

graph: A pictorial representation of data.

graphics: (1) Information presented in the form of pictures or images. (2) The display of pictures or images on a computer's display screen. Compare **text**.

half duplex: A two-wire communication circuit or protocol designed for data transmission in either direction but not both directions simultaneously. Compare **full duplex**.

hand control connector: A 9-pin connector on the back panel of the Apple IIe and IIc computers, used for connecting hand controls to the computer. Compare **game I/O connector**.

hand controls: Peripheral devices, with rotating dials and push buttons. Hand controls are used to control game-playing programs, but they can also be used in other applications.

hang: To cease operation because either an expected condition is not satisfied or an infinite loop is occurring. A computer that's hanging is called a *hung system*. Compare **crash**.

hard disk: A disk made of metal and sealed into a drive or cartridge. A hard disk can store very large amounts of information compared to a **floppy disk**.

hard disk drive: A device that holds a hard disk, retrieves information from it, and saves information to it. Hard disks made for microprocessors are permanently sealed into the drives.

hardware: In computer terminology, the machinery that makes up a computer system. Compare **firmware**, **software**.

hertz: The unit of frequency of vibration or oscillation, defined as the number of *cycles per second*. Named for the physicist Heinrich Hertz and abbreviated *Hz*. The 6502 microprocessor used in the Apple II systems operates at a clock frequency of about 1 million hertz, or 1 megahertz (MHz). The 68000 microprocessor used in the Macintosh operates at 7.8336 MHz.

hexadecimal: The representation of numbers in the base-16 system, using the ten digits 0 through 9 and the six letters A through F. For example, the decimal numbers 0, 1, 2, 3, 4, ... 8, 9, 10, 11, ... 15, 16, 17 would be shown in hexadecimal notation as 00, 01, 02, 03, 04, ... 08, 09, 0A, 0B, ... 0F, 10, 11. Hexadecimal numbers are easier for people to read and understand than are binary numbers, and they can be converted easily and directly to binary form. Each hexadecimal digit corresponds to a sequence of four **binary digits**, or bits. Hexadecimal numbers are usually preceded by a dollar sign (\$).

high ASCII characters: ASCII characters with decimal values of 128 to 255. Called *high ASCII* because their high bit (first binary digit) is set to 1 (for *on*) rather than 0 (for *off*).

high-level language: A programming language that is relatively easy for people to understand. A single statement in a high-level language typically corresponds to several instructions of machine language. High-level languages available from Apple Computer include BASIC, Pascal, Instant Pascal, Logo, Pilot, SuperPILOT, and Fortran. Compare **low-level language**.

high-order byte: The more significant half of a memory address or other two-byte quantity. In the 6502 microprocessor used in the Apple II family of computers, the **low-order byte** of an address is usually stored first, and the high-order byte second. In the 68000 microprocessors used in the Macintosh family, the high-order byte is stored first.

high-resolution graphics: The display of graphics on a screen as a six-color array of points, 280 columns wide and 192 rows high. When a text window is in use, the visible high-resolution graphics display is 280 by 160 points.

hold time: In computer circuits, the amount of time a signal must remain valid after some related signal has been turned off. Compare **setup time**.

Hz: See **hertz**.