

You should be sure that you really need the Shift-key mod before you go ahead and do it. It probably is not worth it unless you have a program that requires the Shift-key mod that you cannot either replace or modify to work without it.

Extended keyboard IIe

The extended keyboard IIe already has the single-wire Shift-key mod hardwired on the logic board.

Warning

If you make the Shift-key modification and connect a joystick or other hand control that uses switch 2, you must be careful never to close the switch and press Shift at the same time; doing so produces a short circuit that causes the power supply to turn off. When this happens, any programs or data in the computer's internal memory are lost.

❖ *Shift-key mod:* To perform this modification on your Apple IIe, all you have to do is solder across the broken diamond labeled X6 on the main circuit board. Remember to turn off the power before changing anything inside the Apple IIe. Also remember that changes such as this are at your own risk and may void your warranty.

Analog inputs

Refer to the section "Game I/O Signals" in Chapter 7 for details.

The four analog inputs are designed for use with 150K ohm variable resistors or potentiometers. The variable resistance is connected between the +5V supply and each input, so that it makes up part of a timing circuit. The circuit changes state when its time constant has elapsed, and the time constant varies as the resistance varies. Your program can measure this time by counting in a loop until the circuit changes state, or times out.

Before a program can read the analog inputs, it must first reset the timing circuits. Accessing memory location 49264 (hexadecimal \$C070 or complementary -16272) does this. As soon as you reset the timing circuits, the high bits of the bytes at locations 49252 through 49255 (hexadecimal \$C064 through \$C067 or complementary -16284 through -16281) are set to 1. If you PEEK at them from BASIC, the values will be 128 or greater. Within about 3 milliseconds, these bits will change back to 0—byte values less than 128—and remain there until you reset the timing circuits again. The exact time each of the four bits remains high is directly proportional to the resistance connected to the corresponding input. If these inputs are open—no resistances are connected—the corresponding bits may remain high indefinitely.