

MICROCOMPUTER DIGEST

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March, 1976

AMS & SIGNETICS 2650 2ND SOURCE PACT

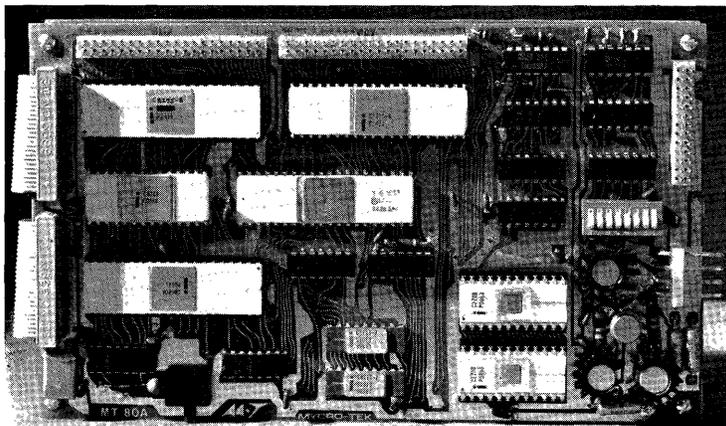
Signetics and Advanced Memory Systems have entered into a second source agreement giving AMS the right to manufacture Signetics' 2650 microprocessor family.

The three-year, renewable pact, calls for close technical cooperation between the two semiconductor firms, including mask and test tape exchanges.

Included in the agreement is the 2650 CPU, the 2650-1, a shrink-version of the 2650 that is currently in the redesign stage, the 2680 4K RAM, 2606 1K x 8 ROM, 2102 1K x 1 RAM, and other support circuits. (cont'd on page 2)

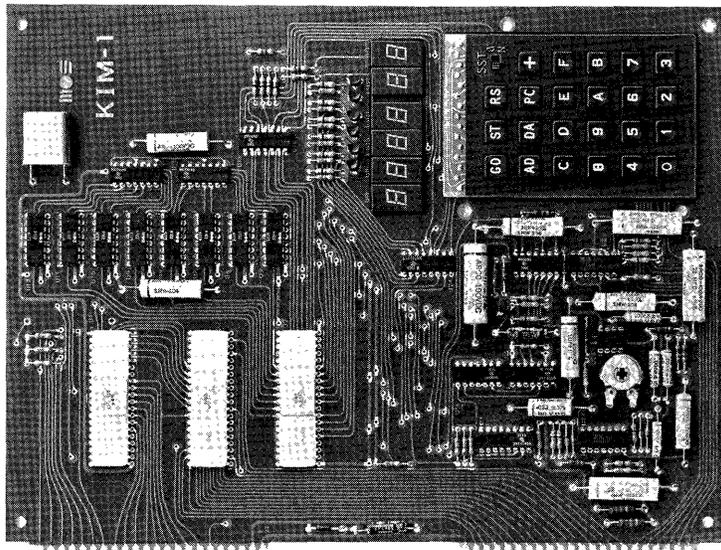
SINGLE CARD MICROCOMPUTER

Myco-Tek, Inc. has expanded its line of microcomputers with the introduction of the MT 80, a single card microcomputer designed for OEM users. The MT 80 contains the 8080 CPU, 2K of EPROM, 256 bytes of RAM, 48 programmable I/O bits and an RS232C port on a single 4.5 x 7.5 inch PC card. An optional on-card converter gives single 5V only operation. If the converter is not used, a $\pm 12V$ and +5V supply is required. (cont'd on page 2)



KIM-1, A FULL SYSTEM—NOT A KIT

The KIM-1 microcomputer just introduced by MOS Technology is not a kit, but a completely assembled system that includes a 6502 microprocessor, two 6530's, I/O interface circuits, LED display and keyboard.



The \$245 board requires only a single power supply (5V at 1.2A) for basic operations, and a second supply (1.1A) for audio cassette operation. The KIM-1 system can be expanded to include additional memory of any variety or additional I/O capability.

A spokesman for the company noted that the firm will soon introduce their MDT 650 Microcomputer Development Terminal, a high-level (cont'd on page 2)

SESCOSEM TO MANUFACTURE 2900

Advanced Micro Devices has inked an agreement with the Sescosem division of Thomson-CSF to second source AMD's 2900 4-bit bipolar microcomputer slice for markets outside the U.S. and Japan.



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SPECIAL FEATURES:**AMS & SIGNETICS 2650 2ND SOURCE PACT**

(from page 1)

Hardware support covered includes the prototyping card, 4K memory card, TTY controller, demonstration base and prototyping kit.

Covered software support includes assembler and simulator products for 16- and 32-bit computers, and for PIPASM, PHPASM, PIPSIM and PIPHSIM on General Electric or NCCSS timesharing.

According to a spokesman, AMS' philosophy for the past year has been to second source a microprocessor currently available rather than to develop their own design. AMS is currently second sourcing the RCA CDP1800.

The 2650 was chosen by AMS, according to the company, because they felt it was well supported internally by software, associated circuitry, programming and design. It was also noted that the two firms' compatible N/MOS silicon-gate technologies and their close geographical locations aided in the decision.

Signetics' parent company, N. V. Philips of The Netherlands will also be producing the 8-bit 2650 at its Mullard facility in England. The parent company is redesigning the 2650 chip.

KIM-1, A FULL SYSTEM—NOT A KIT

(from page 1)

development tool for modeling new 650X designs. The MDT can be interfaced through the keyboard, display or I/O port.

The KIM-1 is available now from stock and the price includes the module, all documentation and all monitor and operation programs stored in ROM.

SINGLE CARD MICROCOMPUTER

(from page 1)

Other features include a switch selectable RS232C clock rate to provide almost any standard speed from 110 to 9600 baud. The board has power-on reset and can be expanded to a larger configuration using add-on cards. The MT 80 Memory card adds 4K bytes of RAM and 2K bytes of EPROM to the system. The board can be purchased with only one Parallel Peripher-

al Interface chip or without the RS232C port logic to lower OEM costs.

The MT 80 can also be interfaced to the firm's operator control panel and is priced at \$395 in single unit quantities. The memory card is \$375.

MICROCOMPUTER-BASED SOFTWARE:**MICROCOMPUTER-BASED PRINTERS**

Sycor has announced its new series of microcomputer-controlled matrix printers for use on its Model 350 intelligent terminal and Model 250 intelligent display system.

The new printers, which operate at 60, 120 and 180 cps, use a microcomputer to control all system dynamics including print head needle timing, character registration, paper acceleration profiles and adaptive print head acceleration and deceleration; and to perform multiple task processing for simultaneous data transfer, line feed, keyboard scanning and indicator drive.

The printers feature bi-directional printing, a look ahead function and vertical and horizontal slewing.

The microcomputer allows the generation of two diagnostic test patterns (continuous print-out of the character set on 132-character lines or short lines of 16 characters with alternating X's and O's for forms alignment) which can be initiated from the function keys.

Page format is set at 10 characters to the inch and 6 lines to the inch or, optionally condensed to 16½ characters to the inch and/or 8 lines to the inch.

Delivery of the Model 350 printer is in June, while the Model 250 printer series is scheduled for July 1976. Prices vary between \$4800 and \$11,830. The printers are also available under several lease programs.

ZILOG TO INTRODUCE Z-80

Zilog Inc. has revealed that they will introduce the Z-80 microcomputer shortly. The system will be heavily supported with both software and hardware development systems. The company refused to go into details about the system but did note that Z-80 uses a half or less of the memory of comparable micros while delivering 25% to 100% more throughput.



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The firm said that although their microprocessor is being fabricated initially by custom houses, they intend to make their own chips in the future.

