

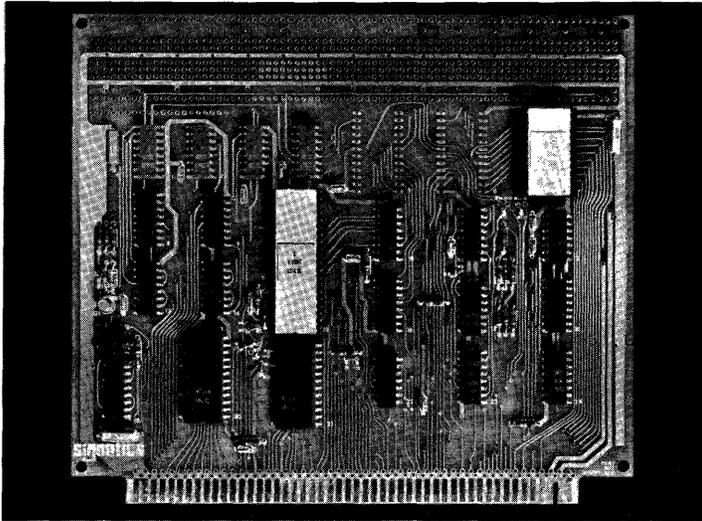
# MICROCOMPUTER DIGEST

Volume 3, Number 4

October, 1976

## ADAPTABLE BOARD COMPUTER

Signetics' Adaptable Board Computer (ABC) allows users to configure prototypes with a minimum of design effort and with the accuracy of a development system built from scratch.

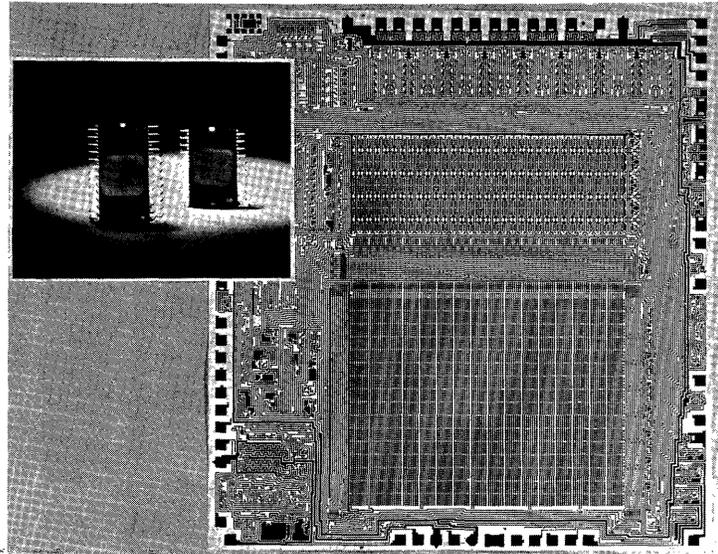


The ABC comes complete with the PC card, 2650 MPU, 1K ROM that includes PIPBUG, a Signetics developed loader, editor and debug program; 512 bytes of RAM, both serial and parallel I/O ports; and a dual monostable on-board clock. Cont'd on Page 2

## TI EXPANDING 9900 FAMILY

Texas Instruments is planning to add a new microprocessor and four peripheral circuits to its TMS 9900 family. The TMS 9980 is said to be a lower performance version of the 16-bit TMS 9900 and packaged in a 40-pin DIP. It will execute all 9900 instructions including hardware multiply and divide. Cont'd on Page 2

## NEW ROCKWELL MICROPROCESSOR LINE



Rockwell International has announced two new microprocessor systems that form complete 8-bit microcomputers on only two chips

Designated the PPS-8/2 family, both systems provide two-chip microcomputers with CPU, one automatic serial and 16 parallel I/O ports, 16-bit interval timer, three-level interrupt, clock circuit, 64 x 8 RAM and either 1024 x 8 or 2048 x 8 ROM. Both use 109 instructions. A 3.5 mHz crystal is the only component required.

The 1K ROM two-chip microcomputer is priced under \$25 for the two devices in 1,000 quantities, while the 2K ROM two-chip microcomputer is under \$30.

The PPS-8/2 CPU chip (P/N 12806) contains logic for system operations, math and data manipulations, and can respond to three unique interrupt request lines to provide 15 sub-level interrupts. Cont'd on Page 2



2589 SCOTT BLVD., SANTA CLARA, CA 95050 • (408) 247-8940

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## SPECIAL FEATURES

### ADAPTABLE BOARD COMPUTER

(Cont'd from Page 1)

Even without adding components, other options can be selected by the user by simply moving jumper wires. These options include replacing either the ROM or the RAM with PROM, implementing asynchronous operation, adding external clock input, interrupt vector, and RS232 or TTY serial I/O.

Additional features or circuits can be added by connecting selected components with jumper wires or wirewrap connections. Room for the new on-board components is provided.

An assembled and tested card is priced at \$275 in unit quantities. The kit is priced at \$190 and both versions are available from stock. 811 E. Arques Ave., Sunnyvale, CA 94086 (408) 739-7700.

### TI EXPANDING 9900 FAMILY

(Cont'd from Page 1)

The TIM 9904 is a four phase clock generator and driver for the 9900.

TMS is a programmable systems interface. The TMS 9902 is an N/MOS asynchronous communications controller. The TMS 9903 performs the synchronous communication control. PO Box 2909, Austin, TX 78767 (512) 258-5121.

### NEW ROCKWELL MICROPROCESSOR LINE

(Cont'd from Page 1)

The second chip is one of two combination ROM-RAM-I/O circuits (2K ROM-P/N A21XX; 1K ROM-P/N A22XX). Both devices use 52-pin quad-in-line packages to achieve their unique functional density which includes the I/O ports, 16-bit interval timer as well as RAM and ROM.

Up to four A21XX or A22XX circuits can be combined with a single PPS-8/2 CPU without need for additional support circuitry.

Provisions of the automatic serial port makes it simple to expand the number of I/O control lines available from each device. Memory mapping of the parallel I/O ports, which are programmable, and an 8-bit register

associated with the automatic serial port, permit direct I/O line manipulation with set, reset, test with skip and byte compare instructions.

The pool instruction innovation is also available in the PPS-8/2. 3310 Miraloma Ave., PO Box 3669, Anaheim, CA 92803.

### TECHNOLOGY

#### NSC BEEFS PACE WITH BIPOLAR VERSION

National Semiconductor has beefed up their PACE with a bipolar version known as "Super PACE." The CPU features a 220 ns cycle time and an average execution interval of 1 us. Thirty instructions have been added.

New instructions include double-word/double precision, multiply, divide, block transfers and memory search. Architect consists of a 16-bit address bus and bidirectional three state data bus. Interface signals, jump condition input signals and control flag output signals are provided and there is a five-level priority vectored interrupt structure with enable or disable features.

National offers Super PACE on an 8 1/2" x 11" \$600 card. A 6-slot card cage prototyping system is available. Support cards include a 16K x 16 RAM, 8K x 16 PROM, I/O, and floppy disc interface. The \$4500 system is configured to operate with either a CRT or TTY. Software support include debugger, assembler and a PACE to Super PACE cross assembler. 2900 Semiconductor Dr., Santa Clara, CA 95051 (408) 732-5000.

#### GI WORKING ON NEW 1600

General Instrument Corp. is expected to enter an upward version of its CP 1600 microprocessor soon. The new n-channel MOS device is said to offer more than just improved performance, although specifics were not released.

