⊛ TAXAN

80-COLUMN & RGB CARD MANUAL
FOR THE APPLE IIe

Notice

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TAXAN 80-COLUMN & RGB CARD FOR THE APPLE IIe

Radio and Television Interference

The equipment described in this manual generates radio-frequency energy. If it is not installed properly it may cause interference with radio and television reception. The RGB or NTSC monitor you purchase must comply with the limits for Class B computing device in accordance with the specifications in Subpart J, Part 15, of FCC rules. These rules are designed to provide reasonable protection against such interference in a residential installation. The cable connection between the computer and the monitor must be a coaxial cable with the shield properly grounded. You can determine if your equipment is the cause of interference by turning it off. If the interference stops, it was probably caused by the computer or the monitor. To correct the problem try:

1. Turning the TV or radio antenna until the interference stops.
2. Moving the computer to one side or the other of the TV or radio.
3. Moving the computer farther away from the TV or radio.
4. Plugging the computer into an outlet that is on a different circuit breaker or fuse other than the TV or radio.
5. Installing a rooftop antenna connected to your TV and radio with a coaxial cable.
6. Narrowing down the offending piece of hardware by selectively turning them off one at a time and checking for interference.

If necessary, you should consult your computer dealer for additional suggestions. You may find the booklet "How to Identify and Resolve Radio-TV Interference Problems" prepared by the Federal Communications Commission helpful. The booklet is available from the U.S. Government Printing Office, Washington, D.C. 20402, stock number 004-000-00345-4.

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CHAPTER 1

1.1 Product Features

Taxan's 80-Column & RGB Card not only gives you 80 column text capability for word processing, but also gives you new video modes, and allows you to interface your Apple IIe to an NTSC or RGB monitor, or both.

For NTSC monitors, the video generated is found in the video output jack on the back of the Apple IIe. Taxan's 80-Column & RGB Card is 100% compatible with Apple's 80 column card when used in this configuration. For RGB monitors, the video output is found in a DB-15 connector (supplied), and is completely pin compatible with the RGB output found in Apple IIIs.

The DB-15 connector at the rear of the Apple IIe can then be connected to the monitor by using TAXAN model 410-05 cable (not included). This brings RGB signal to any Taxan RGBvision monitor. NOTE: It is important that the mode switch on the rear of the Taxan monitor be set in mode position III.

1.1.1 Apple IIe compatible video modes

Whether you are interfacing your Apple IIe to an NTSC or RGB monitor, the following standard video modes will be the same in either type. The RGB output of Taxan's 80-Column & RGB Card improves the video quality of the Apple IIe by removing the extraneous colors that occur during color transitions in LORES and in mix mode text, and allowing you to select the text color by setting the two switches on the board (see RGB monitors section of this chapter).

1. 40 column white text (text color is switch selectable for RGB monitors).
2. 80 column white text (text color is switch selectable for RGB monitors).
3. 16 color LORES with option of mixing 40 column text.
4. 16 color LORES with option of mixing 80 column text.
5. 6 color HIRES with option of mixing 40 column text.
6. 6 color HIRES with option of mixing 80 column text.

1.1.2 Software Compatability

The hardware of Taxan's 80-Column & RGB Card is designed such that when you power up your Apple IIe the above video modes are always chosen and remain in effect until you decide to change to one of the new video modes. The latter, coupled with the fact that Taxan's 80-Column & RGB Card uses the resident Apple IIe 80 column firmware, allows for complete software compatibility with all existing (Apple Writer IIe, Quick File IIe, etc.) and future Apple IIe software.

1.1.3 NTSC monitors

If your Apple IIe is a Rev A and you are interfacing to an NTSC monitor, the above video modes are the only modes attainable. If your Apple IIe is a Rev B or higher you will obtain the following new video modes:

1. 16 color 80 x 48 with option of mixing 80 column black and white text.
2. 16 color HIRES on odd columns with 16 color 40 x 24 on even columns with option of mixing 80 column black and white text.

