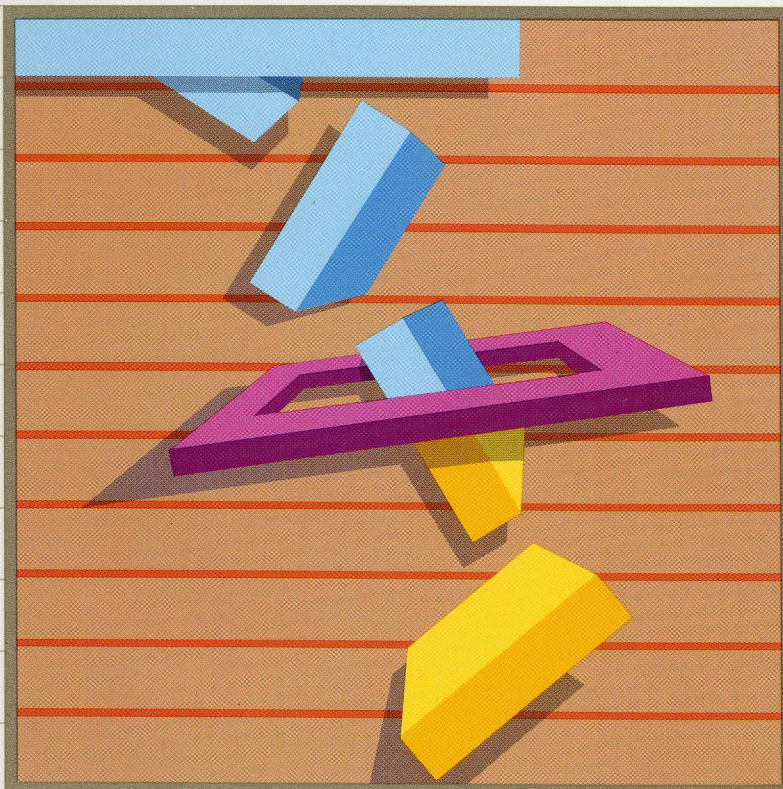


Apple IIe

Guide To The New Features



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Apple IIe

Guide To The
New Features



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A Guide to the New Features of the Apple IIe Computer

Introduction

This guide describes, as briefly and completely as possible, the new features of the Apple IIe computer. The Apple IIe is a new addition to the Apple II series of computers; in fact, it is a refined and improved Apple II Plus.

The information in this guide is divided into two sections:

- new features, grouped under five headings—keyboard, display, back panel, main logic board, and firmware
- effects of the new features on the user, and on software and hardware designed for use with the Apple II or II Plus

This guide is the first of a Product Support Series intended for Apple dealers and sales representatives. Two other guides are currently available in this series:

Apple IIe Cable and Connector Guide

Apple Product Number A2F2115

Apple IIe Design Guidelines

Apple Product Number A2F2116

The Cable and Connector Guide explains how to obtain and install connectors for attaching an Apple IIe to any Apple II peripheral device.

The Design Guidelines provide hardware, software and firmware developers with detailed recommendations for tailoring their products to Apple II Series devices and users.

This guide makes reference to four other Apple IIe manuals:

Apple IIe Owner's Manual

Apple Product Number A2L2001

Apple IIe Reference Manual

Apple Product Number A2L2005

Apple IIe 80-Column Card Manual

Apple Product Number A2L2006

Apple IIe Extended 80-Column Text Card Supplement

Apple Product Number A2L2007

For definitions of terms, refer to the glossaries of the first two manuals cited above.

Use the index to locate individual topics discussed in this guide.

New Features

The Apple IIe is an enhanced version of the Apple II Plus computer. It was designed to improve the performance and flexibility of the Apple II family of computers, while remaining compatible with virtually all software and hardware that work with the Apple II and II Plus.

The new features of the Apple IIe fall into five broad categories:

1. Enhanced keyboard, including the full ASCII character set
2. Improved video display capabilities, including both uppercase and lowercase and easy expandability to display of 80 characters per line
3. Redesigned back panel, which meets FCC requirements and provides for standardized connection of a display device, hand controls, and up to 12 other peripheral devices
4. Fewer parts on the main logic board; built-in 64K random access memory (RAM) and 16K read-only memory (ROM); new slot arrangement
5. Improved firmware, including new video handling routines and built-in self-tests

Keyboard



The Apple IIe keyboard is laid out like the most widely used electric typewriter keyboards, and now has 63 keys. Here are the new keyboard's features:

