


Apple Graphics

Special Effects

by Mark Pelczarski and David Lubar

penguin 
software

Special Effects

for the Apple II
by Mark Pelczarski
and David Lubar



**penguin
software**

830 4th Avenue
Geneva, IL 60134
(312) 232-1984

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We hope you find many hours of enjoyment and use in this package.

Sincerely,

A handwritten signature in blue ink that reads "Mark W. Pelczarski". The signature is written in a cursive, flowing style.

President, Penguin Software

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Special Effects

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This software has been thoroughly tested prior to release. If you should have any problem with it, try to duplicate the situation leading to the problem. If it recurs, let us know the exact circumstances and we will act to correct the situation. Those who return their registration cards will be notified of updates, if any.

I. Introduction

Special Effects is a collection of graphics utilities that helps you design intricate high resolution displays on the Apple, and interface these displays with your own programs. The painting module included lets you use any of up to 96 different size and shape "brushes" and any of 108 blended colors to create screen pictures with incredibly intricate shading. This style of color usage opens an entire new avenue of computer artistry with the Apple, forsaking the old "fill in between the lines" approach. Control of the brushes can be with paddles or joystick, with a tablet version available separately.

The painting module also includes a magnifying mode that lets you scale your pictures by factors of 2 or 4. The enlarged pictures can then be edited point-by-point for fine detail work. Magnified by 2, you can still clearly see what the picture looks like; magnified by 4, you can clearly see every point, and how the color patterns are created.

Also included with **Special Effects** is a packing module that lets you take a standard hi-res screen image and store it in less space on disk or in RAM. The amount of space saved depends on the actual picture, but it usually ranges between 30 and 70 percent. This allows you to fit anywhere from 15 to 50 pictures on one disk, and with the stringing utility included, 4 to 11 in RAM at the same time (on a 48K machine). An unpacking routine is included that allows your own programs to unpack pictures that are stored in packed format.

The other major module included is one with a variety of picture "tricks". It allows you to create mirror images of your pictures, turn them upside down, move part of a picture to a different part of the screen, move part of one picture over to any part of another, reverse colors in five different ways, do upward and downward picture scrolling, and add a spiraling effect to picture transfers in your own programs. All of these routines are portable, and this manual explains how they may also be used in your programming.

Lastly, an extra program has been added for those who own our **Complete Graphics System**. A font converter is included that will change the format of other common Apple fonts (those from Apple Computer, on the **DOS Toolkit**, and those from various Synergistic Software and A.P.P.L.E. products), to the format used with the **Complete Graphics System's** character generator. Also in this module is a quick converter that will move pictures from page one to page two and back, saving a step for those using our graphics software packages in conjunction with others that use different naming conventions or the opposite hi-res page.

Special Effects can be used by itself, or together with **The Complete Graphics System II**. It operates as a stand-alone package, yet its functions are designed to be compatible with those in our other graphics software packages.

If you own both **The Complete Graphics System II** and **Special Effects**, you may request a single disk version containing both programs running from the same menu. This will further simplify movement among the utilities and provide you with the most powerful graphics editor in existence for the Apple. To order this combination disk, return both master disks along with \$5.00.

If you call with questions regarding this program, be prepared to provide the registration number which is stamped on the inside front cover of this manual. This is the same number which is encoded on your master disk. Be sure to return your registration card so we have your name on file as owning our software and we can also send you information about updates and special offers.

Backup Copies

All of the machine language routines in this package are accessible for use in your programs. The entire disk may be copied with any standard copy program. We recommend that you use a backup of the master disk as your working master.

Saving Your Files

Any files you create must be saved on an initialized disk, not the master disk or its backup. To initialize a blank disk, turn on your computer with the DOS 3.3 System Master in the drive. When the "J" appears, type "NEW", press Return, insert your blank disk, type "INIT HELLO", and press Return. After you receive the Applesoft "J" prompt again, your data disk is ready.

II. Getting Started

After you've booted the master diskette, the main options page, or menu, will appear. Put in your backup copy now if you've made one. The choices will be (B) brush module (for painting), (T) tricks module, (P) packing module, (V) viewstring program, (F) font and picture converter, (C) color bars, (I) issue disk command, and (Q) quit.