Due to the limited resolution of color NTSC monitors, the above video modes are unsatisfactory, and are not recommended by Taxan.
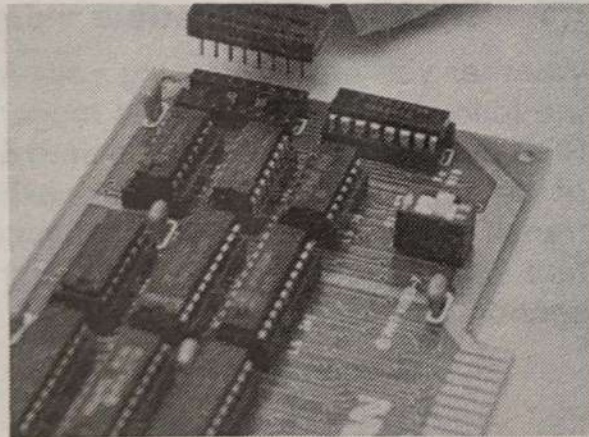
1.1.4 RGB monitors

With RGB monitors Taxan's 80-Column & RGB Card simulates monitors of different color phosphorous. Highlighting of text (inverse mode) however, is always done in white to clearly accentuate the highlighted text. If you are accustomed to doing your word processing in either green, blue, amber, or white, you may select that text color by setting the two switches on the board as follows:

green 40 or 80 column text.

blue 40 or 80 column text.

amber 40 or 80 column text.

white 40 or 80 column text.

Text will now be displayed in the color of your choice. If at any future time you decide to change the text color, be sure to power down the computer, before removing the Taxan 80-Column & RGB Card to change the switch positions.

With RGB monitors you will also obtain the following video modes (if your apple IIe is a Rev A you will not get MERES):

1. 40 column text with choice of 16 colors for foreground and 16 colors for background.
2. 16 color LORES with option of mixing 40 column foreground/ background text.
3. 16 color MERES with option of mixing 80 column text.
4. 16 color foreground/background HIRES on 40 x 24 color pixels with option of mixing 40 column foreground/background text.
5. 16 color 80 x 192 with option of mixing 80 column text.

Due to RGB monitor's inherent higher resolution, all video modes available from the Taxan's 80-Column & RGB Card yield crisp and legible displays, and are strongly recommended by Taxan not only for word processing, but for color graphic displays, or combinations thereof.

1.2 Installation

Your Taxan 80-Column & RGB Card kit should include the following items:

1. The 80 column card enclosed in its packaging material.
2. A 2-pin female molex connector.
3. This manual.

If any of the above items are missing, please contact your dealer. To install the card in your Apple IIe, carry out steps 1 through 10 listed below.

1. Fill out the warranty card at this time and be sure to mail it in to activate your warranty.
2. Remove the cover from your Apple IIe by pulling up on the rear edges until the cover snaps off.
3. Touch the power supply cover (the big gold or silver metal box to the left of the auxiliary slot) to discharge any static charge you may have accumulated on your clothes or body.
4. Make sure your Apple IIe has been powered down by checking to see that the red light at the left rear corner of the slots is off.
5. Remove the card from its package and set the text color switches to your desired color as explained under RGB monitors, earlier in this chapter.
6. IMPORTANT: ONLY IF YOUR APPLE IIe IS A **REV A** COM-PUTER REMOVE THE 2-PIN MOLEX CONNECTOR FROM THE CARD, AS SHOWN IN FIGURE 1.
7. Install the card in the auxiliary slot of the Apple IIe. Make sure that the components are to your right as you install the card, see Figure 2.
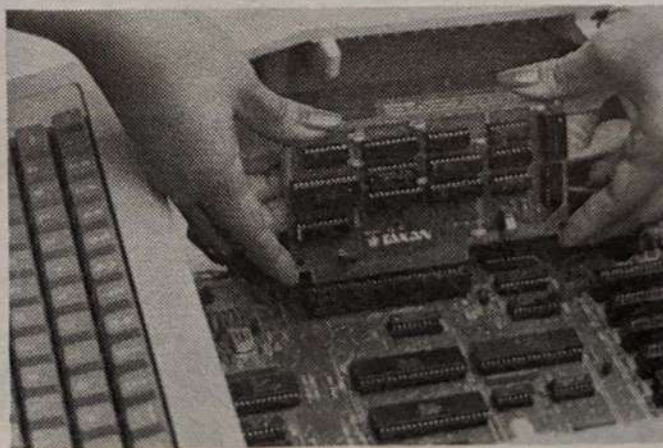
8. Attach the DB-15 connector to the back of the Apple IIe as shown in Figure 3.

