of photographs or game scenes often appear too dark due to technically inevitable non-linearities in the brightness of CRT screens, or as a result of a variety of image compression algorithms. Attempts to compensate these errors using the brightness and contrast controls generally available on monitors usually results in an overall worsening of the display quality. Generally the brighter parts of the image will be washed out, or the image as a whole will appear too hard.

ELSA ColorControl affects the processing of image information on the graphics board (i.e. before the signal reaches the monitor), thus permitting a targeted adjustment of the midrange brightness. As a result, you can then take advantage of the full contrast and brightness ranges of your monitor.



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What is "Gamma Correction"?

The display characteristics of cathode ray tubes (CRT) used in nearly all monitors are non-linear for technical reasons: the intensity of the light on the display area of a CRT monitor is a non-linear function of the input voltage sent to the monitor by the graphics board. This effect is due to the characteristics of the luminescent material used in the picture tubes, as well as the psychological sensitivity of human eyesight.

Gamma Correction is the process of compensating this non-linearity to achieve a correct image. Theoretically, this correction must be performed separately for the three color components—red, green and blue—due to differences in sensitivity to different colors of both the luminescent material and the human eye.

Why another tool?

Nearly all monitors have controls that permit the convenient adjustment of brightness and contrast. These controls have the disadvantage of reducing the color range of the picture, however. In many cases either the light sections of the image will appear "overexposed", or the shadow detail of the darker sections will be lost in solid black. This is caused by the fact that these controls only affect the basic level or increase of the voltage at the picture tube. The linearity of the voltage curve and thus the non-linearity of the brightness curve are preserved.

ELSA ColorControl is able to modify the midrange without affecting the brightness of the light or shadow tones. What's more, these changes can be made individually for each color component. This even permits an adaptation of the color temperature to a certain degree, permitting two monitors to be adapted to one another in multi-screen operation, for example.

Starting the tool

The *ELSA ColorControl* application appears as an additional page in the *Display Properties* dialog. It can be started by opening the *Control Panel* and selecting the *Display* icon. This opens a dialog box that contains a page with the *ELSA ColorControl* tab. Click on this tab to open the page with the tool.

Under Windows® 98 and Windows® 2000, the program can be accessed via the *Advanced* option on the *Settings* page.

Using the controls for "Desktop" settings

The lower section of the *ELSA ColorControl* user interface contains the controls for the adjustment of the color correction characteristics. The lower three controls are for the gamma correction of the three color components, while the two controls above them regulate the brightness (Blacklevel) and contrast (Picture).

The upper section contains a display field in which you can monitor the current color correction characteristics. The controls to the right of the field can be used to save or reload the optimal settings for specific applications.

Gamma correction sliders



The coefficient of the correction curves for the three color components can be set using the three gamma correction sliders.



Moving the slider **to the left** reduces the gamma value, which amounts to a **reduction to the midrange values** and vice versa. The current gamma coefficients can be monitored in a small rectangle while moving the slider with the mouse. The value range extends from approx. 0.1 on the left and 5.0 on the right side.



The exact calculation of the values for the correction curves can be found in the [Formulas](#) section.

The *Link Sliders* button can be used to link the sliders so as to apply the same correction to all three color components.

Brightness



The top one of the group of three controls affects the overall brightness of the picture. Like the contrast control, this control always affects all three color components. To put it precisely, this control adjusts the voltage generated by the graphics board for the monitor in order to display solid black (base brightness). For negative values (slider left of center) the number of colors are set for which the monitor will not receive voltage.

The exact calculation of the values for the correction curves can be found in the [Formulas](#) section.

Caution! When changing only this parameter, the number of colors that can be displayed will be reduced. The use of this slider is therefore only advisable in conjunction with the gamma controls.

Contrast (Contrast, Picture)



The second control affects the rise of the correction curves and is also referred to in technical literature as the *Picture Parameter*. This parameter changes the intensity of the light tones and the intermediate tones in proportion. This changes the contrast as the dark tones remain unchanged.

Like the Brightness control, the *Contrast* control affects all three color channels simultaneously.

Display

The diagram visible in the upper section of the page gives a rough overview of the current color correction curve settings. The X axis (horizontal) shows the brightness values of the picture and the Y axis (vertical) the output voltage generated by the palette (i.e. the intensity of the image generated on the monitor).

Thus a "convex" (as seen from the top) curve corresponds to a brightness curve with increased midrange values.

A single curve in the corresponding color is shown for each of the color components. A composite color results if multiple curves are superimposed.

Save option

To save a correction curve, click the *Save as...* button and enter a name in the following input dialog. These names then appear in the *Settings* list, permitting a quick change from one setting to another.

The *Reset* button restores the default settings (a one-to-one correction curve).

Formulas of the correction curves

This section describes the calculation algorithm used to determine the values of the correction curves on the basis of the slider positions.

This calculation is performed separately for each color component. The following formula is used to calculate a result for each of the 256 possible input values between 0.0 and 1.0, resulting in a corresponding curve.

Input parameter

Symbol	Name	Def. range	Explanation
<i>i</i>	Intensity	0.0 .. +1.0	Input color intensity. X axis of the display
<i>pic</i>	Contrast	-2.0 .. +2.0	Value of the contrast control
<i>bl</i>	Brightness	-2.0 .. +2.0	Value of the brightness control
<i>ga</i>	Gamma	0.1 .. +5.0	Value of the gamma control

Calculation formula

The result *a* of the output intensity is calculated using the following formula:

$$a = (pic * i^{\frac{1}{ga}}) + bl$$

If the value *a* in this calculation is less than 0.0 or greater than 1.0, it will be set to 0.0 or 1.0. The result is *a* then multiplied by 65535 and sent to the graphics board.

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Troubleshooting

No difference can be observed in the picture

Normally, changes to the brightness or gamma settings are immediately visible on the monitor. If no changes can be observed, the driver for your current graphics mode does not support gamma correction. Generally, that is a question of the color depth in use.

Try changing to a different color depth (16 or 32 bpp).

Settings are lost

If the picture changes when the settings are altered but these settings are lost when restarting Windows, it means that the graphics driver is not saving the color settings.

This is normal behavior for a number of older graphics drivers since *ELSA ColorControl* uses the standard Windows interfaces—which make no provision for saving settings across a reboot—for color correction with these drivers.



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Select a range in this list for which the color settings should apply. "Desktop" and "Video" can be selected.

Graphical display of the correction curve settings.

Select one of the user-defined settings.

[Click here to save the current settings under a name of your choice.](#)

[Click here to delete these user-defined settings.](#)

[Click here to select the default correction curve for this driver.](#)

This control affects the base brightness.

This control affects the intensity of the bright tones and thus the contrast.

This control sets the gamma parameter for the red color channel.

This control sets the gamma parameter for the green color channel.

This control sets the gamma parameter for the blue color channel.

Mark this checkbox to link the three gamma correction controls.

This control affects the base brightness.

This control affects the intensity of the bright tones and thus the contrast.

This control affects the saturation

This control affects the hue

