Hobbiests! Engineers! Technicians! Students!

FALL 1978 ISSUE

Write and run machine language programs at home, display video graphics on your TV set and design microprocessor circuits — starting the very first night — even if you've never used a computer before!

ELF II featuring the amazing RCA COSMAC

Now you can own the world's most practical computer for just $99.95. ELF II comes with wonderfully simple operating instructions that soon make you an expert, even if you've never had your hands on a computer before. Then, when you've mastered each of the commands an RCA 1802 will execute, ELF II's highly advanced add-ons let you run circles around "big name" personal computers that sell for a lot more money. ELF II has all the power most people will ever need for complex business, industrial, scientific or hobby applications.

1802 microprocessor/mini-

COMPUTER ONLY $99.95

THE FAST WAY TO LEARN COMPUTER FUNDAMENTALS! Owning an ELF II is probably the fastest, easiest, most foolproof way to gain a working knowledge of computers the world has ever known. First of all, you get your hands on *your own* computer, so you can spend all the time you want with it and use it for anything that turns you on.

Secondly, our *Short Course On Microprocessor And Computer Programming* makes it impossible for you to fail. We take you inside the RCA 1802 and teach you every instruction it can be given. Everything is explained in plain English. When you're finished, you'll know everything there is to know about using an ELF II. You'll be able to make ELF II do whatever you want it to do. You won't be limited to predeveloped software.

Third, once you understand ELF II inside and out, you'll be ready to use its highly sophisticated add-ons intelligently. And, as you expand your ELF II, you'll begin to appreciate just how advanced its technology really is.

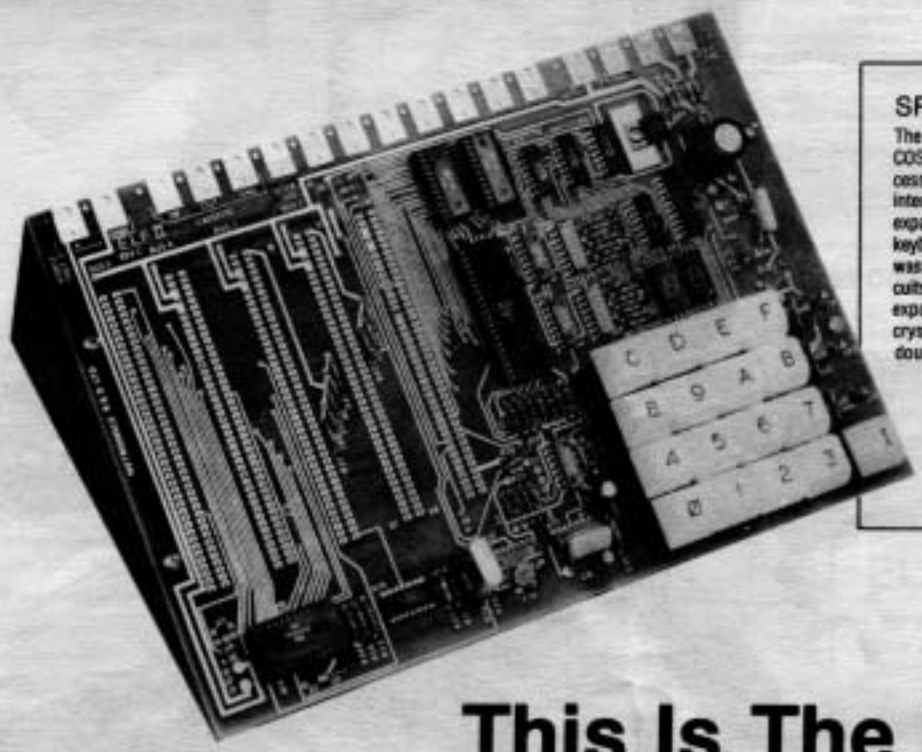
In addition to I/O, monitor, memory, ASCII keyboard and BASIC, ELF II offers you exotic add-on features such as the ELF II Light Pen and the ELF II Color Graphics & Music System.

It's no wonder ELF II's are being used by high schools and universities, IEEE seminars, factory training programs, trade schools and the R&D labs of leading high technology corporations.

(over please)

ELF II gives both students and professionals a chance to get their hands on a computer . . . and master it as they learn computer fundamentals. These people know that today a practical understanding of computers is as important as a college degree.

Owning your own ELF II gives you an understanding of computers far beyond anything you can get from reading books. You will learn to think in machine language — the fundamental language of computers — so even big computers will lose their mystery for you. In fact, once you've mastered ELF II you'll never be intimidated by any computer again, because now you'll have a sound knowledge of the fundamentals.



