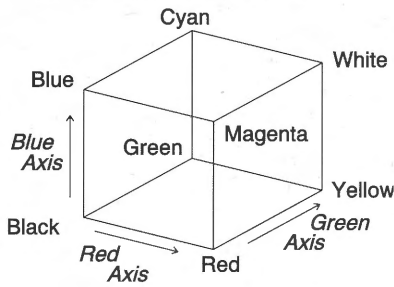


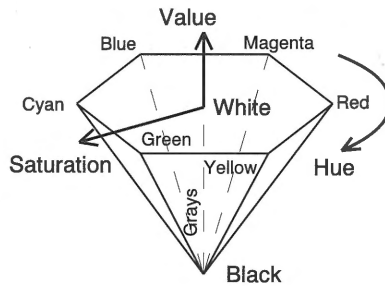
COLOR MODELS

Red-Green-Blue Cube

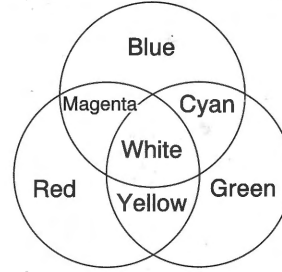


Shades of gray are on the long diagonal between black and white.

Hue-Saturation-Value Cone

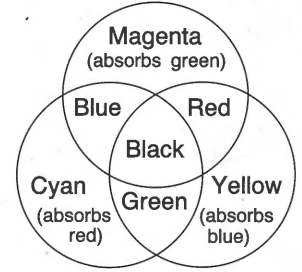


Additive Color Mixing



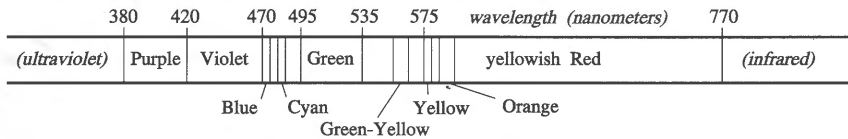
When mixing **light**, red, green, and blue are primaries. Yellow is formed by adding red and green, for example.

Subtractive Color Mixing



When mixing **pigments**, cyan, yellow, and magenta are primaries. Example: To get blue, mix cyan and magenta. Cyan pigment absorbs red, magenta pigment absorbs green, so the only component of white light that gets reflected is blue.

The Visible Electromagnetic Spectrum



Hue: Color; spectral position. Often measured in degrees; red=0°, yellow=60°, magenta=300°, etc. Hue is undefined for shades of gray.

Saturation: Color purity. A highly-saturated color is nearly monochromatic, i.e., contains only one color from the spectrum. White, black, and shades of gray have zero saturation.

Value: The darkness of a color. How much black it contains. White has a value of one, black has a value of zero.

DELUXE PAINT III KEYBOARD COMMANDS

Brush Painting Modes

- F1 matte (brush pattern)
- F2 color (solid)
- F3 replace
- F4 smear
- F5 shade
- F6 blend
- F7 cycle
- F8 smooth

Brush Sizing and Orientation

- . (period) one-pixel brush
- (minus) smaller brush
- +,= larger brush
- Z stretch
- h halve
- H double
- x flip top-to-bottom
- y flip right-to-left
- z rotate 90 degrees clockwise
- X double size horizontally
- Y double size vertically
- o add outline to brush
- O remove outline from brush

Brush Handle Placement

- Alt-s center brush handle (default)
- Alt-x flip brush handle horizontally
- Alt-y flip brush handle vertically
- Alt-z set brush handle location

Color

- p call palette requester
- { previous background color
- } next background color
- [previous drawing color
-] next drawing color
- Tab cycle colors
- , (comma) pick color from screen

Page and Screen Commands

- F9 menu bar on/off
- F10 menu bar and toolbox on/off
- l coordinates on/off
- S show full page
- j jump to spare page
- J copy to spare page
- ~ make stencil
- n center page around pointer
- ' (grave) stencil on/off
- cursor keys scroll screen
- Ctrl-cursor adjust screen position

