Apple IIe Enhancement Kit

Run Apple //c Software On Your Apple IIe

Installation Guide

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Apple IIe Enhancement Kit
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TOC

The Apple IIe Enhancement Kit

The Apple™ IIe enhancement kit gives your Apple IIe greater compatibility with the Apple IIc and lets you run state-of-the-art software that's been designed to take advantage of your enhanced machine. Some features this new software may include are pull-down menus, Mouse-text characters, faster and smoother-looking graphics, and the ability to use the computer to work on one document while the printer is printing another.

The enhancement kit involves replacing four integrated circuit chips in your Apple IIe with these more powerful chips:

- A character generator ROM, which makes it possible for your enhanced IIe to run software that uses Mouse-text characters and pull-down menus.
- Two new monitor ROMs, which allow your enhanced IIe to run software that incorporates features such as faster scrolling and smoother looking graphics.
- A 65C02 microprocessor, which replaces the 6502 microprocessor and gives your IIe the ability to run most Apple //c software.

The IIe enhancement by itself does not automatically give you Mouse-text characters, pull-down menus, and speed. You'll get the full benefit of your enhanced IIe when you use software that takes advantage of these enhanced features.

Flexibility and Convenience

The IIe enhancement gives you more flexibility and convenience in several ways:

- If you write programs, you don't have to buy an assembler. You can write small machine-language programs with the new Mini-Assembler.
- You can type Applesoft™ BASIC and ProDOS™ programs and commands in uppercase or lowercase. This means that if you forget to press CAPS LOCK, you won't get `'SYNTAX ERROR'` message. Also, Applesoft™ now works in 80-column mode.
- The IIe enhancement also offers several programming benefits. For details about these benefits and about the Mini-Assembler, see About Your Enhanced Apple IIe: Programmer's Guide.

System Hardware Changes

The enhanced Apple IIe changes the following:

- The 65C02 microprocessor, which is a new version of the 6502 uses less power
- Has 27 new **opcodes**, and runs at the same speed as the 6502.
- The identification byte at $FBC0 has been changed. In the original Apple IIe it was $EA (decimal 234), in the enhanced Apple IIe it is $E0 (decimal 224).
- Interrupt handler support in the enhanced Apple IIe firmware now handles any Apple IIe memory configuration.

Opcode is short for operation code and is used to describe the basic instructions performed by the central processing unit of a computer.

Enhanced Speed

Your enhanced Apple IIe has the potential to run software a lot faster, so it can give you faster scrolling, smoother-looking graphics, and quicker mouse response. With the IIe enhancement and software that takes advantage of it, your Apple doesn't have to spend time checking each device every few moments to see if it needs attention. Instead, devices can now ask for the attention of the computer directly. Software that takes advantage of this ability to *"interrupt"* the computer can run up to 30% faster on an enhanced IIe than it would on a IIe that has not been enhanced.

The enhanced IIe's ability to handle interruptions also allows you to perform some time-dependent functions that were difficult or impossible to do before. For instance, with the enhanced IIe and appropriate software you could print one document while you're working on another — because your enhanced IIe can format pieces of one document and send them to the printer during the spare bits of time when you're editing the other.

Startup Drives

You can use startup (boot) devices other than a Disk II to start up **ProDOS** on the enhanced Apple IIe. When you turn on your enhanced Apple IIe, it searches for a disk drive controller to start up from, beginning with slot 7 and working down toward slot 1. As soon as a disk controller card is found, the Apple enhanced IIe will try to load and execute the operating system found on the disk. If the drive is not a Disk II, then the operating system of the startup volume must be either ProDOS or Apple II Pascal (v1.3 or later). If it is a Disk II, then the startup volume may be any Apple II operating system.

ProDOS is the operating system for the Apple IIe that allows you to use both drives for flexible disks and mass storage devices (such as the ProFile disk drive).

Video Enhancements

The enhanced Apple IIe has improved 80-column firmware:

- The enhanced Apple IIe now supports lowercase input.
- ESC CONTROL E passes most control characters to the screen.
- ESC CONTROL D traps most control characters before they get to the screen.
- ESC R removed because uppercase characters are no longer required by Applesoft.

Both 80-column Pascal and 80-column mode Applesoft output are faster than before and scrolling is smoother. 40-column Pascal performance is unchanged. In the original Apple IIe, characters echoed to COUT1 during 80-column operation were printed in every other column; the enhanced Apple IIe firmware now prints the characters in each column.

Applesoft Lowercase Support

Applesoft now lets you do all your programming in lowercase. When you list your programs, all Applesoft keywords and variable names automatically are in uppercase characters; literal strings and the contents of DATA and REM statements are unchanged.

Applesoft 80-Column Support

The following Applesoft routines now work in 80-column mode:

- HTAB
- TAB
- SPC
- Comma tabbing in PRINT statements.

Improved System Monitor

Enhancements to the Apple IIe's built-in Monitor include the following:

- Lowercase input
- ASCII input mode
- Monitor Search command
- The Mini-Assembler

Software Enhancements

With the IIe enhancement you can run, easy-to-use software that was developed originally for the Apple IIc — and IIe upgrades of old favorites as well. This means that you have access to a larger volume of software, and software that has a more consistent, intuitive interface.

Most IIe software will run just the same on an enhanced IIe as it does on a IIe without the enhancement. However, in a few cases software will behave differently. That's why it's a good idea to check all of your existing software right after you install the IIe enhancement kit. That way, if you have a piece of software that doesn't work properly, you'll know - and avoid the confusion of trying to track the problem later on.

Of the few programs that are affected by the IIe enhancement, most are only superficially affected: in some programs, highlighted uppercase characters are displayed as Mouse-text characters instead. Here's why: the original character generator ROM had two identical sets of highlighted uppercase characters.

The enhanced character generator ROM has only one set of highlighted uppercase characters, and replaces the other set with Mouse-text characters (the characters shown in Table 1). Hence, programs that used the other set of highlighted uppercase characters now display Mouse-text characters in their place.