Zilog was founded last year by three former Intel Corp. employees: Ralph Ungermann, Federico Faggin and Masatoshi Shima.

MICROCOMPUTER TRAINER

Ohio Scientific Instruments has completed development of their Model 300 microcomputer Trainer. The unit is a completely assembled and tested, ready to use microcomputer designed to teach users the fundamentals of micros.

Designed around the MOS Technology 6502 microprocessor, it includes 128 bytes of RAM, 7 addresses and 8 data LEDs and switches, 2 TTL input lines, 1 TTL output latch and sync signals for oscilloscopes. Built on an 8 x 10-inch PC board, Model 300 requires 5V dc at 500 mA maximum.

A 20-experiment lab manual is included with the \$99 trainer.

F-8 BASED CRT EDUCATOR

With a F-8 microprocessor at its heart, the M-8 EDUCATOR provides a communications terminal and a microcomputer module within one single enclosure.

The terminal includes a 53-key keyboard, 31-line x 64 character CRT display, 110-baud TTY I/O, 200- or 600-baud TTL serial I/O and composite video output.

Features of the microcomputer include a debug/monitor with user-callable I/O subroutines, 2K RAM expandable to 32K, two 8-bit output and two 8-bit input TTL-compatible ports and parallel entry port.

Delivery is 6-8 weeks ARO for the \$1795 development system.

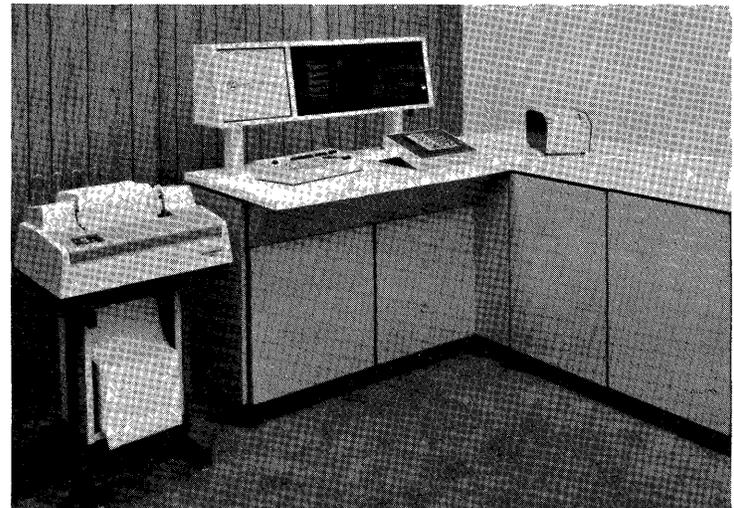
8080 HEART OF TIMET TERMINAL

Texas Instruments has revealed that the Timet terminal which Wells Fargo Bank will use next year for credit verification will use the firm's 8080 microcomputer. TI will reportedly maintain the terminals at the bank's locations through their Digital Systems divi-

sion field service force.

In another area, TI announced that they have begun marketing an assembled version of their 4-bit I²L microprocessor. The \$150 system is designed to familiarize enthusiasts with microcomputer operations. All units will contain a power supply with some containing memory. An instruction booklet steps the novice through the entire system experiment by experiment.

9080-BASED IN-CIRCUIT TESTER



Troubleshooter 400, a new computer using the Advanced Micro Devices 9080 8-bit microcomputer is an in-circuit test system which provides complete analog and digital fault analysis to the component level on complete analog and digital fault analysis to the component level on complex PC boards plus extensive functional test capabilities, has been introduced by Zehntel, Inc.

The microprocessor allows, with software, for the system to handle and instantly change many functions that were hardwired. Fully compatible with other Zehntel in-circuit and functional test systems, Troubleshooter 400 has a variety of standard features designed to reduce both testing and programming overhead. A CRT terminal and associated keyboard is used during the program preparation stage. During testing, the CRT provides operator instructions and display of test data. Mass program storage is provided by floppy disc,
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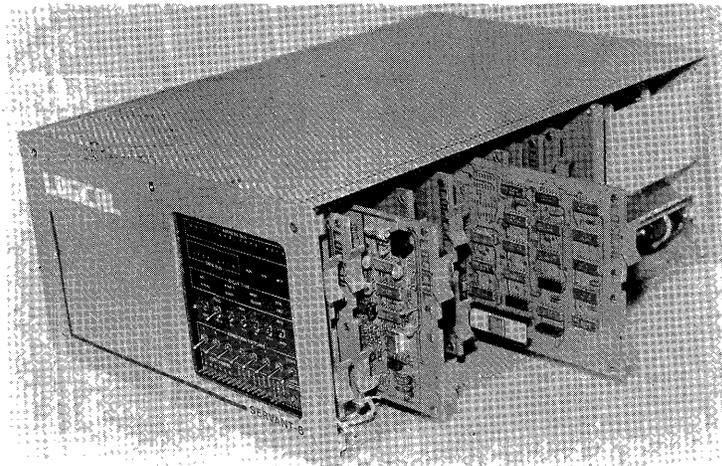
while solid state memory stores currently operating test programs. Repair instructions, calibration data, or other test parameters may be recorded on a fully programmable alphanumeric printer.

Program preparation is expedited with full interactive editing on the test system itself. The programmer may control all tester functions manually.

Prices for Troubleshooter 400 start at \$47,950. Delivery is 90 days ARO.

THE SERVANT 8

A new 8-bit microcomputer system is presently available from Logical Services. The system, Servant 8, is designed around the 8080A microprocessor and is suitable for prototype development as well as OEM industrial control and production test systems.



The system is totally modular with CPU, control, memory and I/O PC modules that plug into an integrated PC board backplane with wire wrap terminals for optional custom wiring. The system is packaged with a heavy duty card cage, cabinet, and a specially designed 80 W power supply with four operating voltages.

Software for the Servant 8 features a monitor program that can be automatically accessed when power is turned on, eliminating bootstrap or manual start up procedures. An assembler, debug software, a test editor, macros, and applications programs are also offered.

Another feature of Servant 8 is that an ordinary oscilloscope display can be used

with a light pen to allow the user to examine and modify the contents of registers and memory locations.

Modules presently available from stock include the 9300 CPU module with an 8080A CPU and a crystal controlled clock generator; a 9310 RAM module with up to 4K static RAM; a 9320 EROM module with a capacity of 4K EROM in 256-byte increments; a 9330 Serial I/O module with teleprinter, RS232C serial I/O and real time clock; a 9340 Parallel I/O Module that provides any combination of input and output on four 8-bit I/O ports; a 9350 Analog Input Module with 16 inputs and an 8-bit A/D converter; a 9343 ASCII Bus Module per IEEE Standard 488-1075; and a 9370 Universal Module that includes bus interface logic, control signals and open DIP positions for breadboarding custom functions.

A basic 4 module SERVANT-8 including chassis, power supply, backplane, control panel, TTY interface, CPU module, 4K RAM and 1K EROM is priced less than \$1800 in single quantities.

RUGGED MICROCOMPUTERS

Multisonics has introduced two new microcomputers designed to withstand rugged process control environments. Built around the Intel 8008, the 801 model includes an all CMOS interface with 8K of memory, TTY and debug software. A more powerful system, the 808, uses the Intel 8080 and has up to 64K of memory.

8080 EMULATOR

An IC emulator that provides from two to four times the throughput of the 8080 microprocessor and has 100% software compatibility is now available from Technology Marketing.

Designated the TMI 8080E, the entire unit consists of 79 multiple-sourced ICs and occupies less than 80 square inches of circuit board area, so that the 8080E fits on a single moderate-sized PC board.