Animation

- M call move requester
- left A hold down for animpaint

unshifted

- 1 previous frame
- 2 next frame
- 3 go to frame
- 4 play and loop continuously
- 5 play animation once
- 6 play ping-pong
- 7 previous animbrush frame
- 8 next animbrush frame

shifted

- 1 first frame
- 2 last frame
- 3 repeat last "go to"
- 4 play in reverse continuously
- 5 play animation once backwards
- 6 not used
- 7 first animbrush frame
- 8 last animbrush frame

While an animation is playing:

- r reverse animation
- < (left arrow) reduce frame rate
- > (right arrow) increase frame rate
- space bar halt animation
- Esc stop animation

Perspective

- All keys are on the numeric keypad.
- Enter activate perspective mode
- . (keypad decimal) reset center
- (keypad minus) perspective fill

unshifted

- 0 reset all axes to 0°
- 7 rotate -1° - large angle *
- X 8 rotate +1° + large angle
- 9 set to 0° fix X axis
- 4 rotate -1° - large angle *
- Y 5 rotate +1° + large angle
- 6 set to 0° fix Y axis
- 1 rotate -1° - large angle *
- Z 2 rotate +1° + large angle
- 3 set to 0° fix Z axis

(* default is 90 degrees)

- ; and ' move brush along fixed axis perpendicular to its plane
- : and " like above but in large steps
- < and > change observer distance
- Ctrl lock y-axis so brush movement changes only on x and z coordinates
- \ toggle angle and position displays

Miscellaneous Commands

- ? show memory info box
- Ctrl-a memory check
- Del pointer on/off
- Shift constrain to vertical or horizontal drawing only
- Ctrl leave traces with line, curve, rectangle, circle, ellipse, and polygon tools
- spacebar cancel operation
- Esc cancel operation
- a (again) repeat last menu command
- Help reset colors 0 and 1 to B&W

Mouse Equivalents

- right Alt-A right mouse button
- left Alt-A left mouse button
- right A-cursor move pointer
- left A-cursor move pointer

Deluxe Paint Toolbox

dotted freehand	s		d continuous freehand	
straight line	v		D filled freehand curve	
fill requester	f		q smoothed curve	
rectangular outline	r		c circle outline	
filled rectangle	R		C filled circle	
ellipse	e		w polygon	
filled ellipse	E		W filled polygon	
pick up brush	b		t text (Esc to quit)	
recall old brush	B		T font requester	
snap grid	g		/ symmetry	
align grid with pointer	G		< zoom out	
magnify	m		> zoom in	
undo	u		K clear screen/animation	



AMIGA FONTS

Helvetica 24 **Bold** *Italic* Underlined All Styles
 ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
 1234567890 &?!\$.,: @#%^* (){}[]<>=+_-~`'"\|/

Courier 11 **Bold** *Italic* Underlined All Styles
 ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
 1234567890 &?!\$.,: @#%^* (){}[]<>=+_-~`'"\|/

Helvetica 18 **Bold** *Italic* Underlined All Styles
 ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
 1234567890 &?!\$.,: @#%^* (){}[]<>=+_-~`'"\|/

Courier 13 **Bold** *Italic* Underlined All Styles
 ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
 1234567890 &?!\$.,: @#%^* (){}[]<>=+_-~`'"\|/

Helvetica 15 **Bold** *Italic* Underlined All Styles
 ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
 1234567890 &?!\$.,: @#%^* (){}[]<>=+_-~`'"\|/

Courier 15 **Bold** *Italic* Underlined All Styles
 ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
 1234567890 &?!\$.,: @#%^* (){}[]<>=+_-~`'"\|/

Helvetica 13 **Bold** *Italic* Underlined All Styles
 ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
 1234567890 &?!\$.,: @#%^* (){}[]<>=+_-~`'"\|/

Courier 18 **Bold** *Italic* Underlined All Styles
 ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
 1234567890 &?!\$.,: @#%^* (){}[]<>=+_-~`'"\|/

Helvetica 11 **Bold** *Italic* Underlined All Styles
 ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
 1234567890 &?!\$.,: @#%^* (){}[]<>=+_-~`'"\|/

Courier 24 **Bold** *Italic* Underlined All Styles
 ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
 1234567890 &?!\$.,: @#%^* (){}[]<>=+_-~`'"\|/