- full ASCII character set, including 96 printable characters and all 32 control characters
- lowercase as well as uppercase
- a **CAPS LOCK** key to shift letters to uppercase and leave other keys unaffected; with this key locked, the Apple IIe keyboard functions almost the same as an Apple II Plus keyboard
- auto-repeat feature on each key: holding down any key for more than a second causes the key to repeat
- new cursor-movement keys: **↑**, **↓** and **TAB**
- new **DELETED** key
- two new special-purpose keys (**⌘** and **⌘**)
- relocated **RESET** key to reduce possibility of accidental loss of data

Table 1. Characters Available on the Apple IIe Keyboard

| Group: | Characters Available: |
|-----------|---|
| Control | @ ABCDEFGHIJKLMNOPQRSTUVWXYZ[\] ^ _ |
| Special* | ! " # \$ % & ' () * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ? |
| Uppercase | @ ABCDEFGHIJKLMNOPQRSTUVWXYZ[\] ^ _ |
| Lowercase | ' a b c d e f g h i j k l m n o p q r s t u v w x y z { } ~ DEL |

* The first special character is the SPACE character.

Table 2. Characters Available on the Apple II and II Plus Keyboard

| Group: | Characters Available: |
|-----------|---|
| Control | All except CONTROL - ↵ and CONTROL - ☐ (ESCAPE key provides CONTROL - ☐) |
| Special | All of this group of characters are available |
| Uppercase | All except [\ and _ |
| Lowercase | None of this group of characters are available |

For further information about the Apple IIe keyboard and its features, consult Chapter 2 of the Owner's Manual, and Chapter 2 of the Reference Manual.

Video Display

The Apple IIe has an improved video display, including:

- the Apple II and II Plus character set, with the addition of lowercase
- an alternate character set with full uppercase and lowercase in normal and inverse fonts (but no lowercase flashing display)

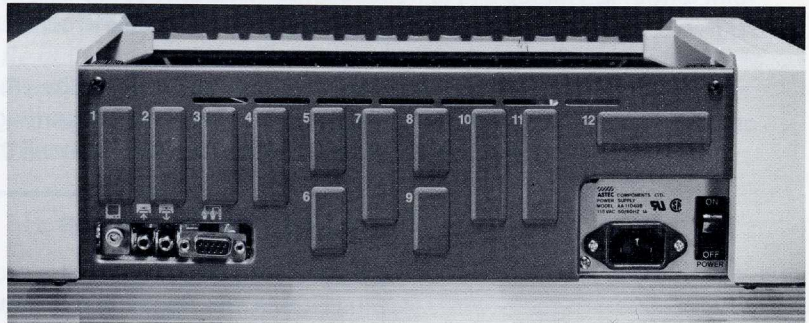
- easy, inexpensive expandability to 80-column text display using the Apple IIe 80-Column Text Card
- additional display functions available from the keyboard (using escape sequences) or from programs (using control characters)
- new software switches for controlling the video display; programs can now read them as well as write (change) them

For a description of the two character sets and how to switch between them, see Chapters 2 and 3, respectively, of the Apple IIe Reference Manual. The Apple IIe 80-Column Text Card and its escape and control characters are described in the Apple IIe 80-Column Text Card Manual and in Chapter 2 of the Reference Manual.

The Reference Manual describes the software switches in Chapter 2.

Redesigned Back Panel

Openings numbered 1 through 4 are usually reserved for attachment of disk drives. Openings 5, 8, 11 and 12 are for peripheral devices requiring 25-pin connectors. Openings 6, 7, 9 and 10 are for 9-pin connectors (and for 5-pin DIN-type connectors).



The Apple IIe has a metal back panel with 12 rectangular openings instead of the notches found on the Apple II and II Plus. This new back panel features small diagrams of the devices you can attach to each of the four built-in connectors, and specially arranged openings for disk drive cables, 9-pin and 25-pin D-type connectors.

The back panel is fully described in Chapter 1 of the Apple IIe Reference Manual. (For product numbers, refer to the first section of this guide.)

Modified Main Logic Board



The Apple IIe main logic board has several noteworthy features:

- three new custom integrated circuit chips, which make the computer easier to service, reduce power consumption and increase reliability
- built-in 64K (65,536) bytes of main memory in RAM, including the functional equivalent of the language card (formerly an extra-cost option)
- built-in 16K (16,384) bytes of firmware in read-only memory (ROM), including a set of self-tests (the Apple II and II Plus had only 12K of ROM)
- a new AUX (auxiliary) CONNECTOR slot with 60 pins, making (along with the normal 50-pin slots) virtually every useful computer signal available for use by peripheral devices; this slot is for the Apple IIe 80-Column Text Card and other special products
- an internal power-on light to remind you not to connect or disconnect anything inside the computer while the power switch is on

The Owner's Manual describes the physical features of the Apple IIe in Chapter 1. For details regarding the electrical and logical characteristics of the Apple IIe, consult the Reference Manual.

