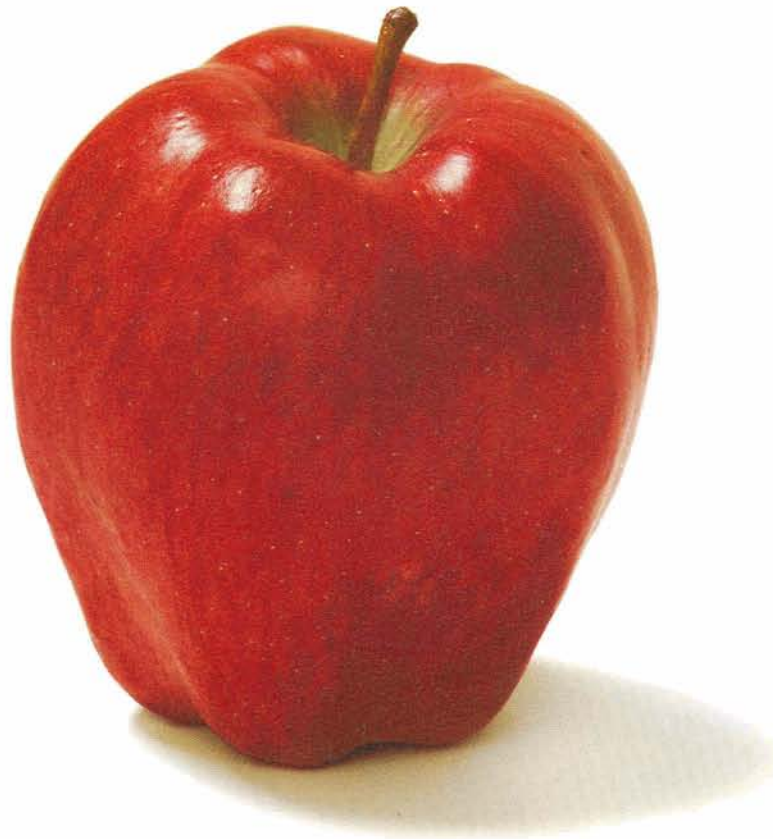# Simplicity is the ultimate sophistication.

Introducing Apple II™, the personal computer.

Sophisticated desi

Apple II will change the way you think about computers. Compared to first generation "hobby" computers, Apple II is easier to use, faster, smaller and more powerful. It brings to personal computing a new level of simplicity through hardware and software sophistication. And Apple II can grow with you as your skill and experience with computers grows.

Sophisticated built-in features such as BASIC, the English-like programming language, advanced color graphics, and use of state-of-the-art high density memory components (16K ROMs and RAMs), set Apple II apart from all the others.

But you don't even need to know a ROM from a RAM to use and enjoy Apple II. Its beauty is in its simplicity. It's a complete, ready to use computer—not a kit. Everything is included. Hook it up to your color TV* and begin writing your own computer programs the very first evening. Even if you've had no

previous computer experience, you can invent your own color games, create artistic displays, or instruct Apple II to chart your home finances. Conversing with Apple II in BASIC is easy using its familiar typewriter-style keyboard.

Games have always been one of the most creatively challenging applications for the computer, and Apple II's sophistication shows through in the games it can help you create. Games like PONG or STARTREK. Apple BASIC contains advanced unique commands for using color graphics (COLOR=, PLOT, HLIN, VLIN, SCRN) which means creating dazzling color displays or writing your own

PONG type game becomes something even a beginner can master. Since text can be displayed along with graphics, your program can keep score, give and accept instructions and even comment on your ability as a player. Paddles and joysticks are interfaced easily using the built-in Apple GAME I/O connector. And a special BASIC command (PDL) automatically senses the position of the paddle. That simplifies writing action games. Apple II's built-in speaker sounds when the ball is hit, and when

gn makes it simple.

a point is made or lost. In STARTREK, you'll actually hear the phasers and photon torpedoes.

Apple II will do more than entertain you. Playing with it, you'll begin to learn what a computer is all about and how rewarding it can be. You'll discover that it's easy to program your Apple II to do things like teach your kids arithmetic or spelling. (Yes, its OK to let your kids use Apple II. It's ruggedly engineered and has a virtually unbreakable plastic case.) And you can save your programs on an ordinary cassette tape using the built-in cassette interface and your home cassette recorder. Other sources of programs are the Apple software library and the Apple II owner down the block.

