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Macintosh II: Color capabilities

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TOPIC ----------

The Macintosh II adds color capabilities to the Macintosh line of computers. Its implementation depends on the Toolbox calls available, and on the hardware installed in the system. This document describes the relationship between the hardware and firmware, and discusses color implementation in the Macintosh II Toolbox.

DISCUSSION ----------

ABSOLUTE COLOR

Color QuickDraw, as defined in the Macintosh II ROMs, uses an absolute approach to determine color representation. A new data type, RGBColor, is defined to be a record containing three 16-bit integers, each of which represents an intensity value for one of the three additive primary colors: red, green, and blue.

```
type
     RGBColor = record
                  red:integer;     {Red component}
                  green:integer;   {Green component}
                  blue:integer;    {Blue component}
                end;
```

Under Color QuickDraw, the application need not be concerned with the type of output device. The application specifies a color in RGBColor format, but the Color Manager then uses information from the device's driver to translate the RGBColor definition into the best available match on the output device. Some output devices may be limited to 8 or 16 colors; others use a lookup table to select from a wide range of possible display

colors. In any event, the Color Manager handles these details independently of Color QuickDraw or the application.

COLOR DEPTH

On the Macintosh II, the user can choose the depth to which the screen image should be displayed, up to the limits of the video hardware, by using the Control Panel desk accessory. This permits choosing a display consistent with the type of program. A word processing application may need only black and white, and a greater selection of colors (i.e., greater depth) would only slow down the application. On the other hand, drawing and charting applications benefit from the ability to use more colors, so the user might choose to use a greater pixel depth.

Pixel depth must be a power of 2. A display of 4 bits per pixel permits each pixel to choose from among 16 colors, while 8 bits per pixel allows a selection of 256 colors. Normally, the device implements these choices through a color lookup table controlled by the Color Manager.

THE PIXMAP

All drawing by Color QuickDraw is done in a pixel map, which is analogous to the bit map of old. New fields have been added to track the horizontal and vertical resolution in pixels per inch, the number of bits per pixel, and the handle to the pixel map's color table.

COLOR PATTERNS

Color QuickDraw includes color patterns. It provides an undefined limit to the size of the pattern, and a variable pattern depth. Although Color QuickDraw is capable of translating the depth of a pattern to the current screen display depth, this can be a time-consuming process, and should be avoided. As always, color patterns provide a method of dithering, which increases the number of perceived colors shown on the screen.

COLOR TRANSFER MODES

Color capabilities introduce new opportunities for transfer modes. Some previously defined transfer modes aren't useful when color display is used, so Color QuickDraw offers new ones:

- Replace with transparency
  Permits overlay of pictures

- Additive
  Adds red, green and blue components on the screen, resulting in a lighter screen image.

- Subtractive
  Subtracts red, green and blue components on the screen, resulting in a darker screen image.

- Max and min

Compares the source and destination values, and chooses either the smaller or the larger. Used to smooth the edges of two objects displayed next to each other.

- Blend
  Uses a formula to calculate a mix of the source and destination values of each component.

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