9. Replace the cover of your Apple IIe by inserting the front tip of the cover and pushing down firmly on its back corners until you feel it snap into place.

10. Connect your monitor cable TAXAN 410-05 (not included) to the back of the Apple IIe on the DB-15 connector if your monitor is RGB, or to the video output jack if your monitor is an NTSC monitor. Note: If desired, both monitors may be connected.

Figure 3. Removal of the 2-pin molex for Rev A Apple IIe. The revision letter is found behind the 7 slots. Rev A computers have the number 820-0064-A while Rev B computers have the number 820-0064-B.
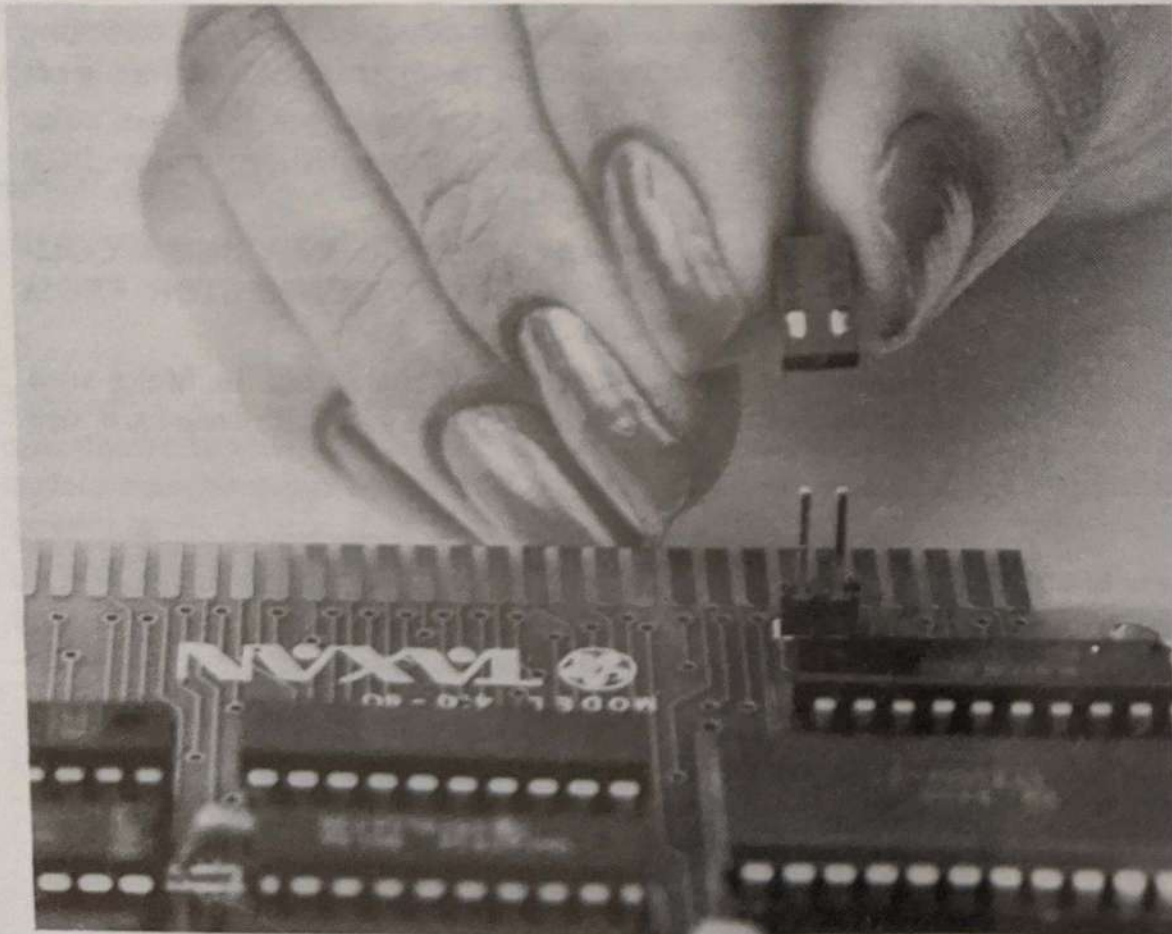
CHAPTER 2

