

BELL1 is described in Appendix B.

The soft switch for the speaker uses memory location 49200 (hexadecimal \$C030). From Integer BASIC, use the complementary address -16336. You can make various tones and buzzes with the speaker by using combinations of timing loops in your program. There is also a routine in the built-in firmware to make a beep through the speaker. This routine is named BELL1.

Cassette input and output

There are two miniature phone jacks on the back panel of the Apple IIe. You can use a pair of standard cables with miniature phone plugs to connect an ordinary cassette tape recorder to the Apple IIe and save programs and data on audio cassettes.

The phone jack marked with a picture of an arrow pointing toward a cassette is the output jack. It's connected to a toggled soft switch, like the speaker switch described above. The signal at the phone jack switches from 0 to 25 millivolts or from 25 millivolts to 0 each time you access the soft switch.

Detailed electrical specifications for the cassette input and output are given in Chapter 7.

If you connect a cable from this jack to the microphone input of a cassette tape recorder and switch the recorder to record mode, the signal changes you produce by accessing this soft switch will be recorded on the tape. The cassette output switch uses memory location 49184 (hexadecimal \$C020; complementary value -16352). Like the speaker, this output will toggle twice if you write to it, so you should only use read operations to control the cassette output.

WRITE is described in Appendix B.

The standard method for writing computer data on audio tapes uses tones with two different pitches to represent the binary states zero and one. To store data, you convert the data into a stream of bits and convert the bits into the appropriate tones. To save you the trouble of actually programming the tones, and to ensure consistency among all Apple II cassette tapes, there is a built-in routine named WRITE for producing cassette data output.

The phone jack marked with a picture of an arrow coming from a cassette is the input jack. It accepts a cable from the cassette recorder's earphone jack. The signal from the cassette is one volt (peak-to-peak) audio. Each time the instantaneous value of this audio signal changes from positive to negative, or vice versa, the state of the cassette input circuit changes from zero to one or vice versa. You can read the state of this circuit at memory location 49248 (hexadecimal \$C060, or complementary decimal -16288).