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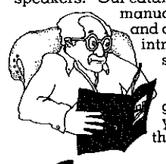

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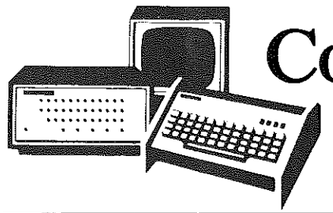


Computer Bits

By Leslie Solomon
Technical Director

WINDOWS IN THE CRT

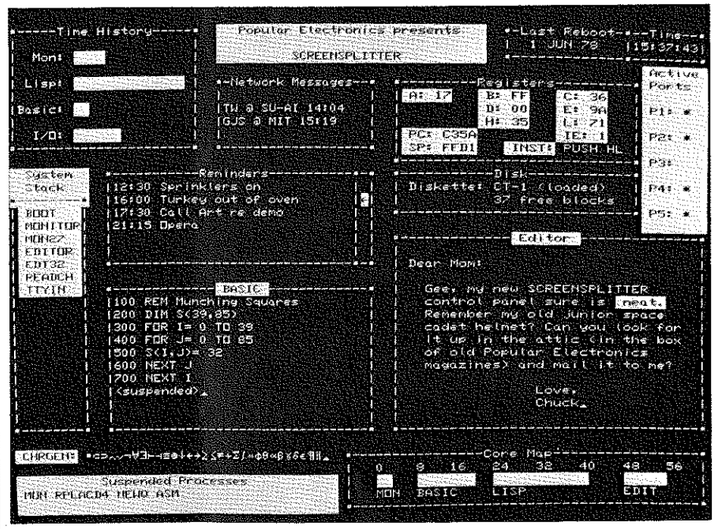
THE MOST common way to communicate with a computer today is via a plug-in or a separate video terminal. The ordinary video terminal forms a single "window," in which all you can see is one piece of data at a time as it appears in sequential order on the screen. Recently, we had the opportunity to work with a very special graphics display system called the "Screensplitter" from Micro Diversions, Inc. (8455-D Tyco Rd., Vienna, VA 22180 Tel: 703-827-0888). This novel plug-in video module is not limited to a single window (see photo). Rather, the user can create, under software control, almost any number of data-display windows, each with its own independent display.

Individual windows in the Screensplitter can be sized, labelled, and framed as desired. Furthermore, frame and window can be made to flash, display in reverse video, clear, scroll, and use any character as a blinking or nonblinking cursor. The window package is contained in an EPROM and has 20 user-callable functions. You can, for example, run a BASIC program and display each subroutine in its own window. Or you can display different data in different windows. You can even move the windows around at will.

If you are doing assembly-language programming, one window can be used as a real-time clock, another to display run time, and others to display register contents or anything else you desire. Debugging information can be contained in its own window. For game playing, you can create as many windows as required. Too, some windows can be dedicated strictly to graphics.

The Screensplitter does not preclude operation as a single window with 40 lines of 80 characters each. Bear in mind, however, that this dense a display requires a video monitor with at least a 10-MHz bandwidth.

The Screensplitter occupies a single S-100 bus slot. It contains its own 4K of RAM that is memory mapped into the address space so that it can be accessed if you wish to use the window package.



The Screensplitter can generate almost any number of independent "windows" contingent on the needs of the user.

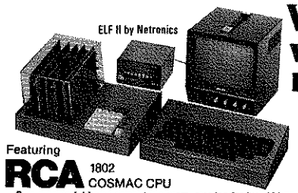
Pascal Microengine. This new computer contains 64K of RAM, two RS-232C ports, two parallel ports, and a floppy-disk controller with DMA. It features self-test diagnostics, Pascal compiler, BASIC compiler, file manager, screen-oriented editor, debugger, and graphics package. Available options include a floppy-disk subsystem, printer, and terminal. Cost at this writing is $1995. Address: Computer Interface Technology, 2080 South Grand, Grand Center, Santa Ana, CA (Tel: 714-979-9920).

Pet S-100 Interface. The Betsi Interface/Motherboard contains all logic required for interfacing S-100 boards to the Pet microcomputer. It connects directly to the Pet's expansion connector and has four S-100 slots. It does not interfere with the Pet's parallel or IEEE ports. The board also contains a dynamic memory controller that permits use of a 32K RAM board. There are also sockets and decoding circuitry for 8K of 2716 PROM. Price is $119.00 for the kit, which includes one S-100 connector, or $165.00 assembled and with four S-100 connectors. Address: Forethought Products, P.O. Box 8066, Coburg, OR 97401 (Tel: 503-485-8575).

