

# Computer Bits

By Leslie Solomon  
Technical Director

## 3D GRAPHICS

**T**WO-DIMENSIONAL graphics at various levels of resolution are quite common. Some computers, especially the newer ones, come with built-in graphics capability, while older machines (especially the S-100 variety) rely on plug-in boards. In either case, reasonably high-resolution graphics, even in color, present no problem.

Now there is a new approach: user-controlled, full three-dimensional graphics. Designed for the Apple II, the graphics are provided by the A2-3D1 Animation Package from SubLogic, Box V, Savoy, IL 61874. This software package is available on cassette for \$45, and the diskette version is \$55. Although it has limited use with 16K of RAM, 24K is required for optimum utility.

After a 10K machine-language program is placed in memory, for an introduction, some simple BASIC commands allow you to maneuver a three-dimensional cube around the screen. The cube can be rotated on any of its axes, can be moved closer to or farther away from the viewers "eye", and can even be made to move off the screen to either side, then apparently pass around (or over) the viewer and return to the screen. The perspective of the figure changes with rotation and movement.

The manuals explain how to create various shapes, or groups of shapes, and move them about. On the Apple, the viewed objects use the 140 X 192 high-resolution mode and can move at 150 lines per second, with a 20-line drawing presented at 5 frames per second. The variable field of view also allows camera-like zooming.

Besides a 32-page Load and Go manual that guides the user through an orientation session, there is also an 84-page booklet that completely covers the machine language and BASIC programs. Special features include array generation of line start and end points so that the program can be used with future graphic output devices; a zero-page restore that leaves all zero-page variables intact after subroutine exit; a page control that allows selective page erase, display and draw to permit smooth animation; and a selective erase feature that allows movement of viewed objects without erasing the full screen.

Another package, Load and Go 3D Graphics in BASIC for the Apple II with Applesoft, is also available. This package contains a 60-page BASIC 3D graphics manual and a 22-page preliminary manual. The BASIC version on cassette is \$30 (\$10 extra for diskette) and generates its own trig functions. There-

fore, the listing may be adapted for other BASIC-using computers from a Level II TRS-80 to more complex models.

**Tarbell Disk.** The VDS-II Vertical Disk Subsystem includes two Seimens 8" disk drives, Tarbell Floppy Disk Interface, CP/M Disk Operating System, and Tarbell BASIC. It is assembled, tested and packaged, with fan and power supply. It includes all cables and complete documentation. The system uses standard IBM-compatible soft-sectored 8" diskettes. Capacity per drive is 256K bytes with a 250-kHz transfer rate. The interface is S-100. Four extra slots allow four more drives. \$1888 from Tarbell Electronics, 950 Doviell Place, Suite B, Carson, CA 90746 (Tel: 213-538-4251 or 2254).

**Reserve Power.** The APPLEJUICE reserve power supply protects against program interruption and data loss due to power flickers and brownouts. It provides a visual, audible and electronic signal output to alert the user when a power failure is occurring. Designed for the Apple computer line, the power supply back-up time is approximately 15 minutes. \$249 from High Technology, Inc., 1611 N.W. 23rd St., Oklahoma City, OK 73106 (Tel: 405-528-8012).

**S-100 Mainframe.** This 12-slot actively terminated S-100 mainframe measures 11 1/2 inches high, 7 inches wide and 18 inches deep and comes complete with fan and circuit breaker. It supports +8 volts at 20 amps and ±16 volts at 4 amps. Input may be 105,

115 or 125 volts ac. It features a flip-top cover and comes in various colors. \$399.95 assembled and tested from California Computer Systems, 309 Laurelwood Dr., Santa Clara, CA 95050 (Tel: 408-988-1620).

**Apple Lower Case.** The Keyboard Expander is a hardware-software modification to an Apple II that allows it to use both upper and lower case. The shift keys can be used conventionally. The hardware change is a one-wire modification. The software modification is a transparent machine-language routine that augments the capabilities of the monitor while avoiding its upper case conversion code. All Apple II characters and editing functions are permitted as well as cap and shift lock. It requires 1/4K of memory. \$20 from C&H Micro, P.O. Box 249, Clifton Park, NY 12065.

**S-100 Accessories.** A catalog of various S-100 plug-ins such as memories, disk systems, motherboards, multi-I/O ports, and software is available from Thinker Toys, 5221 Central Ave., Richmond, CA 94804.