SPECIFICATIONS

The $99.95 ELF II computer features an RCA COSMAC COS/MOS 1802 8-bit microprocessor addressable to 64k bytes with DMA, interrupt, 16 registers, ALU, 256 byte RAM expandable to 64K bytes, professional hex keyboard fully decoded so there's no need to waste memory with keyboard scanning circuits, built-in power regulator, 5 slot plug-in expansion bus (less connectors), stable crystal clock for timing purposes and a double-sided, plated-through pc board plus RCA 1861 video IC to display any segment of memory on a video monitor or TV screen along with all the logic and support circuitry you need to learn every one of the RCA 1802's capabilities.

This Is The Famous

$99.95 ELF II Computer

The $99.95 ELF II is a self-contained personal computer that includes everything you need to write and run machine language programs. ELF II also lets you display computer-generated video graphics on any TV set or video monitor. If you're an engineer or hobbiest, you can use ELF II in microprocessor-based circuits of your own design as a counter, alarm, lock, thermostat, timer, telephone dialer, etc. The possibilities are endless.

ELF II was designed to be both a trainer and the heart of a powerful computer system. The $99.95 ELF II gives you all components and everything you need to write and run your own programs immediately, even if you've never used a computer before. Then, once you've mastered computer fundamentals, ELF II can be expanded to give you tremendous computing power.

USES Use your ELF II with a photocell or switch input to count packages, parts, cars or people • Add a simple motor driven photocell scanner to detect movement in a room • Monitor burglar alarm switches • Play games of all kinds . . . invent your own games • Maintain the water level in a fish tank with a moisture sensitive switch, ELF II and a water valve solenoid • Measure motor speed with a photocell input • Add an external speaker to create a programmable music box • Monitor and control experiments in labs and schools • Create a programmable multiple pulse generator • Use ELF II as a precision crystal controlled clock or timer, started and stopped by external events • Use ELF II to create a programmable tester for printed circuit cards, circuits, IC's, memories, etc. • Build a low cost microprocessor breadboard and program development system with ELF II • Make your own programmable sequencer for light shows, advertising displays, holiday lighting, etc. • Create a programmable complex waveform generator via appropriate D-A circuits • Add a speaker and use ELF II for a metronome • Create a random number generator • Build a telephone dialer • Create a random number generator • Build a telephone dialer • Use ELF II for controlling battery operated toys including cars, trucks, robots, etc. • Simulate digital circuits or systems • Use ELF II to detect tape player tones and control slide projectors . . . *that's just the beginning!*

The potential applications of ELF II are limited only by your imagination! As your ability to use ELF II grows, you may discover new applications for ELF II and the 1802 that RCA and Netronics never even thought of!

WRITE AND RUN PROGRAMS THE VERY FIRST NIGHT! ELF II can help anyone — even the layman — quickly develop a practical understanding of computers and their applications that goes far beyond what can be learned by reading textbooks or by working with giant computers in FORTRAN or BASIC. If you've been struggling to learn computers by reading books, owning an ELF II will make those books infinitely more meaningful for you.

The ELF II Owner's Manual and our *Short Course On Microprocessor And Computer Programming* give you all the easy instructions you need and get you started right away, even if you've never used a computer before. These manuals cover testing, programming, video graphics and games and make everything extremely easy to understand. The Owner's Manual also includes a program to display video graphics and an exciting new moving target and missile game.

Whether you're an absolute novice or a professional engineer, you'll find working with ELF II to be a pleasure. Simple, clear instructions let you write and run programs the very first night. From that moment on, the world of computers will be wide open to you!

ELF II kit (Includes ELF II Owner's Manual with simple and complete instructions for assembly, testing) **$99.95**

Wall Mounted AC Power Supply **$5.00**

RCA 1802 User's Manual (RCA's own manual for the 1802. Very useful if you plan to design microprocessor circuits with ELF II) **$5.00**

***A Short Course On Microprocessor And Computer Programming* (See below)** **$5.00**

ELF II wired and tested (includes power transformer, RCA 1802 User's Manual and *Short Course* **$149.95**

Steel Cabinet (deluxe IBM blue and black) with smoked, see-through plexiglas dust cover **$29.95**

RF Modulator (Needed when connecting ELF II to a TV set, if you prefer the convenience of attaching ELF II to the antenna terminals rather than wiring it to your TV's video input circuit) **$8.95**

Gold Plated 86-Pin Connector (one required for each expansion board) each **$5.70**

Learning Breakthrough!

