

I. Electronic Color Separation

A. High-end scanners

B. Desktop scanners

II. Basic concepts of high-end scanning

A. Densitometry

1. Original mounted to drum
2. Drum spins
3. Light source illuminates the original
4. Light is reflected back to photomultiplier tube from each point on the original.
5. The scanner acts as a densitometer and measures the densities of each spot with red, blue and green filters.

a) *each point is measured with a red, green, and blue filter*

(1) demonstrate with GAM densitometer

b) *the 3-point measurement of each spot is known as tristimulus value*

(1) For example,

Color of spot	Blue filter	Green filter	Red filter
Yellow	0.95	0.04	0.02
Magenta	0.50	1.20	0.12
Cyan	0.15	0.30	1.25
Orange	1.69	1.05	0.19

c) *the tristimulus value of each spot is stored in memory.*

B. The scanner does the separation into CMYK.

C. Lookup table

1. The densities of each spot are compared to data in a lookup table.

2. The table contains the appropriate halftone-dot size for each density combination of red, green, and blue.
3. Based upon the data found in the lookup table, the scanner images the sheets of film with the appropriate-sized cyan, magenta, yellow, and black dots.

D. Calibration of scanner

1. The lookup tables must be programmed using a series of color chart images that have been printed under normal printing conditions.
2. Different lookup tables must be used for different processes.

E. Tone compression due to differences in gamut.

1. When the original contains a color that is outside the gamut of the stored lookup table, an appropriate trade-off is made between saturation and lightness.

F. Tone alteration

1. Gray balance
 - a) *Color shifts can be made in either the red, green, blue, or yellow directions.*
 - b) *Shifts can be either toward or away from each of the colors.*
2. Selective color correction
 - a) *A given color can be selected using a point device such as a light-pen or cursor.*
 - b) *The selected color can then be manipulated in the same way as the gray balance is adjusted.*

G. Proper exposure of film

1. As you know, increased exposure darkens film leading to a lighter image (and visa-versa).
2. The lookup table assumes that the output device is properly exposing the film

- a) *a 50% dot that is sent from the scanner needs to be a 50% dot on the output film.*

III. Basic concepts of desktop-scanning

A. Densitometry

1. Original placed on glass bed
2. Original remains stationary—light source and CCD's move.
3. Moving light source illuminates the original
4. Light is reflected back to CCD's from each point on the original.
5. Like the high-end scanner, the desktop scanner measures the tristimulus value of each point on the original.

B. The scanner does not do the separation into CMYK

C. Lookup table

1. Desktop scanners do not have built-in lookup tables.
2. Instead, the tristimulus values are saved directly.
3. The computer monitor can directly display the RGB file.
4. It is up to a computer software package such as Photoshop to translate the file to CMYK.

a) *Photoshop contains the lookup table.*

b) *Photoshop compares the value (from 0–255—256 shades) of each color in each spot to the appropriate halftone dot size(s) in its lookup table and then displays those values.*

D. Calibration of scanner

1. The desktop scanner self-calibrates by reading all the densities of the spots on the original before performing the color scan.
2. However, the desktop scanner cannot be directly calibrated to compensate for press performance—it does not deal with CMYK.

a) *Color calibration must be done in Photoshop.*

3. The lookup table in Photoshop must be calibrated to properly separate the colors.

E. Tone compression due to differences in gamut

1. You can adjust the overall gamut of the scan through the use of the scanner dialog box.
 - a) *Gamut = Density range or original/density range of reproduction.*
2. When the original contains a color that is outside the gamut of CMYK, that color is still recorded and saved in the file.
3. An appropriate trade-off is made between saturation and lightness for out-of-gamut colors must be done using Photoshop.

F. Tone alteration

1. You cannot adjust the individual color gamuts on a desktop scanner.
2. Photoshop must be calibrated for gray balance.
3. Selective color correction must be done in Photoshop.

G. Proper exposure of film

1. *Like the high-end scanner, scanned photographs altered in Photoshop depend on proper exposure of the film by the imagesetter.*
2. *Imagesetter software comes with a file that can be downloaded directly to the imagesetter to create various gray scale reproductions.*
 - a) Show example
3. *The imaged screen tints must be measured with a transmission densitometer.*
 - a) The density measurements must be converted to dot percentage using an integrated halftone density to percentage table (give out tables).
 - b) Demonstrate measuring dot size.

4. *The exposure that provides the closest to nominal halftone dot size is then programmed into the imagesetter.*
5. *Exposure must be checked (and adjusted if necessary) any time a new roll of film is placed in the imagesetter.*