The 8080E replaces the 8080 microprocessor plus the 8228 system controller and bus driver, the 8224 clock generator, 8216 bus drivers, and the associated electronics. TMI plans to sell the 8080 emulator under various plans: one a licensing arrangement with modest



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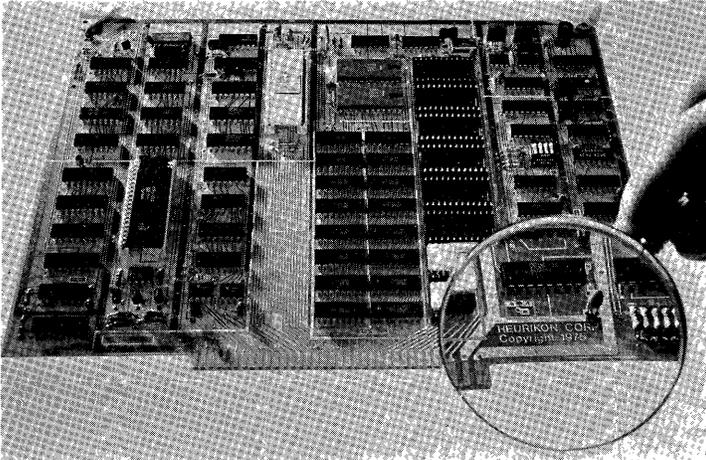
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royalties for those who wish to build and make payments when revenues are received. Others include a single payment for an outright license to build units, while another alternative is to simply purchase units of the 8080E from TMI. Cost will be dependent upon the degree of customization required. Delivery is three weeks ARO.

HEURIKON OEM μ C BOARD

The Heurikon Corp. has introduced a complete microcomputer on a single PC card. The processor, designated the MLP-8080 uses an 8080 microprocessor and is designed for OEM use in control, data acquisition, and data processing systems.

The microcomputer card contains space for 2K of static RAM and 2K of PROM, expandable to 65K



Features include an asynchronous serial receiver and transmitter for communications with TTYs and CRT terminal systems. The on-card clock allows transmission rates between 110 baud and 9600 baud and the system provides two types of interfaces, a 20 mA optically isolated current loop and a RS232C interface for use with modems or other devices using EIA levels. The microcomputer contains an 8-level vectored priority interrupt system and logic for DMA channel control.

Also introduced, the MLP-8080 memory card combines 4K RAM, 4K PROM on a single standard system card for applications which require larger memory capacities.

Available for system design are chassis, power supplies and bus cards. Software avail-

able to support the microcomputer includes a macro-assembler, text editor, monitor system, and an on-line program debugging system which includes an execution trace feature and program break-point capability.

Delivery is 30 to 60 days ARO.

MICROCOMPUTER SOFTWARE:

RESIDENT SBC 80/10 SOFTWARE

Extensys Corp. has for immediate delivery a complete resident software development package for the newly announced Intel SBC 80/10 OEM board. The software system includes an assembler, editor and monitor and is supplied in four pre-programmed 2708 PROMs that plug directly into sockets that are part of the SBC 80/10.

The resident assembler operates in one pass accepting input from tape or keyboard and assembling code directly into the SBC 80/10 memory. Source code, according to the company, needs to be read in only once, making the assembler 2 to 3 times faster than the comparable MDS resident assembler. Since the assembler resides on PROMs, it does not have to be read in every time it is used and all of the SBC 80/10 RAM storage is available for program use.

The resident editor provides all the facilities for preparing assembler input tapes, including tape creation and modifications. The monitor contains functions necessary for software debug including tape dumping and loading, storage and register modifications and selective program execution.

The complete package price of \$995 includes the four pre-programmed 2708 PROMs and all documentation. The software has a complete warranty which includes periodic updates and redistribution to existing users. A 5% discount applies to all cash orders before June 1, 1976.

μ C MACRO-ASSEMBLERS & SIMULATORS

Microtec has added to its line of micro-processor support products a set of macro-assemblers and simulators for the Motorola 6800, Fairchild F-8 and the Signetics 2650. These programs are written in ANSI standard FORTRAN
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IV and will operate on any computer that has a word length greater than or equal to 16-bits and has 16 words of main memory. This includes most minicomputers.

The assemblers are manufacture compatible, providing all the standard features including symbolic addressing, relative addressing, constant generation, etc. Many other additional features have been added to each assembler program including a powerful macro facility, conditional assembly statements, and a versatile set of listing and punch pseudo-ops. Many diagnostic error messages are also provided.

The simulators provide a very flexible set of commands which enable users to set breakpoints, trace program flow, display and patch memory locations, display and modify simulated processor registers, simulate I/O, simulate interrupts, and keep track of timing information.

The programs are priced at \$800 and they can be delivered on several types of computer readable media. A detailed manual, source listing, and a test program and its output listing accompany each program.

FORTRAN COMPILER

Isyk Corp. has announced an 8080 FORTRAN compiler and intends to market a BASIC and COBOL compiler for the popular micro shortly. The compiler can process only a limited number of FORTRAN instructions.

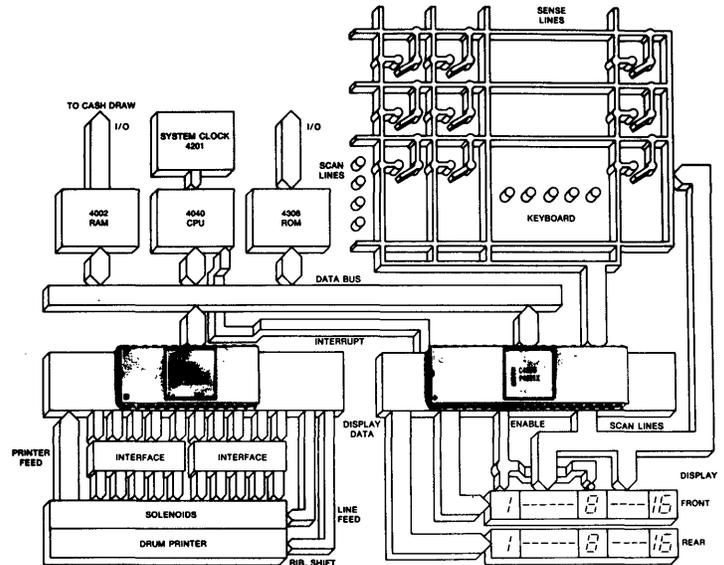
PACE CROSS ASSEMBLER

B&D Software is offering a cross assembler for \$300 written in Macro-11 for the PDP-11 minicomputers for developing National Semiconductor PACE programs. According to the company, punch tape output by a DEC editor program is employed for the cross-assembler source tape input. An error code is printed to the left of each source code line containing an assembler error, and a symbol table is printed at the end of each listing. B&D reports they are willing to modify the cross-assembler to fit individual customer needs for a minimal fee.

MEMORIES AND PERIPHERALS:

PROGRAMMABLE MCS-40 SUPPORT CIRCUITS

Intel has added two software-programmable devices, the 4269 Programmable Keyboard/Display Unit and the 4265 General Purpose Programmable I/O unit to the MCS-40 system. The new devices have built-in logic functions that simplify program routines and take care of local control functions for the CPU.



The 4269 Programmable Keyboard/Display Unit is a general-purpose interface and control unit and is configured with software and selected like a RAM-I/O unit. Each unit provides the equivalent of seven I/O ports, a RAM, a ROM, and the logic required for control and communications with man-machine interface equipment. The CPU can directly control up to four 4269 units.

The 4269 can interface with a wide assortment of manual controls, displays and indicators, and is divided into two portions, one for the keyboard, another for displays.