Each of the major modules will be described in detail in this manual. It is a good idea to choose the color bars option first, however, to check the adjustments on your video display. This will label each of the six primary high-resolution Apple colors. Some very early Apples have only four colors, and some televisions may change the orange and blue, but most systems should match the labeling.

Choice 'M' from the menu allows you to modify the disk access routines. You are asked to specify information about the location of your master and data disks. If you are using a single drive system, you should type 'D1' for each. If you are using multiple drives, or a hard disk system, you may choose to use S for slot, D for drive, or V for volume. With two disk drives on one controller card (the most common two disk setup), use 'D1' and 'D2' for your master and data disks. If your drives are in more than one slot (two controller cards), use 'S6' and 'S5', for example. If you have a hard disk system, depending on the type you may also use specifications like 'V14' or 'D23'. If you are unsure, contact your dealer.

The 'I' option allows you to give disk commands such as CATALOG or DELETE without leaving the **Special Effects** system. If at any point you forget a file name or run out of room on a disk, you can return to the menu and issue the appropriate disk command.

After any error message generated by the graphics system, pressing any key should return you to the appropriate options.

We recommend that you try all of the following modules and options on the computer as you read about them. Visual manipulation will help you learn to use this package much better than reading alone.

III. The Painting Module

When you enter the paint module, you are automatically in a brush mode with the brush up, and color white (number 0; see the appendix for a color listing). The text window at the bottom of the page will look like figure 1. The letters on the top row are your options, the second row tells whether the brush is up or down, the third row tells you the current color, and the bottom row displays the x,y coordinates of the brush.

```
C B P 2 4 L S X ESC J M  
BRUSH UP  
COLOR : 0  
X:105 Y:93
```

Figure 1 - Painting Options

Brush Control

The paddles or joystick control movement of the cursor. If the joystick is orientated wrong, type 'J' (for joystick) to reverse the orientation. Button 0 sets the brush down. Button 1 lifts the brush.

Color Selection

To change colors, type 'C', then the number of the color you want (0-107), and press RETURN.

If you'd like to check colors before selection, type 'P' for palette. This will display the entire color palette. The color numbers can be found by checking the row and column in which they appear. For more information, check appendix A.

Brush Selection

To change brushes, press 'B'. Page 2 will display the available brushes. Move the paddles or joystick so that the brush you want is flashing, then press button 0 to select.

If you have the **Complete Graphics System**, you can redefine the brush set with the character editor (in the text module). The brushes are actually a character set named 'BRUSH.FNT'. (The '.FNT' suffix is handled automatically.) All changes should be made on backup copies of your **Special Effects** disk, not the master copy.

Loading and Saving Pictures

To save a picture, press 'S' from the options. The program will ask for a name. The name you give will have '.PIC' automatically appended when it is saved on disk.

To load a previously saved picture (from another module or the **Complete Graphics System**), type 'L', then the name you gave the picture when saving it. The '.PIC' suffix is again handled automatically by the program.

Clearing the Screen

To clear the screen, type 'X'. After verifying (by typing 'Y', for 'yes'), the picture that was on the screen will be erased. To back out, press any key other than 'Y' when asked to verify.

Full Screen

To clear the text from the bottom of the screen so you can use that area for graphics, press the ESC key. The graphics area behind the text is always there, even if the text overlays it. Pressing the ESC key again returns the text (although the graphics still hide behind).

Magnifying Modes

Pressing '2' or '4' magnifies the area around the cursor two or four times, respectively. The magnification shows each point and the specific color patterns used within the picture. All patterns use the basic Apple colors of green, violet, orange, blue, and black. Green and violet together give white, as do blue and orange. These combinations are shown as white in the magnified modes.

The paddles or joystick control movement of a single flashing point. Pressing button 0 will set the point under the cursor, and button 1 will make that point black. Depending on the column, a point can either be blue or violet (even columns), or green or orange (odd columns). Every change you make to a magnified picture will also affect the normal size picture.

Any byte, which is displayed as a horizontal set of seven points, can contain (1) black, green, and violet, or (2) black, orange, and blue, but no mixture between the groups. Changing any dot within the set of seven will flip the others into the color group that matches the new point. A toggle switches between the two color groups. When you enter the magnify mode, any point you turn on will come from color group 2 (and that entire byte will switch over to group 2 colors). Press 'R' to reverse the toggle to group 1. Subsequent points will be set in group 1 colors. Pressing 'R' again brings you back to group 2.

