

The addresses of the built-in I/O features are described in Chapter 2 and listed in Tables 2-1, 2-10, and 2-11. All of the built-in I/O features except the displays use memory locations between \$C000 and \$C070 (decimal 49152 and 49264). The I/O address decoding is performed by three ICs: a 74LS138, a 74LS154, and a 74LS251.

The 74LS138 decodes address lines A8, A9, A10, and A11 to select address pages on 256-byte boundaries starting at \$C000 (decimal 49152). When it detects addresses between \$C000 and \$C0FF, it enables the IOU and the 74LS154. The 74LS154 in turn decodes address lines A4, A5, A6, and A7 to select 16-byte address areas between \$C000 and \$C0FF. Addresses between \$C060 and \$C06F enable the 74LS251 that multiplexes the hand control switches and paddles; addresses between \$C070 and \$C07F reset the NE558 quadruple timer that interfaces to the hand controls, as described later in the section "Game I/O Signals."

The keyboard

The Apple IIe's keyboard is a matrix of keyswitches connected to an AY-3600-type keyboard decoder via a ribbon cable and a 26-pin connector. The AY-3600 scans the array of keys over and over to detect any keys pressed. The scanning rate is set by the external resistor-capacitor network made up of C70 and R32. The debounce time is also set externally, by C71.

The AY-3600's outputs include five bits of key code plus separate lines for Control, Shift, any-key-down, and keyboard strobe. The any-key-down and keyboard-strobe lines are connected to the IOU, which addresses them as soft switches. The key-code lines, along with Control and Shift, are inputs to a separate 2316 ROM. The ROM translates them to the character codes that are enabled onto the data bus by signals named KBD' and ENKBD'. The KBD' signal is enabled by the MMU whenever a program reads location \$C000, as described in the section "Reading the Keyboard" in Chapter 2.

Table 7-16
Keyboard connector signals

Pin	Signal	Description
1,2,4,6,8,10, 23,25,12,22	Y0-Y9	Y-direction key-matrix connections
3	+5	+5 volt supply
5,7,9,15	n.c.	
11	LCNTL'	Line from Control key