Helvetica 9 **Bold** *Italic* Underlined All Styles
 ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
 1234567890 &?!\$.,: @#%^* (){}[]<>=+_-~`'"\|/

Times 11 **Bold** *Italic* Underlined All Styles
 ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
 1234567890 &?!\$.,: @#%^* (){}[]<>=+_-~`'"\|/

Times 18 **Bold** *Italic* Underlined All Styles
 ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
 1234567890 &?!\$.,: @#%^* (){}[]<>=+_-~`'"\|/

Times 13 **Bold** *Italic* Underlined All Styles
 ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
 1234567890 &?!\$.,: @#%^* (){}[]<>=+_-~`'"\|/

Times 15 **Bold** *Italic* Underlined All Styles
 ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
 1234567890 &?!\$.,: @#%^* (){}[]<>=+_-~`'"\|/

Times 24 **Bold** *Italic* Underlined All Styles
 ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
 1234567890 &?!\$.,: @#%^* (){}[]<>=+_-~`'"\|/

This page shows representative alphabets of the Amiga bit-mapped fonts included with Workbench. Courier, Helvetica and Times are on the Extras 1.3 disk.

Diamond 12 **Bold** *Italic* Underlined All Styles
 ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
 1234567890 &?!\$.,: @#%^* (){}[]<>=+_-~`'"\|/

Opal 12 **Bold** *Italic* Underlined All Styles
 ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
 1234567890 &?!\$.,: @#%^* (){}[]<>=+_-~`'"\|/

Diamond 28 **Bold** *Italic* Underlined All Styles
 ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
 1234567890 &?!\$.,: @#%^* (){}[]<>=+_-~`'"\|/

Ruby 8 **Bold** *Italic* Underlined All Styles
 ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
 1234567890 &?!\$.,: @#%^* (){}[]<>=+_-~`'"\|/

emerald 17 **Bold** *Italic* Underlined All Styles
 ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
 1234567890 &?!\$.,: @#%^* (){}[]<>=+_-~`'"\|/

Ruby 12 **Bold** *Italic* Underlined All Styles
 ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
 1234567890 &?!\$.,: @#%^* (){}[]<>=+_-~`'"\|/

emerald 20 **Bold** *Italic* Underlined All Styles
 ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
 1234567890 &?!\$.,: @#%^* (){}[]<>=+_-~`'"\|/

Ruby 15 **Bold** *Italic* Underlined All Styles
 ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
 1234567890 &?!\$.,: @#%^* (){}[]<>=+_-~`'"\|/

Garnet 9 **Bold** *Italic* Underlined All Styles
 ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
 1234567890 &?!\$.,: @#%^* (){}[]<>=+_-~`'"\|/

Sapphire 14 **Bold** *Italic* Underlined All Styles
 ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
 1234567890 &?!\$.,: @#%^* (){}[]<>=+_-~`'"\|/

Garnet 16 **Bold** *Italic* Underlined All Styles
 ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
 1234567890 &?!\$.,: @#%^* (){}[]<>=+_-~`'"\|/

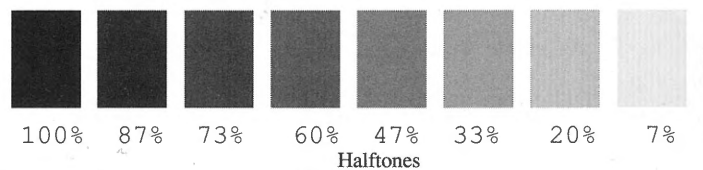
Sapphire 19 **Bold** *Italic* Underlined All Styles
 ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
 1234567890 &?!\$.,: @#%^* (){}[]<>=+_-~`'"\|/

Opal 9 **Bold** *Italic* Underlined All Styles
 ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
 1234567890 &?!\$.,: @#%^* (){}[]<>=+_-~`'"\|/

Topaz 8 **Bold** *Italic* Underlined All Styles
 ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
 1234567890 &?!\$.,: @#%^* (){}[]<>=+_-~`'"\|/

hairline
 1 point
 2 points
 3 points
 4 points

24 Points
 20 Points
 18 Points
 16 Points
 14 Points



One inch equals 72 points.

