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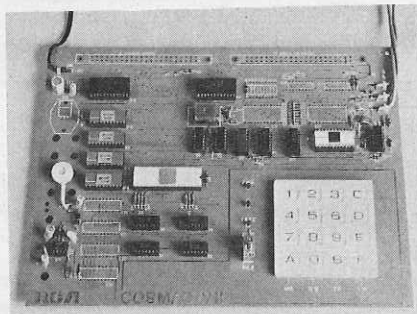
EQUIPMENT REPORT

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The model 390 VOM uses two batteries, a 1.5-volt unit for all ohms ranges except the 1K range, which uses a 15-volt battery. The low ohms ranges are protected by a 1/16-amp fuse located under the 1.5-volt battery. The batteries are easily accessible by removing a small plate on the back of the case.

A leather carrying case, model 379, is available. **R-E**

RCA VIP Computer Kit



CIRCLE 104 ON FREE INFORMATION CARD

THE RCA VIDEO INTERFACE PROCESSOR IS A hobbyist microcomputer with a graphic video output. As soon as it is assembled and operational, you become acquainted with the system by loading and running an assortment of video games, including "Kaleidoscope" and (my favorite) "Armored Vehicle Clash." After you gain this initial familiarity and have some fun, you can graduate to writing 1802 machine language and CHIP-8 programs.

The VIP is constructed on a single $8\frac{1}{2} \times 11$ -inch PC board that holds the CDP1802 microprocessor, 2048 words of user RAM, a 512-word ROM-based operating system, a 3.521280-MHz crystal oscillator, a video display generator IC, a cassette recorder interface and various system related IC's. A 5-volt, 600-mA power-supply module is part of the package. On-board memory can be increased to 4096 words (a higher current supply may be needed), and parallel I/O ports can be added by filling wired, empty IC positions. Standard 44-pin connectors can be used to expand up to 32,000 memory bytes, and beyond the 19-line on-board I/O limitation.

Programs, data and system control commands are entered through a 16-key hexadecimal keypad. Depressing a key switch on the keyboard operates the Q light, affects the on-screen display and generates an audio tone (the speaker is not included). The uppermost 256-byte portion of memory is displayed in a format that is 64 bits horizontal by 32 bits vertical. The video output is monochrome and noninterlaced, and must be connected to a video monitor, the video circuits of a TV receiver, or an external RF modulator for hookup to a TV antenna terminals. User programs are started at address 0000 by flipping the reset toggle switch from RES to RUN. To access the 512-word operating system at address 8000, key c is held while the reset switch is flipped.

The operating system has four functions—memory write, memory read, tape write and tape read. When memory contents are entered and checked, the address and contents are displayed simultaneously at the bottom of the TV screen, so you can keep track of what you are doing. The video format can be expanded

to 64×64 bits or 64×128 bits for higher resolution by writing your own video refresh interrupt routine in machine language. Video format expansion uses more memory for the display (512 bytes or 1024 bytes). Using the video display slows down the processor because of the time it spends translating memory contents into a video display pattern. The operating system saves the processor registers on the last page of memory for debugging programs.

The CHIP-8 interpreter is a 512-byte program that you must load manually, or from tape, into locations 0-01FF. CHIP-8 user programs, such as games, are then loaded starting at 0200. The language is a series of 31 two-byte instructions that let you control up to 15 variables, run a timer, display patterns, generate a variable-duration audio-output tone, convert binary to decimal, obtain random numbers and perform skips and subroutine jumps. You can create all kinds of static and moving displays with relatively few instructions. The CHIP-8 interpreter should be stored on cassette tape to save reloading and checking each time you want to use it.

A VIP operating manual, the MPM-201 1802 microprocessor manual, and data sheets describing the ROM, video display IC and 1802 microprocessor are included. The VIP manual includes all the details, but a beginning computer hobbyist will find a reference book or two helpful. Twenty video games are listed, plus some short "getting-started" programs.

Kit assembly requires good soldering technique since a single short between the necessarily close PC traces keeps the unit from creating its pretty pictures. While the VIP is basically designed to be used for fun, it can be expanded to perform useful control and calculation work.

After I resolved a couple of self-inflicted assembly errors, the system performed flawlessly. Programming mistakes did have the annoying habit of wiping out CHIP-8, but shifting to the tape cassette mode of operation made recovery easy. I used both an inexpensive time-worn audio cassette recorder and a better-grade Heathkit tape deck. The tape deck loaded programs successively nine times out of 10, but the less expensive recorder performed only once out of every three times.

The model CDP18S022 VIP Kit is priced at \$275. An order form is available from RCA Solid State Division, Box 3200, Somerville, NJ 08876. **R-E**

Redco Model FM-30 Frequency Monitor



CIRCLE 105 ON FREE INFORMATION CARD

THE RELIABLE ELECTRONICS DESIGN COMPANY, 11823 Slauson, Santa Fe Springs, CA 90670, manufacturers of frequency counters for communications and amateur work, as well as CB accessories, such as preamps and speech processors, has developed the model FM-30 frequency-monitor counter with a range of 1.0 MHz to 40 MHz. This low-cost unit (sug-

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