2.1 Introduction

This chapter describes the firmware resident in the Apple IIe that supports the 80 column feature of the machine. When the 80 column firmware is inactive the cursor is a checkerboard cursor. The firmware is activated automatically by Pascal or CPM. From DOS either a PR#3 or IN#3 will activate the resident firmware. From the firmware monitor a 3-Cntl-P or 3-Cntl-K achieves the same results. When the 80 column firmware is active the cursor is a solid cursor.

Two sets of keyboard commands encompass all of the features found in the resident firmware, the Escape commands, and the Control commands as follows:

2.2 The Escape Commands

As soon as you press the ESC key, the escape mode firmware is activated and the cursor changes to a "+" sign. Any subsequent key closure other than I, J, K, M or the left, right, up, and down arrow keys will deactivate the escape mode.

Esc-@	Clears the video display and moves the cursor to its HOME position.
Esc-A	Moves the cursor up one line.
Esc-B	Moves the cursor right one space.
Esc-C	Moves the cursor left one space.
Esc-D	Moves the cursor down one line.
Esc-E	Clears from cursor to the end of line.
Esc-F	Clears from cursor to end of screen.
Esc-I	Moves the cursor up one line.
Esc-J	Moves the cursor left one space.
Esc-K	Moves the cursor right one space.
Esc-M	Moves the cursor down one line.
Esc-R	Activates the uppercase-restrict mode. That is, independent from the setting of the caps lock or shift key it forces all text entered to uppercase, except from within parenthesis, where the text entered is dependent on the caps lock or shift key.
Esc-T	Deactivates the uppercase-restrict mode.
Esc-4	Switches from an 40 column display to an 80 column Switches from an 80 column display to a 40 column display without deactivating the 80 column firmware.
Esc-8	Switches from a 40 column display to an 80 column display only if the 80 column firmware was active.
Esc-Cntl-Q	Deactivates the 80 column firmware.

NOTES:

1. Esc-A signifies pressing the escape key **followed** by the A key.
2. Esc-Cntl-Q signifies pressing the escape key followed by the control key **and** Q keys pressed simultaneously.
3. Further cursor control may be obtained through the left, right, and down arrows. The up arrow has to be activated through the Esc-up arrow sequence to obtain cursor control.
4. The 80 column firmware may also be deactivated by the Cntl-reset or Cntl-open Apple-reset sequence.

2.3 The Control Commands

The ASCII decimal code is in parenthesis.

Cntl-G (7) Generates a 1000Hz tone for 0.1 second.
Cntl-H (8) Moves cursor one space to the left.
Cntl-J (10) Moves cursor one line down.
Cntl-K (11) Clears from cursor to end of screen.
Cntl-L (12) Homes cursor and clears screen.
Cntl-M (13) Moves cursor to left most end of next line.
Cntl-S (19) Stops sending characters to the display until another key is pressed.
Cntl-V (22) Scrolls the display down one line, leaving cursor in current position.
Cntl-Y (25) Homes cursor but does not clear screen.
Cntl-Z (26) Clears the cursor line.
Cntl- (28) Moves cursor one space to the right.
Cntl-] (29) Clears from cursor to end of line.