SCREEN MEMORY REQUIRED (Bytes)

Standard NTSC

# of bit planes	# of colors	lores		hires		super hires	superhires
		320x200	320x400	640x200	640x400	1280x200	1280x400
1	2	8,000	16,000	16,000	32,000	32,000	64,000
2	4	16,000	32,000	32,000	64,000	64,000	128,000
3	8	24,000	48,000	48,000	96,000		
4	16	32,000	64,000	64,000	128,000	64-	64-
5	32	40,000	80,000	n/a	n/a	color	color
6 EHB	64	48,000	96,000	n/a	n/a	palette	palette
6 HAM	4096	48,000	96,000	n/a	n/a		

Standard PAL

# of bit planes	# of colors	lores		hires		super hires	superhires
		320x256	320x512	640x256	640x512	1280x256	1280x512
1	2	10,240	20,480	20,480	40,960	40,960	81,920
2	4	20,480	40,960	40,960	81,920	81,920	163,840
3	8	30,720	61,440	61,440	122,880		
4	16	40,960	81,920	81,920	163,840	64-	64-
5	32	51,200	102,400	n/a	n/a	color	color
6 EHB	64	61,440	122,880	n/a	n/a	palette	palette
6 HAM	4096	61,440	122,880	n/a	n/a		

31.5 KHz Modes

# of bit planes	# of colors	non-interlaced			interlaced		
		extra lores	lores	productivity	extra lores	lores	productivity
1	2	9,600	19,200	38,400	19,200	38,400	76,800
2	4	19,200	38,400	76,800	38,400	76,800	153,600
3	8	28,800	57,600	n/a	57,600	115,200	n/a
4	16	38,400	76,800	n/a	76,800	153,600	n/a
5	32	48,000	n/a	n/a	96,000	n/a	n/a
palette		4096	4096	64	4096	4096	64

IFF FILE SIZES (Rules of Thumb)

When you save a picture from a paint program, the software creates a file that is smaller than the memory required to display it. The degree of compression depends on the complexity of the image.

picture density	screen size and number of colors				
	320x200	320x200	640x400	640x400	320x200
empty	6.0%	5.9%	3.4%	2.8%	5.2%
line drawing	20%	15%	30%	20%	20%
painting	55%	60%	--	55%	65%
dense painting	85%	85%	--	85%	95%
digitized	80%	90%	--	80%	90%

This data is empirical. Any image can easily be 10% larger or smaller than the table indicates. Simple pictures will be smaller, complex pictures larger. To calculate the disk space needed, look up the memory size for the picture in the "SCREEN MEMORY REQUIRED" table, and multiply it by the corresponding compression factor. Example: A 320x200, greyscale, digitized picture with 16 shades of grey requires 32,000 bytes of chip RAM to display. When saved to disk, the file should 80% of 32,000, or 25,600 bytes (on average). Since an Amiga disk can store 857,904 bytes, you can store about 33 of these pictures on a single disk.

A very simple rule of thumb is: The better a digitized picture looks, the more space it occupies. Note also that in cases where a picture is very finely detailed, it is possible for its IFF file to be larger than the memory needed to display it.



OVERSCAN DISPLAY SIZES

Amiga DOS 1.3 NTSC Overscan

	non-interlace		interlace	
	lores	hires	lores	hires
standard screen	320x200	640x200	320x400	640x400
Aegis medium	352x220	704x220	352x440	704x440
Aegis severe	384x240	768x240	384x480	768x480
Deluxe Paint III	352x240	704x240	352x480	704x480
Art Department	368x240	736x240	368x480	736x480
New Tek #1	352x240	704x240	352x480	704x480
New Tek #2	384x240	768x240	384x480	768x480

Amiga DOS 1.3 PAL Overscan

	non-interlace		interlace	
	lores	hires	lores	hires
standard screen	320x256	640x256	320x512	640x512
Aegis medium	352x276	704x276	352x552	704x552
Aegis severe	384x300	768x300	384x600	768x600
Deluxe Paint III	352x290	704x290	352x580	704x580
Art Department	368x296	736x296	368x592	736x592

Amiga DOS 2.0 Standard Overscan

Text	All displayed data appears within visible area.
Standard	Border begins just beyond monitor edge. Most efficient borderless overscan.
Video	Bleeds past monitor edges enough that borders will never show on videotape.
Max	Maximum possible overscan. Reflects hardware limitations.