Software instructions control the unit's operating logic and change the organization of an on-chip RAM that serves as a FIFO buffer for key and sensor inputs. To improve CPU throughput, the unit handles scanning of switch arrays, key input encoding, character input buffer storage, keyboard over-entry recovery, and interrupt generation. Also, the

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display portion makes unnecessary the use of system memory for display refresh.

The new 4265 I/O device provides a convenient interface between MCS-40 and MCS-80 systems. With this device, a system designer can either add on MCS-80 peripheral components to the MCS-40 or he can integrate MCS-40 and MCS-80 systems in multi-processor applications.

Up to four 4265's may be used without external address decoding. The CPU selects the units in the same manner as RAM-I/O units, directly controlling up to 128 I/O lines. Each device's four ports can be used in 14 different organizations. These 14 modes are selectable with the MCS-40's I/O instruction set.

µC WIRE WRAPPING PANELS

A family of 3-potential wire-wrapping panels from Mupac Corp. is designed for use with current 18-pin to 40-pin microprocessors. The panels accept RAMs, ROMs and microprocessors with different package pin-counts and spacing, voltage requirements and system operation, as well as 8 or 10 different speed or power options.

A complete line of complementary hardware and 3-potential connector backplanes and rack assemblies are also available.

PROM ERASER

Up to five UV-erasable PROMs can be erased in 5 to 10 minutes with complete safety with Prometrics Inc.'s new eraser. An adjustable timer shuts off the UV source when the set-in time has elapsed. An interlock shuts off the UV when the unit is opened. No price was given by the firm.

SHUGART STREAKER

Shugart Associates' new SA8800 Streaker Kit is designed for OEMs who want to include a floppy disc storage in minicomputer or microcomputer systems. The kit contains a single 12.5 x 17.5 inch PCB disc controller and from two to three disc drives in optional single or double density.

Users can add their own cabinet, standard power supply and interface to the \$1110 system or they can purchase a standard Shugart

SA3800 Diskette storage sub-system and add additional drives in increments of one, two or three in a single cabinet.

MILITARIZED PROM PROGRAMMER

Spectrum Dynamics has available a militarized version of the firm's line of automatic PROM patterning equipment. The Model 550/MR is intended for high-rel users who are concerned with reliable programming and identification of marginal parts. The instrument inhibits localized heating problems and identifies devices that are marginal due to excess leakage, low-gain transistors or high-resistance links.

CONTROLLER/COMPUTER INTERFACE

Struthers-Dunn Inc.'s Systems Division's new programmable logic controller/computer interface enables communication between the company's Model 77 programmable logic controller and computers, data terminals, microcomputers or other compatible devices.

With 128 internal storage locations, the interface is plugged into a reserved slot on the 77, which is connected to an EIA RS232C port in a compatible system. By acting as a transmitter and receiver of data, the controller permits a computer to monitor I/O status, command outputs, and select memory segments. The system can also interconnect up to eight controllers, all computer interfaced, in a loop to exchange I/O status.

When interfaced with a data terminal, the system allows the terminal to print programmed messages from memory and through the terminal keyboard, manually command the 77 to energize or de-energize selected outputs.

PROM COPIER/READER/VERIFIER

A compact, low cost comprehensive PROM programmer/copier/reader/verifier has been introduced by Technitrol Inc. Model 107 can be used to program EROMs, copy previously-written PROMs, read data from addresses sequenced by the machine or randomly selected by the operator and verify data while writing or reading. The company has tagged the instrument at \$850.



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MICRO I/O SUPPORT CHIP

The TMS5501, just introduced by Texas Instruments, is a multifunction I/O circuit for use with the 8080. The 40-pin DIP device provides the microprocessor with asynchronous interface, data I/O buffers, interrupt control logic and interval timers.

The I/O section contains an 8-bit parallel input port and separate 8-bit output port with storage register. Five programmable interval timers provide intervals from 64 μ s to 16.32 ms.

Single unit price is \$49.50.

LSI CHIP & μ P TESTER

A new low-cost semiconductor-memory tester that is the first to offer 100 ns cycle time for all test patterns is now available from the TestMaster Division of Technology Marketing Inc. (TMI).

Designated the TestMaster Series 5000, the new unit is designed for high-speed automatic testing of memory systems or devices, as well as other LSI chips and microprocessors. The tester features specialized processors with either ROM or optional RAM for program storage. The RAM option provides maximum flexibility to alter test programs for users with changing device test and system test requirements.

For functional testing of microprocessors, the Series 5000 incorporates a programming language for the user to generate original test programs. In addition, further custom programs can be generated using the software library of the computer that is part of the tester.

The general-purpose computer facilitates programming, data logging and provides control of optional peripheral devices such as printers, display scopes and tape readers. A range of Device Interface Modules (DIM) is available from TMI for testing RAMs. Word lengths used in the 5000 are variable from 1 to 48 bits.

TMI offers a choice of peripherals and the test system is available in seven standard configurations. Pricing starts at around \$17,000 and delivery is about 12 weeks ARO.

IMP & PACE TAPE READER

National Semiconductor is now offering a photoelectric tape reader from Plessey Microsystems that connects directly to the IMP-16P and PACE (IPC-16P) Prototyping System's TTY/card reader interface. The reader will transmit up to 100 cps.

The IMP-11/852 reader is priced at \$1025 and includes all the necessary cabling and documentation.

COMMUNICATIONS MAG TAPE PERIPHERAL

Micro Communications Corp. has announced the MicroVox Magnetic Tape Communications Peripheral Model 30-001. The peripheral can be used for logging and storing data, replacing a paper tape punch and reader. Its operating rates are the standard communications data rates of 110, 300, 600 and 1200 baud, and it is fully double buffered and capable of operating under both local and remote control. Front panel switches are used for local control; standard ASCII characters control it remotely. The Model 30-001 is fully transparent in local mode; control character recording is optional in remote mode.

The Model 30-001 stores 20,000 ASCII characters on a 35' MicroVox continuous-loop magnetic tape wafer that sells for \$3.50 in single quantity. Five tape wafers are included in the \$895 selling price of the Model 30-001.

AMD INTRODUCES STATIC 4K RAM

A pair of 4K static RAMs with an innovative memory status feature have been introduced by Advanced Micro Devices. The devices, AM9130-AM9140, feature a single 5V power supply and come in models with speeds to 200 ns. Organized 1K x 4 and 4K x 1, the 350 ns circuits have input and output logic levels identical to TTL.

The RAMs offer high output drive (3.2 mA at .4V), have a DC stand-by mode that reduces power dissipation by 80% and are available in the -55° to +125°C temperature range. A special signal incorporated within the RAM is the memory status which indicates when data is valid optionally allowing improved overall

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system performance and simplified timing.

Hermetic parts are available from Hamilton/Avnet, Cramer and Schweber Electronics. Pricing varies between \$24 and \$90 in 100-up quantities.

LOGIC PROBE

Designed to simplify and speed logic circuit testing, the new \$125 Model 545A Logic Probe from Hewlett-Packard indicates digital status and pulses in both CMOS logic and TTL logic. An unambiguous single lamp indicator displays high or low levels or detects bad levels and open circuit conditions. CMOS and TTL operation is selected with a slide switch and CMOS logic threshold levels are variable and set automatically.

Another feature of the 545A is a built-in pulse memory which, along with the display, will catch intermittent pulses. When a logic change occurs, the indicator lamp turns on and remains lighted until the memory is reset.

PEOPLE, LITERATURE AND EVENTS:

COMPDESIGN/76

COMPDESIGN/76, a touring conference sponsored by Computer Design and presented in conjunction with Computer Caravan will provide a series of workshops featuring microprocessors in terms of design, availability, performance, applications and future trends. The tour through major U.S. cities will begin in early March.

