LaserWriter: Cause and Elimination of Image Ghosts (7/95)

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TOPIC --

What causes of the ghosting effect on the LaserWriter printers? How can it be
reduced or eliminated?

DISCUSSION ---

Overview and Recommendation

The most common type of ghosting problem exhibited by the LaserWriter is
developer system ghosting. This form of ghosting is inherent in the design of
the cartridge. In an effort to reduce or eliminate the ghosting problem, many
alternate toners and cartridge designs were considered, but all of them would
have substantially increased the cost of the printers.

The problem can be reduced by either increasing the copy density level (turning
the print density dial counterclockwise or software density indicator if the
printer is so equipped to a lower value) or by running several pages of the
desired document (in many cases, the ghost image is reduced to acceptable levels
by the third copy).

Detailed Explanation: the Causes of Ghosting

The xerographic process used in the LaserWriter has two major sources of ghost
images:
- latent image on the photosensitive drum
- latent image on the developer cylinder

One source of ghosting is a latent image on the photosensitive drum. This
results from either the failure of the cleaning system to remove a toner image
from the drum, or failure of the drum preconditioning system to remove
electrostatic image from the drum. It is also possible to "burn" an image into a
drum by exposing a drum, which has a toner image on the surface, to bright light
for a long enough period of time.

The second source of ghosting is the image developer system. It manifests itself
either as a darker or lighter ghost image in the solid areas of output copy.

The darker ghost is caused by the reduced ability of the toner, left for a period of time on the developer cylinder, to adequately develop the electrostatic image on the photosensitive drum. This reduced development capability results in a lighter image. Once replaced by more active toner from the toner supply bin, the image is noticeably thicker and darker. This effect can be seen when a solid black page is printed after the machine is allow to sit unused for several minutes. In this case, the first two inches or so (one revolution of the developing cylinder) of the image will be lighter than the rest of the page.

This darker form of ghosting occurs when an image is created from the less active toner on the developer cylinder. The toner that was removed from the cylinder to develop the image on the drum, is replaced by the more active toner from the toner bin. Images formed on subsequent revolutions of the developer cylinder will be made of a combination of the more active and less active toners. These subsequent images will be dark where they are made by the active toner (remember that the active toner is in the shape of the earlier image which selectively removed the inactive toner) and lighter, where the less active toner is placed. This is why you see a dark "ghost" image approximately two inches from the original image, in what should be a uniform solid-area image. Of course, as the machine is run, more and more of the less-active toner is replaced by the more-active toner, resulting in decreased ghosting.

The visual effect of "dark" developer ghosting can also be diminished by increasing the print density. Because, once the paper is completely coated with toner, the paper no longer shows through to visually decrease the image density, increasing the print density to cover up the ghosting by making the light areas darker. Although the problem is still there, it is not as visible, and may be acceptable to the user.

The lighter form of developer system ghosting is caused by the lack of sufficient replenishing toner in the toner bin. It usually occurs as the toner supply in the cartridge is depleted. In this case, as above, toner is removed from the developer cylinder in forming a toner image on the drum. But, unlike the case above, there is a lack of toner in the bin to replace the lost toner on the cylinder. This results in a light form of ghost in the solid area parts of the output copy. With this form of ghosting, rocking the cartridge may be enough to redistribute the toner to the developer cylinder.

Because ghosting is affected by several other factors of environment and machine tolerance, you may notice different ghosting levels at various times during the year or from one machine to another.

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