#### NEC ANNOUNCES TWO-CHIP MICRO

A two-chip 4-bit microprocessor introduced by Nippon Electric Co. features 69 instructions and interfaces directly with a 64-key keyboard and a 16-digit display.

One chip is the CPU; the other contains a 2048 x 8 ROM and a 128 x 4 RAM. Designated

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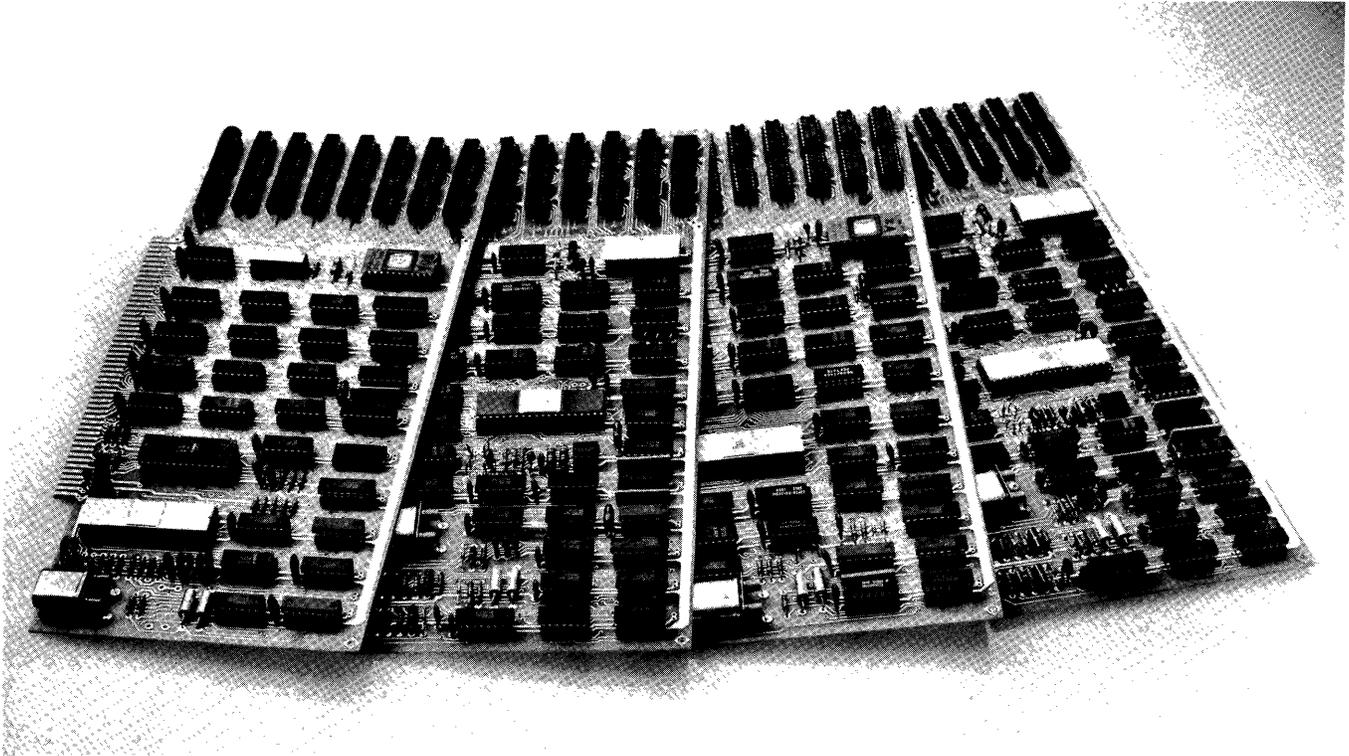


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# Pick a card. Any card.

## From the Digital Group.



If you've been considering the purchase of a microcomputer and looking at the myriad of products on the market, chances are you're just a bit confused about which system makes sense for you.

As you've no doubt discovered by getting further into this fascinating hobby, if there is one constant it is constant change. So how do you go about protecting the considerable investment you are about to make in a microprocessor?

The Digital Group offers a safe way to hedge your bets. Here's how we do it:

### **CPU-Independent Bus Structure**

Digital Group systems are based on an extensive bus structure (the equivalent of 200 lines) that allows you to completely change your system's architecture by merely exchanging CPU cards and reading in a new operating system tape. It's that simple. One card and a tape to get from 6500 to 6800 to 8080A to the remarkable new Z-80. Or something even newer.

The Digital Group system design is quite complex but the result is simple. All CPU dependencies are handled on the CPU card — nothing else in the system changes. Not memory, readouts, I/O interfaces or even cabinets. And that represents a significant savings for you.

When many Digital Group system owners wanted to upgrade to the revolutionary new Z-80 CPU, it cost them a total of \$185. Nothing more.

### **Stand-Alone Design**

Each component in a Digital Group system is designed to be as independent from the other components as possible.

Most of our designs are parallel port driven with their own buffers. If you can get eight bits to a Digital Group interface, it'll take over and get the job done.

### **Coordinated Cabinets**

Right down to our new line of cabinets, Digital Group systems are designed to protect your investment and keep you at state of the art. Every one of our unique, custom cabinets is part of a coordinated line, and you can rest assured that each new product will maintain the same unmistakable up-to-the-minute Digital Group image.

As much as is possible in this fast-growing, ever-changing field, the Digital Group offers protection from obsolescence. So go ahead and pick a card. Any card from the Digital Group is a safe bet.

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the digital group<sub>inc</sub>

P.O. Box 6528 / Denver, Colorado 80206 / (303) 777-7133

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Name \_\_\_\_\_

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City/State/Zip \_\_\_\_\_

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(Cont'd from Page 2)  
ucom-41, the two chips are priced at \$40 each in 1,000 lots. Interface chips are also offered.

The ucom-41 will not be imported into the US as software routines are not in English.

## MOTOROLA FORMALLY ENTERS ECL SERIES

Motorola has formally introduced the first chip in its 4-bit ECL slice microprocessor series. The 10800 ALU is priced at \$75 and can be ganged with other ALUs to comprise up to a 32-bit machine. The 10800 is compatible with Motorola's line of existing ECL memories.

Scheduled for introduction in January are the microprogram controller, timer, and a memory interface circuit. PO Box 2953, Phoenix AZ 85062 (602) 244-4826.

## ROCKWELL'S DEVELOPMENTAL PAIR

Rockwell's latest 4-bit micro is two chips, no...two micros and one chip, or... Adding a new dimension in microprocessing, the PPS-4/1 MPU is a single chip micro housed in a 64-pin package for development and a 42-pin production model.

The user designs and debugs his entire product using the 64-pin version which brings out memory address lines, the program counter, data address register and one status line. An external erasable PROM is used with the chip for program development. Once the design is complete, the 42-pin device with an internal mask-programmed ROM (replacing external PROM) is used to provide a single chip microcomputer.

The current 4-bit design differs from earlier models in that a shift clock control line has been added along with two new instructions, SAG for special address generation and TAB for table look-up.

Also the current model can skip any instruction whereas the earlier PPS-4 could only skip one or two-byte instructions. 3370 Miraloma Ave., Anaheim, CA 92803.