NOTES:

1. Cntl-G signifies to press both the control key **and** the G key **together.**

CHAPTER 3

3.1 The 80 column firmware and Pascal or CPM

As was mentioned in Chapter 2, both Pascal and CPM automatically sense the presence of Taxan's 80-Column & RGB Card and activate the 80 column firmware resident in the Apple IIe. In Pascal, the SETUP program should be run to make the up and down arrows funtional. Cursor positioning in Pascal is further supported by the Cntl-∧-x-y sequence which uses X=x-32 and Y=y-32 to move the cursor to a horizontal position given by X and a vertical position given by Y. For further information consult the appropriate manual for the particular operating system.

3.2 The 80 column firmware and DOS

Also mentioned in Chapter 2, the 80 column card firmware is activated in DOS by performing a PR#3. The firmware can be made to automatically activate by inserting the following Applesoft statement somewhere in your Hello program:

D$=CHR$(4): PRINT D$; "PR#3"

CHR$(4) is the ASCII decimal code for Cntl-D and informs DOS that the print statement is an operating system directive. In a similar fashion, any of the control commands listed in the following table may be used in a print statement to control the 80 column firmware. The ASCII decimal code is in parenthesis.

Cntl-N (14) Sets video output to normal ie white on black.
Cntl-O (15) Sets video output to inverse ie. black on white.
Cntl-Q (17) Sets display to 40 columns.
Cntl-R (18) Sets display to 80 columns.
Cntl-U (21) Deactivates 80 column firmware, homes cursor, and clears the screen.

NOTES:

1. Cntl-N signifies to press both the control key **and** the N key **together.**
2. These control commands work only if the 80 column firmware has been activated.
3. For RGB monitors normal text color is switch selectable to colors other than white.

As an example: boot DOS, type in, then run the following Applesoft program:

Statement	Comments
10 PRINT CHR$(4); "PR#3"	Activate 80 col firmware
20 HOME: PRINT "This is 80"	
30 PRINT CHR$(17)	Set display to 40
40 PRINT "THIS IS 40"	
50 PRINT CHR$(18)	Set display to 80
60 FOR I=0 TO 100	
70 NEXT I:GOTO 20	

3.2.1 Tabbing

The 80 column firmware is completely compatible with BASIC's VTAB command. HTAB, however, wraps around to the next line if it reaches the 41st line. The HTAB problem may be bypassed by using the poke command, as follows:

POKE 36, [y] where y is an integer number between 1 and 255 that gives the horizontal tab position with wrap around every multiple of 80.

3.2.2 Comma and Semicolon Tabbing

The 80 column firmware is completely compatible with the semicolon method of tabbing from within the BASIC print statements. However, the comma method gives unpredictable results and should not be used. The comma method problem may be bypassed by inserting the appropriate number of blanks in the print statement.

3.2.3 Altering the Screen Size

With the 80 column firmware active the horizontal width of the screen may be changed with the following BASIC command:

POKE 33, [y] where y is any integer number up to 80 that determines the width of the screen.

IMPORTANT NOTICE

The following chapters are highly technical in nature and are intended for those who have an extensive knowledge of the Apple II or Apple IIe hardware and also know 6502 machine language programming. They are not necessary for those who only want to use the card's 80 column capability or reap the benefits of the higher resolution acquired through the use of an RGB monitor with off-the-shelf programs.