Additional Firmware

Besides the video and monitor programs resident in all Apple II and II Plus ROMs, the Apple IIe has new firmware:

- 80-column display handling routines
- built-in self-tests invocable using the  key with **CONTROL-RESET**
- a new full reset invocable from the keyboard using the  key with **CONTROL-RESET**; this provides a convenient alternative to turning the power off and on again to restart the system

The 80-column display handling routines are described in the Reference Manual; new video display firmware features and how to use them are described both in the Reference Manual and in the Apple IIe 80-Column Text Card Manual.

The Owner's Manual describes how to invoke the self-tests and the reset functions; the Reference Manual explains how they work.

Effects of New Features

This section deals with the effects that the differences between the Apple IIe and the Apple II or II Plus have on:

- the layout and use of the keyboard
- the characters available for display
- connection methods at the back panel
- connection methods inside the case
- use of self-tests and reset
- interactions of the computer with software

The following six charts discuss these effects and what to do about them. Some of these effects occur only if you have installed an Apple IIe 80-Column Card; such effects are so marked.

The first five charts correspond to the lists of features and further reading presented in the first section of this guide. For further information, refer to the manuals cited in those lists and study the Apple IIe data sheets. Technical support is also available from your Apple Regional Support Center. In the case of undocumented problems with software and hardware from a manufacturer other than Apple Computer, Inc., notify the manufacturer directly.

| Feature involved | Effect | What to Do |
|---|---|---|
| Keyboard now has 63 keys, arranged in the format most popular among touch typists. | About a dozen symbols have moved to new positions. | People used to typing on an Apple II or II Plus may have to adjust to this. Some documentation may be wrong or misleading as a result of the new character positions. |
| The caret (^), at-sign (@) and closing square bracket (]) are now on non-alphabetic keys so that all control characters work with both uppercase and lowercase keystrokes. | Many manuals specify ^ as (SHIFT)-N, @ as (SHIFT)-P, and] as (SHIFT)-M; that is, they specify the associated letter keys instead of the characters themselves. | The user must take this change into account, especially when typing control characters. For example, (CONTROL)-(SHIFT)-P is really (CONTROL)-@, wherever that appears on the keyboard involved. |
| Lowercase letters are available on the Apple IIe. | Programs written to run under DOS or in BASIC do not recognize lowercase letters (except between quotation marks). | The user must be careful to use (CAPS LOCK) or (SHIFT) when typing commands to DOS or writing BASIC programs. |
| <p>Programmer note: Apple IIe firmware supports an uppercase-restrict mode that forces uppercase except between double quotation marks. This feature is described in the Apple IIe 80-Column Text Card Manual.</p> | | |

| Feature involved | Effect | What to Do |
|---|--|---|
| Each character key has the auto-repeat feature. | There is no longer a (REPT) key. The user may inadvertently cause a repeated character. | To cause a key to repeat its character, press it and hold it down. Users should be aware of the auto-repeat feature and not let their fingers rest too long on the keys. |
| <p>Note: Pressing a second key while a key is repeating may cause the second key's character to begin appearing instead of the first.</p> | | |
| <p>Note: Holding down the (ESCAPE) key a bit too long when starting an escape sequence may actually cancel the escape sequence that the user thought was underway.</p> | | |

Feature involved**Effect****What to Do**

There are four new control keys on the Apple IIe.

Not all programs written for the Apple II recognize the three new cursor movement keys (**↑**, **↓** and **TAB**) and the new **DELETE** key.

Use the keystrokes designated in the program documentation to move the cursor up or down or to the next tab setting, or to delete characters.

The Apple IIe has an **⏏** and **⏏** key as special-purpose keys. Among other uses, these keys can be used instead of the pushbuttons of hand controls #0 and #1, respectively.

Some manufacturers make hand controls with pushbuttons that are normally closed, or that can be locked in a closed position. This can cause a **CONTROL**-**RESET** to invoke the self-tests instead of a reset.

Make sure the hand control pushbuttons are off or disconnected when you are not using them, and especially when you press **RESET** or turn on the Apple IIe power switch.