## 8080 BIPOLAR VERSION

Signetics Corp. will soon begin volume production of a Schottky-bipolar emulation of the 8080A and several of its peripheral devices. Signetics is using the bipolar 3000 that it second sources.

The emulator, 80E is said to achieve system speeds two to 12 times faster than the

8080A and will replace it in high-speed applications.

Functionally equivalent to Intel's 8080A together with Intel's 8228 system controller, 8224 clock generator and driver, and 8212 8-bit, I/O port, the 80E emulation is configured around two independent arrays, each containing four 3002 CPUs. The two 8-bit buses for the processing units are tied together.

## COMPLETE MICROCOMPUTER

A complete microcomputer system based on a 6502, the Electronic Tool Co's ETC-1000, comprises a 40-key keyboard, programmable 8-digit display, I/O interfaces, power supply, and memory.

Available expansion options include communications, real-time and DMA interfaces, memory expansions, and various add-on CPUs.

The package is intended for system development, control, and small-scale data processing applications. Software currently available includes a resident assembler, I/O handlers, diagnostics, and other support tools.

The CPU consists of MPU, clocks, control logic, interface buffers, and 256 bytes of EAROM containing system control functions. ROM and RAM may be added in increments of 4K and 8K bytes per module, up to 64K. 4736 W. El Segundo Blvd., Hawthorne, CA 90750.

## MICROCOMPUTER BASED PRODUCTS

### UNIVERSAL MASTER/SLAVE SYSTEM

A new microcomputer development system is now available from Millennium Information Systems, Inc. that interfaces directly to the 8080 and 2650 microprocessors. The system, Universal One, will interface to the 6800 by the end of 1976 and other microprocessors in the near future.

The system is similar to Signetics TWIN and a powerful universal DOS built around a floppy disc provides a number of development aids and protection devices to speed prototype development and avoid fatal programming errors.

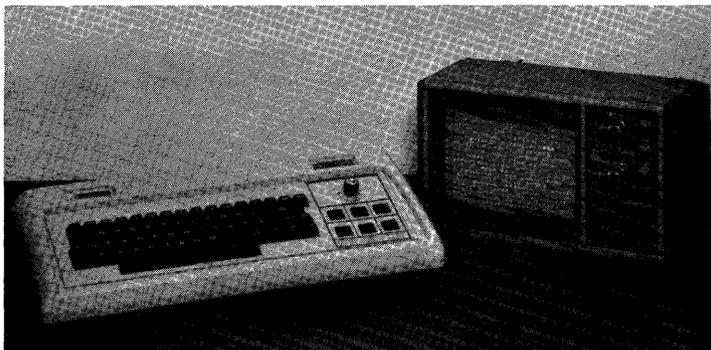
Universal One also burns PROMs, and front panel sockets are provided for the most common PROMs. The system can also be used to automatically generate ROM masking tapes.

A basic system is available for immediate delivery for \$8,900. Complete documentation and service is provided. 20440 Town Center Lane 4-1, Cupertino, CA 95014 (408) 243-6652.

## DUMB/INTELLIGENT TERMINAL UNVEILED

Microcomputer Associates Inc. (MAI) chose the Mini/Micro Computer Conference held in San Francisco to unveil its new video terminal. The VT 100 video terminal when connected to an ordinary television set allows the microcomputer user to communicate with most computers, especially the rising number of home personal computers.

Ray Holt, executive vice president of MAI said, "The VT 100 is an excellent replacement for teletypewriter terminals and conventional CRT terminals while offering the highest performance per dollar for any man-machine instrument available. The VT 100 is the cost effective means for entering or retrieving data from any system."



The standard interface includes an RS232 connection as well as a 20 ma current loop.

A full typewriter-like keyboard with quality easy-to-depress keys provides the standard ASCII character set including upper and lower case alphabets. Two key roll-over enhances ease of operation. Switches include LOCAL/LINE, LINE TRUNCATION (ON/OFF), READBACK (START/STOP), TRANSMIT CONTROL CHARACTER (ON/OFF), and STORE RECEIVING CONTROL CHARACTER (ON/OFF). A rotary switch selects baud rates up to 9600.

A 32 character x 16 line screen (page) makes viewing easy and comfortable. The standard unit comes with 2 pages of memory (1024 characters) expandable to 16 pages. The readback features allows the user to read all or part of the screen memory to his terminal output line (RS232 or 20 ma current). This allows a user to transfer data to the terminal, modify the data using cursor control commands and then read the data back to the main computer system. The readback feature also allows the VT 100 to perform local editing without tying up the main computer system. Eight cursor controls are available via the keyboard. These are Advance (move right), Backspace (move left),

Up, Down (line feed), Carriage Return, Home (move to upper left of screen), Erase Screen, Page Advance (automatic at end of previous page).

Features of the system include: Standard RS 232 and ma current loop interface, ASCII keyboard input, video output, 32 character x 16 line display, 5 x 7 character font, upper/lower case, eight cursor controls and bell, crystal controlled baud rates up to 9600, Full duplex, standard with 2 pages, 512 chars/page, up to 16 pages of screen memory, auto/manual readback of screen memory, and transmit/store control character switch.

MAI is also offering the VT 200 which includes all of the above features, and houses a resident 6502 microcomputer system complete with resident assembler and BASIC.

The VT 100 base system is currently priced at \$695 with the VT 200 priced at \$1395. 2589 Scott Blvd., Santa Clara, CA 95050 (408) 247-8940.

## NEW 2640 SERIES

Hewlett-Packard has introduced the 2645A, the newest and most powerful of the HP 2640 terminals. Priced at \$3,500, the microcomputer controlled CRT display station, designed for both local and distributed computing networks, can operate at selectable speeds up to 9600 baud and has the optional capability of asynchronous or synchronous (BISYNC) multipoint polling of up to 32 terminals on the same line. Additional options to increase data communications flexibility include 20 mA current loop, split I/O speed and custom baud rates.

HP's lower cost 2640 B interactive CRT terminal features enhanced data communications capability, improved keyboard layout and cursor/sensing positioning.

The \$2,600 B version gives users a choice of either main-channel protocol or standard reverse-channel protocol for half duplex modem operation. Additional firmware enhancements allow connection of most serial printers via an EIA RS 232 interface. Also malfunctions of interfaced printers are detectable by the remote computer. 1501 Page Mill Road, Palo Alto CA 94304 (415) 493-1501.

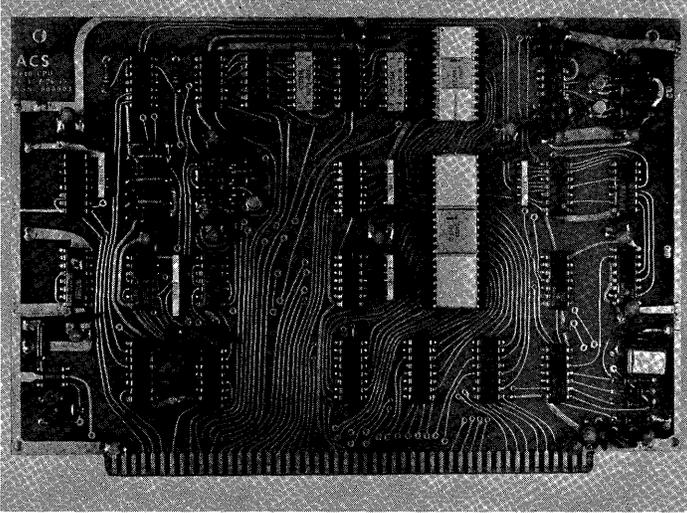
## 6800 EVALUATOR

Configured with 6800, 128 x 8 RAM, 1024 x 8 ROM, PIA, ACIA, clock oscillator and bit-rate generator, Motorola's new M6800B Evaluation Module II is priced at \$795.