PATCA

The Professional and Technical Consultants Association (PATCA), formed last March as a non-profit association of independent consultants for the California Bay Area has elected a new Board of Directors at its first Annual Membership Meeting held February 11, 1976 at the Mountain View Recreation Center.

The newly elected directors are Wayne E. Evans of Los Altos Hills, Alexander W. Greenwood of Palo Alto, Grant O. Heninger of Santa Cruz, James N. Porter of Mountain View, and Irene M. Watson of Los Altos Hills. Heninger and Porter had previously been members of the

board.

Dennis Paull of Los Altos and Wayne E. Evans were retained as president and vice president, respectively. Forrest Warthman of Palo Alto was named secretary.

While PATCA is primarily a San Francisco Bay Area organization, it has members as far away as Santa Barbara. Membership is open to all independent consultants including individuals and small companies offering consulting services to the business community.

MINI/MICRO COMPUTER CONFERENCE

Initial sessions for the 1976 MINI/MICRO Computer Conference and Exposition set for San Francisco CA next October 19-21 have been announced by Conference Program Chairman Robert J. Frankenberg. They include: Interfacing the Analog World to Minis/Micros; Military Applications for Microcomputers; Integrating OEM Peripherals into Computer Systems for End-use Systems; Distributed Processing with Minis; The Effect of LSI Technology on Memory Systems; and Current Developments of Memory Peripherals for Mini and Microcomputers.

Also planned is a full day session on microcomputer development aids, with software being the morning topic and hardware being covered in the afternoon. Frankenberg noted that additionally a tutorial session on minis and micros is scheduled as is a special session for the growing computer hobbyist area.

Contact Robert D. Rankin, Managing Director, MINI/MICRO, 5544 E. La Palma Ave., Anaheim CA 92807 (714) 528-2400

MIRCO & FAIRCHILD AGREEMENT

Fairchild Camera & Instrument has announced the signing of an agreement to develop jointly with Mirco, Inc. semiconductor circuitry for electronic games. Mirco currently is using the Fairchild F-8 microprocessor in its electronic games.

The agreement calls for both companies to develop and produce home video games using LSI components based on a logic system currently used by Mirco.

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EXORCISOR ADDED TO μ C CENTER

Almac/Stroum Electronics, a division of Laser Link Corp. has added the Motorola EXORCISOR System with the TI 733 Dual Cassette Terminal and the Motorola Demo II Evaluation System to its Microcomputer Development Center. In addition, the Center contains the complete Intel Intellec MDS Development System and the National IMP-16P/308 System and PACE Development CPU card.

The Center affords interested engineers and designers the opportunity to obtain free hands-on experience with these systems. The equipment can be leased by the day for the software/hardware development of the prototype system of a microprocessor based product. The Center staff will also take on assignments for software development and provide technical seminars and demonstrations.

1,000TH LSI-11 SHIPPED

After only ten months of production, Digital Equipment Corp. has announced the delivery of its 1,000th microcomputer. The LSI-11 was delivered to the Electronics Division of Aeronutronic Ford Corp. of Blue Bell PA, a subsidiary of Ford Motor Co. and will be used to test automotive electronic components.

62 POUNDS OF LSI

Rockwell International last month produced more than two million LSI semiconductors, highest monthly output in the five-year history of its Microelectronic Device Division and three times that of last January. The semiconductors contained the equivalent of 20 billion transistors and weighed only 62 pounds.

PEOPLE ON THE MOVE

HOWARD A. SHAREK was promoted to vice president of sales for NEC Microcomputers. He will be responsible for all sales activities in North America, working with sales representatives and distributors. RICHARD KOERNER was promoted to director of marketing, and will be responsible for all home office marketing functions.

JOHN M. BRAKONECKE has been appointed Na-

tional distributor sales manager for American Microsystems Inc. according to Jerry Oberly, director of domestic sales.

DANIEL L. BRORS has recently joined AMI in the newly created position of product manager for CMOS products, according to George Avery, vice president of AMI's Standard and Custom Products division.

DONALD D. WINSTEAD has been named director of marketing for the Microsystems Division of the Instrumentation Systems Group at Fairchild Camera and Instrument Corp. Winstead had formerly been at Monolithic Memories, Inc.

VANTAGE CORP. is now sales representative for all semiconductor products manufactured by National Semiconductor Corp., with a franchise for the Western Canadian provinces of British Columbia, Alberta, Saskatchewan and Manitoba, according to Don Beadle, sales director for NSC.

INTERSIL INC. has appointed MARSHALL INDUSTRIES as the Southern California distributor and INTERMARK ELECTRONICS as the Northern California distributor for their complete line of products.

8080 DESIGN MANUAL

The 8080 Design Manual offered by Northeast Services, Inc. covers signal definition, timing and state transition, memory configuration, control-panel design and all aspects pertinent to designing with the 8080 microprocessor and its chip-set family.

According to the company, the manual was written specifically for the hardware designer to familiarize him with software usage. Extensive discussion of the instruction set, programming pitfalls, tradeoffs, etc. are given. Price is \$24.95

SIMULATION ADDS μ C DEPARTMENT

Now on the horizon are microcomputers with capabilities equivalent to their larger fore-runners but with unparalleled sophistication. In response to this emerging technology, the journal of the Society for Computer Simulation, SIMULATION, inaugurates a new department in its April issue—Microprocessors in Simulation.

(cont'd next page)



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Dr. Lance A. Leventhal, editor of the new department, is an independent consultant specializing in the areas of mini and microcomputers. He has taught courses on microcomputers and is currently involved in writing a textbook on microprocessors and in teaching a series of microprocessor courses at Grossmount College in San Diego CA.

The first article in the April issue of SIMULATION, "Microprocessors—A Software Point of View", will be followed by others discussing the existing processors, their use in distributed systems, the construction of special-purpose computing elements from microprocessors, the definition and use of interface systems, and other related topics. The series will be interrupted occasionally to present current developments in microcomputer research and technology.

AVAILABLE DOCUMENTS

PRO-LOG is offering two free booklets. They are a 36-page "Microprocessor User's Guide" and a 26-page "PROM User's Guide".

The microprocessor book contains the company product line as well as sections on microprocessor characteristics and design. The PROM text describes how to select and use PROMs and what equipment is available to support PROM users. There's an introduction to PROM technologies covering both MOS and bipolar PROMs. A cross-referenced guide to PROM manufacturers is also included.

NATIONAL SEMICONDUCTOR has announced the availability of the following new documents: IMP-16 Disc Operating System (DOS) Users Manual, SC/MP Programming and Assembler Manual and the PACE Instruction Guide.

A 544-page book, "Memory Data Book", is now available that covers most of National's memory and memory-related products including bipolar, MOS, CMOS RAMs, field and mask-programmable ROMs, MOS shift registers and PLAs. This book is priced at \$3.

Three new data sheets describing plug-in options for the HP Model 2640A CRT terminal and 2644A Mini DataStation are available without cost from the HP company.

#

RECENT LITERATURE

"Multi-Level Nesting of Subroutines in a One-Level Microprocessor"

Philippe de Marchin, Fairchild Semiconductor
Computer Design February 1976, page 118

The handling of subroutines and nested subroutines for the F-8 microprocessor is the theme of this article. Mr. Marchin fully analyzes the use of the F-8's 64-byte scratchpad memory, which is used as an automatically expandable stack register. The author steps through several examples, illustrating how the hardware is manipulated and the instructions used.

The article is extremely informative for those programmers who have the need of handling more than one interrupt on a microprocessor with only a one-level stack register.

"Enter the 16,384-Bit RAM"

James E. Coe & William G. Oldham, Intel
Electronics February 19, 1976, page 116

1976 will long be noted as the year of the 16K RAM. Since 1969 memory chip bit densities have nearly doubled every year.