There is no longer a way to actuate **RESET** without pressing **CONTROL**. This is a software safety feature.

Pressing **RESET** alone has no effect.

Users must remember to press **CONTROL**-**RESET**.

Video Display

| Feature involved | Effect | What to Do |
|--|---|---|
| The Monitor in firmware has new code to support many new features. | Application programs that called Monitor routines at non-standard places (that is, places other than the entry points listed in the Reference Manual) may no longer work. | The user may have such software; screen functions may work differently than expected, or not at all. The user should contact the software manufacturer regarding updated versions of the product in question. |
| The 80-column firmware has to execute many more program steps than the 40-column firmware. | An 80-column text display may change more slowly during scrolling or updating. | The user should be aware of this known side effect. |
| Characters appear dimmer after switching from 40 to 80 columns. | Characters are made up of smaller dots on the screen in 80 columns than in 40 columns. | Readjust the brightness and contrast controls of the TV set or monitor if necessary. |

Programmer note: Table 4 illustrates the displayed characters for each range of codes in three display character sets: Apple II and II Plus, Apple IIe Primary, and Apple IIe Alternate. The groups of characters are those enumerated in Table 1, not in Table 2. In other words, the Apple II and II Plus can display several characters not available on their keyboards ([, _ and their control-character counterparts).

Table 4. Apple II, II Plus and IIe Displayed Character Sets

| Dec Hex | 0-31 00-1F | 32-63 20-3F | 64-95 40-5F | 96-127 60-7F | 128-159 80-9F* | 160-191 A0-BF | 192-223 C0-DF | 224-255 E0-FF |
|--------------------|-----------------------|----------------------------|-----------------------|--------------------------|----------------------|---------------------------|----------------------|---------------------------|
| II or II+ | upper-case inverse | special charac. inverse | upper-case flash | special charac. flash | upper-case normal | special charac. normal | upper-case normal | special charac. normal |
| IIe pri set | upper-case inverse | special charac. inverse | upper-case flash | special charac. flash | upper-case normal | special charac. normal | upper-case normal | lower-case normal |
| IIe alt set | upper-case inverse | special charac. inverse | upper-case inverse | lower-case inverse | upper-case normal | special charac. normal | upper-case normal | lower-case normal |

* Ordinarily, the computer does not display control characters. However, if the codes corresponding to control characters occur in the display area of memory, they are displayed as uppercase. For example, the code generated by `CONTROL-J` is displayed as J.

For a full listing of the character codes, and descriptions of normal, inverse, flashing, primary and alternate character sets, refer to Chapter 2 of the Apple IIe Reference Manual.

The differences among these character sets are:

- The IIe primary character set substitutes the lowercase group for the special character group in the range 224-255.
- The IIe alternate character set makes the additional substitution of lowercase inverse for special characters flashing in the range 96-127. (Bit 7 off is interpreted as inverse; no flashing characters are available in this character set.)

You can switch between the primary and the alternate character set from software (Table 2-10 in the Apple IIe Reference Manual).

Normally, the alternate character set is selected only when there is an Apple IIe 80-column card installed and active (turned on).

Table 5 illustrates the groups of characters and display modes available under various circumstances with the Apple II, II Plus and IIe.

Table 5. Allowable Display Modes

| Characters | II or II Plus | IIe Pri (no 80) | IIe Alt (yes 80) | IIe with Applesoft |
|----------------------------|---------------|-----------------|------------------|--------------------|
| Normal uppercase/special | Y | Y | Y | Y |
| Inverse uppercase/special | Y | Y | Y | Y |
| Flashing uppercase/special | Y | Y | N | Y |
| Normal lowercase | N | Y | Y | Y |
| Inverse lowercase | N | N | Y | N |
| Flashing lowercase | N | N | N | N |

Legend:

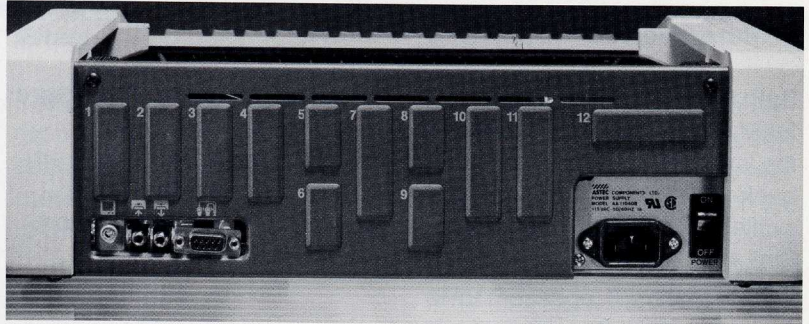
Y = yes

N = not available or displays incorrectly

yes 80 = 80-column card both installed and active, or alternate character set selected by programmer

no 80 = 80-column card either not installed or not active, or primary character set selected by programmer

Redesigned Back Panel



Feature involved

There is a built-in 9-pin connector on the back panel for hand controls.