A mask-programmed ROM contains MinibugII,

a diagnostic/debug program. A resident editor and assembler programs are available which require 8K memory, and the module will operate with either a TTY at 110 baud or an RS 232 terminal at 300 baud. PO Box 20294, Phoenix AZ 85036 (602) 244-3465.

## GENERAL PURPOSE 4-BIT MICRO



The ACS-4040 MPU is Automated Computer System's 4-bit general purpose PCB mechanized around Intel's 4040 chip. Adaptable for control environment, the system features crystal clock timing, 8 bank RAM addressing, 2 bank PROM addressing, 8-bit program instruction buffered expansion bus, 13-bit PROM I/O address buffered expansion bus, RAM bidirectional memory data expansion bus, I/O bidirectional buffered expansion bus, Run/Single-Step mode control, photo isolated local/remote power reset and master reset. On-board bus control logic is provided to interface with an optional Program Development Control and Display Panel module.

The ACS 4040 is priced at \$250 in single units with availability in 30 days.

### WOODLEY ASSOCIATES

Custom hardware and software development for  
INTEL 8080, ZILOG Z-80  
(In-house development equipment)

604 Indian Home Road (415) 837-3992  
Danville, California 94526

### LJM ASSOCIATES

Custom hardware and software development for  
INTEL 8080, 4040, 4004

6331 Glade Ave., Suite 318 (213) 347-2695  
Woodland Hills, CA 91364

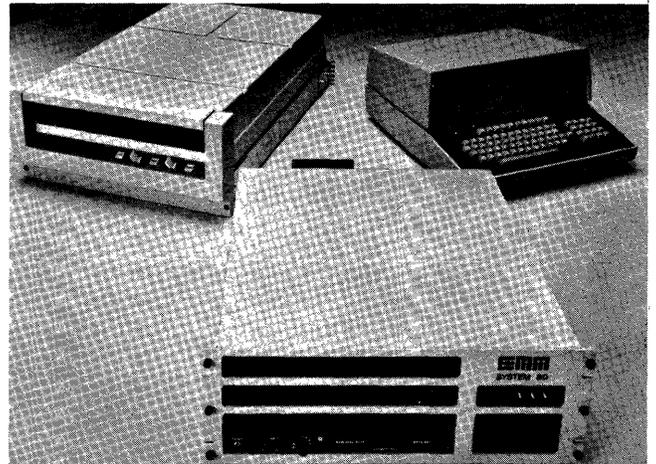
## DIVERSIFIED COSMOS

Designed by Diversified Technology, the COSMOS microcomputer features Key-Top programming keyboard which allows ASCII and assembly language to be entered. Other features include bus-oriented design, and low power CMOS technology which facilitates battery operation.

The unit is available either complete or in a kit form containing an RCA CDP 1801 CPU, four I/O ports of 8-bits each, 256 word RAM memory (expandable to 64K bytes), discretely variable clock with control panel, keyboard interface, display, and 11-position motherboard. PO Box 213, Ridgeland, MI 39157.

## DISC-BASED MICRO SYSTEM

Electronic Memories and Magnetics Corp., Commercial Memory Products Division (CMP) announces their 8080 software compatible disc based microcomputer system, the S/80-DSK. The system features EMM's high speed bipolar 8080 emulator and a 5 megabyte disc drive with one fixed and one removable disc. The drive/controller combination transfers data at 200K bytes per second on a cycle stealing basis.



The S/80-DSK is supported by a disc executive software package called S/80-DEX, which features file management on a named file basis, and a disc resident editor and assembler. The S/80-DSK provides necessary I/O drivers as well as symbolic debug capability and essentially does away with the need for paper tape during program generation and debug.

The configuration includes CPU, chassis and P/S, disc controller, 5 megabyte disc and a 32K memory. The S/80-DSK can be custom configured.

Delivery of the S/80 DSK is 60 to 90 days ARO, and sells for \$9,450 in single quantities.

## SMART RADIO SCANNER

The first radio scanner to use a microprocessor can search for and locate some 12,000 VHF and UHF frequencies in the police, fire, weather, marine, rescue and business bands.

Tennelec Inc. has used a Rockwell PPS-4/2 microprocessor to provide several automatic control functions.

## FOXBORO USING 2901

Foxboro is reportedly ordering 2901 bipolar microprocessors from Raytheon for use in a 1977 line of process control equipment. Deliveries are said to have already begun by the second source supplier.

## μC BASED CONTROLLER FOR PDP-11

Diva has introduced Computroller V, a microcomputer based disc controller that is said to be software compatible with Digital Equipment Corp's PDP-11, Data General's Nova and Eclipse, and Interdata's small computers.

The \$13,600 Computroller's V/DD-50 series starts with 27.3 megabytes of disc storage and is expandable to 821 megabytes of storage at \$17,500. Eatontown, NJ.

## SIEMENS OFFERING KIT FOR EUROPE

Getting into the act, Siemens AG has built a couple of microcomputer kits around the SAB 8080A. Priced around \$200 the Sikit-N/8080 kit contains MPU 256 x 8 EPROM, static RAM memory, clock generator, and I/O logic. The higher priced Sikit-DK/8080, \$430, has two RAM's, 512 x 8 EPROM, and additional I/O and peripheral circuits.

## 8080+ DEVELOPMENT SYSTEM

A new development system from Monolithic Systems allows the user to step through education, experimentation, prototyping and production volume manufacturing using the same hardware. Based on Monolithic System's 8080+ microcomputer card, the system includes control panel and logic, 16K x 8 RAM, 512 x 8 EPROM, resident assembler, editor, TTY software/hardware interface and requires only +5 and +12V supplies.

Program entry and debugging or program control can be exercised through a hexadecimal keyboard. A 4-digit hexadecimal display allows users to monitor data, status, instruc-

tions, or memory addresses. Engelwood, CO 80110 (303) 770-7400.

## PACE KIT NOW OFFERED

National Semiconductor has configured its popular single chip, 16-bit microprocessor into a kit designed to aid logic designers in learning the PACE system.

The \$196 kit is comprised of the PACE micro, 256 x 16 RAM, 2K x 16 PROM, with a program monitor burned-in, I/O devices and system clock. Full documentation is provided including a logic design guide that shows the software equivalents of common logic circuits including counters, adders, multiplexers and shift registers. 2900 Semiconductor Dr., Santa Clara, CA 95051. (408) 732-5000.

## 6800 DESKTOP TURNKEY SYSTEM

Wintex Computer has incorporated a microcomputer into a \$11,800 desktop turnkey system for telephone answering services, law firms, etc. Basic configuration includes the MPU, 8K memory, two floppy disc drives, 1,080-character display and a 110 cps printer. 544 Lunt Ave., Schaumburg, IL 60193.

## NEW HARDWARE/SOFTWARE MODULES

A full hardware/software microcomputer development system can be constructed with a family of modules built by Revenue Control Sciences. The CPU board includes the M6800, 4K RAM, 1K PROM, four PIAs, and address/data drivers.