From either magnified mode, pressing 'N' returns you to the normal picture. You may also press '2' or '4' from either magnified mode. Those choices will re-enter a magnified mode with the center at the cursor position. Therefore, from a magnification of 2, you can switch directly to a magnification of 4 and back. You can also move the magnified section by changing its center.

Returning to the Menu

When you want to return to the main options page from the painting module, type 'M', for menu.

IV. The Graphics Tricks Module

On entering the tricks module, the choices will be (F) flip, (C) color, (M) move, (T) transfer, (ESC) full screen switch, (Space Bar) page switch, and (0) options. Most commands in the tricks module are 2-letter commands, with these choices the first of the two letters (for example, 'FR' flips the right side of the picture). The choices for the second letter are displayed after the first is chosen. From any of the sub-menus in this module, 'X' returns you to these choices.

Basic Options

By pressing '0', you get to the load, save, and menu options. 'L' then allows you to load a picture to page 1 or page 2, 'S' lets you save the picture displayed on page 1, and 'M' returns you to the main **Special Effects** menu. '.PIC' is handled automatically as a picture name suffix when saving and loading. The ESC and SP functions (full screen and page switches) also work from this sub-menu. 'X' returns you to the first options without performing an operation.

Page 1 is always the page that is shown with text on the bottom. Text is never shown over page 2.

Picture Flips

The following choices give various mirror images and reverses with the picture on page one:

- A) All, flips the entire picture left/right across the screen
- L) Does a mirror image of the left side onto the right.
- R) Does a mirror image of the right side over the left.
- T) Mirrors the top of the screen onto the bottom.
- B) Mirrors the bottom onto the top.
- U) Turns the picture upside down.

ESC toggles between full screen and mixed text, and 'X' cancels the flip. After the flip is performed, you are returned to the original options. Color is preserved in all of these flips.

Color Tricks

32 different color changes to page one are possible with the following color swaps, plus two special mirror images can be done.

- A) Mirror image of the entire picture with no color compensation. Orange and blue are swapped, as are green and violet.
- L) Mirror image of the left side onto the right, with no color compensation.
- R) Mirror image of the right side over the left, with no color compensation.
- 1) Change the color group for every byte. Green and orange are swapped, as are blue and violet.
- 2) Change color group and alignment, swapping black and white, orange and violet, and blue and green.
- 3, 4) More complex changes, interchanging black and white with variations of the other four colors.

'X' returns you to the original options without a color change, and ESC works as a full screen switch. Every color change, except 'R' and 'L', is reversible by selecting the same change a second time. After the change is made, you are returned to the main options.

Moving Parts of Pictures

You can take any rectangular portion of a picture and move it to any portion of the picture on page 1. The source may be either page 1 or page 2. This way you can move part of a picture onto itself (page 1 to page 1), or part of one picture onto another (page 2 to page 1). Similar transfers can be made to the picture on page 2.

After selecting 'M', for move, you will be asked whether you want to move from page 1 or 2. Type '1' or '2' for your source. Next, choose the destination page in the same way. In most cases your destination should be page 1, since that is the one that can be readily saved. You will then be asked to specify the upper left corner of the section to be moved. Set the crosshair to the desired spot with the paddles or joystick, and press button 0. To preserve color on movement, the x-coordinate is limited to seven-dot boundaries. The following command keys will be active:

N) No, back up to last step, in this case the options page.

ESC) Full screen switch.

Space Bar) Page switch.

J) Joystick toggle, changes x,y orientation.

The available commands will always be shown on the text portion of page 1, so use the ESC and Space keys if you're not sure of what they are.

After selecting the upper left corner, move the crosshair to the lower right corner and press button 1. 'N', ESC, and the Space Bar commands are active.

After the two corners have been chosen, the remaining two will be shown automatically, and you'll be asked to verify the source. 'Y' means 'yes, it's okay', and 'N' means 'no, back up a step'. The ESC and Space Bar commands are also active.