This particular article is the first to carefully examine the new chip, define its operation, discuss the chip operating characteristics and cite working applications.

The authors have centered the article around Intel's new 16K RAM, the 2116. Each transistor cell is less than half the size of the densest 4K RAM, is housed in a 16-pin package, and is fully compatible with existing 4K RAMs.

The authors note that "the chip is arranged as two 8K RAMs sharing a column decoder. Each 8K RAM is organized as two balanced 32-by-128 bit arrays, sharing 128 sense amplifiers. In normal operation, address A_6 selects the top or bottom 8K half, and the other 8K half is kept inactive to conserve power."

"Enter the 16,384-Bit RAM" is the announcement of the arrival of a new technology and a new dawn for microcomputer designers.

"How DEBUG Software Can Make a uP Breadboard Intelligent"

James L. Tallman, Datatron, Inc.
EDN February 20, 1976, page 53

This 10-page article is an excellent and
(cont'd on page 17)



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EDUCATION:

MICROCOMPUTER COURSES, SEMINARS, CONFERENCES. Date, title, cost, location, sponsoring organization (addresses on page 14).

March

- 29- 1 Microprocessor Fundamentals \$395 Dallas TX National Semiconductor Corp.
 29- 1 SC/MP Applications \$395 Santa Clara CA National Semiconductor Corp.
 29- 1 Microprogramming \$395 Miami FL National Semiconductor Corp.
 29- 2 How To Design With Programmed Logic \$350 Monterey CA Pro-Log Corp.
 31- 2 Hands-On Microprocessor Workshop \$495 Florida Wintek Corp.

April

- 3- 4 Laboratory Automation: Micro-, Mini-, or Midicomputers? Chicago IL American Chemical Society
 5 Basic Microcomputer Theory \$40 Tampa FL Microcomputer Training Labs
 5- 6 Survey and Application of Microprocessors \$300 San Francisco CA Yourdon Inc.
 5- 7 Hands-On Microprocessor Workshop \$495 Austria Wintek Corp.
 5- 7 Microprocessors and Microcomputers: Using Tomorrow's Technology in Today's Systems \$485 San Francisco CA Institute for Science and Public Affairs
 5- 8 Advanced Programming \$395 Santa Clara CA National Semiconductor Corp.
 5- 8 IMP-16/PACE Applications \$395 Dallas TX National Semiconductor Corp.
 5- 8 MCS-80/ICE-80 \$350 Boston MA and Santa Clara CA Intel Corp.
 5- 9 Microprocessors and Microcomputers: Theory and Applications \$425 Washington DC George Washington University
 6- 7 Intel Memory \$30 Hawthorne CA Liberty Electronics

- 6- 8 How To Design With Programmed Logic \$300 Washington DC Pro-Log Corp.
 7 Basic Microcomputer Theory \$40 Atlanta GA Microcomputer Training Labs
 7 PROM Programming—A Systems Approach Free San Jose CA Data I/O Corp.
 8- 9 Intel Memory Seminar \$15/day Palo Alto CA Elmar Electronics
 9 Basic Microcomputer Theory \$40 Raleigh NC Microcomputer Training Labs
 12 Microprocessors/Microcomputers \$220 Chicago IL Integrated Computer Systems Inc.
 12-14 MOS/LSI Logic Design Techniques \$320 Washington DC George Washington Univ.
 12-14 PL/M \$350 Santa Clara CA Intel Corp.
 12-15 Microprocessor Fundamentals \$395 Miami FL National Semiconductor Corp.
 12-15 SC/MP Applications \$395 Dallas TX National Semiconductor Corp.
 12-23 LSI-11 & PDP-11/03 Hardware and Interfacing \$750 Maynard MA Digital Equipment Corp.
 13-14 Software Development and Applications Techniques for Microcomputers \$395 Chicago IL Integrated Computer Systems Inc.
 13-14 Microprocessors and LSI in Telecommunications Applications \$395 San Francisco CA Integrated Computer Systems Inc.
 13-15 Compdesign/76 \$50-\$120 Chicago IL Computer Design Magazine
 15 Software Development and Applications Techniques for Microcomputers \$220 San Francisco CA Integrated Computer Systems Inc.
 16 A Manager-Level Overview of Microprocessors/Microcomputers \$220 Chicago IL Integrated Computer Systems Inc.
 19 NSC SC/MP Seminar No Charge Seattle WA Elmar Electronics
 19-21 Series 3000 \$350 Santa Clara CA Intel Corp.



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April

- 19-22 Advanced Programming \$395 Dallas TX
National Semiconductor Corp.
- 19-22 IMP-16/PACE Applications \$395 Miami
FL National Semiconductor Corp.
- 19-22 MCS-80/ICE-80 \$350 Boston MA and
Santa Clara CA Intel Corp.
- 19-30 LSI-11 & PDP-11/03 Hardware and Inter-
facing \$750 Sunnyvale CA Digital
Equipment Corp.
- 20 NSC SC/MP Seminar No Charge Denver
CO Elmar Electronics
- 20-21 Military and Aerospace Microprocessor
Systems \$395 Washington DC Integra-
ted Computer Systems Inc.
- 20-22 How To Design With Programmed Logic
\$300 Dallas TX Pro-Log Corp.
- 21 NSC SC/MP Seminar No Charge Mountain
View CA Elmar Electronics
- 22-23 Bit-Slice Microprocessors, PLA's and
Microprogramming \$395 Washington DC
Integrated Computer Systems Inc.
- 26-28 MCS-4/40 \$350 Santa Clara CA Intel
Corp.
- 26-29 Microprocessor Fundamentals \$395 San-
ta Clara CA National Semiconductor
Corp.
- 26-29 SC/MP Applications \$395 Miami FL
National Semiconductor Corp.
- 27 National SC/MP No Charge Encino CA
Liberty Electronics
- 27-28 Military and Aerospace Microprocessor
Systems \$395 Chicago IL Integrated
Computer Systems Inc.
- 27-29 How To Design With Programmed Logic
\$300 Freeport CT Pro-Log Corp.
- 28 National SC/MP No Charge Encino CA
Liberty Electronics
- 28-30 Second Annual Asilomar Workshop on
Microprocessors Asilomar CA Contact:
T. Laliotis, ASI, Inc.
- 29 National SC/MP No Charge Anaheim CA
Liberty Electronics

- 29-30 Bit-Slice Microprocessors, PLA's and
Microprogramming \$395 Chicago IL
Integrated Computer Systems Inc.

May

- 3 Microprocessors/Microcomputers \$220
Los Angeles CA Integrated Computer
Systems Inc.
- 3- 5 IMP-16/PACE Applications \$395 Santa
Clara CA National Semiconductor Corp.
- 3- 6 MCS-80/ICE-80 \$350 Boston MA & Santa
Clara CA Intel Corp.
- 3- 7 Advanced Programming \$395 Miami FL
National Semiconductor Corp.
- 3- 7 Microprocessor Fundamentals \$395 Dal-
las TX National Semiconductor Corp.
- 4 National SC/MP No Charge San Fernan-
do CA Liberty Electronics
- 4- 5 Software Development and Applications
Techniques for Microcomputers \$395
Los Angeles CA Integrated Computer
Systems Inc.
- 4- 6 Compdesign/76 \$50-\$120 Los Angeles
CA Computer Design Magazine
- 5 National SC/MP No Charge Hawthorne
CA Liberty Electronics
- 5 1976 Western Microcomputer Show Palo
Alto CA IEEE Computer Society Con-
tact: Western Microcomputer Show
- 6 National SC/MP No Charge Anaheim CA
Liberty Electronics
- 6- 7 Workshop on Microprocessor Architecture
and Systems Evanston IL Contact: M.
Gonzalez, Northwestern University
- 7 A Manager-Level Overview of Micropro-
cessors/Microcomputers \$220 Los An-
geles CA Integrated Computer Systems
- 10 Microprocessors/Microcomputers \$220
San Francisco CA Integrated Computer
Systems Inc.
- 10-12 PL/M \$350 Boston MA Intel Corp.
- 10-13 IMP-16/PACE Applications \$395 Dallas
TX National Semiconductor Corp.