Other modules include main board; regulator board with real-time clock, power fail sensing, and battery back-up; PROM-ROM board with 14K bytes of 2708 PROM, current loop async port or EIA port, and integral 300-baud modem; memory board with 4K to 16 bytes RAM and 1K PROM, PROM Program Board, and general interface board. 137 Richmond St., El Segundo, CA 90245.

## ROCKWELL MICRO IN FIELD BOOKKEEPER

Wordsmith, Inc., has incorporated a Rockwell microcomputer into a portable computer terminal for field bookkeeping.

The portable terminal looks like and is about the same size as a handheld calculator. It records and transmits daily sales.

## MICROCOMPUTER SOFTWARE

### 8080 UTILITY PROGRAMS

Tempress Microelectronics is offering Intel 8080 microcomputer software utility programs augmenting the Intel MDS 80 ISIS DOS program development system capabilities.

The programs perform memory loading, memory dumping, disc file listing and diagnostic-only assembly functions.

These utilities are implemented as ISIS operating system commands. Program object code is delivered on an Intel MDS 800 ISIS DOS compatible flexible diskette with detailed usage instructions. The price is \$35 per program plus a \$30 diskette preparation charge with a \$100 minimum order (two programs plus the diskette preparation charge). 980 University Ave., Los Gatos, CA 95050, (408) 356-8151.

### 2650 PLUS

PLUS, Signetics version of PL/M, supports the 2650 microprocessor and generates lines of machine code from a single symbolic statement. Features include a block structuring, procedure calls, byte and address data elements and micro capability. The software also generates relocatable code supported by a relocating loader and allows separate compilation of program modules.

Prices at \$1,250 the cross-compiler is available on National CSS and General Electric time sharing system. 811 E. Arques Ave. Sunnyvale, CA 94086 (408) 739-7700.

### PDP-8 CROSS-ASSEMBLERS FOR TOP THREE

Sierra Digital System is offering PDP-8 cross assemblers for the 6502, 6800 and 8080 microprocessors. The X8 assemblers run in 8K of memory under the OS/8 operating systems. X8 assemblers are two pass assemblers with an optional third pass for a listing. Execution time is less than 30 seconds for a 3K byte program.

Numeric local symbols minimize the need to originate unique label names for internal referencing. Operands may be expressed in standard algebraic notation. And unlike other assemblers parenthesis are allowed in expressions.

Each X8 assembler is priced at \$400 and is available in binary format on paper tape, DEC-tape, or floppy diskette. A detailed

user's manual is provided as well as one year of software support. 1440 Westfield Ave., Reno, NV 89509 (702) 329-9548.

### LIVERMORE RELEASING BASIC TO PUBLIC

The Livermore Laboratories' 8080 BASIC software is to be released to the general public royalty-free. Details of the release are now being arranged.

The program is a stripped-down version of BASIC with a floating point package that can run as a local interpreter in about 5K memory locations. A FORTRAN compiler goes with the program and will operate either on local computers or from time-sharing services. The program can recompile the original BASIC program with about a three to one savings.

### 6502 CROSS-COMPILER

Remote Computing Corp. is making available a FORTRAN cross-compiler for the MOS Technology/Synertek 6500 microcomputer. The FORTRAN compiler accepts an enhanced version of the FORTRAN IV language and produces, as output, a well annotated assembly language program which is then processed by the RCC 6500 cross-assembler to produce an object file in either 6500 simulator, or Intel 8080 formats. The Intel 8080 format allows the use of a 1702 PROM programmer.

The compiler and cross-assembler are available, via timesharing, exclusively on Remote Computing Corp.'s nationwide time-sharing network. One Wilshire Bldg., Suite 1400, Los Angeles, CA 90017 (213) 629-2532.

### 6502 CROSS-ASSEMBLER

Computer Applications Corp. is offering a PDP-11 based cross-assembler for MOS Technology's 6502 microprocessor. Written in MACRO-II, the \$900 assembler runs under Digital Equipment's RT-11 operating system, using 5K words, minimum. The price includes disc and one year of support. 413 Kellogg, Ames, IA 50010 (515) 232-8181.

### 1800 HIGH LEVEL LANGUAGE

A new, resident CDP1800, high-level language capable of direct execution on the CDP 1800 microcomputer system, has been developed for RCA by Forth, Inc.

## MEMORIES/PERIPHERALS/SUPPORT

### 8K/16K PROM BOARD FOR SBC

Microtec has developed an 8K/16K PROM board that is plug compatible with Intel's SBC 80/10, SK-80 and MDS-800. The board may contain up to 8K or 16K bytes of PROM/ROM depending on the PROM type used.

Switches and jumpers allow the selection of PROM type and the base address of the board. Switches are also used to alter the timing of the acknowledge signals to correspond to the access time of each PROM type. A three terminal -5V regulator is provided on the \$250 board so that the -10V power supply in the MDS may optionally be used to provide -5V for 8708s.

The board is also available with PROMS containing a self-assembler for the Intel 8080 microprocessor and a line oriented editor. PO Box 337, Sunnyvale, CA 94088 (408) 733-2919.

### 6800 PROGRAMMING PANEL

Program Debugging, Production Testing, and Field Servicing of 6800 based products is now easier using Applied Microsystems new 6800 Programming Panel. It connects easily to a custom 6800 product using a 50-conductor flat cable and provides program and I/O troubleshooting capability.

Program debugging features include keys for Reset, Run, Pause and Single-Step as well as Examine/Change memory and Examine/Change processor registers. The Programmers' Panel has a hardware implemented breakpoint comparator to stop program execution at any desired point. A trace memory is implemented which captures the last 100 processor cycles for easy review. PIA's and other I/O devices can be quickly initialized and tested. Delivery is from stock to 6 weeks; single units are priced at \$1590. PO Box 245, Bothell, WA 98011 (206) 827-9111.

### MEMORY MODULES

Revenue Control Sciences' Memory Modules for the Motorola EXORciser of MC6800 can be configured for 4K, 8K, 12K or 16K bytes.

Power supply inputs are separated to allow battery back-up and up to 1K bytes of erasable PROM can be included on each board. Modules fit directly into the EXORciser and measure 9.75x9.75 in an 8K module costs \$6. 137 Richmond Street, Box868, El Segundo, CA 90245 (213) 322-1893.

### MICROCOMPUTER SYSTEM ANALYZER

The Model AQ6800 Microprocessor System Analyzer designed to develop and debug 6800 microcomputer systems is a product of AQ Systems, marketed by E&L Instruments, Inc. The instrument can display all address, data and status information and permits direct user interaction with memory and all registers including the program counter. A buffered cloop-on probe that attaches directly to the microprocessor converts the analyzer into a portable production test of field maintenance instrument.

Switches on the front panel, permit access to the internal registers, control of the microprocessor, and access to memory. Other switches are used to set a breakpoint or monitor a recorder.

Four register switches permit data to be written into any selected register of the 6800 or display the contents of the selected register.

All circuitry on the \$875 AQ6800 is packaged on one mother board positioned behind the front panel. Delivery is 6 weeks. 61 First St., Derby, CT 06418 (203) 735-8774.

### ROM SIMULATOR

Providing high speed static RAMs to replace MOS PROMs or ROMs, as an option to the MM80 microprocessor in-circuit emulator, Ramtek Corp's PROM simulator acts as a memory extension to the emulator, permitting multiple units to be daisy chained.