Now select the upper left corner of the destination. the x-coordinate is limited to 14-dot boundaries so that the color patterns can be matched to the source section. 'N', ESC, and Space Bar are active. Use button 0 to select, after which the four corners of the destination will automatically be shown. Verify the destination the same way you verified the source.

The last step is to choose whether to scroll the new section upward or downward into place. In most cases this will make no difference. If the source and destination are both on the same page and overlap each other, some differences may occur. For best results, however, avoid any overlap.

Transferring Pictures Between pages

The last option is 'T', which allows you to move an entire picture from page 1 to page 2, or vice versa. The routine used to move a picture from page 2 to page 1 is the spiral routine described in the programmers' section of this manual.

V. The Packing Module

The packing module takes any picture stored in standard format (as a binary save of the page 1 memory area), and packs it into a table by looking for patterns, such as several adjacent bytes of the same color. The amount of space saved depends on the picture. A normal picture takes 34 sectors on a disk; we've had line drawings pack to as little as 7 sectors, and very detailed drawings with a lot of color change throughout pack to 33 sectors. The majority of the color pictures we've tried have packed to somewhere between 15 and 25 sectors.

The packing module can take standard pictures and store them in packed format, take packed pictures and store them in standard format, or take packed pictures and store several together in one string of pictures. This "stringing" approach allows further compression on disk, and also allows several packed pictures to be loaded at one time into RAM.

Standard format pictures are stored on disk with the suffix '.PIC'. Packed pictures will be stored with the suffix '.PAK'. Strings are given the suffix '.STR'. These are all handled automatically by the graphics software. When you specify names, only give the name portion.

All other modules (except Viewstring) will only use standard format pictures. If you want to edit a packed picture, you must first convert it back to standard format with this module.

Your choices in the packing module are to (P) pack a picture, (U) unpack a picture, (S) create a string of packed pictures, or (M) return to the main menu. At most points in the module you can also type 'C' to catalog the current disk.

Packing a Picture

To pack a picture, type 'P', and then the name of the picture you want packed. The picture will be loaded, and after a couple of seconds you will be asked for the packed name (for saving). In most cases, you'll want to use the same name for the standard and packed versions, since the program automatically makes them distinguishable by adding '.PIC' or '.PAK'. If you want the packed picture on a different disk, put in the other disk before naming your packed picture.

Unpacking a Picture

Unpacking a picture involves the same steps as packing one. After typing 'U', give the name of the packed picture, then, when prompted, give the name for the standard formatted picture.

Creating a String

To create a string of packed pictures, first all the pictures you want to use must be stored on disk in packed format. Then type 'S' from the options, and you will be asked for the name of each picture in succession. The number of pictures that will fit in a string depends on how well each packed, but you can expect to fit 3 to 10. When a packed picture is loaded and there is not enough room for it in the string, you will be told 'OUT OF ROOM' and asked for a name for the string. You can also end the string by pressing RETURN when asked for the picture name.

Strings are stored in RAM starting at address 16384, or hex \$4000, and continue up to HIMEM. Do not use graphics page 2 together with a picture string in your own programs.

VI. The Viewstring Module

Viewstring is a short BASIC program that allows you to look at the pictures stored in a picture string created with the packing module. It loads the machine language unpacking routine, then lets you load a stored string file from disk. Pressing 'M' during the program will return you to the main menu, and the ESC key acts as a full screen switch.

When asked for the string name, give the name without the suffix; '.STR' is added automatically. After the file is loaded, typing the number of the picture in the string displays that picture (e.g. '3' for the third picture in the string). Typing 'S' when a picture is displayed allows you to save the picture back into standard format.

This program can be loaded and run from any disk. Lines 10, 30, 55, and 60 are the key lines in the program for displaying a picture from a string, and can be used as an example for using in your own programs. A\$ is the string name, and N holds the number of the picture to be displayed. For more information, see Chapter VIII.

VII. The Conversion Module

This module allows you to take a picture that was saved from page 2 and move it over to page 1 format on disk, or vice versa, and to rename pictures to and from our '.PIC' convention. This is a handy utility to use if you are using our graphics software with graphics software from various other publishers who use different conventions.