Apple II Pascal

Apple II Pascal' v1.2 and later can now use a ProFile hard disk through the Pascal ProFile Manager. The Pascal 1.1 firmware no longer supports the control character that switches from 80-column to 40-column operation. This control character is no longer supported because it can put Pascal in a condition where the exact memory configuration is not known. Apple II Pascal versions 1.3 and later may start up from slots 4, 5, or 6 on a Disk II, ProFile, or other Apple II disk drive. Apple II Pascal versions 1.0 through 1.2 must start up from a Disk II in slot 6. DOS 3.3 may be started from a Disk II in any slot.

Note: Apple reserved parts of the old ROM chips for future uses — such as these Apple IIe enhancements.

Mouse-text Characters

The new character generator ROM not only generates all of the characters that you're used to seeing on your Apple IIe display, it also gives you Mouse-text characters that make learning intuitive and fun.

When you use software that takes advantage of this feature, you'll see that many of the keystrokes, commands, and concepts that used to be represented on the display in words are now represented in pictures.

Note: With the Enhanced IIe and appropriate software, instead of seeing 'OPEN-APPLE' on the screen you will the Open Apple character .

To see how Mouse-text characters can simplify the display and make it easier to read, compare Figure 1 (unenhanced IIe display) with Figure 2 (the same display with many of the words replaced by Mouse-text characters). The Mouse-text characters included in the enhanced IIe and the more familiar alphanumeric characters they correspond to are shown in Table 1.

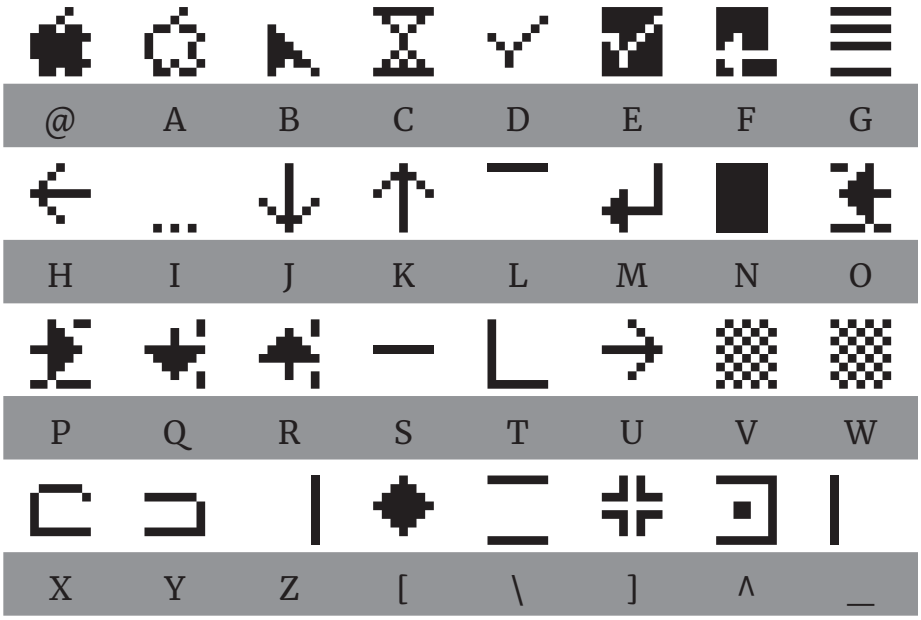


Table 1. Alternate Mouse-text chart

Note: Some of the Mouse-text characters form a picture only when used side by side. For instance, the Mouse-text characters associated with the letters X and Y form the image of a file folder.

With an 80-column text expansion card installed you can display the Mouse-text characters set by starting up ProDOS™ and then running the **BASIC** program listing showing in Table 2.

```
10 D$ = CHR$ (4): REM CONTROL-D
20 PRINT: PRINT D$; "PR#3" : REM TURN ON
   80-COLUMN CARD
30 INVERSE
40 PRINT CHR$ (27);
   "@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_";:
   REM PRINT ALTERNATE CHARACTER SET
50 PRINT CHR$ (24);: REM TURN OFF THE
   ALTERNATE CHARACTER SET
60 NORMAL : REM TURN OFF INVERSE
```

Table 2. Basic Program Mouse-text Characters

Apple IIe Owner's Manual: To find out how to run a BASIC program, see the chapter on programming.

Pull-down Menus and Windows

With the IIe enhancement you can also run software that uses pull-down menus and windows. Your IIe can give you these features because some of the new Mouse-text characters are line-drawing characters - characters that are specifically used to create crisp-looking corners and rectangular images.

The appeal of pull-down menus and windows is more than just cosmetic: they allow you to use a program without knowing its commands or the structure of its menus. Instead of memorizing commands and typing them, you can look at a menu and see what's available, then select what you want by pointing to it with the cursor.

To see an example of how **Pull-down Menus** and **Windows** can save you time and frustration, compare Figures 1 and 2.

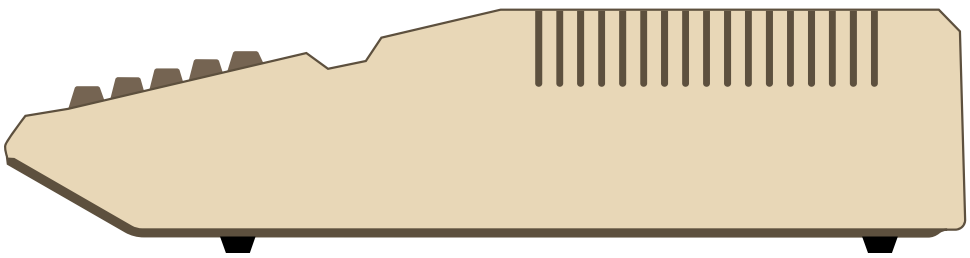


Figure 1 shows a typical way of saving a file: by typing the command (/S) followed by the name of the file and the number of the disk drive to save it to. You must memorize the command, the drive number abbreviation, and the syntax to put it all together.

