List of 16-bit Computer Hardware Palettes

Subjects: Computer Science, Theory & Methods

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This is a list of notable 16-bit RGB color palettes, which were primarily manufactured from 1985 to 1995. Due to mixed-bit architectures, the n-bit distinction is not always a strict categorization.

color mixed-bit rgb

1. Atari

1.1. ST Series

The Atari ST series has a Digital-to-Analog Converter of 3-bits, eight levels per RGB channel, featuring a 9-bit RGB palette (512 colors). The STE series has a Digital-to-Analog Converter of 4-bits, sixteen levels per RGB channel, featuring a 12-bit RGB palette (4096 colors).

Depending on the (proprietary) monitor type attached, it displays one of the 320×200, 16-colors and 640×200, 4-colors modes with the color monitor, or the high resolution 640×400 black and white mode with the monochrome monitor.

2-color mode

https://handwiki.org/wiki/index.php?curid=1916970

2. Commodore

2.1. Amiga OCS

The Original Chip Set (OCS) of the Commodore Amiga features a 12-bit RGB, 4,096-color palette. As the Amiga Copper programmable graphics coprocessor is capable of changing color lookup table entries on the fly during display, in practice the number of distinct colors visible on-screen may have exceed static color lookup table sizes documented here.

5-bit

The graphic surface is divided in a series of bit planes, between 1 and 6 for horizontal resolutions of 320 (or up to 384 with overscan), and between 1 and 4 for horizontal resolutions of 640 (or up to 768 with overscan). For either horizontal resolution, the vertical resolution is either 200 (or up to 240 with overscan), or 400 (or up to 480 with overscan) if interlaced, for NTSC-compatible video modes; or 256 (or up to 288 with overscan), or 512 (or up to 576 with overscan) if interlaced, for PAL-compatible video modes. The color lookup table has up to 32 entries. So the different indexed color modes are from 1 to 5 bits pixel depth, 2-, 4-, 8-, 16- or 32-color out of 4,096.

2 colors	4 colors	8 colors	32 colors
https://handwiki.org/wiki/index.php?curid=1703174	https://handwiki.org/wiki/index.php?curid=1301058	https://handwiki.org/wiki/index.php?curid=1214592	https://handwiki.org/wiki/index.php?curid=1172585

6-b

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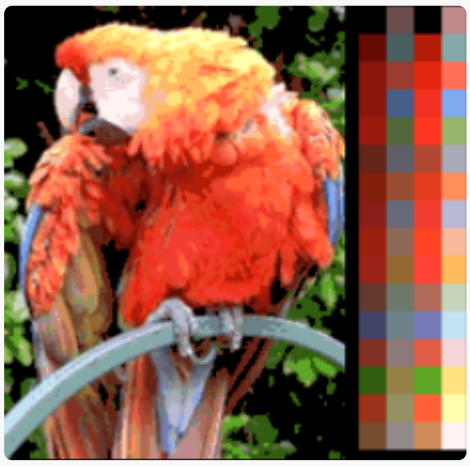
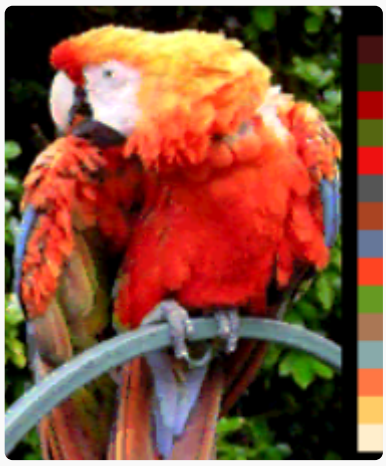
In the EHB mode, 6-bits pixel points to one of the 32 colors in the palette with their lower 5-bits, and if the 6th bit is on, the bright of the color is halved (hence the name of this mode). So there are a total of 64 visible colors: the user chooses light versions of the first 32 colors and the system already provides their darker versions.

In the HAM mode, the two higher bits of the 6-bits pixels are used as a four state command. Three of the states changes only the red, green or blue component of the pixel respect of the precedent in the scan line, and hold the other two RGB components. The new value for the modified color component is in the four lower bits. The remaining command state forces the pixel value to be one of the 16 first values of the palette, whose indice is in the four lower bits of the pixel. So it is very important to have a well selected palette, or the color will spread easily among consecutive pixels in the scan line of the image. This mode can display all of the 4,096 colors simultaneously.

64 colors (EHB mode)	4096 colors (HAM mode)



https://handwiki.org/wiki/index.php?curid=1131773



https://handwiki.org/wiki/index.php?curid=1436066

3. Apple

3.1. Apple IIgs

Apple IIgs, along with full compatible graphic modes with the Apple II, features a custom Video Graphics Chip (VGC)[1] which supports a 12-bit RGB, 4,096-color palette. It has an extended set of 320×200 and 640×200 graphic modes, (called Super High-Res modes by Apple) with different (and a bit complex) color modes:

- 320×200 with 16 palettes of 16 selected colors out of 4,096 each. Every single scan line can be assigned to one of the sixteen palettes, so it can have up to 16×16=256 different simultaneous colors (although some common colors like black and white are usually shared among the different palettes, giving fewer than 256 total different colors). The most simple way to use this mode is having a unique 16-color selection for the entire screen and assign it to all scan lines. Here are shown the sample image both using a single shared palette and using all the 16 palettes (in this case, by dividing the image into 16 strips):

Screen color test AppleIIgs 16colors. https://handwiki.org/wiki/index.php?curid=1687502