If you own the **Complete Graphics System**, this module also lets you convert character sets from other software products to use with the **Complete Graphic System's** character generator. Particularly, you can convert the small character sets that come with Apple Computer's **DOS Toolkit** and the large fonts that are included with Synergistic Software products. By converting them to use with the **Complete Graphics System** you eliminate the restriction of printing the characters only at specified rows and columns; you can print them at any point on the hi-res screen in any of the graphics system colors.

Throughout the convert module, typing 'C' will usually give you a catalog of the current disk. When you first enter the module, your choices are (F) fonts, (P) pictures, or (M) return to menu.

Picture Converter

To change picture page and name formats, type 'P' from the options. Next specify whether you want to convert a picture from another format to Penguin Software format, or from Penguin Software format to another.

If you chose to convert to another format, you will be asked whether it should be changed to a page 1 picture or a page 2 picture. Pictures converted to P.S. format automatically go to page 1.

The next step is to give the name of the picture to be loaded. If it is from another format, you must give the full name. If it's from P.S. format, omit the '.PIC' suffix, which is added automatically.

The last step is to give a name for saving the picture. Again, if it's to be saved in another format, give the full name. If it's to be saved in P.S. format, the program adds the '.PIC'.

Font Converter

To convert a character set, first specify whether the character set is a small set (Apple text size) or a large set (double width and height). Give the complete name of the file to be converted, then after a short wait (for the small sets), or a slightly longer wait (for the large sets), give a name for saving the converted font. '.FNT' is added automatically when saving.

VIII. Programmers' Notes

This section tells you how to use pictures and some of the subroutines from **Special Effects** in your own programs. It is not necessary to be familiar with this section for normal use of **Special Effects**. Specific line numbers are not critical in any of the sample programs.

Using Pictures - Standard Format

Using a picture stored in standard format is fairly easy from your own programs. Here's a short sample program that will do it:

```
10 HGR : D$ = CHR$(4)
20 PRINT D$; "BLOAD name.PIC"
30 POKE -16302,0
```

Line 10 sets the hi-res mode, and sets D\$ for disk commands. Line 20 loads the picture from disk. Line 30 is optional; it removes the bottom 4 lines of text from the screen.

To get back to normal text mode, use the TEXT command in your program.

If you have a program with large arrays, the following command will prevent most memory conflicts:

```
5 LOMEM: 16384
```

Using Pictures - Packed Format

To use the unpacking routine in your programs, you must add a few extra commands. The following sample loads and displays a packed picture:

```
10 HGR : D$ = CHR$(4)
20 PRINT D$; "BLOAD RUNPACK"
30 PRINT D$; "BLOAD name.PAK"
40 CALL 8048
```

Line 20 loads the machine language unpacker, line 30 loads the packed picture file, and line 40 unpacks the picture onto page 1. 'POKE -16302,0' can be added to display the full graphics screen. Lines 30 and 40 can be repeated with other picture file names.

To put the unpacking routine on your disk, do the following:

- 1) Insert the **Special Effects** disk and type 'BLOAD RUNPACK'.
- 2) Insert your disk and type 'BSAVE RUNPACK,A8048, L144'.

The machine language unpacking routine is relocatable, so advanced users can load it anywhere in memory and execute the routine by placing a call to its first location. As is, it fits just under page 1 of graphics, and it is 144 bytes long.

Using Pictures - String Format

This is the most tricky way to load pictures into your own programs, but it also has the advantage of allowing several to reside in RAM at a time. The program is similar to the last, with a few new statements again:

```
10 HGR : D$ = CHR$(4)
20 PRINT D$; "BLOAD RUNPACK"
30 PRINT D$; "BLOAD name.STR"
40 VTAB 21:INPUT N
50 M = (N-1)*2
60 POKE 8050, PEEK(16386 + M)
70 POKE 8058, PEEK(16386 + M)
80 POKE 8049, PEEK(16385 + M)
90 POKE 8054, PEEK(16385 + M) + 1
100 CALL 8048
110 GOTO 40
```

Line 40 allows you to select the picture number, and line 110 loops back to let you choose another. These two lines will most likely be changed for your various applications. Lines 50-100 select and display the chosen picture. N is the number of the picture in the string that will be displayed. The minimum value for N is 1, and the maximum (the number of pictures in the string) can be found with a PEEK(16384) after loading the string.