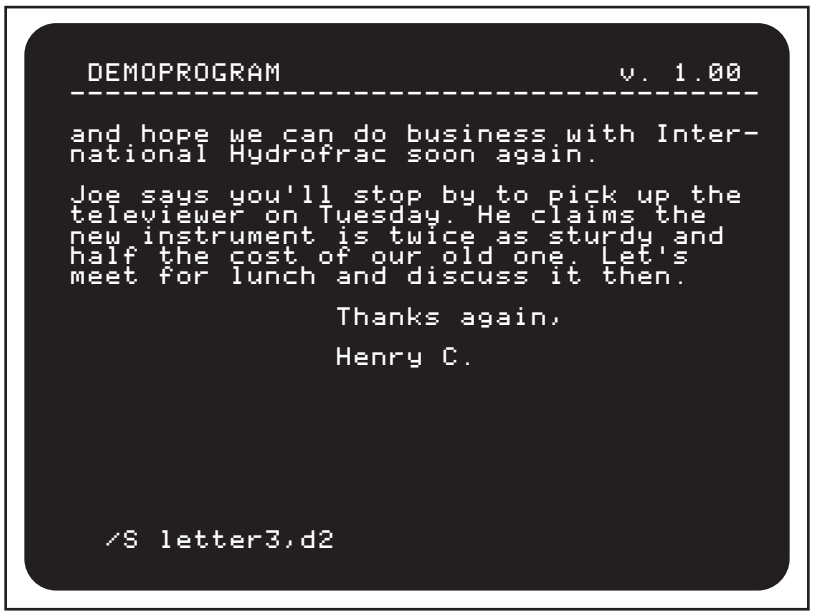


Figure 1. Typing a command

Figure 2 shows how to do the same thing using software that has pull-down menus and windows. You just point the cursor at the menu you want and pull it down to see the commands that are contained in it, then select the command you want with the cursor.

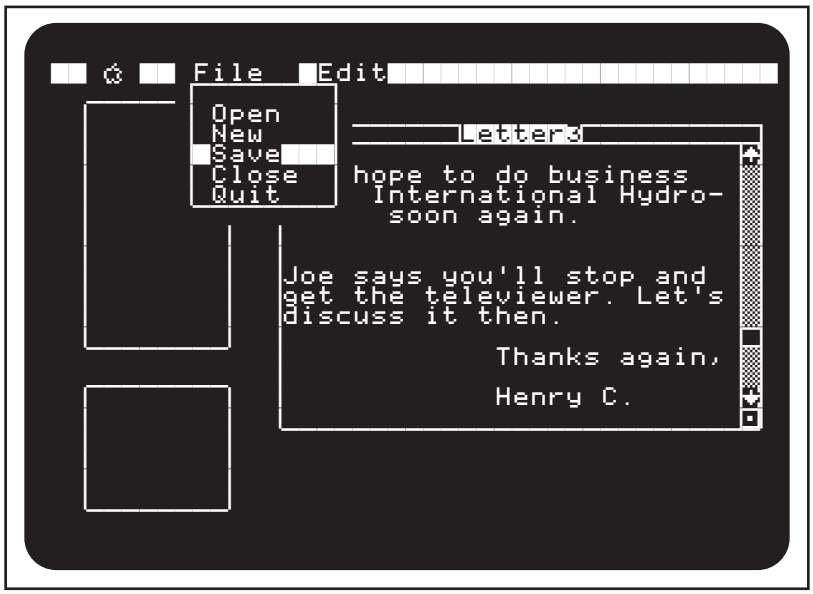


Figure 2. IIe Selecting a command from a Pull-down Menu

The unenhanced IIe displays the familiar alphanumeric characters and is without the ability to show Mouse-text characters as seen in Figure 3. Once the IIe enhancement kit has been installed the more advanced display as seen in Figure 4.

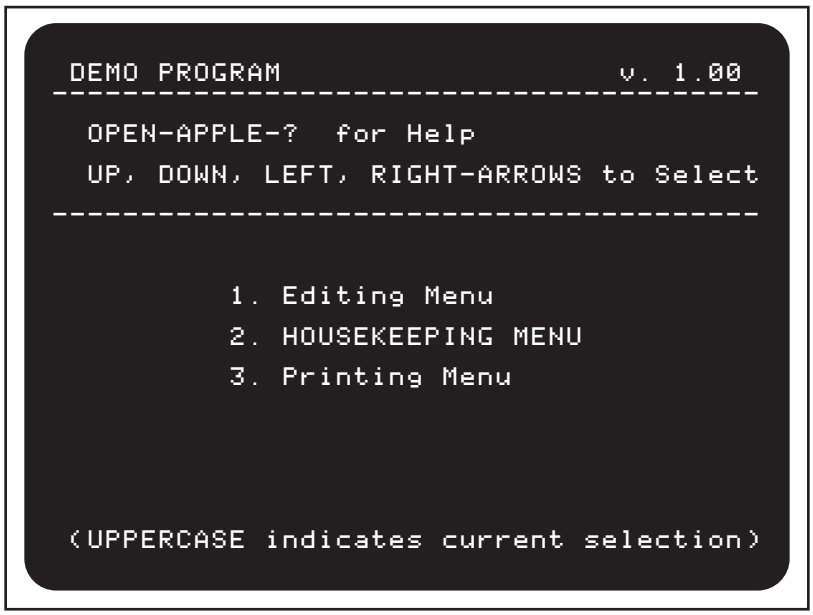


Figure 3. Typical display without the IIe enhancement

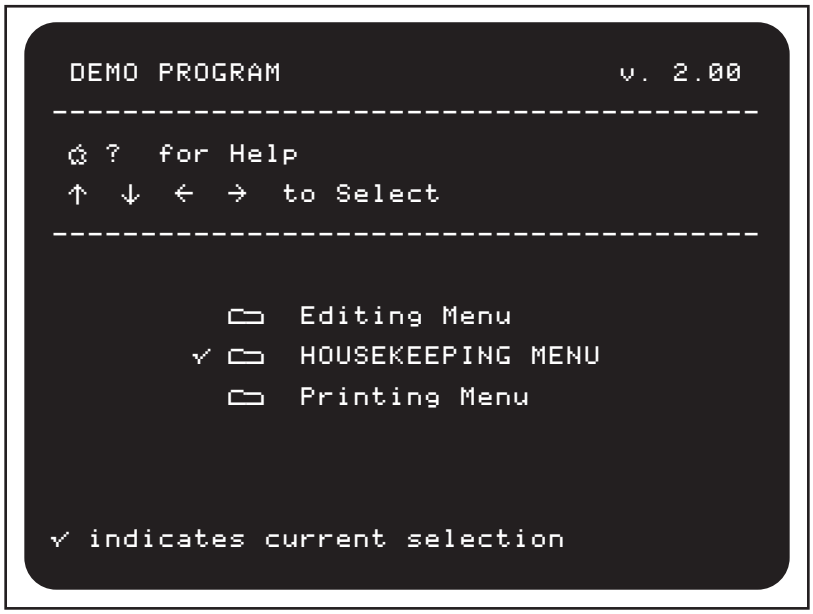


Figure 4. IIe Enhancement (//c) capable software

Enhancement Kit Installation

To upgrade your Apple IIe, you will be replacing four integrated circuit chips currently installed on the mainboard with four new chips from the Apple IIe Enhancement Kit as shown in Table 3.