Each unit will simulate two PROMs of up to 1K x 8 bits. The device being simulated is replaced by a PROM simulator connector cable and plug. Front panel controls select true/complement data and write protection. Self-contained power supply retains memory contents when emulator is off. 585 N. Mary, Sunnyvale, CA 94086.

### AMI ANNOUNCES 16K ROM

The S6831 (Series/A/B/C/) 16K MOS ROMs are organized as 2048 x 8 by American Micro Systems. Using a silicon-gate, depletion-load process, the ROM have access times of 450ns and consume 150 mW. The S6831A is pin compatible with the Intel 2316A and 8316A. The B version is compatible with the Intel 2316B, 8316B and the Motorola 68317, and the C version with the Electronics Arrays 4600. 3800 Homestead Rd., Santa Clara, CA 95051, (408) 246-0330.

## PERIPHERAL CONTROLLER

A new peripheral controller described as fully plug-compatible with the SBC 80/10 and Intellec MDS from Intel has been introduced by Cybernetic Micro Systems. The immediately available KDP/C board (Keyboard-Display-Printer-Computing Board) handles an ASCII standard electronic keyboard, a Victor Comp-tometer printer, and an on-board 4-function calculator.

the KDP/C's functions are controlled by the host 8080 while the on-board calculator performs the four basic arithmetic functions to 12-digit accuracy.

The KDP/C is priced at \$295 in 100 quantities. 2460 Embarcadero Way, Palo Alto, CA 94303 (415) 321-0410.

## 8K RAM BOARD

Solid State Music announces the addition of an 8K RAM board, MB6, to its line of Altair, IMSAI plug compatible boards. MB6 uses low-power 500ns, static RAMs and low-power Schottky support chips.

Featuring memory protect setable in blocks of 256, 512, 1K, 2K, 4K and 8K bytes, the board sells for \$295. As an 8K kit, it sells for \$250. 2102A Walsh Ave., Santa Clara, CA. 95050.

## AUDIO CASSETTE/TTY/CRT ADAPTOR

Electronic Product Associates, Inc.'s new, \$129 Audio Cassette/TTY/CRT Adapter allows any serial TTL or MOS output to simultaneously interface a low cost audio cassette player via frequency shift keying (Byte Standard) up to 300 Baud and to a standard RS232 CRT and a 20 mA current loop TTY.

The adapter also simultaneously decodes Byte Standard FSK data from low-cost players and from 20 mA current loop TTY and RS232 CRT. The model TCC3 is 4½" x 3¼" (11½cm x 8cm) and mounts piggyback on the EPA Micro-68 development computer.

## LOW-COST FLOPPY DISC SYSTEM

ICOM Inc. has developed two new peripherals—a low-cost floppy disc system and a PROM programmer—specifically designed to operate with Intel's SBC80/10 Single Board Computer.

The \$1495 Model FF36-1 Floppy Disk System includes a disc drive with daisy chain capability, and IBM compatible controller, and

all cabled and connectors. Also provided is iCOM's 360-56 interface card for the SBC80/10. This card, which plugs into a slot in the Intel SBC card cage, contains a software driver PROM and iCOM's FDOS-II software with macro assembler and string oriented text editor.

The \$395 PP80 PROM Programmer/Memory Expander card which programs 2704 and 2708 EPROMS includes 1K ROM resident programming firmware, and occupies one slot in the SBC card cage, has sockets for up to 8K of additional PROM. 6741 Variel Ave., Cnaoga Park, CA 91303.

## INTEL COMPATIBLE FLOATING POINT UNIT

A floating point unit that is plug compatible with the Intel MDS and SBC microcomputers is now offered by Applied Cybernetics. The FPU extends the 8080 instruction set to include binary-to-floating-point decimal conversion, all trig functions, logarithms and powers, multiply, divide, addition, subtraction (12 digit precision), coordinate transformation, and mean and standard deviation.

The module contains a set of macro-instructions or a set of sub-routines which may be called by assembly language programs, and it requires less than 64 bytes of user-supplied RAM. 960 N. San Antonio Rd., S281, Los Altos, CA 94022.

## RAM INTERFACE CIRCUIT

Rockwell International Corp.'s new RAM interface circuit, RIC 10929, interfaces NMOS 16-pin 4K RAMs with any PPS-4 or -8 microcomputer systems. The IC fully buffers the PPS bus from dynamic RAM loading effects and provides all address multiplexing, system control and refresh functions. Memory refreshing is transparent to the PPS system.

Up to 32 NMOS 16-pin 4K RAMs can be controlled and directly addressed by a single pair of RIC devices, and additional RIC pairs combined with bank switching can be used to directly access up to 16 banks of 16K-bytes each in a single PPS-8 system.

Production quantities of the RAM interface are available now. The price is part of a PPS system cost. 3310 Miraloma Ave., Anaheim CA 92803.

## PAPER TAPE DUPLICATING

Shepardson Microsystems  
10601 S. De Anza Blvd., Cupertino, CA 95014  
(408) 257-2996

**PEOPLE, LITERATURE AND EVENTS****LSI TASK FORCE FOR MIL STANDARDS**

A task force to establish standards for LSI circuitry including microprocessors for military applications and to resolve issues of concern among interested industry and government representatives has been formed by JEDEC. The task force is sponsored by the Electronic Industries Association and the National Electronic Manufacturers Association.

The group will concentrate initially on drafting detail microprocessor specifications for the 6800 and the 8080. Hank Malloy is chairman of the task force.

It was also learned that fifteen semiconductor competitors and two trade groups, EIA and WEMA, have organized to set industry-wide JEDEC standards for memory circuits, including the 16K RAM. Joe McDowell, general manager of the Memory/Standard Products division at AMI, is chairman of the committee.

**NEC OFFERING 3-DAY COURSES**

A series of 3-day courses to provide hands-on training in 8080A hardware and software design will be taught on a monthly basis by NEC Microcomputers.

The Monday-through-Wednesday course, limited to 3 to 10 persons, will provide microprocessor users and prospective users with detailed information on the 8080A, its instruction set, system components, programming, debugging and the various software tools.

Cost of the course, which includes study materials and daily luncheons, is \$295 per person. NEC will provide a list of area motels for course attendees. 62 Henderson Street, Needham, MA 02192 (617) 449-2217.

**PATCA OFFERING MICRO MEMBER LIST**

PATCA, the professional & technical consultant for the San Francisco Bay Area has just published their Microprocessor Group list of Members. For a copy call (415) 961-1155.

**MICRO CONFERENCE PLANNED FOR DEC.**

Stressing the latest developments and practical applications in MATERIAL REQUIREMENTS PLANNING, MINI-MICRO COMPUTERES, and PRODUCTIVITY will be the object of the American Institute of Industrial Engineer's 1976 Systems Engineering Conference being held December 1-3, 1976 in the Sheraton-Boston Hotel, Boston, MA. American Institute of Engineers, 25 Technology Park, Norcross, GA

(404) 449-0460.

**WEST COAST COMPUTER FAIR**

The San Francisco Bay Area will be hosting a major conference and exhibition exclusively concerned with personal and home computing, The First West Coast Computer Faire. It will take place in the Civic Auditorium in San Francisco. It will be a two-and-a half day affair, starting on Friday evening and running through Sunday evening, April 15-17, 1977. The Faire is sponsored by a number of local and regional hobbyist clubs, educational organizations, and professional groups.