Effect

The user may have hand controls that have a 16-pin rectangular connector on them.

What to Do

The user can feed the 16-pin connector through one of the larger openings in the back panel and connect it to the GAME I/O connector on the main logic board.



Caution

If the user does this, conformance with FCC requirements cannot be guaranteed.

Note: For details, refer to the Cable and Connector Guide.

Feature involved

It is possible to connect hand controls via the 9-pin back-panel connector or the GAME I/O connector.

Effect

Programs may not run as expected when devices are attached to both the GAME I/O connector and the 9-pin hand control connector at the same time.

What to Do

The user may use one or the other of these two connectors at any given time, but not both.

Rectangular openings replace the notches at the back of the Apple II and II Plus.

The cord and connector of a peripheral device may not fit through the back panel openings, and the cover cannot be closed tightly.

It may be necessary to purchase or fashion an adapter for the device connection.

If the peripheral card was manufactured by Apple Computer, Inc., the user may be able to connect it using one of the nut plates from the Apple IIe accessories kit.

Modified Main Logic Board

Feature involved

Both the maximum amount of RAM (64K) and the equivalent of the language card (now called bank-switched memory) are now available as standard equipment. Slot #0 is no longer present on the Apple IIe.

Effect

Those add-on cards that require installation in slot 0 or that require an extra connection on the main circuit board of an Apple II or II Plus may not work with the Apple IIe.

What to Do

Most add-on cards that work with the Apple II or II Plus also work with the Apple IIe. When in doubt, consult the manufacturer of the hardware product.



Caution

Do not plug cards intended for slot 0 into the AUX CONNECTOR slot. This may permanently damage the card or the computer.

Feature involved

The Apple IIe has new and rearranged chips inside.

Effect

Peripheral cards that had connections to chip sockets within the computer case may no longer be connectable.

What to Do

When in doubt, consult the manufacturer of the hardware product.

The new AUX CONNECTOR slot is set off from the other slots because it has a different purpose than the other slots.

Because of the AUX CONNECTOR slot's position away from the back edge of the computer case, cards designed for this slot can be inadvertently connected facing the wrong way.


Always install cards with the component side facing away from the power supply case (Owner's Manual, Chapter 1). If the cover does not close tightly, the card may have been installed incorrectly.



Caution

Install only cards that are specifically designed for this slot!