USING THE MACHINE LANGUAGE SUBROUTINES

The tricks module has three sets of machine language routines, which can all fit together above page 2 of graphics (hex address \$6000, decimal 24576). The scroll routines start at 24576, and handle picture and partial picture scrolling. The flip and color routines start at location 25344, and handle mirror images and color swaps. The spiral routine starts at 27648 and spirals the page 2 picture onto page 1.

The Scroll Routine

To use the scroll routine, you must do the following (examples are given as parts of a program, although the line numbers are not important):

```
10D$ = CHR$(4):PRINT D$;"BLOAD SCROLLML"
```

Load the picture(s) you want onto the hi-res page(s). If you have to load a picture onto page 2, use:

```
20 PRINT D$;"BLOAD name.PIC,A$4000"
```

Set the following values (the actual variable names are unimportant):

XL - left edge of the source (value can be 0-39, the actual screen coordinate corresponds to 7 times the value you use).

XR - right edge of the source (0-39).

YT - top edge of the source (0-191, actual screen coordinate value).

YB - bottom edge of the source (0-191).

XD - left edge of the destination (0-39).

YD - top edge of the destination (0-191).

SP - source page code: 0 for page 1, 32 for page 2.

DP - destination page code: 0 or 32.

For a partial scroll, use the following commands:

POKE 250,YT

POKE 251,YB

POKE 252,YD

POKE 253,XL

POKE 254,XR

POKE 255,XD

POKE 6,SP

POKE 7,DP

Then to scroll upward, use:

CALL 24702

To scroll downward, use:

CALL 24594

If you want to do a complete scroll, use only the last two POKEs in the list (the x and y coordinates do not matter), and use the following CALLs:

Full scroll upward: CALL 24684

Full scroll downward: CALL 24576

With the partial scrolls, color is guaranteed to be preserved if XL and XD are both even or both odd. An even/odd mixture may switch some colors.

To put the scroll routine on your own disk, use the following:

- 1) Put in the **Special Effects** disk and type 'BLOAD SCROLLML'.
- 2) Put in your disk and type 'BSAVE SCROLLML,A24576,L656'.

Flip and Color Routines

To use the flip routines, all you do is load a picture into page 1 and call the appropriate function. To use the color routine, you need 2 POKEs and a CALL.

Put the machine language portion on your disk with the following commands:

- 1) Put in the **Special Effects** disk and type 'BLOAD TML2'.
- 2) Put in your disk and type 'BSAVE TML2,A25344,L2223'.

The following CALLs perform the various flips:

CALL 25344 - mirror image entire picture without color compensation.

CALL 25600 - mirror left onto right without color compensation.

CALL 25856 - mirror right onto left without color compensation.

CALL 26112 - mirror all with color compensation.

CALL 26368 - mirror left onto right with color compensation.

CALL 26624 - mirror right onto left with color compensation.

CALL 26880 - turn picture upside down.

CALL 27462 - mirror bottom onto top.

CALL 27470 - mirror top onto bottom.

To perform the color flips, use the following commands:

POKE 27136, even mask

POKE 27137, odd mask

CALL 27138

The numbers we used for the masks are as follows:

| COLOR FLIP | EVEN | ODD |
|------------|------|-----|
| 1 | 128 | 128 |
| 2 | 255 | 255 |
| 3 | 85 | 42 |
| 4 | 42 | 85 |

These combinations were chosen because of the bit patterns they produce when written in binary. Any number from 0 to 255 can be used as a mask, producing some interesting results, but the above produce consistent changes.

The Spiral Routine

Not significantly used in the Special Effects programs (it is used in the tricks module for transferring pictures) the spiral routine can be used to add some variety to picture moves in your own programs. It takes the picture on page 2 and spirals it outward onto page 1. To put the routine on your disk, use the following:

- 1) Insert the **Special Effects** disk and type 'BLOAD SPIRAL2'.
- 2) Insert your disk and type 'BSAVE SPIRAL2,A27648,L672'.

To use it in your program, load the routine, load a picture into page 2, and use 'CALL 27648'. To control the speed of the spiral, use 'POKE 27802, speed', where speed is a value from 1 to 255, with 1 the fastest.