The Faire is expected to draw 7,000 to 10,000 people and will have 50 to 100 conference sessions, with over 200 commercial exhibitors. Conference sessions will cover Personal Computers For Education—the home, elementary and secondary schools, and one-on-one computers for college and university students; Microprogrammable Microprocessors for hobbyists; Computer Music and a number of panel sessions and working groups concerning various standards—Digital Cassette Tape Standards, Peripherals Interface Standards, Bus Standards, Software Modularization for Program Portability, etc. There will be information exchange sessions for Club Officers, Newsletter Editors, and Conference Organizers. Of course, there will be a multitude of talks given by manufacturers of microprocessors, microcomputers, speech synthesis systems, tape systems, etc., concerning their various products. (415) 851-7664.

**MICROCOMPUTER REFERENCE BOOKS**

Osborne and Associates has announced the publication of there new reference books.

Volume 1 - BASIC CONCEPTS takes you by the hand, from elementary logic and simple binary arithmetic through the concepts which are shared by all microcomputers. It describes how to take an idea that may need a microcomputer and create a product that uses one. This book is complete—every aspect of microcomputers is covered: the logic devices that constitute a microcomputer system; communicating with external logic via interrupts, direct memory access, and serial or parallel I/O; microprogramming and macroprogramming; assemblers and assembler directives; linking and relocation—everything you need to know if you are going to select or use a microcomputer. Volume 1 is equivalent to Chapters 1 through 6 of AN INTRODUCTION TO MICROCOMPUTERS, first edition, but with extensive

new sections on chip slice products and serial I/O. The price is \$7.50.

Volume 2 - A loaded 900 page manual covers real microcomputers, in considerable detail. Every major microcomputer: 4-bit, 8-bit, or 16-bit, is described, including some soon to be announced products. Major chip slice products are also covered. More than 20 microcomputers in all. Available in November, price is \$12.50.

Also available from Osborne and Associates, 8080 Programming For Logic Design. This is a completely new book on a totally new subject: implementing digital and combinatorial logic using assembly language within an 8080 microcomputer system. The book simulates well known digital logic devices using assembly language; and shows how to simulate an entire schematic, device by device, keeping the assembly language simulation as close to the digital logic as possible. But that is the wrong way to use a microcomputer; the book explains why, then shows you the correct way. Written for both readers, this book describes the meeting ground of programmer and logic designer; it is available now for \$7.50. PO Box 2036, Berkeley, CA 94702 (415) 548-2805.

## PERSONAL COMPUTING

Benwill Publishing Corp. has announced that they will commence publishing "Personal Computing" in October, 1976. The computer hobbyist magazine will provide "educational articles on basic computer jargon, computer architecture, and computer programming. These articles will be written in an easy to understand language for the beginner and will serve as a reference for people already knowledgeable in the field."

The bimonthly publication carries an annual \$8 subscription rate. 167 Carey Rd., Brookline, MA 02146.

## SMALL BUSINESS SYSTEMS INDUSTRY REPORT

A new publication has emerged from the San Francisco Bay Area. "Small Business Systems Industry Report" is a monthly newsletter designed to provide readers with valuable insights into the small business computer market.

The publication focuses on a different segment of the industry each month, analyzing current events, systems, market and active consultants. Subscriptions are \$95 per year

and a sample copy can be received by writing 701 Welch Rd., Suite 1119, Palo Alto, CA 94304.

## MICRO NOTES

Electronic Product Associates has announced the availability of a new 66 page User's Manual for the Micro-68 Micro-Computer prototyping system. The price is \$5.

A six page brochure, describing the advantages of TROUBLESHOOTER 400, a microcomputer-controlled in-circuit test system, is now available from Zehntel, Inc.

A Fifty page manual that includes hardware schematics, timing, and interface software for "Interfacing Selectrics to the 8080A" is now available for \$12 prepaid from the Center for the Study of the Future, 4110 N.W. Alameda, Portland, OR 97212.

A 16-page brochure describing RCA Solid State Division's full line of memory products is now available. Write for "RCA—Fastest moving house in memory," 2M1147. Box 3200, Somerville, NJ 08876.

Eight new application notes, each describing the use of logic-state troubleshooting instruments to analyze commonly used microprocessor systems, are available without charge from Hewlett-Packard. Microprocessor systems that are subjects of individual notes include the National IMP and SC/MP, Intel 4040, 4004, 8008, 8080, Fairchild F8, and Motorola M6800. 1501 Page Mill Road, Palo Alto, CA 94304, (415) 493-1501.

Intel is selling its 305 page third edition of the MCS-40 Microcomputer System User's Manual for \$5. Order through the literature department.

Intel is making available their 151 page Series 3000 Reference Manual and their 73 page Series 3000 Microprogramming Manual. The manuals are priced at \$5 each.

Texas Instruments Inc. has published an 8 page, 4 color brochure describing the firm's total microprocessor capability. Included are all TI microprocessor CPUs, software, support hardware and memory components.

## PEOPLE ON THE MOVE

WARREN WHEELER, one of the original founders of American Microsystems, Inc. has joined its board of directors.

RONALD E ECKERT has joined AMI as product engineering manager for the Memory and Microprocessor Group.

MORRIS CLARK has joined Hamilton Electro-Sales as microprocessor regional account specialist.

Mostek has placed BOB COOK in charge of its microcomputer group. VAN LEWING has resigned as microcomputer manager because of philosophical differences. Mr. Lewing is now with Fairchild's F-8 Marketing Team.

KENT MUELLER has been named division sales manager for Intel's end-user products.

BRUCE R. CARLSON, has been elected vice-president, finance treasurer of Mostek Corp.

BRIAN SEAR has been promoted to general manager of the Systems Technology Division of Fairchild Camera and Instrument Corp.

STEVE ZELENCIK, an Advanced Micro Devices' area sales manager for the past six years, has been named the company's director of Distribution Operations.

STEVEN J. SHARP has been promoted to General Manager of the Logic Division at Signetics, Sunnyvale, CA. Sharp replaces Norm Miller who resigned to take the position of President, US Operations for ITT Semiconductor.

ROBERT BICKERS, has joined Advanced Micro Devices in a newly created manufacturing manager position for the operation of one of the firm's three fabrication areas as well as an accompanying computerized test area, both used in the production of digital bipolar devices.

## FINANCIAL

### RECORD SEMICONDUCTOR SALES YEAR

A record sales year is shaping up for US based semiconductor manufacturer, probably exceeding the 28% gain predicted earlier by WEMA, the trade association for the electronics industries.

With sales for the first six months of 1976 totaling \$1.6 billion and new orders continuing strong, US semiconductor manufacturers expect the full year to exceed the 1974 record of \$3.2 billion and show a healthy recovery from 1975's 18% decline to \$2.6 billion.

These figures were reported in a special statistical report published by WEMA, which represents 800 electronics companies. Data was supplied by 49 semiconductor manufacturers and represents worldwide shipments and bookings of all US based semiconductor manufacturers.

For the first six months of 1976 IC's out-sold discrete devices \$946 million to \$700 million. June shipments of both types were a record \$321 million, of which \$133 million was in discretely and \$187 million in IC's.

New order bookings totaled \$1.9 billion at the end of June, with discrete devices accounting for \$807 million and IC's \$1.1 billion.

accounting for \$807 million and IC's \$1.1 billion.

About 67% of total semiconductor shipments were consumed in the US and the remainder shipped overseas.

