

A Discussion: Using Histogram, Brightness-Intensity-Contrast, and Tone Curve

Given the multitude of Photo-Paint controls and tools, it's easy to be confused at the subtle differences certain features make to correct color. For example, most users will initially use the Brightness-Contrast-Intensity command to fix under or over-exposed photos. While this may work for fixing low contrast images, you may end up *crushing* or clipping the whites and blacks by affecting every pixel in the image. Applying a brightness value linearly applies the value to *all* pixels and colors in the image.

Instead, you may find better results using the Tone Curve feature to adjust the tonal range of the image to fix under or over-exposed photos. Individual pixel values are plotted along a response curve that appears in a graph and represents the balance between shadows, midtones, and highlights. This allows you to fix a specific problem in these areas without affecting other tones.

The following exercise will discuss and experiment with the following image adjustment tools:

- ❑ **Histogram:** An analysis tool that plots the brightness values of the pixels in an image on a scale of 0 (dark) to 255 (light). Clicking on the histogram provides statistics that can help you balance an image.
- ❑ **Brightness-Contrast-Intensity:** Lets you change the brightness, contrast, and intensity of image tones. Adjusting the brightness lightens or darkens all colors equally. Contrast and intensity usually work together, because increasing the contrast can wash out detail in shadows and highlights. Increasing the intensity can restore this detail.
- ❑ **Tone Curve:** Allows you to accentuate or tone down detail in shadow or highlighted areas, correct overexposure or underexposure, or to change the entire tonal range.

Exercise: Changing Brightness Versus Tone Curve Comparison

★ **Note:** This discussion and tutorial are compliments of David MacDonald who's prior experience lies in lighting and photography for film and TV. Visit www.cedesign.com/davidmac for a sample of his photorealistic illusions done in CorelDRAW and Photo-Paint.

Steps to Follow

Comments

1. Open **Target.wi** in the Learn folder and press [F4] to fit the entire image within the window.
2. Select **Tools, Color Management** and choose **Optimized for professional output** in the Style list.

The Color Management window appears.

Analyzing the Histogram

3. Select **Image, Histogram**.
4. Observe the Start and End values of 0 and 255.

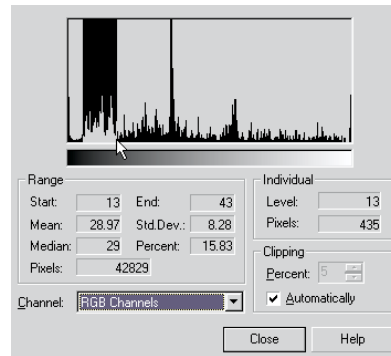
The Histogram dialog box is for analysis only. You cannot make changes to the image.

The histogram shows series of spikes because this image contains a multitude of distinct and sharply separated tones.

These values indicate the brightness value where 0 is black and 255 is white.

5. To experiment with the distribution of data, drag on the histogram to highlight a specific area.

Observe the Start, End, Median, and Standard Deviation.



6. Click **OK**.

To exit the Histogram dialog box.

Using Brightness-Contrast-Intensity

7. Select **Image, Adjust, Brightness-Contrast-Intensity**.

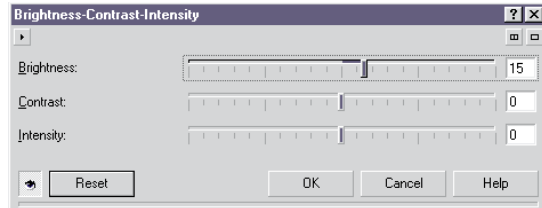
The Brightness-Contrast-Intensity dialog box appears.

8. Click the **Reset** button.

To reset the sliders back to the 0 setting defaults.

9. Choose a Brightness value of 15.

10. Observe how the lighter shades of gray at the bottom of the image are crushed to become white. Also, there are less areas of solid black and more murky grays since 15 is now the lowest brightness in the image.



11. Set the Brightness value to -15 and observe how the blacks are now crushed.

Everything below a brightness of 15 becomes clipped to 0. Some of the whites become dull shades of gray.

12. Click the **Reset** button.

To reset back to the default settings.

13. Experiment by increasing and decreasing the contrast.

Increasing the contrast adds to all pixels above 128 and subtracts from all the pixels below, which results in fewer tones in between.

Decreasing contrasts adds to all pixels below 128 and subtracts from all pixels above. Instead of crushing the black and whites, the grayscale approaches a uniform gray.

14. Intensity is generally not a control that used on its own. Use it to counteract information losses of contrast. Slide it gently in the opposite direction of the Contrast slider.

Adjusting the intensity helps to restore detail in the whites but does little for the blacks.

★ **Tip:** Use Brightness-Contrast-Intensity only when you want to deliberately emulate the effects of over and under-exposure (causes a loss of information).

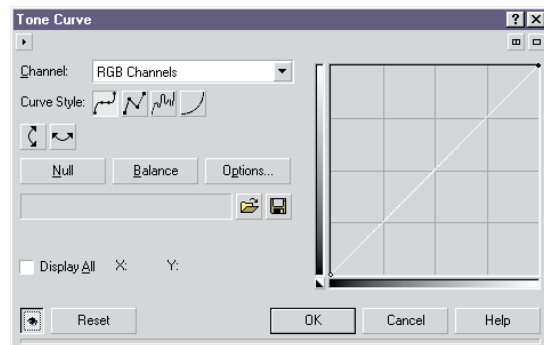
15. Click **Cancel** to exit the Brightness-Contrast-Intensity dialog box.

