

Module 4– Color Print Quality Issues

Overview

This module describes the most common print quality issues in color laser printing. It gives you practice in using and recognizing the names of common problems and in identifying their causes and cures.

The Skills Checklist (next page) lists the skills you should be able to demonstrate by the end of this module.

Equipment Required

- Paper and pencil (for exercises)
- Recommended: Color monitor set to “Thousands” of colors or more (for best on-screen viewing of illustrations in this module)

Skills Checklist

The Skills Checklist (below) lists the skills you should be able to demonstrate by the end of this module; if you think you can already demonstrate the skills, try the Exercises. If you pass the Exercises, you should be able to pass the portion of the course test that covers these skills. (The course test is found on this CD.)

Skill	Where Practiced
Identify the problems referred to by the following terms: <ul style="list-style-type: none">• Banding• White gap• Plane-to-plane registration problems• "Background"• Dropout• Color gradient problems• Blurry text• Color differences between units• Slow printing	Exercise 1
Given a description of a faulty print sample, choose the term from the list above that would best describe the problem.	Exercise 1
Identify the likely causes and possible solutions or workarounds for the problems described by the terms above.	Exercise 1

Color Print Quality Issues

Banding

Banding is a term used to describe unwanted horizontal lines caused by variations in print density. A certain amount of fine horizontal banding is always present in current state-of-the-art printers, including the Color LaserWriter 12/600 PS. The technician's job is to distinguish a normal level of banding from an unacceptable level that indicates a need for service.

Normal Banding

Fine horizontal bands (less than 2 millimeters in width) are caused by electro-photographic and high-voltage processes. They are most visible in large areas of solid color. This type of banding is normal and acceptable from a service standpoint: No repairs are necessary or possible.

Workarounds for Normal Banding

If a user is bothered by even the normal level of banding, you can suggest workarounds.

- In general, banding is most obvious in areas of 30 to 60 percent print coverage of a solid color. Using a different background pattern, with either more white space or more coverage, may help.
- It may also help to use a lighter background color.
- Different types of paper can also increase or reduce apparent banding. Try using a different type of paper.

You can refer users to the user's manual for their printer for information on fixing this level of image problems. (For the Color LaserWriter 12/600 PS, this information is contained in Chapter 12 of the User's Manual.)

Unacceptable Banding

On the other hand, if you see horizontal banding two or more millimeters wide, repeated at regular intervals along the page, it probably indicates a problem with one of the following parts:

- The photosensitive drum (photoconductor cartridge)
- The primary charging roller (photoconductor cartridge)
- The developing cylinder in one of the toner cartridges (if banding occurs in only one color on test prints, suspect the toner cartridge for that color)

The distance between bands will be equal to the circumference of the drum, cylinder, or roller at fault. For specific troubleshooting and repair information, refer to Service Source or the Apple Service Guide for the printer in question.

Banding is impossible to represent accurately in an illustration, but the simulation below may help you recognize it when you see an actual example.

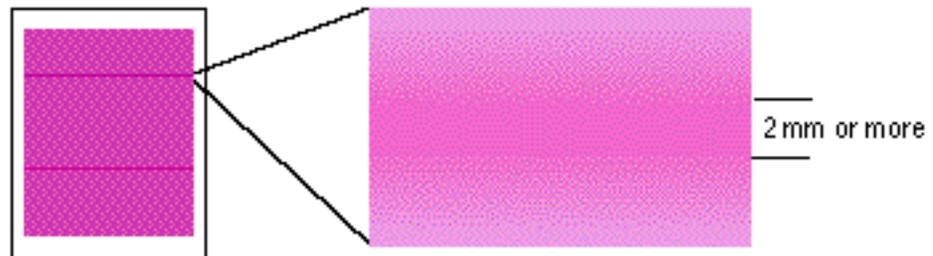


Figure 4-1: Banding (simulation)

Note: For proper viewing, Figure 4-1 should be viewed on a color monitor set to “Thousands” of colors.

Photoconductor Cartridge Insertion Problems

The Color LaserWriter 12/600 PS photosensitive drum can easily be damaged if the photoconductor cartridge is inserted improperly. Before inserting the photoconductor cartridge, make sure that:

- The shipping screw has been removed
- The toner carousel is locked into position (that is, one of the toner cartridges must be locked into fetch position)
- The transfer drum lever is pushed completely down

If the photosensitive drum is scratched or otherwise damaged, you will see banding—or some other defect—repeated along the page horizontally at an interval of 5.07 inches. For more information, see Service Source or the Apple Service Guide for the Color LaserWriter 12/600 PS printer.

Other Repetitive Horizontal Defects

If any horizontal print defects occur repetitively over a single page—not only banding, but tracking, blank spots, lines, etc.—they are almost certainly caused by dirty or damaged rollers. By measuring the distance between bands you can determine which roller is involved. For specific roller circumferences and other specific troubleshooting information, refer to the troubleshooting sections of Service Source or the Apple Service Guide for the printer in question.