## EUROPEAN MARKET STUDY

Mackintosh Research, Inc. has released a study that predicts a 500% growth in the West European microprocessor-component market over the 6-year period, 1974 to 1980. The study indicates that LSI-inspired cuts in OEM mini and microcomputer prices will make those systems the market's slowest growing segment in terms of value.

The report finds that West European companies will dominate the small business computer market while US firms will dominate minicomputer systems, OEM mini- and microcomputers, and microprocessor component markets.

Sales should reach just under \$1.8 billion by 1980 for the above mentioned markets.

## MOSTEK CUTS F8 PRICES

Mostek has cut prices on its F8 microprocessor family as high as 50% in distributor quantities.

The 3850 (F8 CPU) has dropped from \$21.24 to \$20.10 in ceramic.

New plastic prices for the 3850 CPU are now \$10, 3852 dynamic memory interface \$7.45, 3854 DMA \$5.95, 3861 peripheral I/O \$6.45.

Ceramic prices have been reduced to \$20.10 for the 3850 and 3851, and \$13 for the 3852. The 3843, 3861, and 3854 remained at \$13.

## AMD FOLLOWS WITH 8080 REDUCTIONS

Advanced Micro Devices has slashed the price of its 1 us 8080-4 microprocessor from \$55 to \$40 in 100-999 quantities. Single unit prices were reduced from \$110 to \$75. Ten to 99 pricing was reduced from \$77 to \$60.

## FORD MOTOR SIGNS CONTRACT WITH TOSHIBA

Ford Motor Co. has signed a contract with Toshiba for an unspecified number of its 12-bit microprocessors. Ford will be using the micros in the 1978 model automobiles to control ignition and exhaust and gas recirculation

**EDUCATION**

MICROCOMPUTER COURSES, SEMINARS, CONFERENCES. Date, title, cost, location, sponsoring organization.

October

- 12 LSI-11 Microcomputer Introduction and Applications Free Palo Alto, CA DEC
- 19-20 Industrial Microcomputer Control \$395 St. Louis MO Integrated Computer Sys.
- 18-22 PACE Applications \$395 Coral Gables, FL National Semiconductor Corp.
- 19-21 Mini/Micro Conference and Exposition San Francisco, CA Mini/Micro
- 19-21 SC/MP Applications \$395 Detroit, MI National Semiconductor Corp.
- 21-22 Software/Systems Development \$395 St. Louis, MO Integrated Computer Sys.
- 24 Computerfest \$3.50 Vienna, VA AMRAD
- 25-29 Microprocessor Fundamentals \$395 Santa Clara, CA National Semi. Corp.
- 26-27 Industrial Microcomputer Control \$395 San Francisco, CA Integrated Computer Systems
- 28-29 Software/Systems Development \$395 San Francisco, CA Integrated Computer Systems

November

- 2- 5 F8 Microprocessor \$300 San Jose, CA Fairchild Micro Systems
- 8- 11 Mini- and Microcomputers Toronto, Canada Hamza
- 9 LSI-11 Microcomputer Introduction and Applications Free Sunnyvale, CA DEC
- 9- 10 Microprocessors in Mfgr. and Control \$395 Houston, TX Int. Computer Sys.
- 11-12 Microcomputer Software/System \$395 Houston, TX Int. Computer Sys.
- 17-19 Second Annual Workshop on Microcomputer Applications San Diego, CA W.J. Dejka
- 16-17 Microprocessors in Mfgr. and Control \$395 Washington D.C. Int. Computer Sys.
- 16-19 F8 Microprocessor \$300 San Jose, CA Fairchild Micro Systems
- 18-19 Microcomputer Software/System \$395 Washington, D.C. Int. Computer Sys.
- 22-24 Microelectronics and Microprocessors \$365 Washington D.C. George Washing-

ton University

- 23-25 COMPEC '76 Middlesex, England Trident
- 30-1 Microprocessors in Mfgr. and Control \$395 Los Angeles, CA Int. Computer Sys.

December

- 6- 10 Microprocessor Design Course 4004/4040 \$350 Monterey, CA Pro-Log Corp.
- 6- 10 Microprocessor Design Course 8080 \$350 Monterey, CA Pro-Log Corp.
- 7 LSI-11 Microcomputer Introduction and Applications Free San Jose, CA DEC
- 7- 8 Microprocessors in Mfgr. and Control \$395 Detroit, MI Int. Computer Sys.
- 9- 10 Microcomputer Software/System \$395 Detroit, MI Int. Computer Sys.
- 11-12 Microcomputer Software/System \$395 Los Angeles, CA Int. Computer Sys.
- 13-17 Microprocessor Design Course 8080 \$350 Monterey, CA Pro-Log Corp.
- 14-16 Applications of Modular Microelectronics and Microprocessors \$365 Miami, FL George Washington University

Sponsoring Organizations and Contacts:

AMRAD, Gerald Adkins, 1206 Livingston St., Arlington, VA 22205

DEC, 2565 Walsh Ave., Santa Clara, CA 95050 (408) 984-0200

W. J. Dejka (714) 225-6173

Fairchild Micro Systems, 1725 Technology Dr., San Jose, CA 95110 (408) 998-0123

George Washington University, Continuing Engineering Education Program, Washington D.C. (202) 676-6106

Hamza, P.O. Box 3243, Station B, Calgary, Alberta T2M 4L8 Canada

Integrated Computer Systems, Inc., 445 Overland Ave., Culver City, CA 90230 (213) 559-9265

Mini/Micro Computer Convergence, Robert D. Rankin, Rankin Exposition Management, 5544 E. La Palma Ave., Anaheim, CA 92807 (714) 528-2400

National Semiconductor Corp., 2900 Semiconductor Dr., Santa Clara, CA 95051 (408) 732-5000

Pro-Log Corp., 2411 Garden Rd., Monterey, CA 93940 (408) 372-4593



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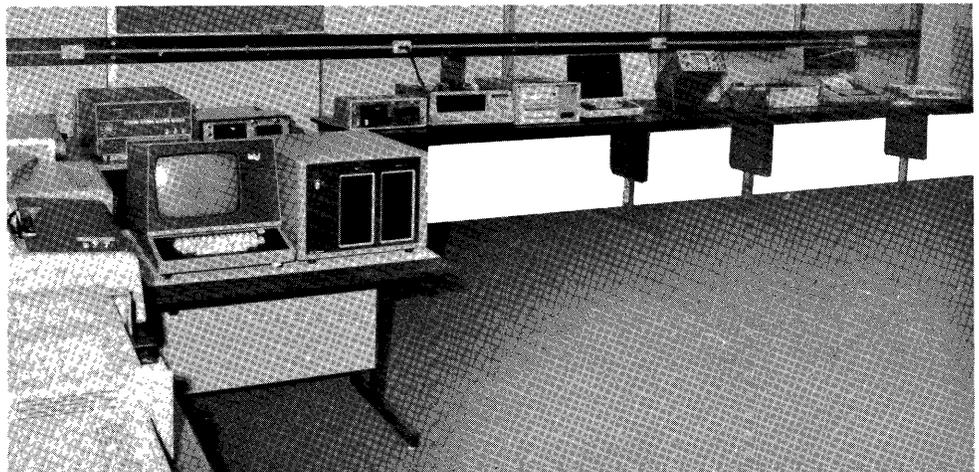
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