CHAPTER 4

4.1 The Apple IIe Video Control

The Apple IIe hardware configures extension RAM, above and beyond the resident 64K, as a mirror image occupying the same address space. Software selectable switches bank-in the desired section of RAM. When in 40 column, all characters displayed are retrieved from resident RAM. When in 80 column all even characters are retrieved from extension RAM while the odd characters are retrieved from resident RAM. Four switches control all the different 80 column display modes, and are:

4.2 The 80 column switch

The 80 column switch doubles the horizontal resolution of the video screen. On power up and during a system reset the switch comes up reset, that is, inactive. To set the switch a microprocessor write to location $COOD (in HEX as denoted by the $ preceeding the number) must be performed. To reset the switch a microprocessor write to location $COOC must be performed. The status of the switch may be read from location $CO1F.

4.3 The 80 store and PG2 switches

The 80 store switch instructs the hardware to access video RAM by using the PG2 switch as a pointer. If PG2 is set, the extension RAM found in the Taxan 80-Column & RGB Card is selected and the resident RAM is deselected. If PG2 is reset the opposite condition is activated. The banking occurs **always** for the range $400 through $7FF, and when in HIRES it also occurs for the range $2000 through $3FFF. The switches come up inactive ie. reset, during power up and during a system reset. To set the 80 store switch, a microprocessor write to location $C001 must be performed. To reset the 80 store switch, a microprocessor write to location $C000 must be performed. The status of the 80 store switch may be read from location $C018. To set the PG2 switch, a microprocessor read or write to location $C055 must be performed. To reset the PG2 switch, a microprocessor read or write to location $C054 must be performed. The status of the PG2 switch may be read from location $C01C.

4.4 The AN3 switch

In Rev B or later, Apple IIe can generate double density graphics. Apple II compatability in the Apple IIe was achieved by always forcing graphics to be 40 columns wide, independent of the status of the 80 column switch. However, in Rev B or later computers only, the AN3 switch defeats this feature and allows the hardware to generate double density graphics. The switch comes up inactive, or set, during power up or a system-reset. To reset the switch a microprocessor read or write to location $C05E must be performed. To set the switch a microprocessor read or write to location $C05F must be performed. There is no way to read the status of the AN3 switch.

CHAPTER 5

5.1 The new RGB Video Modes

This chapter describes the new video modes generated by Taxan's 80-Column & RGB Card. These video modes are made available only for RGB, since the NTSC system does not have the color resolution required. To obtain any of the new modes the AN3 must be reset. Text mixing in the lower four lines of a graphics display will occur as follows: when in 40 columns the text mixed will be in foreground/background colors, when in 80 columns the lower four lines will be in hard switch selectable color on black background in normal video, and black on white in inverse video. The Aplle IIe software switch settings for all different video modes are given in the appendix and the Taxan's 80-Column & RGB Card text color switch settings are given in Chapter 1.

5.2 Foreground/Background Text

In this mode the extension RAM in the 80 column card is used only for color information. The most significant nibble of each byte is used to generate any one of 16 foreground colors while the least significant nibble is used for the background color.

The 40 column text video information is retrieved from page one of resident RAM, that is, from locations $400 through $7FF.

The color information is retrieved from extension RAM from location $400 through $7FF in a one-to-one correspondence with the video information.

The Apple IIe must be in text mode with the 80 column video switches in the following state:

80 column switch:	reset
80 store switch:	set
PG2 switch:	used as pointer: when set, color information is stored; when reset, video information is stored.

5.3 LORES Mixed with Foreground/Background Text

In this mode the LORES graphics mode is mixed with 40 columns of foreground/background text. The bottom four lines of text follow the rules of Section 5.2

5.4 16 Color MERES (NOT available in Rev A Apple IIe)

In this video mode the screen is divided into 80 x 40 pixels, any one of which can be 16 different colors. The extension RAM is used to generate the color pixels in even columns, while the resident RAM is used to generate the color pixels in odd columns. The video mapping is identical to that of page one LORES, that is, from $400 through $7FF. The most significant nibble of each byte contains the color information for the even

rows while the least significant nibble contains the color information for the odd rows. Text mixing in the lower four lines will be in 80 column.

The Apple IIe must be in the LORES video mode with the 80 column video switches in the following state:

80 column switch:	set
80 store switch:	set
PG2 switch:	used as pointer: when set, even horizontal pixels are accessed; when reset, the odd ones are accessed.