A Short Course On Microprocessor And Computer Programming

Now — even if you're an extreme beginner — you can add a computer to your arsenal of personal business (or hobby) tools! *Our Short Course On Microprocessor And Computer Programming* lets anyone master an RCA 1802 computer, quickly, painlessly and without frustrations.

No other computer on the market today offers a learning aid so revolutionary in its simplicity. Everything you need to know is explained in plain English. You learn ELF II so thoroughly that you'll be able to fully exploit all of the 1802's capabilities.

This means you get all the power you're paying for when you buy an ELF II computer. No matter how little you may know about computers now, our *Short Course* will make you a master of the ELF II. You don't pay for one byte of power you can't use because we teach you to push ELF II to the limit. Then we offer you technically advanced add-ons that will expand ELF II and give you tremendous problem solving capabilities.

Our *Short Course* takes you, step by step, through each of the 91 instructions that an RCA COSMAC will

NOW! With These Breakthroughs From RCA And Netronics,

ELF II Explodes Into A Giant!

When you're learning to use a computer, you want to concentrate on learning machine language and the particular instructions that your computer will execute. You don't want to get bogged down with accessories. But, once you've taught yourself computer fundamentals, you want POWER . . . and ELF II can give it to you!

Expanded, ELF II is a perfect computer for solving complex industrial, business and scientific problems. You'll also find countless household and hobby applications for its advanced capabilities. And, when you want to relax, ELF II will entertain you with exciting electronic games.

ALL ELF II EXPANSION PC BOARDS PLUG DIRECTLY INTO ELF II'S EXPANSION BUS.

GIANT BOARD™

Let's ELF II Control Events In The Outside World!

Plug the GIANT BOARD™ into ELF's expansion bus and your $99.95 trainer becomes the heart of a powerful system. The GIANT BOARD™ lets ELF II "talk" back and forth to devices in the outside world. ELF II "listens" to their problems and tells them what to do.

The GIANT BOARD™ includes a system monitor/editor that works on all 64k bytes of possible memory. The monitor will search the entire memory for a particular instruction and tell you its address.

Using the monitor, you can examine and change the memory content at any location. An automatic scanning feature lets you locate and change or eliminate an incorrect instruction without stepping your way through the program. This is an extremely helpful feature for debugging.

Both the low order address and its memory content can be displayed, one after the other, on ELF II's built-in dual 7-segment display. The monitor is also programmed to allow you to begin execution of your programs at any location, so you can store a number of programs simultaneously and make use of every byte of memory you've paid for.

A cassette I/O routine lets you record programs on an ordinary cassette. A cassette read/write instruction allows dumping and loading programs from address to address. This is a very convenient feature when you want to move entire blocks of memory. The system includes a fail-safe device and will not indicate that a program has been properly loaded unless, in fact, this is the case.

The ELF II GIANT BOARD™ also includes two 8-bit parallel I/O ports with handshaking. This allows you to connect the ELF II to a printer and ASCII keyboard or any 8-bit parallel interface. In fact, the Netronics ASCII keyboard plugs right in. The serial RS 232 and 20 ma. TTY I/O's let you hook on to printers, terminals or any serial I/O device.

Using the GIANT BOARD™, ELF II can also be interfaced with dozens of other I/O's including photoelectric paper tape strip readers, input line scanning circuits, photocells and switches.

ELF II GIANT BOARD™ kit $39.95

wired & tested $59.95

Kluge (Prototype) Board

Let's You Wire ELF II Into Hobby Projects Or Use ELF II For One Experiment After Another In The Lab!

The ELF II Kluge Board gives you a quick, simple way to tap ELF II's resources for hobby applications and laboratory experiments, without having to wire your circuits permanently to ELF II's components.

This glass epoxy G-10 pc board has gold plated connectors and accepts up to 36 IC's including 40, 24, 22, 18, 16 and 14 pin. Space is available for an onboard regulator.

With the ELF II Kluge Board, you can put ELF II to work for you solving specific problems such as operating a more complex alarm system or controlling a printing press, etc. The Kluge Board gives you tremendous flexibility so you can use ELF II for one special application after another.

Kluge (Prototype) Board $17.00

4k STATIC RAM BOARDS

For more memory, add 4k RAM boards and write longer programs . . . or write 2, 3, 4 or even 5 programs or more in a single 4k memory card. This tremendous memory potential means you can use ELF II simultaneously for several different tasks. For example, with one single 4k memory card you can create an alarm system, a telephone dialer and a real time clock.

Expand ELF II's Memory!

The ELF II 4k RAM is mounted on a deluxe glass epoxy pc board with gold plated connectors. It uses low power 2102's, is fully buffered and decoded, features page selection in 4k blocks, anywhere in memory, and is complete with onboard regulator. Chip select circuit allows original 256 bytes of memory to be used too. 4k RAM requires ELF II Expansion Power Supply or 500-mA from a 5 or 8 volt source.