**Apple Graphics.** The Versa-Writer is a digitizer and software package for the Apple II. Sixteen commands permit fill-in coloring using six colors and control cursor movement, horizontal and vertical scaling, centering on screen, and storing and recalling to and from disk, etc. The drawing board plugs into the game I/O, and requires 32K of RAM, Applesoft in ROM and Disk II. \$199 from Rainbow Computing Inc., 9719 Resada Blvd., Northridge, CA 91324 (Tel: 213-349-5560).

**KIM I/O.** This RS-232 interface is designed for the AIM/KIM/SYM microcomputers, to allow these devices to connect to any RS-232 terminal, printer or modem. The I/O features 15 baud rates, programmable word length, a choice of stop bits, odd/even parity, serial echo mode, interrupt and status register, half/full duplex operation, parity/framing/overrun error detection, expansion connector and a DB25 connector. Kit is \$69.95, wired/tested is \$84.95. Fobel Enterprises, 552 E. El Morado, Ontario, CA 91764 (Tel: 714-984-8871).

**Real Time Clock.** The CompuClock six-digit, noninterruptable digital clock delivers

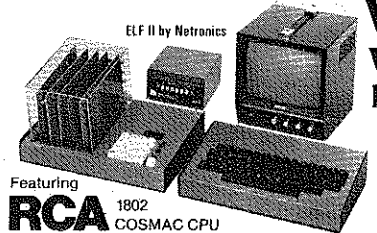
time and date via an RS-232C port of any computer. It can operate for about two weeks on its internal battery if the display is turned off. Comtronics, 105 N.W. 43rd St., Boca Raton, FL 33431 (Tel: 305-392-8700).

**PET Graphics.** The K-1008A-P Visible Memory is a graphics display board that upgrades the PET system by providing a high-resolution matrix of 64,000 dots (320 wide by 200 high) with each dot independently controlled. During image update, there is no visible interference. When not used for graphics, the board serves as an 8K-byte expansion. It interfaces via the K-1007A-1 bus adapter with easily detached ribbon cable interconnects. Without the bus adapter, the Visible Memory can be used with the AIM-75, KIM-1 and SYM-1 computers. \$243. The K-1007A-1 bus adapter is \$99, the K-1004A-P card file is \$80, and the K-1008-3C software is \$20. Micro Technology Unlimited, 841 Galaxy Way, P.O. Box 4596, Manchester, NH 03108 (Tel: 603-627-1464).

**Work Station.** The 90 Micro Work Station features the Quay 90MPS or 90F/MPS single-board computer, power supply and a wood-grain base with hinged plastic cover. The 90MPS includes a Z80, up to 65K dynamic RAM, up to 14K of EPROM, 1K of static RAM, up to eight 8-bit programmable I/O ports, four programmable counter/timers, RS-232 or 20-mA ports with selectable baud rates, 2.5- or 4-MHz operation and a PROM-resident system monitor with debug capabilities. It also includes a DMA floppy-disk compatible with Digital Research CP/M and an S-100 bus adapter. \$1050 with 4K dynamic RAM, \$1675 with 16K dynamic RAM. Quay Corporation, P.O. Box 386, Freehold, NJ 07728 (Tel: 201-681-8700).

**Custom Enclosure.** Vacuum-formed from ABS flame-retardant plastic, the MicroDaSys enclosure kit has cassette wells and protective feet. Machined for assorted I/O connectors and having a 4" fan, the enclosure supports a 64-key ASCII board that generates all 128 codes, a +8-volt supply at 16 amperes, and ±16 volts at 2 amperes. A 6-slot S-100 motherboard allows any S-100 plug-in. \$249 kit, \$299 assembled. MicroDaSys, Box 36051, Los Angeles, CA 90036 (Tel: 213-935-4555).

**Video RAM.** The PV-1 is a user-programmable video RAM that "looks" like a memory-mapped 1K-by-8 RAM and contains a programmable CRT controller with internal/external sync capability. Via its 75-ohm composite video output, any screen format up to 16 lines by 64 characters can be generated. The characters can be 10X13, 10X16, or 7X9 upper/lower case with adjustable width and screen position. The PV-1 requires a single 5-volt line, can be simply configured for USA/European video standards, and has intensity control and character blink/inverse. It can be easily mixed with a conventional TV camera output so that combined analog and digital display can be produced. The device will generate 96 ASCII and 32 graphics symbols. The 4.5" X 6" module can be interfaced to almost any micro-minicomputer. \$295 from Matrox Electronic Systems, Ltd., 2795 Bates Rd., Montreal, Quebec, Canada H3S 1B5 (Tel: 514-481-6838 or 735-1182).