5.5 Foreground/Background HIRES

This video mode is identical to the text foreground/background mode, with the exception that foreground color is determined by an "on" HIRES dot instead of an "on" text dot. The extension RAM is used to generate color information and is stored in $400 through $7FF giving 40 x 24 color pixels. The color determining data is stored at $2000 through $3FFF. A "one" chooses the foreground color (high nibble in extension RAM), while a "zero" chooses the background color (low nibble in extension RAM).

In mixed mode, the text in the lower four lines will be foreground/background 40 column text.

The Apple IIe must be in HIRES with the 80 column video switches in the following state:

80 column switch:	reset
80 store switch:	set
PG2 switch:	used as pointer to store color information in extension RAM (set) or text and HIRES information in resident RAM (reset).

5.6 16 Color 80 x 192

This mode is just a different interpretation of the HIRES screen. Instead of bit mapping, the byte is interpreted as a color code. The upper nibble of each byte selects one of 16 colors for the even horizontal pixels, while the lower nibble selects one of 16 colors for the odd horizontal pixels. When in mixed mode, the four lower lines of text will be in 80 column.

The Apple IIe must be in HIRES with the 80 column video switches in the following state:

80 column switch:	set
80 store switch:	set
PG2 switch:	reset displays HIRES for $2000 through $3FFF and set displays HIRES for $4000 through $5FFF.

Appendix

Video mode software switch settings for the Taxan 80-Column & RGB Card.

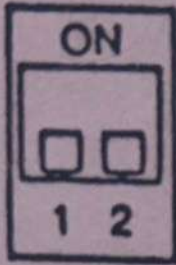| AN3	TEXT	HIRES	80COL	VIDEO MODE
1	1	X	0	1. 40 column black and white text.
1	1	X	1	2. 80 column black and white text.
1	0	0	0	3. LORES mix with 1.
1	0	0	1	4. LORES mix with 2.
1	0	1	0	5. HIRES mix with 1.
1	0	1	1	6. HIRES mix with 2.
0	1	X	0	7. Foreground/background text.
0	1	X	1	8. 80 column black and white text.
0	0	0	0	9. LORES mix with 7.
0	0	0	1	10. MERES mix with 8.
0	0	1	0	11. Foreground/background HIRES mix with 7.
0	0	1	1	12. 80 x 192 mix with 8.

NOTES:

1. X signifies a do not care state.
2. TEXT is set (1) by microprocessor read o write to location $C051, it is cleared (0) by microprocessor read or write to location $C050.
3. HIRES is set (1) by microprocessor read or write to location $C057, it is cleared (0) by microprocessor read or write to location $C056.
4. For explanation of AN3 and 80COL see Chapters 4 and 5.
5. For RGB monitors text color for normal video mode is switch selectable to colors other than white.
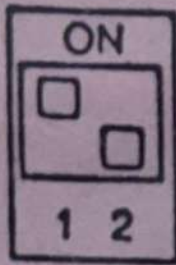
NOTICES:

Apple, Apple IIe, Apple Writer IIe, Quick File IIe, Apple DOS, Applesoft, and Apple Pascal are registered trademarks of Apple Computer, Inc.
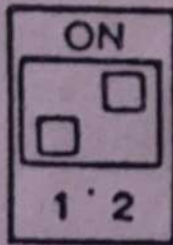
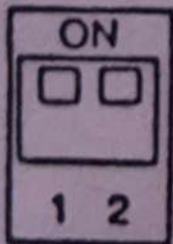CPM is a registered trademark of Digital Research, Inc.

ON □ □ (both down) 1 2	green 40 or 80 column text.
ON □ (1 up) □ (2 down) 1 2	blue 40 or 80 column text.
ON □ (2 up) □ (1 down) 1 2	amber 40 or 80 column text.
ON □ □ (both up) 1 2	white 40 or 80 column text.