Here's an example:

```
10 HGR : POKE-16302,0: D$ = CHR$(4)
20 PRINT D$;"BLOAD SPIRAL2"
30 PRINT D$;"BLOAD name.PIC,A$4000"
40 POKE 27802,10
50 CALL 27648
```

Appendix A - Colors

An important note is that there are three color groups on the palette, each of which does not mix well horizontally with the other two, due to Apple's color organization on the screen. The groups will not affect one another if placed vertically next to each other on the screen; only horizontal mixing may cause problems. We recommend that if you use more than one color group, you set up your screen in horizontal zones, so that group B is using the top third of the screen, group A the middle third, and group C the bottom, for example.

You'll notice 3 whites on the palette. Each is actually different internally, and each marks the beginning of a color group. Several other colors appear in at least two of the groups, allowing you to give the appearance of a color crossing a zone vertically, while in fact you are using different constructions of the same color. Color group A consists of colors 0 through 51, color group B contains colors 52 through 76, plus standard Apple colors 4-7, and color group C has colors 77 through 107, along with Apple colors 0-3.

If you want to use the fill routine in a picture created with the 3-D Module, you can reverse the background with the 'X' command, which changes white to black and black to white.

Appendix B - Reference Guide

From the Main Menu

- B - Brush Module
- T - Tricks Module
- P - Packing Module
- V - Viewstring Module
- F - Font and Picture Converter
- C - Color Bars
- I - Issue Disk Command
- M - Modify Disk Access
- Q - Quit

Common Options

- ESC - full page switch
- Space Bar - page flip

Painting Module

- C - Color (0-107)
- B - Brush (paddles and button 0 to select)
- P - Palette
 - Space Bar returns to drawing
- 2 - 2X magnification
- 4 - 4X magnification
 - R - color bank reverse in magnify
 - Button 0 sets points
 - Button 1 blanks points
 - N - normal picture
- L - Load Picture
- S - Save Picture
- X - Clear Screen
- J - Joystick Toggle
- M - Main Menu

Tricks Module

- F - Picture Flip
 - A - mirror all left/right
 - L - mirror left onto right
 - R - mirror right onto left
 - T - mirror top onto bottom
 - B - mirror bottom onto top
 - U - upside down
 - X - no operation

- C - Color Flip
 - A - mirror all, no color comp.
 - L - mirror left, no color comp.
 - R - mirror right, no color comp.
 - 1,2,3,4 - color changes
 - X - no operation
- M - Move Part of Picture; steps:
 - Choose source page
 - Choose destination page
 - Choose top/left of source
 - Choose bottom/right of source
 - Verify source
 - Choose top/left of destination
 - Verify destination
 - Up or down
 - Y - Yes, verifies
 - N - No, back up a step
 - Button 0 - selects top/left
 - Button 1 - selects bottom/right
 - J - joystick toggle
- T - Transfer Picture between Pages
- O - Option Selection
 - L - Load picture
 - S - Save picture
 - X - No operation
 - M - Return to main menu

Packing Module

- C - Catalog
- P - Pack Picture
- U - Unpack Picture
- S - Create a String
 - RETURN for name terminates
- M - Return to menu

Viewstring

- Load String
- Number displays picture
- S - Save in standard format
- M - Return to menu

Converter

- C - Catalog
- F - Convert a Font
- P - Convert a Picture
- M - Return to menu

Special Effects includes:

- A new brush mode that lets you "paint" with various size brushes in any of 108 colors, allowing unbelievably intricate shading, and taking Apple graphics out of the "coloring book" era.
- A magnifying option that lets you magnify your pictures by factors of 2 or 4, giving you direct access to point-by-point editing.
- Picture packing routines that reduce screen image storage by 30 to 70%, allowing 4 to 10 pictures in RAM, and 16 to 50 on one disk.
- Extra tricks that allow color reverses, picture flips, mirror images, and partial picture movement onto the same or opposite screen.
- As always, documentation that lets you incorporate our routines into your programs.

*Bonus for **Complete Graphics System** owners: a font converter is included that lets you use other popular fonts with the CGS character generator.

Great as a stand-alone package, or to complement **The Complete Graphics System**. Requires 48K, Applesoft, and paddles or joystick.