# Write and run programs—the very first night—even if you've never used a computer before!

You're up and running with video graphics for just \$99.95 — then use low cost add-ons to create your own personal system that rivals home computers sold for 5-times ELF II's low price!

Featuring **RCA 1802 COSMAC CPU**  
Own a powerful home computer system, starting for just \$99.95—a price that gets you up and running the very first night... with your own TV for a video display. \$99.95 ELF II includes RCA 1802 8-bit microprocessor addressable to 64k bytes with DMA, interrupt, 16 registers, ALU, 256 byte RAM, full hex keyboard, two digit hex output display, stable crystal clock for timing purposes, RCA 1861 video IC to display your programs on any video monitor or TV screen and 5-slot plug-in expansion bus (flex connectors) to expand ELF II into a giant!

**ELF II Explodes Into A Giant!**  
Master ELF II's \$99.95 capabilities, then expand with GIANT BOARD... KLUGE BOARD... 4K RAM BOARDS... TINY BASIC... ASCII KEYBOARD... LIGHT PEN... ELF-BUG MONITOR... COLOR GRAPHICS & MUSIC SYSTEM... TEXT EDITOR... ASSEMBLER... DISASSEMBLER... VIDEO DISPLAY BOARD... and, another great reason for getting your ELF now—

## BREAKTHROUGH!

Netronics proudly announced the release of the first 1802 FULL BASIC, written by L. Sandlin, with a hardware floating point RPN math package (requires 8k RAM plus ASCII and video display boards), \$79.95 plus \$2 p&h. Also available for RCA VIP and other 1802 systems Board includes area for a ROM version.

**Master This Computer In A Flash!**  
Regardless of how minimal your computer background is now, you can learn to program an ELF II in almost no time at all. Our Short Course On Microprocessor & Computer Programming—written in non-technical language—guides you through each of the RCA COSMAC 1802's capabilities, so you'll understand everything ELF II can do... and how to get ELF II to do it! Don't worry if you've never been stumped by computer books before. The Short Course represents a major advance in literary clarity in the computer field. You don't have to be a computer engineer in order to understand it. Keyed to ELF II, it's loaded with "hands on" illustrations. When you're finished with the Short Course, neither ELF II nor the RCA 1802 will hold any mysteries for you.

In fact, not only will you now be able to use a personal computer creatively, you'll also be able to read magazines such as BYTE... INTERFACE AGE... POPULAR ELECTRONICS and PERSONAL COMPUTING and fully understand the articles. And, you'll understand how to expand ELF II to give you the exact capabilities you need!

If you work with large computers, ELF II and the Short Course will help you understand what they're doing.

**Get Started For Just \$99.95, Complete!**  
\$99.95 ELF II includes all the hardware and software you need to start writing and running programs at home, displaying video graphics on your TV screen and designing circuits using a microprocessor—the very first night—even if you've never used a computer before.

ELF II connects directly to the video input of your TV set, without any additional hardware. Or, with an \$8.95 RF modulator (see coupon below), you can connect ELF II to your TV's antenna terminals instead.

ELF II has been designed to play all the video games you want, including a fascinating new target/misile gun game that was developed specifically for ELF II. But games are only the icing on the cake. The real value of ELF II is that it gives you a chance to write machine language programs—and machine language is the fundamental language of all computers. Of course, machine language is only a starting point. You can also program ELF II with assembly language and tiny BASIC. But ELF II's machine language capability gives you a chance to develop a working knowledge of computers that you can't get from running only

pre-recorded tape cassettes.

**ELF II Gives You The Power To Make Things Happen!**  
Expanded, ELF II can give you more power to make things happen in the real world than heavily advertised home computers that sell for a lot more money. Thanks to an ongoing commitment to develop the RCA 1802 for home computer use, the ELF II products—being introduced by Netronics—keep you right on the outer fringe of today's small computer technology. It's a perfect computer for engineering, business, industrial, scientific and personal applications.