Applications written for 2.0 should allow you to specify the type of overscan you want, rather than making you wonder about exact pixel counts. Standard overscan sizes may change with future upgrades in software or hardware.

PAINT PROGRAM PAGE SIZES

Program	minimum	maximum
Deluxe Paint III	320x200	*
Deluxe Paint II	320x200	1008x1024
Photon Paint 2	320x200	352x480
Digi-Paint 3	32x20**	1024x1024
Deluxe Photo Lab	320x150	33072x32938***
Express Paint	320x200	limited by memory

* Depends on version. 3.01 can create pages up to 1008x1008, and sometimes edit larger files. 3.14 is limited by chip RAM, and has no discernible fixed limits.

** Yes, the page can really be this small.

*** Images this size won't fit in memory, but width or height may be specified up to the limits listed. (i.e., you can create a very tall or very wide picture.)

With 9 MB of RAM, maximum possible square page is about 8000x8000 in two colors.

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Please send comments to: VIDIA, P.O. Box 1180, Manhattan Beach, CA 90266.

First edition May 1990. Second edition November 1990.



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Color Palettes

word size (bits)	# bits each R,G,B	total number of colors	# of shades of grey	notes
3	1	2 ³ = 8	2	IBM CGA graphics
6	2	2 ⁶ = 64	4	IBM EGA graphics
9	3	2 ⁹ = 512	8	
12	4	2 ¹² = 4096	16	Amiga color system
15	5	2 ¹⁵ = 32,768	32	apparent range of Amiga color system with dithering; color range of Targa 16
18	6	2 ¹⁸ = 262,144	64	IBM VGA graphics; color system used on consumer still video cameras; limit of human color perception in most images
21	7	2 ²¹ = 2,097,152	128	color range of Commodore PVA; internal resolution of Digi-View
24	8	2 ²⁴ = 16,777,216	256	Sometimes referred to as "true color." Video Toaster, Turbo Silver, SGI IRIS, Targa 24 & 32, Mac II, Sharp color scanners

Screen and Pixel Sizes

The following data apply to Commodore 15.75 KHz monitors, including models 1080, 1084, 2002, 1084S, and 1084SD.

Visible screen size:

13.0 inches (diagonally)
10.6 inches (width at center)
7.7 inches (height at center)

Non-overscan active screen size:

10.3 inches (width at center)
7.3 inches (height at center)

Pixel density:

62 pixels/inch horizontally (640-width)
31 pixels/inch horizontally (320-width)
55 pixels/inch vertically (NTSC 400-ht)
27 pixels/inch vertically (NTSC 200-ht)
70 pixels/inch vertically (PAL 512-height)
35 pixels/inch vertically (PAL 256-height)

Aspect Ratios

screen format	pixel size ratio (h:v)	correction factor*
320 x 200	0.887:1	1.127
320 x 400	1.774:1	0.564
640 x 200	0.435:1	2.296
640 x 400	0.887:1	1.127

* multiply by horizontal size in pixels

Red-Green-Blue Color Values

COLOR	R	G	B
white	15	15	15
red	15	0	0
brick red	13	0	0
brown	12	8	0
tan	13	12	9
pink	15	10	12
flesh tone	15	12	10
suntan	12	9	6
orange	15	9	0
lemon yellow	15	15	0
lime green	11	15	0
green	0	15	0
forest green	0	11	1
blue green	0	11	11
aqua	0	13	11
sky blue	6	15	14
blue	0	0	15
bright blue	6	1	15
purple	9	1	15
violet	12	1	15
magenta	15	1	15
light gray	12	12	12
medium gray	7	7	7
dark gray	4	4	4
black	0	0	0

