

Let $x \in \{1, 2, 4, 8\}$ be the number of bits per pixel. Then we have that there are $\frac{8}{x} \in \mathbf{Z}$ pixels per byte. Suppose we want to calculate the number of bytes per row, B , needed to display our image. That's simple,... Given n as the number of pixels per row, the number of bytes will be $b = \frac{n}{(\frac{8}{x})}$. The one limitation we have is that $B \in \mathbf{Z}$ (i.e. we can't have fractional bytes in a row). So what if $\frac{n}{(\frac{8}{x})} \notin \mathbf{Z}$?

Here is how B is determined. Using the division algorithm we have that

$$n = \left(\frac{8}{x}\right)b + m, \quad 0 \leq m < \frac{8}{x}.$$

If $n \equiv 0 \pmod{\frac{8}{x}} \Rightarrow m = 0$ and thus $B = b$. Suppose $n \not\equiv 0 \pmod{\frac{8}{x}} \Rightarrow 0 < m < \frac{8}{x}$. This gives us b bytes but leaves a fraction of a byte behind. Precisely, we are left with $\frac{mx}{8} < 1$ bytes. So to have an integral number of bytes per row in our PostScript file, and include the entire image, we set $B = b + 1$. But now, if we count the number of pixels per row in our PostScript file we get

$$B\frac{8}{x} = (b + 1)\frac{8}{x} = b\frac{8}{x} + \frac{8}{x} = n - m + \frac{8}{x} = n + \left(\frac{8}{x} - m\right)$$

pixels. Furthermore, since $m < \frac{8}{x}$, this leaves us with $\frac{8}{x} - m$ extra pixels per row in the PostScript file.

Lets look at an example. Suppose that $x = 4$ (4 bits per pixel which implies 2 pixels per byte) and $n = 5$ (our image has 5 pixels per row). First note that $5 \equiv 1 \not\equiv 0 \pmod{2}$. Hence we will have $2 - 1 = 1$ extra pixel added to each row. A worst case scenario would be if we set $x = 1$ (1 bit per pixel which implies 8 pixels per byte) and $n \equiv 1 \pmod{8}$ ($n = 9$ for example). This would result in $8 - 1 = 7$ extra pixels per row. To avoid this problem completely, set $x = 8$. This way $\frac{n}{(\frac{8}{x})} = n \in \mathbf{Z}$ and the remainder m will always be 0.

What does PostScript do with these extra pixels? It sets their value to 255 which will be white in many color tables. In this case you won't see these extra pixels,... But they're there! In some cases however, the color table being used has a color other than white for index 255. In this case the extra pixels will be visible in the PostScript file.