Plug in the GIANT BOARD to record and play back programs, edit and debug programs, communicate with remote devices and make things happen in the outside world. Add Kluge (prototyping) Board and you can use ELF II to solve special problems such as operating a complex alarm system or controlling a printing press. Add 4k RAM Boards to write longer programs, store more information and solve more sophisticated problems.

ELF II add-ons already include the ELF II Light Pen and the amazing ELF-BUG Monitor—two extremely recent breakthroughs that have not yet been duplicated by any other manufacturer.

The ELF-BUG Monitor lets you debug programs with lightning speed because the key to debugging is to know what's inside the registers of the microprocessor. And, with the ELF-BUG Monitor, instead of single stepping through your programs, you can now display the entire contents of the registers on your TV screen. You find out immediately what's going on and can make any necessary changes.

The incredible ELF II Light Pen lets you write or draw anything you want on a TV screen with just a wave of the "magic wand." Netronics has also introduced the ELF II Color Graphics & Music System—more breakthroughs that ELF II owners were the first to enjoy!

**ELF II Tiny BASIC**  
Ultimately, ELF II understands only machine language—the fundamental coding required by all computers. But, to simplify your relationship with ELF II, we've introduced an ELF II Tiny BASIC that makes communicating with ELF II a breeze.

**Now Available! Text Editor, Assembler, Disassembler And A New Video Display Board!**  
The Text Editor gives you word processing ability and the ability to edit programs as text while it is displayed on your video monitor. Lines and characters may be quickly inserted, deleted or changed. Add a printer and ELF II can type letters for you—error free—plus print names and addresses from your mailing list!

ELF II's Assembler translates assembly language programs into hexadecimal machine code for ELF II use. The Assembler features mnemonic abbreviations rather than numerics so that the instructions on your programs are easier to read—this is a big help in catching errors.

ELF II's Disassembler takes machine code programs and produces assembly language source listings. This helps you understand the programs you are working with... and improve them when required.

The new ELF II Video Display Board lets you generate a sharp, professional 32 or 64 character by 16 line upper and lower case display on your TV screen or video monitor—dramatically improving your unexpanded \$99.95 ELF II. When you get into longer programs, the Video Display Board is a real blessing!

**Now Available!**

- A-D-D-A Board Kit includes 1 channel (expandable to 4) D-A, A-D converters, \$39.95 plus \$2 postage & handling.
- PILOT Language—A new text-oriented language that allows you to write educational programs on ELF II with speed and ease! Write programs for games... unscrambling sentences... spelling drills... "fill in the missing word" tests, etc! PILOT is a must for any ELF II owner with children. PILOT Language on cassette tape, only \$19.95 postpaid!
- Game Package on cassette tape (requires 4k RAM), \$9.95 plus \$2 postage & handling.

Clip Here and Attach to Your Order Below!

**PHONE ORDERS ACCEPTED!**  
Call (203) 354-9375

**Netronics R&D Ltd., Dept PE-4**  
333 Litchfield Road, New Milford, CT 06776

Yes! I want my own computer! Please rush me—

- RCA COSMAC ELF II kit at \$99.95 plus \$3 postage and handling (requires 6.3 to 8 volt AC power supply)
- Power Supply (required), \$4.95 postpaid
- RCA 1802 User's Manual \$5 postpaid
- Tom Pittman's Short Course On Microprocessor & Computer Programming teaches you just about everything there is to know about ELF II or any RCA 1802 computer. Written in non-technical language. \$3 postpaid.
- I want my ELF II wired and tested with power supply, RCA 1802 User's Manual and Short Course—all for just \$149.95 plus \$3 p&h.