Special Characters

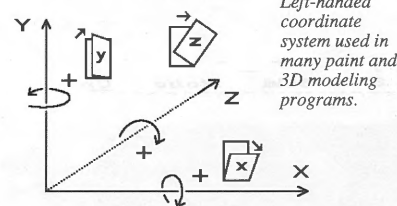
alt-a	æ	alt-4	€
alt-b	°	alt-8	•
alt-c	ç	alt-9	«
alt-e	©	alt-0	»
alt-i	ï	alt-A	Æ
alt-l	£	alt-B	°
alt-o	ø	alt-C	Ç
alt-p	¶	alt-E	©
alt-q	à	alt-L	£
alt-r	®	alt-M	¿
alt-s	ß	alt-N	-
alt-v	ª	alt-O	∅
alt-w	°	alt-P	¶
alt-y	□	alt-Q	Å
		alt-R	®
		alt-S	§
		alt-V	ˆ
		alt-W	˙
		alt-Y	ÿ
		alt-Z	˘

Animation Frame Rates

film (U.S.)	24 frames/sec
film (Europe)	25 frames/sec
NTSC video	59.94 frames/sec *
PAL video	50 frames/sec **
"flicker"	15 frames/sec ***

* NTSC is interlaced. The full-field frame rate is 29.97/second.
** PAL is interlaced. The full-field frame rate is 25/second, the same rate as European film.
*** Minimum flickerless frame rate.

X-Y-Z Rotations



Left-handed coordinate system used in many paint and 3D modeling programs.

Pixel Shapes

15.75 KHz	320	640	1280
200/256	■	■	■
400/512	■	■	■

"Traditional" modes, plus superhires.

31.5 KHz	160	320	640
480	■	■	■
960	■	■	■

New "VGA" modes on the A3000.

Hires Screen Ruler

24-Bit Graphics Hardware

Frame Buffers

FrameBuffer	Mimetics	746x484
Firecracker 24*	Impulse	512x482, 1024x482, 384x482, and 768x482
Video Toaster	New Tek	35ns horiz. resolution
VideoMaster 32*	P.P. & S.	800x600, 1024x512

Digital Video Effects (DVE)

Video Toaster	New Tek	switcher, genlock, framegrabber, DVE, framebuffer
Video Blender*	P.P. & S.	switcher, genlock

RGB Signal Interpreters

These devices connect to the 23-pin RGB output port, so they are compatible with all Amigas. RGB analog output from a hires screen is interpreted and used as data. The hires image (640-width) is converted into a lores picture (320-width) with an expanded palette.

HAM-E	Black Belt Systems	RGB out
REGISTER mode:	256 colors; palette of 16.7 million; 320x200, 320x400.	HAM-E mode: similar to HAM; 2 control bits, 6 color bits; 262,000 colors simultaneously; 320x200, 320x400.
DCTV*	Digital Creations	NTSC out
Colorburst*	M.A.S.T.	RGB out

* Check with manufacturer for availability.

Specialized Graphics Modes

Dynamic Hires A new color palette is created at the start of each scan line. Each line uses its own set of 16 colors, allowing more colors in the hires image. The cost is extreme processor overhead, meaning that other tasks will be stopped while the image is displayed.

Dynamic HAM Like dynamic hires, a new palette is created at the start of each scan line. Each line still uses HAM mode, but the 16 register set can be different on each line, reducing HAM fringing. Again, other tasks will stop during display of the image.

A2024 Modes

# of bit planes	# of colors	NTSC 1008x800	PAL 1008x1024
1	2	100,800	129,024
2	4	201,600	258,048
palette		16 grey	16 grey

Hold-and-Modify (HAM)

HAM is essentially a trick for getting 12 bits of color into a picture which only uses 6 bitplanes. HAM pictures require half the display memory and storage space of a 12-bitplane image. Each pixel in the picture is represented by six bits:

5	4	3	2	1	0
control				color	

Every HAM picture has a basic palette of 16 colors, just like a hires picture. If the two control bits are set to 0, then the four color bits form a number from 0 to 15 which selects a color from the basic palette.

If the control bits are anything else, then the color of the pixel is the same as its neighbor to the left, except that one of its components, Red, Green, or Blue, gets changed. The new value of the component is given by the color bits. If the control bits are 01, then Blue is changed; 10, Red is changed; and 11, Green is changed.

Extra-Halfbright

Uses 6 bitplanes. 5 planes are used to select colors from a palette of 32 colors. The last bitplane indicates whether a pixel should be the palette color, or a color which has RGB components half that of the palette color. 64 total colors are available: 32 bright, and 32 half-bright.