Additional Firmware

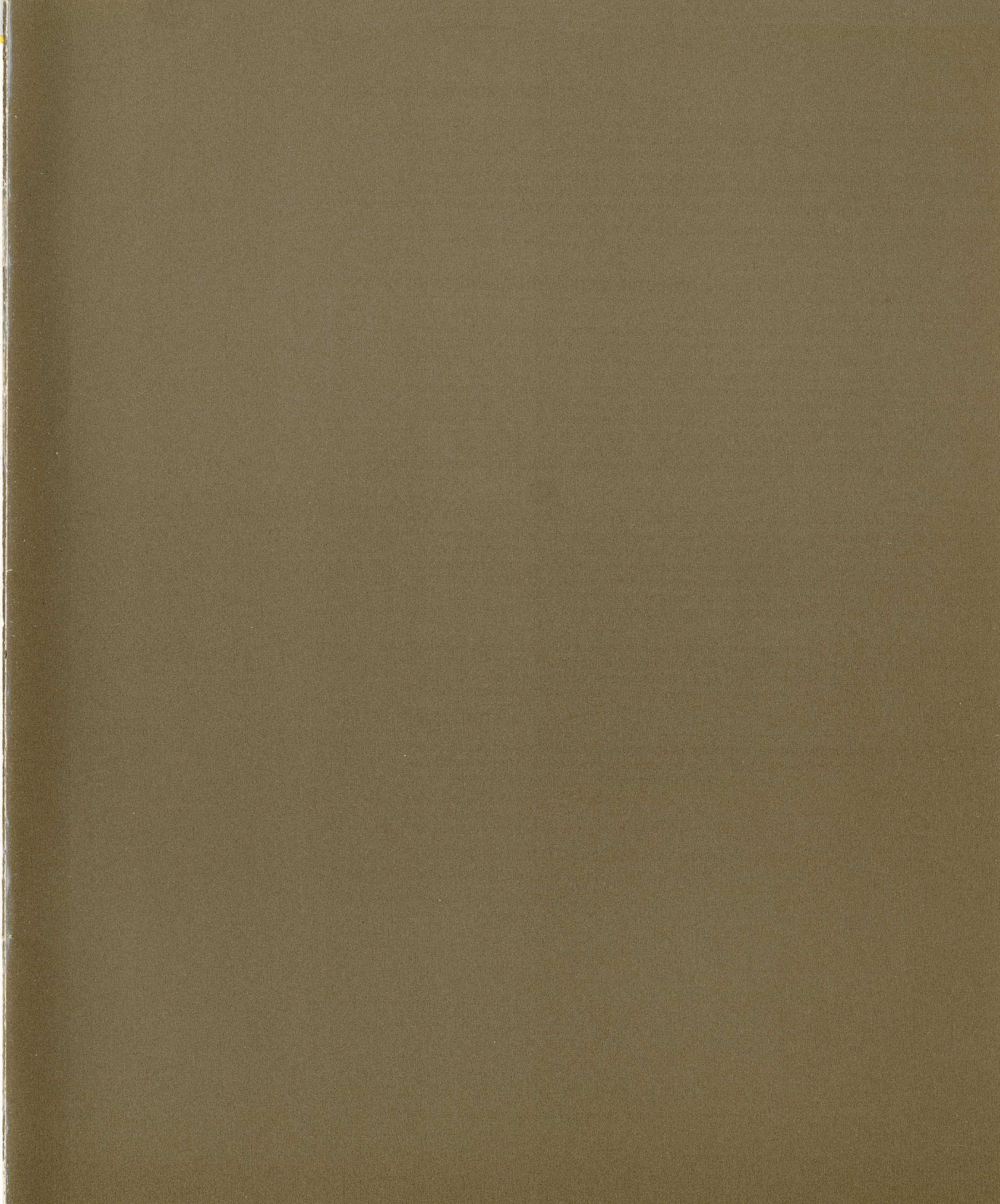
| Feature involved | Effect | What to Do |
|---|--|---|
| The Apple IIe self-tests can be run at any time. (See Owner's Manual, Chapter 8.) However, invoking them after running some other program may cause the tests to find unexpected values in main memory. | The Apple IIe self-tests may report errors (instead of displaying the KERNEL OK message) even when everything is OK. | If you see an error message on the screen after running the self-tests, turn off the computer, wait 7 seconds or more, then turn the computer on again while holding down the  key. If you still get an error message, the computer may require servicing. |
| The APPLE keys "modify" CONTROL - RESET and make it invoke other functions besides a simple reset. | Pressing or locking the #0 or #1 hand control buttons (which are connected to the APPLE keys) in their ON position may cause CONTROL - RESET to invoke the self-tests. | Make sure the hand control buttons are off or the hand controls are disconnected when turning on the power or pressing CONTROL - RESET . |

Interactions with Software

This section lists the effects that the new features of the Apple IIe may have when you use various programs with it, along with the remedies available.

| Interaction of | Effect | What to Do |
|---|--|---|
| New full-reset feature and programs that rely on CONTROL-RESET to reach a menu, start up a second disk, and so on. | CONTROL-RESET performs a full reset (that is, all 64K, including the "language card" area) rather than a partial reset (the low 48K) as the Apple II and II Plus did. | Procedures or programs that depend on the upper 16K of memory not being reset may not work; or you may have to start up such programs again to access a different menu directly. |
| 80-Column Text Card and DOS | Starting up DOS 3.3 turns off the 80-column card firmware, causing the screen to display garbage. | Turn the card back on by typing PR#3, or make sure it was off before you start up DOS. |
| Lowercase letters with DOS, Applesoft or Integer BASIC. | User constantly gets SYNTAX ERROR message. | Press the CAPS LOCK key so it clicks into its down position, so it converts all letters to uppercase; or use SHIFT key. If the Apple IIe 80-Column Text Card is installed and active, you can use "uppercase restrict mode" in BASIC or DOS; this forces uppercase except between quotation marks. |
| 80-Column Text Card and Applesoft. | Applesoft does not do "comma tabbing" beyond column 40. | This is not a problem with existing Apple II or II Plus programs written for a 40-column screen. |

Programmers: For "comma tabbing" beyond column 40, POKE location 36 with the desired location for each tab in turn.





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