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May

- 10-13 Microprocessor Fundamentals \$395 Miami FL National Semiconductor Corp.
- 10-13 SC/MP Applications \$395 Santa Clara CA National Semiconductor Corp.
- 11-12 Software Development and Applications Techniques for Microcomputers \$395 San Francisco CA Integrated Computer Systems Inc.
- 11-13 How To Design With Programmed Logic \$300 Milwaukee WI Pro-Log Corp.
- 11-14 Compdesign/76 \$50-\$120 San Francisco CA Computer Design Magazine
- 13-14 Intel Memory Seminar \$15/day Palo Alto CA Elmar Electronics
- 14 A Manager-Level Overview of Microprocessors/Microcomputers \$220 San Francisco CA Integrated Computer Systems
- 17-18 Military and Aerospace Microprocessor Systems \$395 Dayton OH Integrated Computer Systems Inc.
- 17-19 Microprocessors and Microcomputers: Using Tomorrow's Technology in Today's Systems \$485 Houston TX Institute for Science and Public Affairs
- 17-20 Advanced Programming \$395 Santa Clara CA National Semiconductor Corp.
- 17-20 IMP-16/PACE Applications \$395 Miami FL National Semiconductor Corp.
- 17-20 MCS-80/ICE-80 \$350 Boston MA & Santa Clara CA Intel Corp.
- 17-20 SC/MP Applications \$395 Dallas TX National Semiconductor Corp.
- 18-20 How To Design With Programmed Logic \$300 Raleigh NC Pro-Log Corp.
- 20-21 Bit-Slice Microprocessors, PLA's and Microprogramming \$395 Dayton OH Integrated Computer Systems
- 24-25 Military and Aerospace Microprocessor Systems \$395 Philadelphia PA Integrated Computer Systems
- 24-26 Series 3000 \$350 Santa Clara CA Intel Corp.

- 24-27 Advanced Programming \$395 Dallas TX National Semiconductor Corp.
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- 24-27 SC/MP Applications \$395 Miami FL National Semiconductor Corp.
- 25-27 How To Design With Programmed Logic \$300 Denver CO Pro-Log Corp.
- 25-27 SEMICON/West San Mateo CA Contact: Golden Gate Enterprises
- 26-27 Bit-Slice Microprocessors, PLA's and Microprogramming \$395 Philadelphia PA Integrated Computer Systems Inc.
- 27 Symposium on Trends and Applications: Micro and Mini Systems Gaithersburg MD IEEE Contact: M. Abrams, National Bureau of Standards

SPONSORING ORGANIZATIONS AND CONTACTS

- American Chemical Society, Educational Activities Division, 1155 16th St NW, Washington DC 20036
- ASI, Inc., Ted Laliotis, 840 Del Rey Ave, Sunnyvale CA 94086
- Computer Design Magazine, Compdesign/76 Registration, 797 Washington St, Newton MA 02160
- Data I/O Corp., 990 E Arques, Sunnyvale CA 94086 (408) 732-8246
- Digital Equipment Corp., Educational Services Dept, 146 Main St, Maynard MA 01754 (617) 897-5111
- Elmar Electronics, 2288G Charleston Rd, Mountain View CA 94040 (415) 961-2611
- George Washington University, Director, Continuing Engineering Education, Washington DC 20052 (202) 676-6106
- Golden Gate Enterprises, 1333 Lawrence Expy, Santa Clara CA 95051 (408) 241-8100
- Institute for Science & Public Affairs, 6003 Executive Blvd, Rockville MD 20852 (301) 770-8576
- Integrated Computer Systems Inc., PO Box 2368 Culver City CA 90230 (213) 559-9265



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Intel Corp., Microcomputer Systems Training,
3065 Bowers Ave, Santa Clara CA 95051 (408)
246-7501

Liberty Electronics, 124 Maryland St, El Se-
gundo CA 90245 (213) 322-8100

Microcomputer Training Labs, 100 N Winchester
Blvd, Suite 260, Santa Clara CA 95050 (408)
244-8695

National Bureau of Standards, Marshall Abrams,
Technology B-212, Washington DC 20234

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

Northwestern University, Prof. Mario Gonzalez,
Computer Science Dept, Evanston IL 60201
(312) 492-3741

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

Western Microcomputer Show, 3855 Corina Way,
Palo Alto CA 94303 (408) 244-8695

Wintek Corp., 902 N 9th St, Lafayette IN
47904 (317) 742-6802

Yourdon Inc., 1133 Ave of the Americas, New
York NY 10036 (212) 575-0572

FINANCIAL:

\$8 MILLION μ C TERMINAL CONTRACT

Zentec Corp. has made public their contract with Technicon Medical Information Systems Corp. for Zentec's Microcomputer-based terminals to be used in their medical information systems. The initial order is for 109 units to be delivered to Technicon's customer, the National Institute of Health, during the first quarter of 1976. The contract is valued in excess of \$8 million.

8080 μ P SALES TO HIT \$30M

Speaking before the New York Society of Security Analysts, Jerry Sanders, president of Advanced Micro Devices, said that 8080-type microprocessors could yield sales of \$30 million this year. He also noted that associated circuitry sales could be as much as four times, \$120 million.

Sanders also said he could foresee 8080-type microprocessors selling for \$6 in large quantities. But he noted that this price would, of course, depend on the memories and peripheral circuits customers purchase with the microprocessors.

U.S. COMPUTER PRINTER MARKET

The U.S. market for computer printers will grow from \$1.08 billion in 1974 to more than \$3.6 billion by 1985 according to a new study by market researchers Frost & Sullivan, Inc. "The market share for non-impact printers will almost triple from 7% in 1974 to 20% by 1985, the 182-page study adds.

Here's how Frost & Sullivan projects market growth by printer category:

U.S. Printer Shipments-Compound Annual Growth Rate Between 1974 and 1985

	% Growth
Minicomputers & Microprocessors	11.3
Small Business Systems	20.1
Small Main Frames	19.0
Medium Main Frames	15.9
Remote Batch Terminals	7.4
Large Main Frames	5.6
CRT Terminals	13.4
Distributed Keyboard Terminals	13.1
Word Processing Systems	44.8
Conversational Printer Terminal ...	decreases
Intelligent Terminals	13.9
Data Entry Systems	1.7
Overall Average	10.7

The study notes that the printer market is intensely competitive and complex with some 110 manufacturers offering about 500 models.

NSC LANDS TWO POS SALES

National Semiconductor Corp. has announced that it has received a \$500,000 order for its IMP-16 based Datachecker T-2500 and T-3000 electronic cash registers from Red Owl Stores of Minneapolis. The order covers a total of 17 store installations which are scheduled for completion by June of this year.

NSC has also received an add-on order for the Datachecker systems from Jewel Stores. The order consists of 16 separate store systems and is valued at approximately \$700,000.



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FC&I QUARTERLY CASH DIVIDEND

The board of directors of Fairchild Camera & Instrument Corp. has declared a quarterly cash dividend of 20 cents per share, payable March 22 to shareholders of record on March 8, 1976.