Upgrade items:

Qty.	Part No#	Description
1	342-0304	Chip: Monitor ROM (CD)
1	342-0303	Chip: Monitor ROM (EF)
1	342-0273	Chip: Character ROM
1	338-6503	Chip: 65C02 Microprocessor
1	Z030-1191	Enhancement Keyboard Sticker

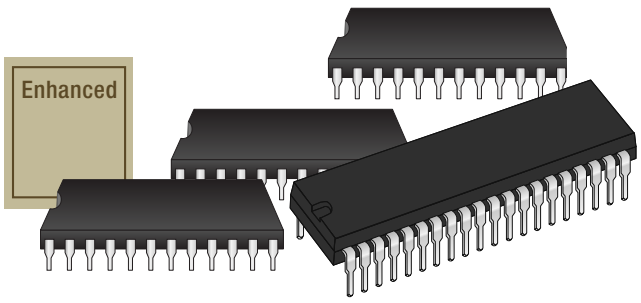
Table 3. Apple IIe Enhancement Kit

Figure 5 shows the main logic board (motherboard) locations of the chips to be replaced on a U.S. (NTSC) main logic board; Figure 6 shows the same things on a European (PAL) main logic board.

Opening Display

Before installing the Enhancement kit, your Apple IIe will display the following at the top of the monitor screen when powered on:

While your newly upgraded enhanced Apple IIe will display the following:



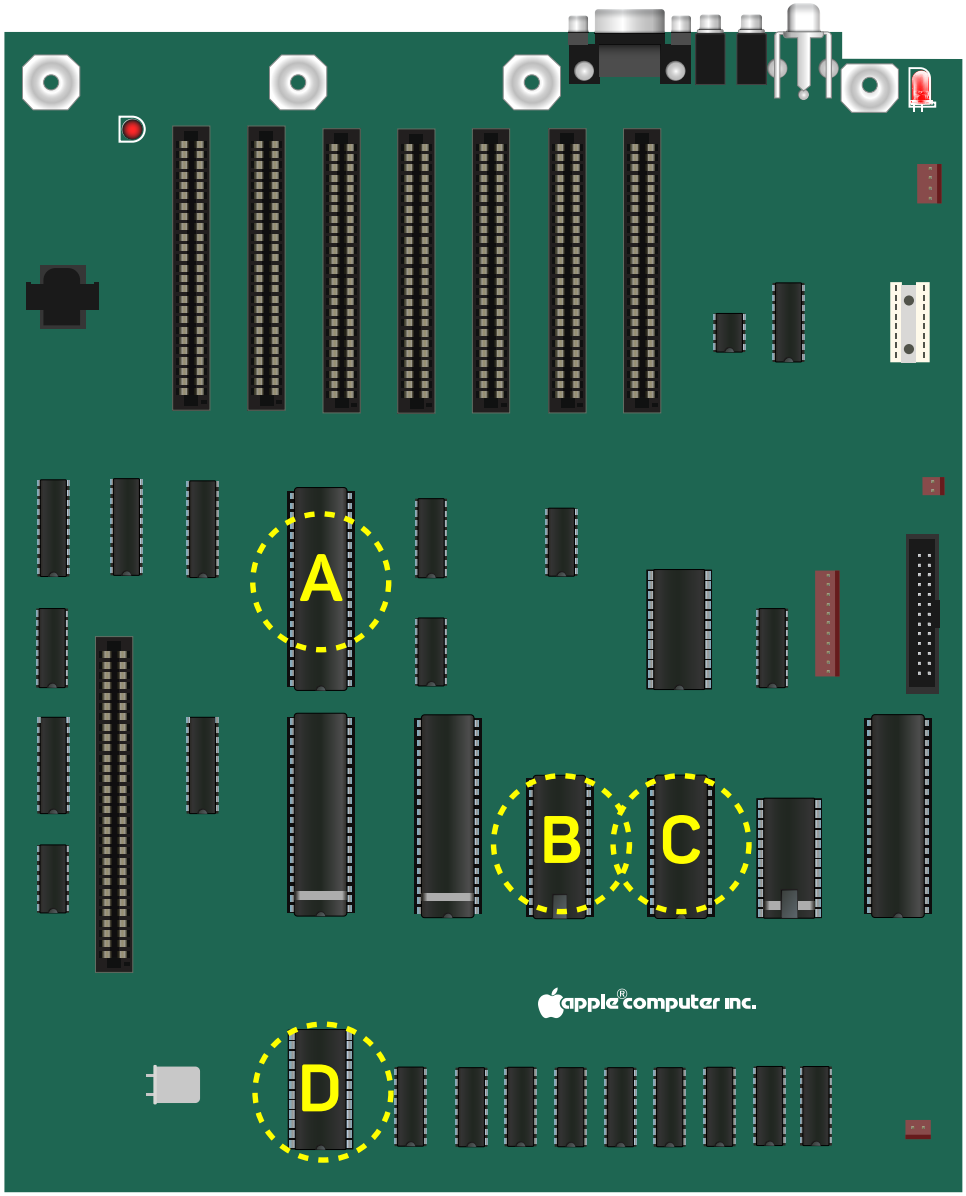


Figure 5. Chip locations on the U.S. (NTSC) main logic board

A. 6502 Central Processing Unit (Microprocessor)
B. CD ROM chip
C. EF ROM chip
D. VIDEO ROM (Character Generator) chip

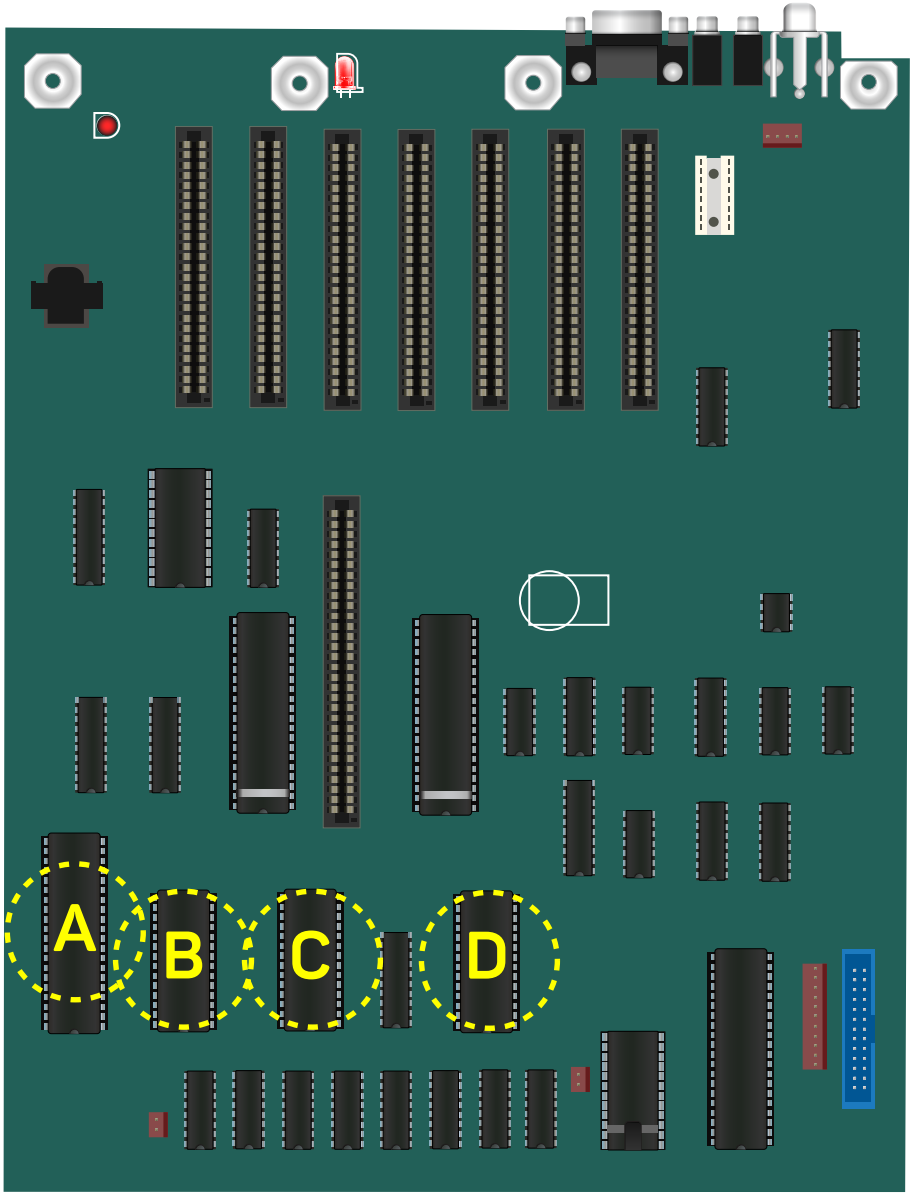


Figure 6. Chips on European (PAL) Main Logic Board

A. 6502 Central Processing Unit (Microprocessor)
B. CD ROM chip
C. EF ROM chip
D. VIDEO ROM (Character Generator) chip

Opening the Apple IIe

Always make sure the computer is switched off and plugged into a power outlet before you remove the TOP. To remove the top, wrap your fingers under the tabs that project from the back of the computer's top and pull up until the fasteners pop as seen in Figure 7. Slide the top toward the back of the computer; then lift it off and set it aside.

Once the top is off, you can see the Apple IIe's main logic board (also known as the motherboard) as seen in Figure 5 and 6. The main logic board is the piece of fiberglass that serves as a platform for the board's components-the chips (the small, black blocks), the lines or traces connecting the components, the power supply (the large metal box on the left) and the slots for interface cards. The board contains a slot labeled **AUX. CONNECTOR** (*for auxiliary connector*), located toward the front of the main circuit board. This slot should already contain the Extended 80-Column Text Card.

