

APPLE BAY AREA COMPUTER USERS SOCIETY

This article describes a simple modification to the Apple II, which can be used to display, either upper/lower case letters, when using the Apple Writer Text Editor, or can be used to display an alternate character set. The modification consists of removing the existing 2513 character generator ROM and replacing it with a 2716 EPROM. The 2716 contains two character sets. The first is the standard duplicate of the 2513 and the second is a special set which, for example, works with the Text Editor characters.

Since the 2716 is not pin compatible with the 2513, an interconnect pattern is needed. In addition, certain connections must be made to the main board. To do this effectively, a small circuit board is used which holds the 2716 and plugs into the 2513 socket. Three wires from this board then go to "piggyback" socket extensions on the main board. By this means, the modification is simply plug-in and no modifications are required to the main board. A circuit diagram of this small board and its interconnections is presented in figure 1.

How the Circuit Works:

Imagine that your character generator ROM has two character areas. The first of these is an upper case area and the second is a lower case area. Switching between these two areas can be accomplished by using a high address bit. This turns out to be very appropriate to the Apple Text Editor since it in fact stores the characters such that upper case characters have the high bit set low so that they will display in inverse video. This bit is picked up from pin 6 of B13 and is used to select the ROM area from which the display character is selected. There is one problem with this method, and that is that the high bit set low tells the Apple hardware to set an inverse character. The result of this simple modification is that we now have lower case but the upper case is still in inverse video. The solution is to put into the ROM the inverse characters so that although the Apple thinks it is displaying an inverse character it is really displaying the inverse of an inverse.

There is still a problem when you come to observe the resulting characters. They have funny lines and extra information which is very distracting. This is solved by getting at the shift register parallel load inputs and setting them with a sixth bit from the ROM. To do this they must be lifted from ground and connected to the little board. Thus pins 3 and 14 are cut and the lead from the 2716 is connected to the 74166 pins.

A final refinement to the system is to make the selection of mode software selectable. So rather than put a switch on the circuit board, the mode select address pin is connected to the game socket at annunciator pin 3. The latch which provides this output always comes up with a low output on power-on. The addressing is arranged so that this gives the normal character set in Apple. The result is that to the unsuspecting user, the system configuration looks exactly as he has always seen it and he will never know that there is lower case present. The case can be set and reset as follows:

MODIFICATIONS TO THE APPLE II DISPLAY UPPER AND LOWER CASE LETTERS

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For use with the text editor, the conversion to lower case can be made automatic by putting the lower case PEEK into the editor HELLO program as follows:

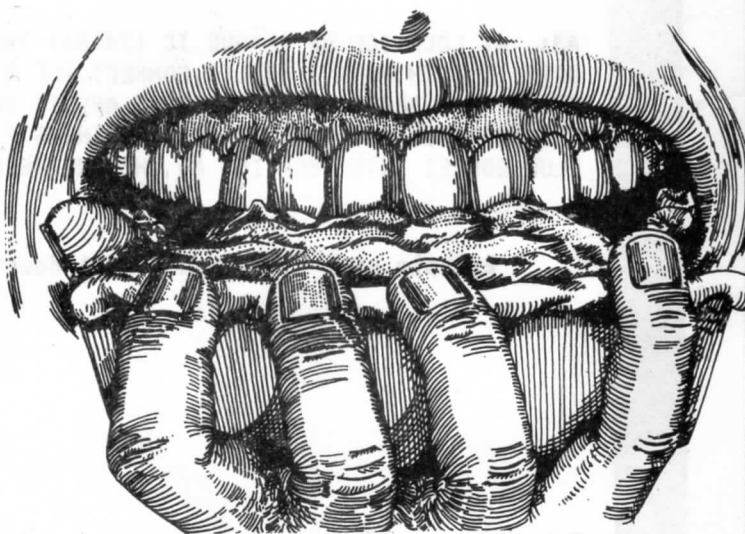
```
5 D$="": REM CONTROL-D
10 PRINT D$; "NOMON I,O,C": CALL -936
20 POKE 1010,191: POKE 1011,157: POKE 1012,56
30 POKE -16289,0
40 PRINT D$; "BRUNTEditor"
50 END
```

Other Features.

Because of the independent character sets with this system, it is possible to have additional characters. You may have noticed the odd brackets used above. The special characters, which can be accessed by this system, as currently implemented, are as follows:

```
[ - esc-control-n
] - esc-shift-m
{ - control-n
} - shift-m
~ - shift-n
^ - esc-shift-n
```

Easy as Pie?



APPLE-PIE !