**ALSO AVAILABLE FOR ELF II**

- GIANT BOARD™ kit with cassette I/O, RS-232-CITY I/O, 8 bit I/O decoders for 14 separate I/O instructions and a system monitor/editor. \$39.95 plus \$2 p&h
- Kluge (Prototype) Board accepts up to 36 IC's \$17.00 plus \$1 p&h
- 4k Static RAM kit. Addressable to any 4k page to 64k. \$8.95 plus \$2 p&h
- Gold plated 86-pin connectors (one required for each plug-in board) \$5.70 ea. postpaid
- Expansion Power Supply (required when adding 4k RAM) \$34.95 plus \$2 p&h
- Professional ASCII Keyboard kit with 128 ASCII upper/lower case set, 96 printable characters, onboard regulator, parity tape selection and choice of 4 hand-shaking signals to mate with almost any computer. \$64.95 plus \$2 p&h
- Deluxe metal cabinet for ASCII Keyboard, \$19.95 plus \$2.50 p&h
- Video Display Board kit lets you generate a sharp, professional 32 or 64 character by 16 line upper and lower case display on your TV screen or video monitor—dramatically improving your unexpanded \$99.95 ELF II. (Fits inside ASCII Keyboard cabinet) \$89.95 plus \$2 p&h
- ELF II Tiny BASIC on cassette tape. Commands include SAVE, LOAD, +, x, +, !.

Total Enclosed \$ \_\_\_\_\_ (Comm. res. add tax)

**CHARGE IT!** Exp. Date \_\_\_\_\_  
 Visa  Master Charge (Bank # \_\_\_\_\_)

Account # \_\_\_\_\_

26 variables A-Z, LET, IF/THEN, INPUT, PRINT, GO TO, GO SUB, RETURN, END, REM, CLEAR, LIST, RUN, PLOT, PEEK, POKE. Comes fully documented and includes alphanumeric generator required to display alphanumeric characters directly on your TV screen with our additional hardware. Also plays back-tape plus a drawing game that uses ELF II's hex keyboard as a joystick. 4k memory required. \$14.95 postpaid

Tom Pittman's Short Course on Tiny Basic for ELF II, \$5 postpaid

ELF-BUG™ Deluxe System Monitor on cassette tape. Allows displaying the contents of all registers on your TV at any point in your program. Also displays 24 bytes of memory with full addresses, blinking cursor and auto scrolling. A must for the serious programmer! \$14.95 postpaid

Text Editor on cassette tape gives you the ability to insert, delete or edit lines and words from your programs while they are displayed on your video monitor. (Add printer and you can use ELF II to type error-free letters plus insert names and addresses from your mailing list.) \$19.95 postpaid

Assembler on cassette tape translates assembly language programs into hexadecimal machine code for ELF II use. Mnemonic abbreviations for instructions (rather than numerics) make programs easier to read and help prevent errors. \$19.95 postpaid

Disassembler on cassette tape takes machine code programs and produces assembly language source listings to help you understand and improve your programs. \$19.95 on cassette tape

**SAVE \$9.90—Text Editor, Assembler & Disassembler purchased together, only \$49.95! (Requires Video Display Board plus 4k memory.)**

ELF II Light Pen, assembled & tested. \$7.95 plus \$1 p&h

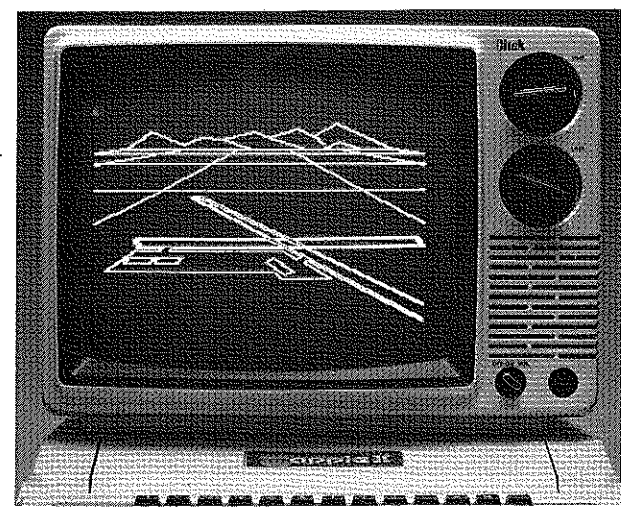
ELF II Color Graphics & Music System Board kit \$49.95 plus \$2 p&h

ELF II connects directly to the video input of your TV set without additional hardware. To connect ELF II to your antenna terminals instead, order RF Modulator, \$8.95 postpaid.

**Coming Soon: A-D, D-A Converter, Controller Board and more!**

Name \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_  
State \_\_\_\_\_ Zip \_\_\_\_\_

**DEALER INQUIRIES INVITED**



The SubLogic A2-3D1 Apple II Animation Package provides full three-dimensional graphics which can be easily maneuvered on the screen.