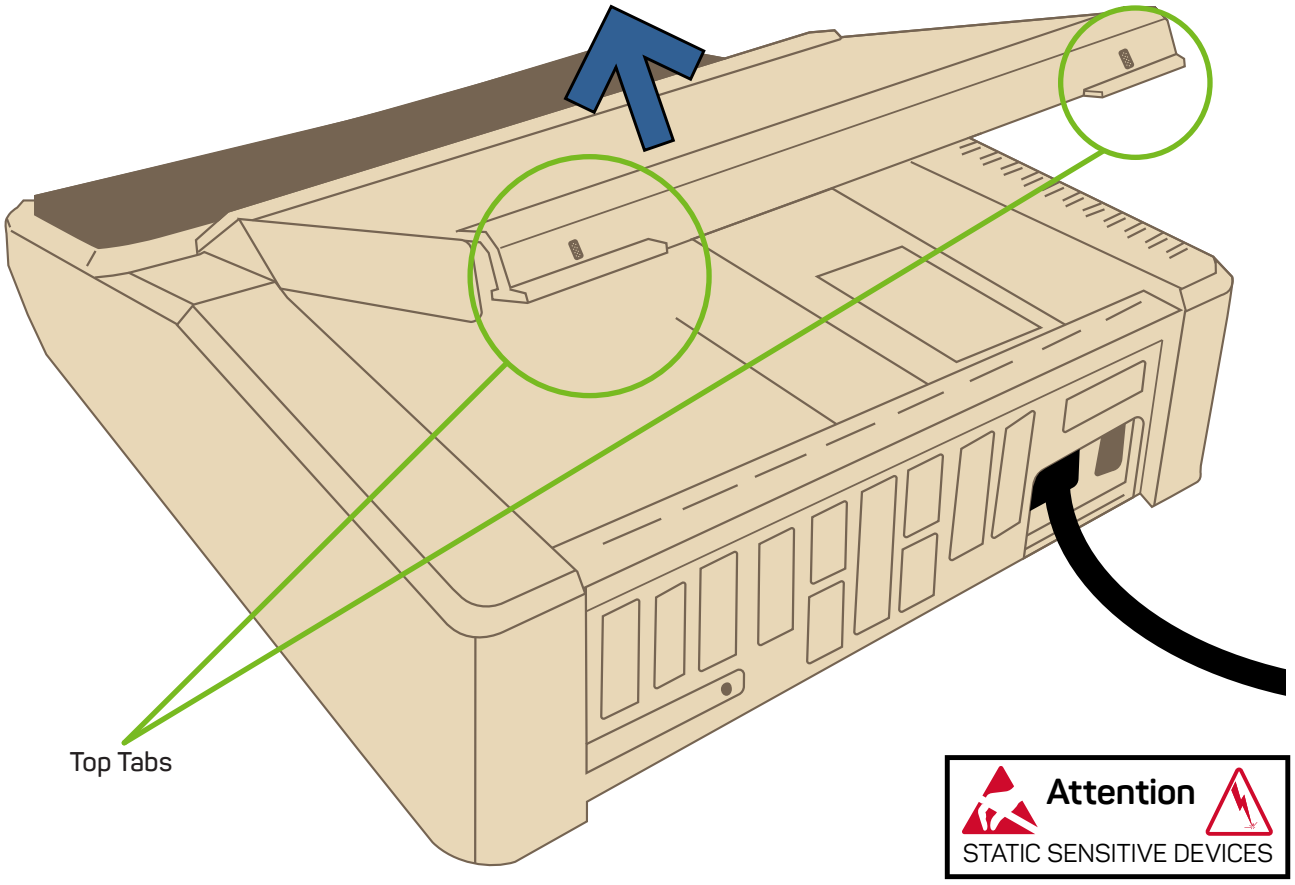


Figure 7. Apple IIe top removal (back view)

Chip Removal Procedure

1. Remove the cover, then check to be sure the small red light inside the case is off.
2. Ground Yourself - Touch the power supply metal enclosure, to discharge any possible static. It is recommended that you use a IC chip remover to remove each IC chip. However, if you do not have access to one, the following instructions below will correctly show how to remove each IC chip from the chip socket using a small screwdriver with a narrow, flat blade.
3. Locate the four chips to be replaced as shown in Figure 5 if you're changing the chips in a U.S. Apple IIe or Figure 6 if you're changing the chips in a European Apple IIe. You may need to remove expansion cards to get at the chips.
4. Insert the flat end under the chip and not the socket as seen in Figure 8. Pry the chip from it's socket, it is very easy to accidentally pull up the socket along with each chip, be careful not to bend the leads. Inserting the screwdriver too far may force the chip out and cause leads to bend.

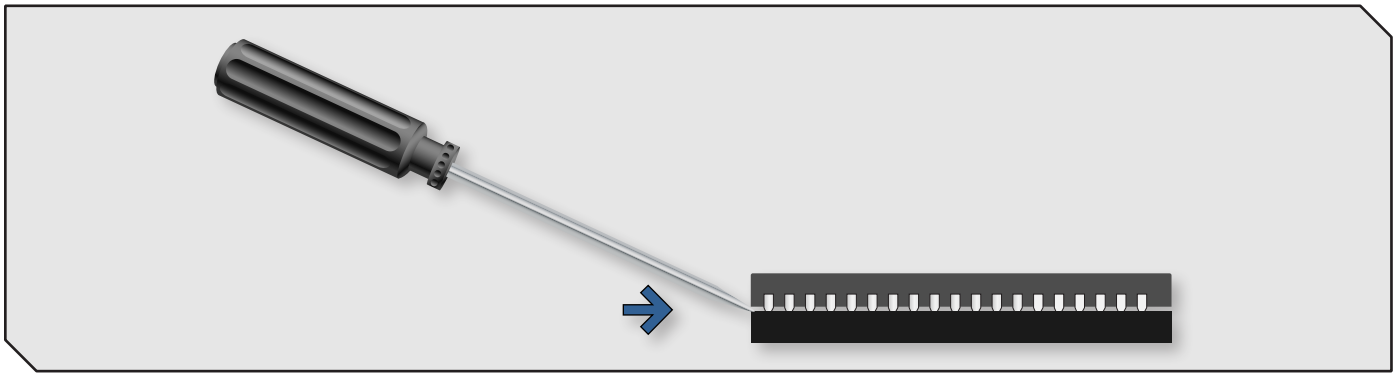


Figure 8. Inserting Screwdriver

5. Remove the chip at each end a little bit at a time as seen in Figure 9 and Figure 10, this will rock the chip out of the socket.