PROCESS CONTROL EQUIPMENT STUDY

The future is generally optimistic for the 100 firms that manufacture process control equipment, although guardedly so depending on product area, according to a new study by market researchers Frost & Sullivan, Inc. The firm finds that the market in the U.S. alone, at \$1.8 billion in 1975 will grow to \$2.1 billion by 1977, \$2.6 billion by 1980, and \$3.3 billion by 1984.

Says the 211-page study: "We should witness the greatest relative advance in the use of digital control techniques between the years 1977 to 1980, spearheaded by the LSI micro-processor, whose impact should dwarf that made by the minicomputer."

Digital controllers, according to the report, will be the principal growth market at \$290 million in 1973 to rise to \$900 million by 1984, a 211% overall increase. Microprocessor designs will account for 40% of the shipments by that end year, with general purpose computers, minicomputers, programmable logic controllers, and digital components accounting for most of the balance.

Measuring instruments, including transmitters, indicators, recorders, signal converters, and panels are the largest market currently and will continue to be so, though its growth will be at a lesser rate than that of the overall market.

Control valves and actuators will account for 25% of the total market throughout the decade. Analog controllers will decline from 14.6% of the total market in 1973 to 10.6% by 1984, but sales will increase in dollar value from \$225 million in the base year to \$350 million 12 years later.

In the overall marketplace, exports of process control will account for the fastest growth, up 144% over the next decade. The domestic petroleum sector, traditionally the

largest user of process control, will show only modest growth during the ten year time frame. Indeed, the petrochemical sector will be overshadowed by the chemicals industry starting in 1977.

The report did note that the Alaskan pipeline is scheduled to begin operation by 1977 and Standard Oil of Ohio and Atlantic Richfield with major stakes in it, are likely to expand their petrochemical operations. New installations by these companies alone could create a major market for microcomputer-based control equipment.

COMPANY ADDRESSES FOR THIS ISSUE:

Advanced Memory Systems, 1275 Hammerwood,
Sunnyvale CA 94086 (408) 734-4330

Advanced Micro Devices, Inc., 901 Thompson Pl,
Sunnyvale CA 94086 (408) 732-2400

Almac/Stroom Electronics, Division of Laser
Link Corp., 5811 Sixth Ave So, Seattle WA
95108 (206) 763-2300

B&D Software, PO Box 31317, Aurora CO 80011

Digital Equipment Corp., One Iron Way, Marl-
boro MA 01752 (617) 897-5111

Extensys Corp., 592 Weddell Dr, Suite H-3,
Sunnyvale CA 94086 (408) 378-3460

Fairchild Camera & Instrument, 464 Ellis St,
Mountain View CA 94040 (415) 962-5011

Heurikon Corp., 700 W Badger Rd, Madison WI
53713 (608) 255-9075

Hewlett-Packard, 1501 Page Mill Rd, Palo Alto
CA 94304 (415) 493-1501

Intel Corp., 3065 Bowers Ave, Santa Clara CA
95051 (408) 246-7501

Isyk, Box 935, Columbia MD 21044 (301)
997-3639

Logical Services Inc., 711 Stierlin Rd,
Mountain View CA 94043 (415) 965-8365

Micro Communications Corp., 80 Beacon St,
Waltham MA 02154 (617) 809-8111

Microcomputer Associates Inc., 2589 Scott
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Micro-Tec, PO Box 337, Sunnyvale CA 94088
(408) 259-8372

MOS Technology, Inc., Valley Forge Corporate Center, 950 Rittenhouse Rd, Norristown PA 19401 (215) 666-7950

Multisonics, 3300 Crow Canyon Rd, San Ramon CA 94583 (415) 837-8111

Mupac Corp., 646 Summer St, Brockton MA 02402 (617) 588-6110

Mycro-Tek, Inc., 216 No Washington, Wichita KS 67201 (316) 265-5276

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

Northeast Services, Inc., 34 Cooper Ave, Wallingford CT 06492 (203) 265-1223

Ohio Scientific Instruments, Box 374, Hudson OH 44236 (216) 653-6484

PATCA, 2680 Bayshore Frontage Rd, Suite 411, Mountain View CA 94043 (415) 961-1155

Plessey Microsystems, 1674 McGraw Ave, Santa Ana CA 92705 (714) 540-9945

Plessey Microsystems, Water Lane, Towcester, Northamptonshire NN127EG, England (0327) 50312 Telex 31628

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

Prometrics Inc., 5345 No Kedzie Ave, Chicago IL 60625 (312) 539-3373

Rockwell International, 3370 Miraloma Ave, Anaheim CA 92803 (213) 647-5000

Shugart Associates, 1030F E Dwain Ave, Sunnyvale CA 94086 (408) 738-2524

Signetics Corp., 811 E Arques Ave, Sunnyvale CA 94086 (408) 739-7700

Simulation, PO Box 2228, La Jolla CA 92038 (714) 459-3888

Spectrum Dynamics, Inc., 11B North Ave, Burlington MA 01803 (617) 273-1850

Struthers-Dunn, Inc. 411 14th St, Bettendorf IA 52722 (319) 359-7501

Technical Communications, Inc., PO Box 306, Olathe KS 66061 (913) 764-0243

Technitrol Inc., 1952 E Allegheny Ave, Philadelphia PA 19134 (215) 426-9105

Technology Marketing Inc., 3170 Red Hill Ave, Costa Mesa CA 92626 (714) 979-1100

Texas Instruments, PO Box 5012, Dallas TX 75222 (214) 238-2011

Zehntel, Inc., 2440 Stanwell Dr, Concord CA 94520 (415) 676-4200

Zilog, Inc., 170 State St, Suite 260A, Los Altos CA 94022 (415) 941-5055

MINI SOFTWARE COMPILER

In October, 1975 MD reported on a resident two-pass compiler which executes on any 16K Intel 8080 microcomputer system. The article generated quite a flood of calls at MD as we had not published an address. The company, MINI Software Inc., is located at PO Box 7438, Alexandria, Virginia 22307 (703) 768-4076. Since contacting the company, MD has received 20 sets of data sheets from C. R. Willis, president, to distribute. So....if you'd like a copy, write us a letter. The first 20 requests receive the data sheets.

RECENT LITERATURE

(from page 11)
detailed description of the DEBUG program tool. Its intent is to provide readers with the basic fundamentals needed to create their own DEBUG utility. Although the author uses the 16-bit PACE microcomputer as his discussion model, the principles defined can easily be transferred to any microcomputer currently available.

Mr. Tallman provides the reader with considerable information on memory configurations, hardware structure, program manipulation and how to debug application programs. The article is heavily supported by schematics, block diagrams and flow charts.



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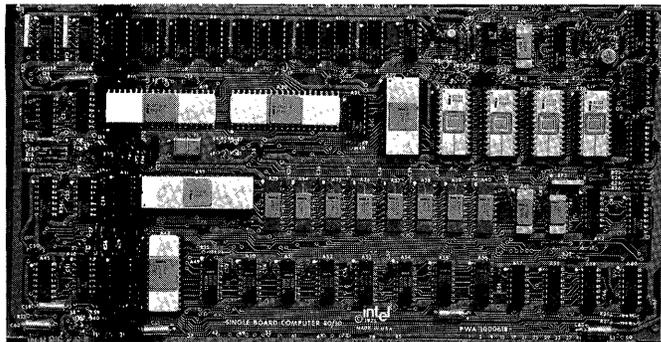
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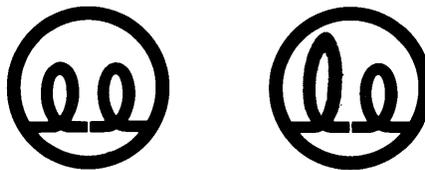
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