Do not apply any changes to the image.

Using Tone Curve

16. Select **Image, Adjust, Tone Curve**.
17. This dialog box represents the standard brightness values. The horizontal axis of the graph is the standard tonal range from 0 to 256. The vertical axis is what the tone can be set to in your adjustments.

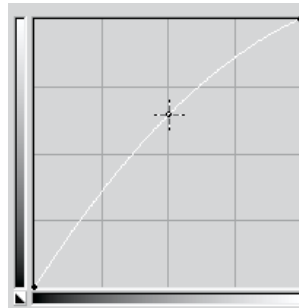
The Tone Curve dialog box appears.



The 45 degree line is called a *response curve* and indicates no change as the standard tones and the adjusted tones are identical. Think of this tool as a filter with which the horizontal axis represents what goes in and the vertical represents what goes out.

18. Drag the middle of the response curve up about half a square.

Observe how the mid tones have brightened but the black and white remain relatively unchanged.



19. Drag the middle node upwards until the tip of the curve starts to flatten against the top of the graph. Drag down slightly until the flattening is eliminated.
20. Point to the bottom-left corner of the curve where the horizontal and vertical axes meet at X=0, Y=0.

You have achieved a maximum brightening of the image without experiencing information loss.

Absolute black has not changed.

21. Follow the response curve upwards. Notice how the Y value starts to rise relative to the X value until you reach the middle of the curve where the difference between the two is at its greatest.

As you continue along the curve the difference starts to reduce until at peak white where X=255 and Y=255.

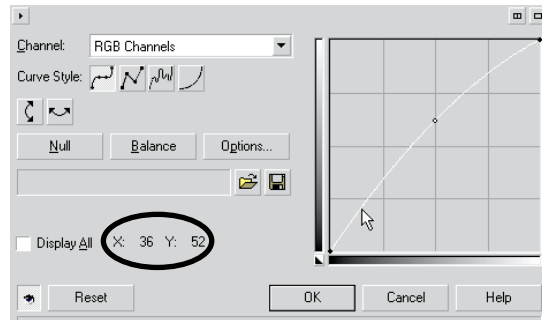
22. Experiment with the principles above to darken the image.
23. Click **Reset**.
24. Point to X=128 Y=128 (the middle) of the response curve and click to place a node.
25. Point to X=192, hold [Ctrl], and drag upwards to Y=215 to create a second node.

Observe the contrast in the mid tones has increased.

26. Hold [Ctrl] and drag the node down to X=192 Y=160.

The contrast in the mid tones has decreased.

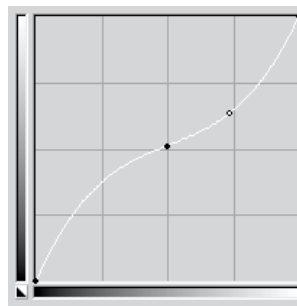
27. Click **Reset**.
28. Click the Linear curve style button in the dialog box.
29. Create two nodes at X=128 Y=128 and X=192 Y=192.



Drag the middle node downwards.

To reset back to the default curve mode.

Tip: [Ctrl] constrains movement vertically. The curve adopts a shallow "S" curve. The steeper the center of the curve, the higher the contrast. The flatter, the lower the contrast.



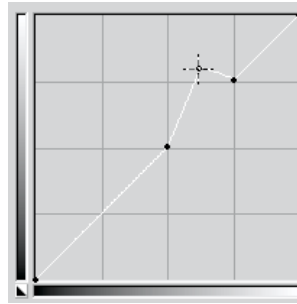
To reset back to the default curve mode.

This curve type allows you to make narrow adjustments to specific tones.



30. Click and drag a node at X=160
Y=205.

Observe the 40% gray in the grayscale. It has been adjusted to become 30% without changes to any of the other tones. This is a useful adjustment for images where you need to correct a narrow tonal band.



31. With the Linear curve style activated, click the **Null** button.

To reset the response curve to a linear line.

32. Experiment with the chart below in order to achieve various types of color corrections.

| Adjustment | Set the following: |
|--|--|
| Input Clipping Whites | Set X=192, Y=255. This curve is equivalent to a white clip at 192. Everything above 192 is set to 255 and the tones from 0 - 192 are stretched to become tones from 0 - 255. The curve has become steeper causing increased contrast and is inevitable when you stretch a narrow band of tones to cover a greater range. |
| Input Clipping Blacks | Set X=64, Y=0. This sets a black clip at 64. The reverse of the above. |
| Output Compression Of White | Click on the spot at the top of the curve and drag down the side wall to set X=255, Y=192. The full tonal range has been compressed to stop at 192. |
| Output Compression Of Black | Set X=0, Y=64. The inverse of the above. |
| Brightness-Contrast-Intensity (BCI) Brighten | Set X=0, Y=50 & X=205, Y=255. Adds 50 to every pixel in the image. The information loss is visible on the curve. |
| BCI Darken | Set X=50, Y=0 and X=255, Y=205. The inverse of the above. |
| BCI Increase Contrast | Set X=50, Y=0 and X=205, Y=255. Adds 50 to the top of the curve and subtracts 50 from the foot. Information loss in blacks and whites, crushing at the toe and tip of the curve. |
| BCI Decrease Contrast | Set X=0, Y=50 and X=255, Y=205. The inverse of the above. Output compression and loss of range at both ends of the scale. |

33. Exit the Tone Curve dialog box.
34. Close the document and do not save the changes.