Increased memory can extend your horizons. For instance, with 12K or more memory, Apple II can generate a high-resolution (280h x 192v) graphic display in 4 colors useful for scientific, medical or artistic applications. The user memory can be expanded up to 48K bytes by simply inserting more memory packages in the sockets provided.

Also, there are several peripheral boards scheduled for introduction soon which will plug into the expansion connectors—Apple II has eight built-in— enabling you to synthesize music or talk to another computer over the phone. Many more interesting peripheral boards to expand your Apple II will be available this year.

As you become an expert, you'll grow to appreciate the sophistication inside Apple II. Its 2K byte ROM monitor contains a mini-assembler, a disassembler, single-step and trace routines, floating point package, a software-simulated 16-bit processor routine, and more.

Apple II is an advanced personal computer that will continue to challenge you for years to come.
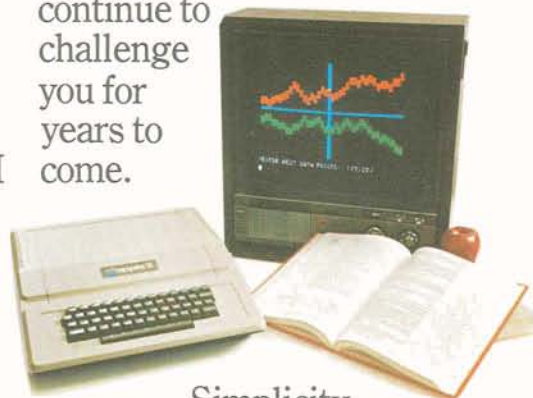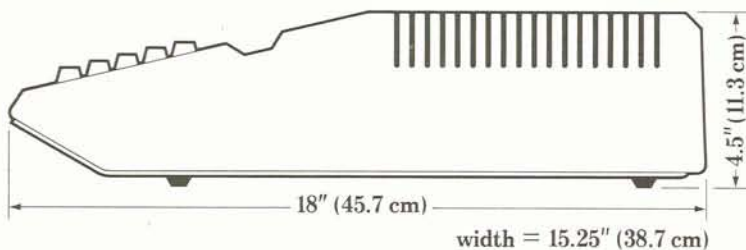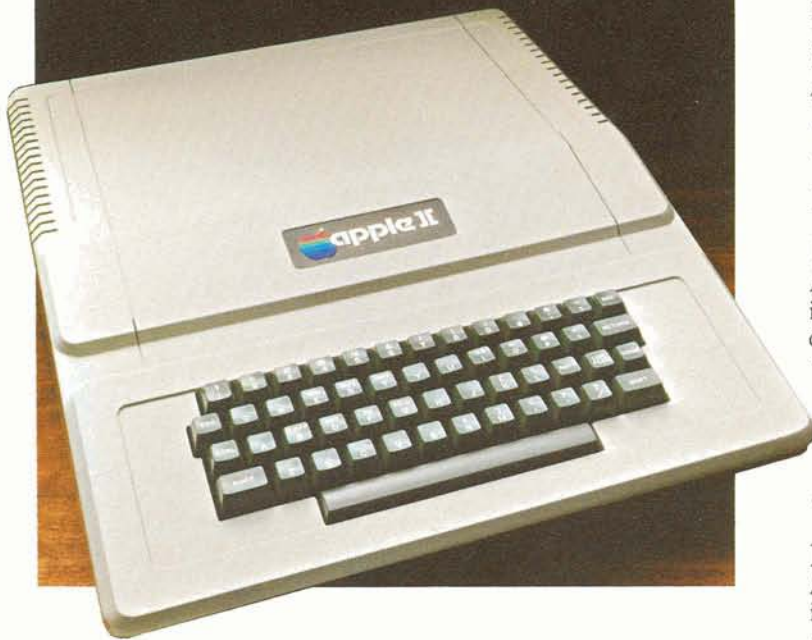
Simplicity.
Sophistication. Apple II.

apple computer inc.™

Technical Overview

18" (45.7 cm)

4.5" (11.3 cm)

width = 15.25" (38.7 cm)

Apple II is a complete, self-contained, ready to use computer. Standard features include BASIC and Monitor in ROM (8K bytes), Color Graphics, up to 48K bytes RAM (4K included), cassette interface, Apple GAME I/O connector, typewriter-style ASCII keyboard, high-efficiency switching power supply and plastic molded case. Also included as standard are: 1 demonstration cassette tape, two game paddle controllers and detailed operations manual.