White Gap

With the Color LaserWriter 12/600 PS, when you print a patch of solid color alongside or inside a different solid color, there sometimes appears a thin white vertical line between the two colors: This is called white gap.

Causes and Workaround

White gap is caused by electrical properties of the toner used in the Color LaserWriter 12/600 PS: Different layers of toner, similarly charged, repel each other to a small degree.

A small amount of white gap is normal and acceptable for the Color LaserWriter 12/600 PS. No repair is necessary or possible. However, there are workarounds that you can suggest to users who want to minimize this effect.

In general, white gap appears when the two colors involved do not share any toner color in common -- for instance, pure magenta and pure cyan. To avoid the problem, you can use two colors that share some toner in common: For instance, use blue and green, both of which use cyan toner.

Note: A vertical white line is probably an example of white gap. A fine white horizontal line between two colors is probably caused by a plane-to-plane registration problem, discussed below.

Plane-to-Plane Registration Problems

The term Plane-to-Plane Registration Problems refers to printing in which one or more color planes are out of alignment with each other. This creates “ghosts,” “haloes,” or “shadows”—double, triple, or even quadruple images. Usually this occurs when paper on the transfer drum shifts position during the four-stage print process.

Plane-to-plane registration problems can be minimized by the following methods:

- Choose “Best” quality in the Print dialog box when printing, or use the Apple Printer Utility to set the printer’s default Imaging Option to “Best.”
- Use good quality laser printing paper (see user’s manual for recommendations).
- Make sure paper is stored properly (see user’s manual for recommendations).

Background

In certain low temperature and low humidity conditions, users may notice a slight tinting of the background of their printouts, like a light fog. This unwanted tinting, called background, is caused by excess static electric charges attracting loose toner dust to the paper on the transfer drum. Most often, this problem occurs when one of the toner cartridges is almost empty and printing is taking place at low temperature and humidity (as in the northeastern United States during winter).

Background is most visible if you look at the top edge of the page, comparing the printable area to the non-printable margin (see Figure 4-3).

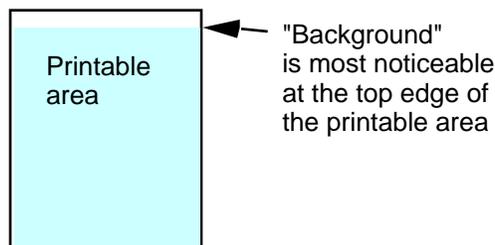


Figure 4-3: Background

To reduce this problem, try the following:

1. Check the temperature and humidity of the operating environment. Check the printer manual or Service Source for recommended environmental conditions. Low-cost digital hygrometers/thermometers that measure temperature and humidity can be purchased at many consumer electronics stores. A humidifier appropriate for the room where the printer will be used may be necessary to increase humidity. Buildings located in dry climates may have humidifiers integrated into their heating and ventilation systems.
2. Store the paper and consumables in the same area as the Color LaserWriter 12/600 PS so that they are exposed to the same temperature and humidity conditions. Leave each ream of paper in its protective paper wrap until it is ready to be loaded into the cassette tray.

3. If the background toner is predominantly one color (cyan, magenta, yellow, black) when printing color documents, then try replacing the corresponding toner cartridge.
4. If background toner appears even though the printer is being used in an environment that meets all of the requirements outlined in the user manual, then there may be another factor contributing to the problem. Consult the Technical Information Library or Apple Technical Support for other possible remedies.

Dropout

In the Color LaserWriter 12/600 PS, Contone is tuned to print a standard letter-size or A4 page using only 12 MB of RAM on the printer's I/O board. If a user attempts to print a legal-size page with 12 MB of printer RAM, Contone will use a higher compression technique and only the C, M, and Y color planes, to fit the larger image into the same amount of RAM. This will cause some areas of light colors to appear white, and some data may disappear altogether. The name for this effect is dropout. Dropout may also occur on letter-size pages that contain extraordinarily complex images.

The solution to dropout is to add more RAM to the printer's I/O board. Adding 4 MB RAM (for a total of 16 MB) will allow legal-size pages to print without dropout.

Color Gradient Problems

Color gradient problems are similar to dropout problems: When images with more than 512 colors or shades are printed on the Color LaserWriter 12/600 PS, some details will be lost. In this case, the problem is a result of compression technology, and there is no remedy for this situation in the current state of the art: It is simply a limitation of the technology.

Blurry Text

Text contained within graphic images is treated as an image by Apple Contone Compression Technology. In some cases, this may cause the text to appear blurry, as the compression technology optimizes images for color and tone quality rather than for position and sharpness. Two possible remedies are to

- Use thicker lines or fewer colors. Solid colors such as black, cyan, magenta, yellow, red, green, or blue look best.
- Use a different application program. Instead of an image-manipulation program, use a page layout, word-processing, or illustration program.