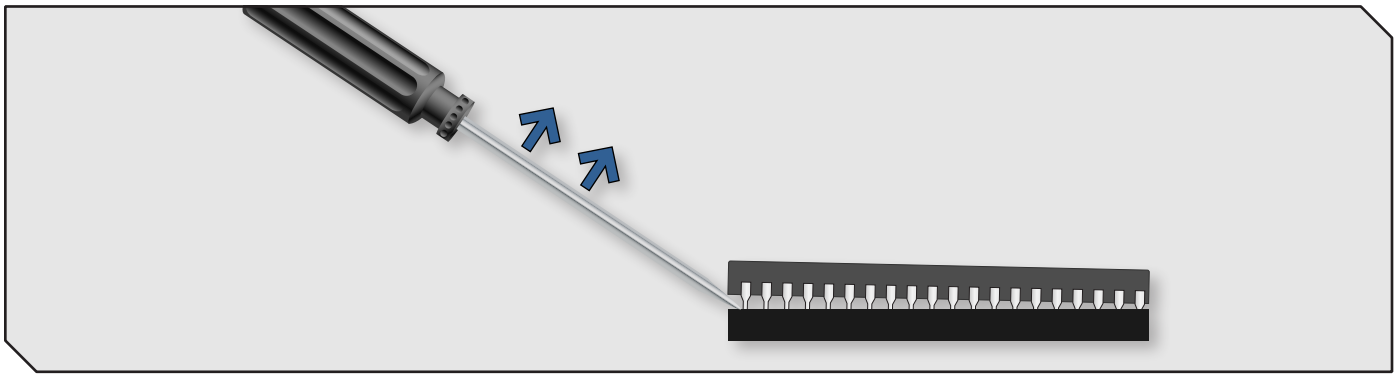


Figure 9. Raise the socketed chip

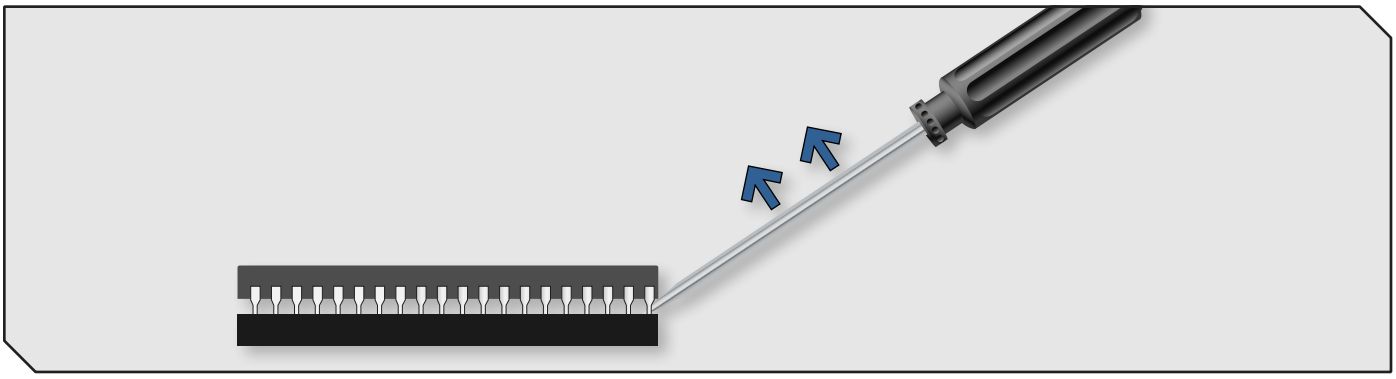


Figure 10. Raise the socketed chip - both ends

6. Gently raise and remove each chip from its socket as seen in Figure 11. If the chip does not pull out easily, do not force it out, continue to carefully use the screwdriver at opposite ends until the chip is loose enough to remove with your fingers.

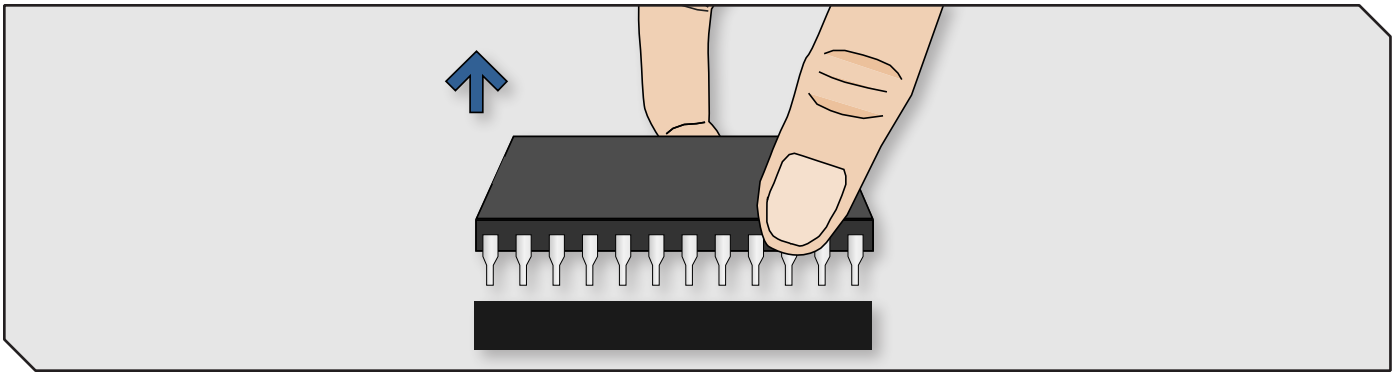


Figure 11. Remove the chip

7. Repeat above steps until all 4 chips have been removed from the mainboard, inspect the chips and sockets to make sure not leads have broken off inside any of the sockets, if by chance any lead has been broken off inside any of the socket holes, use tweezers to remove any broken leads.

Enhancement Chip Installation

Here is the installation procedure.

1. The Enhancement Kit as shown in Table 3 contains 4 chips that you will install, the CD ROM chip, the EF ROM chip, the VIDEO ROM chip and the 65C02 microprocessor.
2. Notice that there is a small notch on one end of each chip as seen in Figure 13. This notch should face the keyboard when each of the chips are in place.

Figure 12. Proper chip orientation

3. Before installing inspect each chip to make sure all the leads are straight and properly aligned before insertion as seen in image Figure 14.

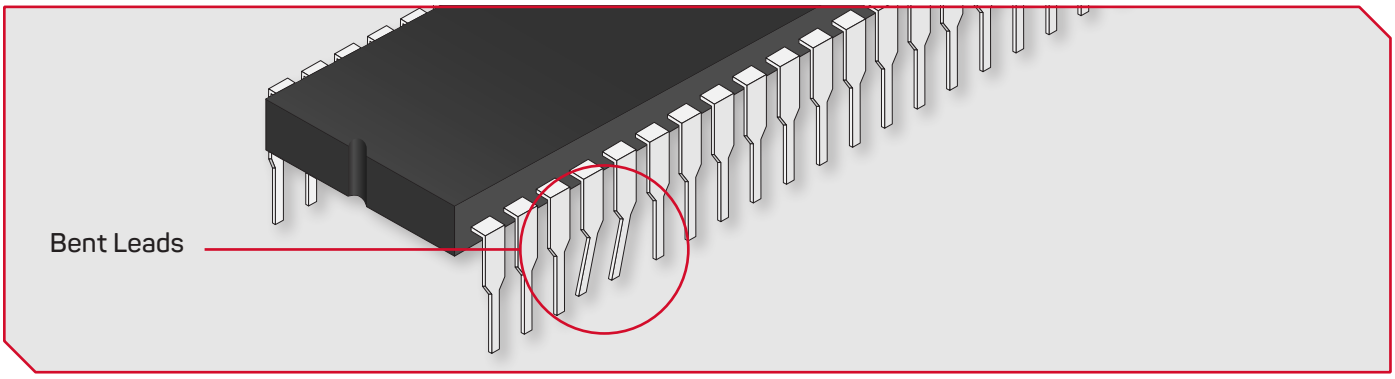


Figure 13. Inspect chip leads

4. When installing each chip make sure all the leads go in correctly as seen in Figure 14. Align all of the pins of a chip so that they will enter the sockets without bending. Press down evenly on the chip until it is in place as seen in Figure 15.