MICROPROCESSOR:
6502 operating at 1 MHz clock.

VIDEO DISPLAY
The Apple II video display section displays memory as either text, *color graphics,* or *high-resolution graphics* (completely transparent memory access). Both graphics modes can be selected to include 4 lines of text at the bottom of the display area. *All display modes are software selectable.* In addition, the user can select under software one of two memory blocks to be displayed.

Text
· 40 characters/line, 24 lines.
· 5 x 7 upper case characters.
· Normal, inverse or flashing characters.
· Extensive display control software in ROM.
· Full cursor control.
· Fast display—1000 cps.

Color Graphics
· 40h x 48v resolution or 40h x 40v with 4 lines text.
· 15 colors — color generated digitally.
· BASIC commands to use graphics easily: COLOR=, PLOT x, y, HLIN, VLIN SCRN.

High Resolution Graphics
· 280h x 192v resolution or 280h x 160v with 4 lines text.
· 4 colors—black, white, violet, green.
· Displays 8K bytes (requires 12K minimum RAM).

MEMORY
RAM is organized into 3 increments. Each increment can be either 4K bytes using 4K chips or 16K bytes using advanced 16K chips. Memory may be easily increased by inserting an additional increment of chips. From 4K to 48K bytes of RAM can be contained on the single board. 8K bytes of ROM are supplied which permanently store Apple BASIC (6K) and a powerful system monitor (2K). Two additional ROM sockets are provided for future Apple software.
· Up to 48K bytes on-board RAM—no peripheral memory boards!
· Unique automatic RAM refresh system, completely transparent.
· Uses 4096, 2104 type 4K and 4116, 2116 type 16K RAMs.
· Fast memory—350ns access time.

I/O
Apple II includes as standard an ASCII keyboard, audio cassette interface, 8 peripheral board connectors, speaker, Apple GAME I/O connector and two game paddle controllers.
· Reliable typewriter-style keyboard.
· Fast cassette interface—1500 bps.
· Peripheral board connectors:
  —fully buffered busses & timing
  —Daisy-chained interrupt and DMA priority structure
· GAME I/O —4 paddle inputs, 3 TTL inputs and 4 TTL outputs.

BASIC
Apple BASIC is an integer BASIC supplied in 6K bytes of ROM and includes the following features (in addition to normal basic features):
· Apple BASIC is a fast translated BASIC.
· Any length variable names (ALPHA, BETA$).
· Syntax and range errors indicated immediately when entered.
· Multiple statements on one line.
· Integers from −32767 to +32767.
· String arrays to 255 characters. Single dimension integer arrays.
· Graphics Commands : COLOR=expr, PLOT, HLIN (draw horizontal line), VLIN, SCRN (x, y) (reads the screen color).
· Paddle read function: PDL (0-3).
· TEXT and Graphics Commands set display mode from BASIC.
· Immediate execution of most statements.
· Memory boundary adjust (does not destroy current program).
· Break and Continue program execution.
· Debug commands: line number trace and variable trace.
· Switchable I/O device assignments.
· Direct memory access: PEEK, POKE, CALL commands.
· Cassette SAVE and LOAD commands.
· Auto line number mode.
· RND, SGN, ASC, LEN and ABS functions.
· POP instruction pops the return stack one level.
· GOTO expr, GOSUB expr allowed.

MONITOR
· 2K byte ROM monitor.
· Screen control (intelligent display routines). Full cursor control.
· Scrolling window adjustable (protected screen feature).
· Software simulated single-step and trace modes.
· Software simulated 16-bit processor.
· Dis-assembler and mini-assembler
· Input/Output device assignment.
· Editing on keyboard entry.
· Floating point package.
· Breakpoint handling.
· Register examine/modify.
· Read/Write cassette routines.
· Inverse/Normal video selection.
· Hex add/subtract for relative branch calculations.
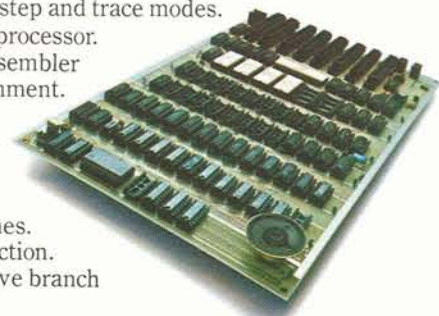
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