4k Static RAM kit $89.95

wired & tested $114.95

execute. Each of the 1802's capabilities is explained carefully and thoroughly along with hands on examples you can follow.

You'll learn I/O and branches, register operations, computer arithmetic and logic, control instructions, interrupts, DMA and video graphics, all in machine language — the fundamental language of computers. Terms that may be unfamiliar to you now are made simple. There's nothing in the *Short Course* beyond the average reader's grasp. The self-teaching format was designed for enjoyable home study.

The *Short Course* was written for Netronics by well-known author/engineer Tom Pittman and was intended for laymen — even novices — as well as for programmers and engineers with a computer background. Technical terms are explained to the reader in plain English. Concepts are simplified so you get a good foundation in the basics.

With our *Short Course* under your belt, you'll be able to write and run your own machine language programs — and machine language is the fundamental language of computers. Never again will you be limited to a manufacturer's library of predeveloped software. Now, if you can't find a predeveloped program to serve your needs, you'll be able to write the program you want yourself.

Our *Short Course* won't make you a professional programmer but it will teach you everything there is to know about using an ELF II and a lot about computers in general. Our *Short Course* will teach you how all computers "think" and how to frame problems so they can be solved by a computer. It will also help you spot situations where a microprocessor (costing just a few dollars) can solve $100,000 industrial problems.

Our *Short Course* was written specifically for ELF II owners but it will help you master any RCA COSMAC. And, once you've learned computer fundamentals with ELF II, you'll find it a lot easier to get on top of any computer they throw your way.

A Short Course On Microprocessor And Computer Programming by Tom Pittman $5.00

Professional ASCII KEYBOARD

The ELF II ASCII Keyboard follows the standard typewriter configuration and generates the entire 128 character ASCII upper/lower case set with 96 printable characters. Features include onboard regulator, parity, logic selection and a choice of four handshaking signals that will mate the keyboard with almost any computer in addition to ELF II.

The ELF II ASCII Keyboard comes complete with a connector that plugs directly into the ELF II GIANT BOARD™. It takes its power from the ELF II Expansion Power Supply or the original wall mounted ELF II AC power supply.

The board is glass epoxy and the ELF II ASCII Keyboard is first class in every way.

ELF II ASCII Keyboard kit $64.95

wired & tested $89.95

Deluxe IBM Blue And Black Steel Enclosure $19.95

ELF II Tiny BASIC . . .

ELF II Tiny BASIC on cassette tape with complete documentation including 2 free games (tic-tack-toe and a drawing game) $14.95

Once you've learned computer fundamentals, you'll want to graduate to a higher level of programming. To help you, Netronics has developed a Tiny BASIC for ELF II. With it, you can program ELF II with simple words that can be typed out on a keyboard such as PRINT, RUN and LOAD. ELF II responds by displaying answers on a printer, video monitor or TV screen.

Armed with ELF II and BASIC, programming becomes a breeze because ELF II Tiny BASIC translates routine instructions into machine language for you, a lot faster than you could possibly type them into ELF II yourself.

ELF II Tiny BASIC is compatible with either ASCII keyboard and TV screen or standard teletype/video terminal utilizing RS 232-C or 20 mil TTY interface. Commands include SAVE and LOAD for storing programs on standard cassettes, a PLOT command to display graphic information and special commands for controlling ELF II I/O devices.

Tiny BASIC also includes 16-bit integer arithmetic, ±, ×, ÷, ( ), 26 variables A-Z, LET, IF/THEN, INPUT, PRINT, OUT, GO TO, GO SUB, RETURN, END, REM, CLEAR, LIST, RUN, PEEK and POKE as well as a random number generator and automatic error message display.

PEEK and POKE let you switch back and forth from BASIC to machine language so that you can program ELF II at maximum speed, without sacrificing the flexibility of being able to modify or supplement a program.

The Netronics Tiny BASIC also includes the alphanumeric generator that is required to display alphanumeric characters directly on your TV screen without an $800 terminal or the other hardware some BASICs require. Netronics has simply built the character generator into the program.

ELF II Tiny BASIC comes with an excellent user's manual. 4k memory is required.

Short Course On Tiny Basic by Tom Pittman

This "how to" book, written specifically for the ELF II, teaches you to program in Tiny BASIC and includes sample programs illustrating simple checkbook balancing, converting decimals to roman numerals, plus plotting complex parabolic and hyperbolic curves (or any function) on your TV screen. It's an indispensible step-by-step text for getting the most out of basic.