S-100 Video Board. The new ALTR-2480 is a 24-line by 80-character S-100-bus video display board. It features upper- and lower-case characters plus graphics. The system also has byte mapping (4K by eight), built-in read/write refresh, 2716 user-programmable EPROM, external/internal sync, normal/inverse/blink control, 500-ns access time, and direct drive for a CRT monitor. Using "Transparent Memory," the CPU can access the refresh memory at any time, the display is glitch-free, and the CPU is never interrupted. No reliance is placed on the peculiar characteristics of a particular CPU. A multiplexing technique permits nonconflicting access by both CRT controller and CPU. Price is $295.00. Address: Matrox Electronic Systems, Ltd., 2795 Bates Rd., Montreal, Quebec, Canada H3S 1B5 (Tel: 514-481-6838/735-1182).

(continued on page 76)

ELF II by Netronics



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More Breakthroughs Coming Soon!

Soon to be introduced: ELF II special application kits that give you the hardware and software you need to use ELF II for specialized purposes such as a telephone dialer...industrial controller...home photography...security system...police alert...motor controller...station output monitor on a conveyor belt assembly line...and some new, super-fantastic games!

Also coming soon: PROM Programmer...A-D, D-A Converter...Controller Board...and more! Unlike some heavily advertised hobby computers, ELF II doesn't limit you to pre-recorded programs. With ELF II you learn computing from the ground up...from machine language to assembly language to BASIC ...in quick, clear and easy steps. ELF II is a powerful computing tool, but one that you can master with the same ease you once mastered a slide rule or pocket calculator.

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 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/missile 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.

Tiny BASIC saves you the time of having to code your individual instructions in machine language for ELF II. Instead, you simply type instructions on a keyboard —PRINT, RUN, LOAD, ETC. Your Tiny BASIC program automatically translates them into machine language for ELF II. Then it translates ELF II's output back into simple words and symbols for you.

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 or 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!

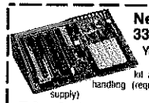
ELF II's **Assembler** translates assembly language programs into hexidecimal machine code for ELF II use. The Assembler features mnemonic abbreviations rather than numerics so that the instructions on your programs are easier to read—this is a big help in catching errors.

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 fine 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!

Ask Not What Your Computer Can Do... But WHAT CAN IT DO FOR YOU?

Don't be trapped into buying an expensive dinosaur, simply because you can afford it. ELF II is more advanced and more fun to use than big name computers that cost a lot more money. With ELF II you learn to write and run your own programs. You're not just a keypunch operator. No matter what your interests are, ELF II is the fastest way to get into computers. ***Order from the coupon below!***



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☐ 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, it's a learning breakthrough for engineers and laymen alike. $5 postpaid.

☐ Deluxe Metal Cabinet with plexiglas dust cover for ELF II. ($29.95 plus $2.50 p&h.

☐ I am also enclosing payment (including postage & handling) for the items checked below!

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☐ **GIANT BOARD™** kit with cassette I/O, RS 232-C/TTY I/O, 8-bit P 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. **$89.95** plus $3 p&h.

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☐ **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, +, ×, ÷, (), 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 without additional hardware. Also plays tick-tack-toe 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.

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☐ **Assembler** on cassette tape translates assembly language programs into hexidecimal 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 $9.80—Text Editor, Assembler & Disassembler purchased together, only **$49.95!** (Require Video Display Board plus 4k memory.)

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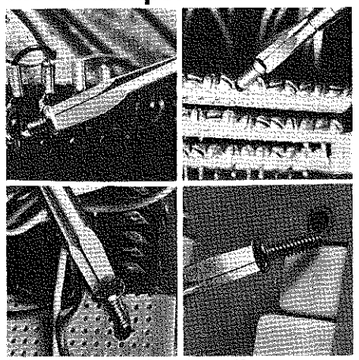

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COMPUTER BITS
(continued from page 75)

S-100 Extender Board. A 7-segment display logic probe and a pulse-catcher LED, whose brightness corresponds to the duty cycle of the pulse stream, are used in the new TB-2 Extender Board kit from Mullen. The board features a general-purpose "kluge" area for circuit development. This section is provided with its own on-board 5-volt, 1-ampere regulator that also powers the logic probe. Other features include power supply links for current measurement, labelled S-100-bus edge connector, and gold-plated connector contacts. Price is $35.00. Address: Mullen Computer Products, P.O. Box 6214, Hayward, CA 94545 (Tel: 415-783-2866).