Screen color test AppleIIgs 16x16colors. https://handwiki.org/wiki/index.php?curid=1919437

- 640×200 with 16 palettes of 8 selected colors out of 4,096 each. Every single scan line can be assigned to one of the sixteen palettes, so it can be have up to 8×16=128 different simultaneous colors (usually less due to shared colors). In a single scan line, even column pixels can have one of the first four colors of the line's assigned palette, and odd column pixels one of the last four colors of the eight. The most simple way to use this mode is having a unique 8-color selection for the entire screen with four duplicate colors (the same to both even and odd pixel columns) and assign it to all scan lines. Here are shown the sample image both with a single shared custom 4-color palette and with a single 8-color palette (black, blue, yellow, white, black again, red, green, white again) to produce 13 dithered-by-hardware colors, ("dark blue" "dark yellow" "gray" "dark red" "magenta" "orange" "light red" "dark green" "cyan" "lime green" "light green" "light blue" and "light yellow") plus pure black and white. The last was the Apple IIgs Finder default mode and palette.

Screen color test Amiga 4colors. https://handwiki.org/wiki/index.php?curid=1301058

Screen color test Amiga 8colors. https://handwiki.org/wiki/index.php?curid=1214592

Also, along with the one of 16 palettes, to each scan line the Apple IIgs VGC is able to assign individual 320 or 640 horizontal resolution independently.

4. IBM PC/AT and Compatible Systems

For the palettes of previous original IBM PC, IBM XT and IBM PCjr/Tandy 1000 series hardware displays, please visit IBM PC/XT and compatible systems in the List of 8-bit computer hardware palettes article.

4.1. EGA

The Enhanced Graphics Adapter (EGA) supports all CGA modes and add three more: two 320×200 and 640×200 graphic modes, both with the full CGA 16-color palette (intended to be used with the same "digital RGB" CGA color monitor of 200 scan lines) and an extra 640×350 graphic mode with 16 colors chosen from a 6-bit RGB (64 colors) palette for what IBM then called an "analog RGB" type monitor.[2]

The word *analog* means here that the RGB signals can have more than the bare two possible levels 0 and 1; (as the so-called —by IBM— "digital RGB" CGA monitor type has) despite of its name, colors are produced digitally, so there exists binary (quantized) steps for every primary RGB signal (two bits, four levels per primary, in this case). Thus, the EGA signal from the computer to this kind of monitor had two wires for each primary red, green and blue. Later, true analog connectors were developed by IBM for the more advanced MCGA and VGA display adapters and monitors, (see the next section) which are unrelated to (and incompatible with) the EGA "analog" monitors.

Some early EGA cards shipped only 64 KiB of video memory, (the nominal was 128KiB, up to a maximum of 256 KiB to allow more screen pages in memory) so the 640×350 graphic mode provides only four colors. This was never a proper mode by itself, and therefore was not popular.

Monochrome "analog" monitors also existed for EGA. The colors are then mapped internally to the correspondent luminance gray, (the sum of the 30% of the red signal, the 59% of the green and the 11% of the blue) giving a 16-shades from a 64-grayscale palette. "Positive" class monitors inverts the signal, providing that the default EGA

colors for text modes (black background and white foreground) displays reversed, (white background and black foreground) as if were a printed document.

16-color CGA	16-color EGA	EGA on monochrome monitor
https://handwiki.org/wiki/index.php?curid=1753265	https://handwiki.org/wiki/index.php?curid=1935846	https://handwiki.org/wiki/index.php?curid=1163226

4.2. MCGA and VGA

The Multicolor Graphics Array (MCGA) and Video Graphics Array (VGA) used a 6-bits per channel, 64 levels Digital-to-Analog Converter (DAC) to give an 18-bit RGB palette (262,144 colors), from which can be selected any 2, 16, or 256 at a time.[2] They both provided full compatibility with CGA modes, while VGA included all the EGA modes as well as the MCGA modes. When connected to analog monochrome monitors, they offered 64 levels of grey. Some of the first portable PCs featured a flat monochrome plasma display with a VGA in shades of red.

16 colors	256 colors	64 shades on grayscale display	64 shades on red plasma display
		https://handwiki.org/wiki/index.php?curid=1091614	https://handwiki.org/wiki/index.php?curid=1747519

4.3

Th)×480 and 1024×768 graphic modes. It does not support compatibility with VGA modes, but a VGA card is usually already installed and *bridged* to the 8514/A to provide a single output cable for a single monitor which can display any of all VGA and 8514/A possible modes.

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4.4. Super VGA (SVGA)

Enhanced clones of the IBM VGA, known as Super VGA, (SVGA) support 256 simultaneous colors in 640×480 and higher pixel resolutions (800×600, 1024×768) in both 16 and 256 picked colors from the VGA 18-bit RGB palette, depending on the model and the manufacturer. Also, some SVGA cards support 15- and 16-bit RGB Highcolor modes, with 32,768 or 65,536 simultaneous colors on screen in 640×480 and higher resolutions. Some later models reach the 24-bit RGB True color modes.

In the 1990s, most manufacturers adhered to the VESA BIOS Extensions (VBE), used for enabling standard support for advanced video modes (at high resolutions and color depths).

They are the direct predecessors, not the IBM 8514/A nor XGA, of actual graphic display PC hardware.

References

1. BYTE.com http://www.byte.com/art/9610/sec4/art2.htm
2. Richard Wilton, Programmer's Guide to PC & PS/2 VIDEO SYSTEMS, 1987, Microsoft Press.

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