Apple 1 VMA Signal Activation
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The VMA signal is a signal needed for the 6800 microcomputer but is not used on the 6502, the pin is a no-connect on the 6502 and a shorting connection area is provided on the Apple 1 board to short it to +5V. The signal is of interest because it is available on the I/O connector. The signal goes to the NAND gate at B1 where it is combined with refresh and the result goes to the 74514 decoder disable pins 18 and 191 disabling all the decoded addresses whenever there is either a refresh or the VMA is low. The signal also goes to a chip select pin on the 6820 PIA which is redundant because the 6820 is disabled whenever the decoder is disabled. The VMA signal can be restored to availability again by replacing the short at approximately A8 labelled 6502 with a pull up resistor. A 2200 ohm resistor in parallel with a 100 pf capacitor should be used, the capacitor controls some crosstalk that has been observed on the signal. When small surface mount parts such as the 0402 parts shown in Figure 1 are used the alteration is nearly invisible.

An alternate implementation is to remove the short at the location and put the added parts under the board between pins 5 and 8 of the 6502 at location A7 or pins 12 and 14 of the DIP at location B1. The capacitor must be connected to the +5V rail instead of GND.
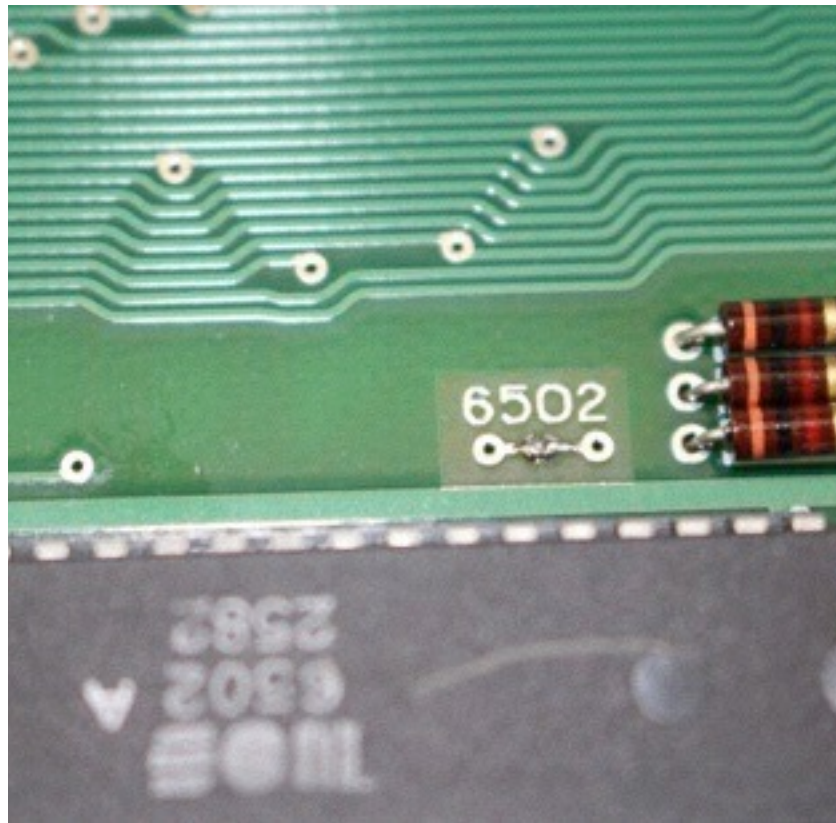

Figure 1

This modification makes available a signal on the peripheral connector that can be used to disable anything accessed using the decoder on a cycle by cycle basis. This includes the 6820 PIA, all on board RAM, the boot ROM and any peripheral using the R, S, or T signals. This permits a peripheral to perform hardware substitution for any of those functions.