Color Differences Between Units (Color LaserWriter 12/600 PS)

Individual Color LaserWriter 12/600 PS units may vary in the actual printouts they produce from the same file, as a consequence of manufacturing variations. Some expert users with more than one unit may wish to use the print density adjustment panel to bring the units into closer conformity with one another. This is a delicate adjustment and can cause problems if done incorrectly. In most cases, users should not be encouraged to adjust the print density.

Slow Printing

Color LaserWriter 12/600 PS print speed can be increased somewhat by adding RAM (up to 28 MB total) to the I/O board. How much speed will be gained depends on the application software and the particular page being printed. For some pages, printing speed will be increased 200 to 300 percent, for others as little as 5 percent.

Adding RAM beyond 28 MB will not increase printing speed noticeably.

Exercise: Terms, Examples, Solutions

1. Unwanted horizontal lines caused by variations in print density are called:
 - A. Background
 - B. Banding
 - C. Dropout
 - D. White gap

2. If one color appears out of alignment with the other colors, the print defect is called:
 - A. Background
 - B. Color gradient problem
 - C. Plane-to-plane registration problem
 - D. White gap

3. Which of the following conditions could cause "dropout"?
 - A. Incorrect paper storage
 - B. Insufficient RAM in the printer
 - C. Poor paper quality
 - D. Low temperature and humidity

4. Which of the following could cause banding?
 - A. Incorrect paper storage
 - B. Insufficient RAM in the printer
 - C. Low temperature and humidity
 - D. A defective toner cartridge

5. White gap is caused by
 - A. A defective photoconductor cartridge
 - B. Electrical properties of toner
 - C. Insufficient RAM in the printer
 - D. Poor quality paper

6. The following print problem is associated with low temperature and humidity conditions:
 - A. Background
 - B. Banding
 - C. Dropout
 - D. Plane-to-plane registration problem

7. Of the following choices, the best workaround for "blurry text" is to
 - A. Turn off the separation discharge unit
 - B. Use better quality paper
 - C. Replace the photoconductor cartridge
 - D. Use a word processing program instead of an image manipulation program

8. If a Color LaserWriter 12/600 PS user has noticed a "dropout" effect while trying to print legal-size pages, you need to increase the printer's RAM to a total of at least:
 - A. 12 MB
 - B. 16 MB
 - C. 24 MB
 - D. 28 MB

9. Although adding RAM to the Color LaserWriter 12/600 PS can increase printing speed, the results will not be noticeable beyond a total RAM size of
 - A. 16 MB
 - B. 24 MB
 - C. 28 MB
 - D. 32 MB

10. Like dropout, this problem is caused by the limitations of compression technology. Unlike dropout, it cannot be remedied by adding RAM to the printer.
 - A. Background
 - B. Color gradient problem
 - C. Plane-to-plane registration problem
 - D. White gap

11. This delicate adjustment can correct color differences between individual Color LaserWriter 12/600 PS units, but it can also cause additional problems if done incorrectly.
 - A. Color balance
 - B. Color gradient
 - C. Print density
 - D. Print intensity

Answers to Exercise

1. Unwanted horizontal lines caused by variations in print density are called:
B. Banding
2. If one color appears out of alignment with the other colors, the print defect is called:
C. Plane-to-plane registration problem
3. Which of the following conditions could cause "dropout"?
B. Insufficient RAM in the printer
4. Which of the following could cause banding?
D. A defective toner cartridge
5. White gap is caused by
B. Electrical properties of toner
6. The following print problem is associated with low temperature and humidity conditions:
A. Background
7. Of the following choices, the best workaround for "blurry text" is to
D. Use a word processing program instead of an image manipulation program
8. If a Color LaserWriter 12/600 PS user has noticed a "dropout" effect while trying to print legal-size pages, you need to increase the printer's RAM to a total of at least:
B. 16 MB

9. Although adding RAM to the Color LaserWriter 12/600 PS can increase printing speed, the results will not be noticeable beyond a total RAM size of
C. 28 MB
10. Like dropout, this problem is caused by the limitations of compression technology. Unlike dropout, it cannot be remedied by adding RAM to the printer.
B. Color gradient problem
11. This delicate adjustment can correct color differences between individual Color LaserWriter 12/600 PS units, but it can also cause additional problems if done incorrectly.
C. Print density

Congratulations!

You have completed the course. If you wish, you may now go to the [Appendix](#) for this course, which contains a Glossary and Bibliography; or you may go directly to the final exam for the Course, which is located in the "Course Test" folder on this CD. There are two versions of the test: one for 680x0-based Macintosh and the other for Power Macintosh computers. Double-click the appropriate test for your computer.

Once you pass the final exam, you will be ready to start the Color LaserWriter 12/600 PS Service Training Course.