S-100 to IEEE Interface. The P&T 488 Interface Board permits the broad spectrum of S-100-bus computers to directly interface with instruments and peripherals that operate on the IEEE 488-1975 Standard Digital Interface for Programmable Instrumentation. The board comes with 488 cable assembly. Software is distributed as source code in machine-readable form. An integral "Bit-wiggler" tape interface is used for reading software with a conventional cassette tape recorder. Price is $250.00 in kit, $325.00 in wired form. Address Pickles & Trout, P.O. Box 1206, Goleta, CA 93017 (Tel: 805-967-9563).

New Printers In Town. The Model DP-8000 hard-copy printer from Anadex prints 80-character lines at 112 character/second (84 lines/minute). Printing is bidirectional, via sprocket feed. Alphanumerics are formed from a 9 × 7 dot matrix. The complete 96-character ASCII set is available. Basic ASCII inputs include RS-232C, 20/60-mA current loop, and parallel-bit/serial character, the last synchronous at high strobe rates. Three data lines of FIFO buffer storage are available, and data can be accepted continuously or in bursts. Serial ASCII is adjustable to 9600 baud. Up to 1000 characters/second can be fed into the input. Address: Anadex, Inc., 9825 DeSoto Ave., Chatsworth, CA 91311 (Tel: 213-998-8010).

Bowmar's Model TP-3150 thermal printer requires no ribbons or ink. It has an 18-character capacity and uses a 5 × 5 solid-state dot-matrix print head. Print direction and character rotation are user controllable. ASCII data can be synchronous parallel or asynchronous serial. The printer accepts the 64 standard ASCII characters and ignores all other codes. Price is $270.00. Address: Bowmar Instrument Corp., Commercial Products Div., 8000 Bluffton Rd., Fort Wayne, IN 46809.

A bidirectional printer from Printer Terminals operates at 75 lines/minute and offers a choice of 7 × 9 or 9 × 9 dot-matrix print capability. It can print up to four copies simultaneously. The full 96-character, upper-and-lower-case ASCII set, plus triple-wide character font, are available. The operator can choose either 80- or 132-character lines. Included are RS-232C and parallel interfaces and 2K of memory for full-page dump. The printer is designed to accommodate roll paper, combination pin form and roll, and tractor feed. Price is $1395.00. Address: Printer Terminals Corp., P.O. Box 535, Ramona, CA 92065 (Tel: 714-789-5200).

Single-Board Microcomputer. The 90F/MPS microcomputer from Quay is based on the Z80 and contains multidensity-DMA floppy-disk controller. It can accommodate up to 65K of dynamic RAM, 14K of EPROM with programmer, and 1K of static RAM. Up to four 8-bit programmable I/O ports are available. There are also four programmable counter/timer channels and an RS-232C or 20-mA serial port, the latter with selectable baud rates. A resident PROM system monitor contains debug capabilities. With 16K of dynamic RAM and two parallel ports, price is $1295.00. Address: Quay Corp., P.O. Box 386, Freehold, NJ 07728 (Tel: 201-681-8700).

S-100/Telephone Interface. The MK-II transceiver board from MK Enterprises interfaces an S-100 bus to the telephone line and uses Touch-Tone frequencies. On incoming calls, vectored interrupts allow for ring detection and DTMF signalling. This permits calling the computer and using the telephone pushbuttons for entry. A 4-bit input post allows additional data to be transferred coincident with decoded DTMF. On outgoing calls, the board operates at telephone company speeds. A 4-bit output port allows supervision of trunk interface equipment (DAA). Single tones can be generated. Price is $425.00. Address: MK Enterprises, 3911 Norwick Rd., Richmond, VA (Tel: 804-740-8380). ◇

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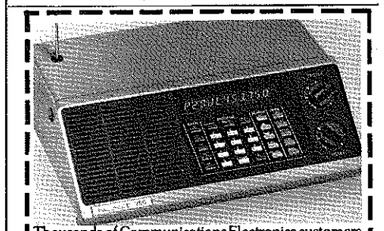

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