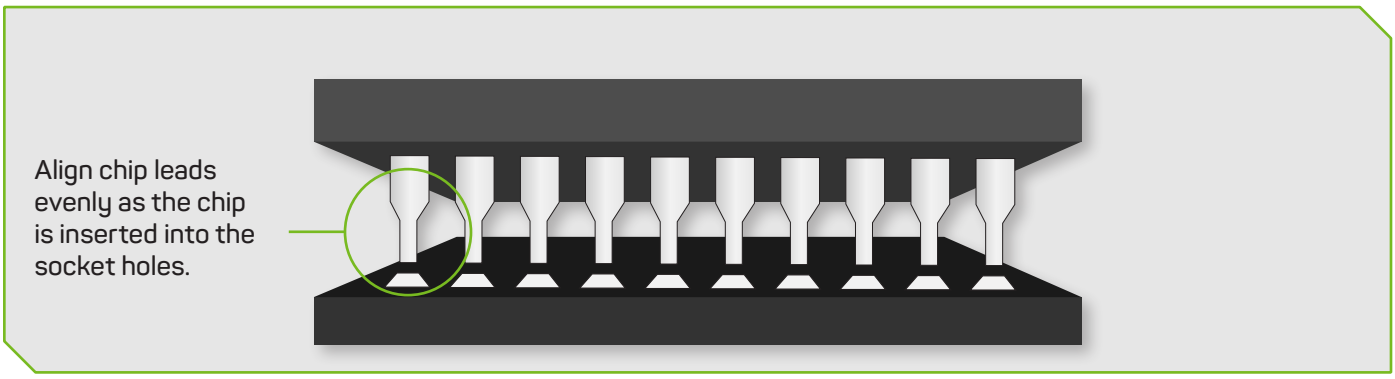


Figure 14. Proper lead alignment

5. Once you've installed all 4 chips, double check them all one more time to make sure everything is installed correctly.

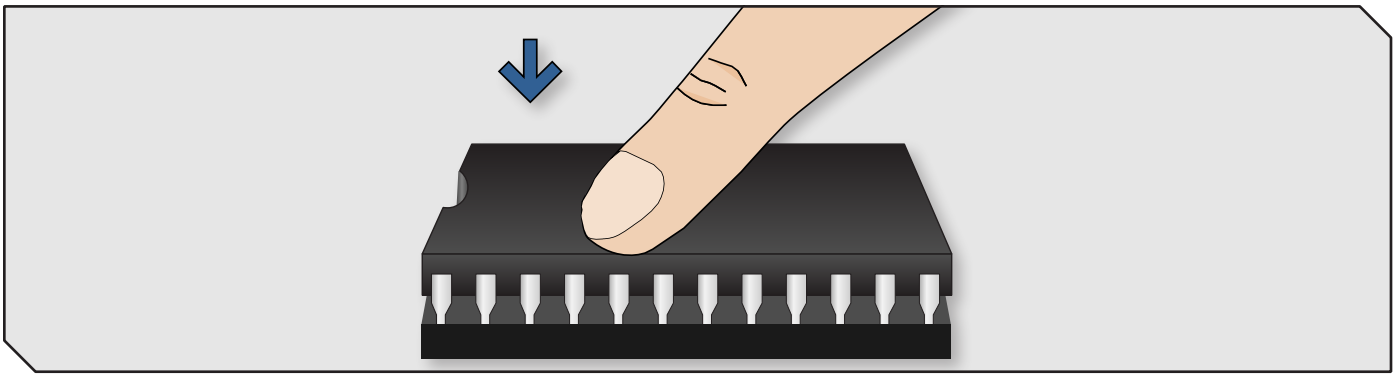


Figure 15. Press chip firmly in place

6. Replace any expansion cards you may have removed and close the computer cover.
7. Turn on the computer and run a program to make sure the computer works properly.

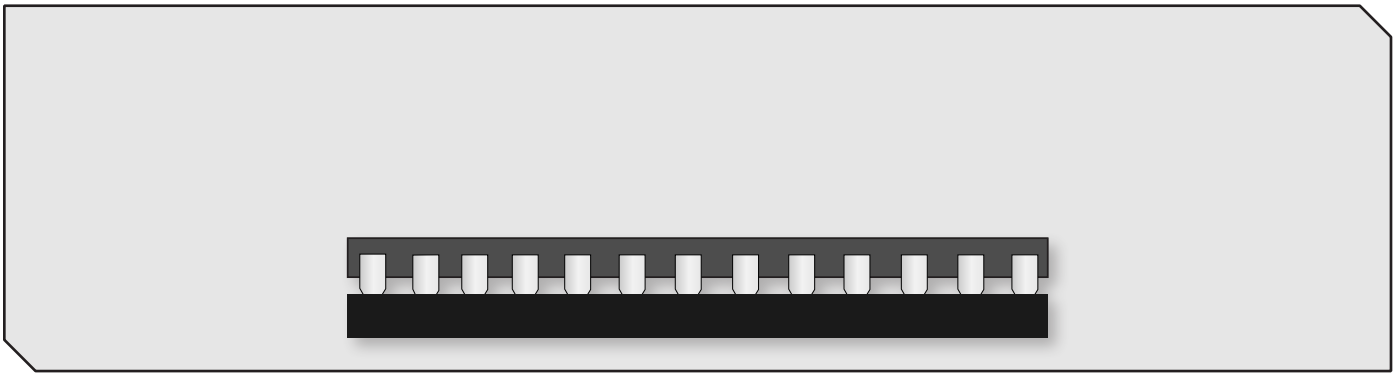


Figure 16. Properly seated chip

One more thing!

Make sure to keep your original chips in a safe, static free bag and don't hesitate to contact ReActiveMicro if you have any questions or need to resolve any technical issues.

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