Short Course On Tiny Basic $5.00

EXPANSION POWER SUPPLY

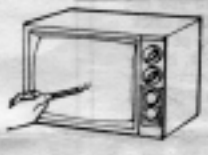
The ELF II Expansion Power Supply gives the ELF II system the reliability and stability required for optimum performance. All components are of the highest quality to provide ± 8 volts DC at 5 amps (unregulated) as well as a 7 volt AC output for timing and other power applications.

The heavy duty unit is fused and includes selector switches which take into account varying line voltage and load conditions, 25 amp rectifier and a deluxe IBM blue and black steel cabinet.

The ELF II Expansion Power Supply powers the entire ELF II system and is required when adding 4k RAM boards.

ELF II Expansion Power Supply kit $34.95

wired & tested $49.95



New! Our Fantastic ELF II Light Pen.. $5.00

Lets you write or draw anything you want on a TV screen plus play exciting games with just a wave of the "magic wand"!

If Building A Kit Worries You . . . Read This!

You don't need any special skill or manual dexterity to assemble one of our highly simplified Netronics ELF II kits.

Remember, the large electronics firms hire young girls in Asia, Mexico and South America to do much of their difficult assembly work.

Many of these assemblers can't read or write. Many live in primative homes without electricity or running water. Yet, by following simplified instructions, they are able to assemble highly sophisticated computers — and so can you!

The step-by-step instructions that come with Netronics kits are simple and clear. You'll have no trouble with them. They have already been used successfully by thousands of beginners who started with little or no kit building experience.

All components mount directly to rugged, high quality pc boards. Ordinary kit builder's tools are all you need — soldering iron, solder, needle-nose pliers, wire snippers, screwdriver — you probably have them already.

The $99.95 ELF II can be assembled in a single evening and you may even have time to write and run a few programs before going to bed. Other Netronics kits are just as simple. All our instructions are extremely clear.

And, as if all that weren't enough, the help that's always available from our **Service Department** further guarantees your success!

ELF II and all ELF II add-ons are also available wired and tested.

A New Breakthrough In Small Computer Technology!

ELF-BUG™ Monitor

Lets You Debug Your Programs With Lightening Speed!

As your programming skills develop and your programs become more complex, debugging becomes more of a problem. To help you debug programs with lightening speed, Netronics has developed a monitor system on cassette tape that's perhaps the most advanced small computer monitor on the market today.

The design eliminates the need to single step through a program to find the contents of the internal registers of the microprocessor. By simply adding break points, you display on your TV screen the contents of all the registers at any point in your program, so you're never in doubt about what's happening inside the microprocessor.

The auto scrolling monitor program will also display 24 bytes of memory with both high and low order addresses on your TV set or monitor and generate a cursor under a byte when it's being changed. The ELF-BUG™ Monitor also has the ability to run a program from any spot in memory. When break points are used to display registers, cutting back into the program is facilitated by reestablishing both X and P registers.

Developed by Netronics as part of its ongoing committment to the ELF II program, the ELF-BUG™ Monitor is the ultimate in programming debugging. It's as essential to the beginner as it is to the pro and it makes ELF II even more useable by both engineers and students.

The key to debugging is to know what's inside the registers and no other product on the market gives you that information, plus the ability to make corrections, with such exceptional speed!

ELF-BUG™ Monitor on cassette tape with complete documentation $14.95

SOON TO BE RELEASED!

ELF II Color Graphics & Music Board

Lets you display a full rainbow of color graphics on any COLOR TV set while you play fantastic computer-generated electronic music on the family stereo! It's a fabulous feast of light, sound and color . . . *all from your ELF II!*

Color Graphics & Music System
Board kit $49.95
wired & tested $69.95

Analog to Digital, Digital to Analog Converter

Extend ELF II's ability to deal with events in the outside world! The ELF II A-D, D-A Converter assigns discrete digital codes to continuous analog events such as changes in voltage, resistance, temperature, lighting, water level, etc. so that ELF II can vary the speed of a motor . . . the lighting in a room . . . the temperature in a freezer . . . the water level in a tank . . . the pitch of a rudder . . . the angle of a steering wheel, etc. — instead of having a mere "on-off" response capability.

ELF II's A-D, D-A Converter has an infinite number of industrial and hobby applications. And, if you're really into computers, you can use it to build your own robot!

Controller Board

. . . And More!

ELF II was recently used by a leading Midwestern TV station to predict election results . . . And ELF II was correct!

USE YOUR CREDIT CARD!
Master Charge • BankAmericard (VISA)

NETRONICS RESEARCH & DEVELOPMENT LTD.

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