

# MICROCOMPUTER DIGEST

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## BIPOLAR $\mu$ C SECOND SOURCE ANNOUNCED

Signetics Corp. has announced that they will second source two device types of the Intel 3000 series microcomputer family as part of a bipolar microcomputer system to be introduced in July or August. Signetics will use industry standard Schottky TTL ROM/PROM, RAM and interface functions to complement the microcomputer.  
(cont'd on page 2)

## JAPAN DEVELOPS FASTER 8080 EQUIVALENT

Two Japanese firms, subsidized by the Ministry of International Trade and Industry, have jointly developed a pin-compatible version of the Intel 8080 8-bit N-channel microprocessor. The two companies, Mitsubishi Electric Corp. and Oki Electric Corp., will announce production manufacturing responsibilities at a later date. Mitsubishi will be first to begin at a monthly rate of 1000 units.  
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## INSIDE THIS ISSUE

MOTOROLA is stocking their MK6800 evaluation kit on distributors' shelves. Story on page 5.

WESTERN DIGITAL is now shipping production quantity LSI-11 microcomputers. Story on page 5.

COMPUTER PRODUCTS introduces PROCOM 1, a full microcomputer control system. Story on page 6.

MARCH LITERATURE REVIEW--"Microcomputer Design", an analysis of 8008 design techniques. Story on page 14.

COURSES--Upcoming microcomputer courses and seminars for March thru June on page 15.

## 4-BIT SLICE I<sup>2</sup>L $\mu$ C ANNOUNCED BY TI

The company's first I<sup>2</sup>L microcomputer has been developed for the low-end minicomputer market. Texas Instruments has put all the circuitry for a full 4-bit-slice microprogrammable microprocessor into a 40-pin DIP. Designated SBP 0400, the device can be expanded into any 4-bit-multiple system and applications range from small controllers to high performance, high speed minicomputer-based multi-controller and process-control systems. The system is ideal for emulating many 16-bit minicomputers and can be used in stand-alone controller applications.  
(cont'd on page 3)

## NATIONAL WILL 2ND SOURCE 4004 FAMILY

National has announced they are second sourcing Intel's 4004 family of microcomputer chips. Phil Roybal, microprocessor product marketing manager, said that National has been shipping sample quantities of the devices for about two months and should be in full production by April.

National has been offering compatible memory chips for some time, but now they can offer a full microcomputer family by second sourcing the 4004 microprocessor.

## INTEL INTRODUCES 4/MOD 40

(THIRD IN A SERIES)

A new modular, self-contained, table-top microcomputer development system has been introduced by Intel Corp. The system, called Intellec 4/MOD 40, is designed to provide a flexible, inexpensive and simplified method of implementing the recently announced 4040 CPU (4-bit) based OEM microcomputer systems.  
(cont'd on page 3)



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**SPECIAL FEATURES (FROM PAGE 1):**

**BIPOLAR  $\mu$ C SECOND SOURCE ANNOUNCED**

(from page 1)

The key 3000 series elements selected are the 3001 Microprogram Control Unit and the 3002 2-bit Central Processing Element. Stan Bruederle, marketing manager for Bipolar Microprocessors at Signetics, stated that "when combined with Signetics' standard families of logic interface and memory elements, these two products essentially complete the industry's first multiple sourced bipolar microprocessor set."

However, Mr. Bruederle pointed out that Signetics will not manufacture all of the products offered by Intel. "For example, there are already industry standard multiple sourced functions available that perform the functions of the 3003 look ahead carry block (74S182) and the 3216 and 3226 bus transceivers (8T26 and 8T28). It is our feeling that it is to the customers' advantage to use the industry standard products rather than choose a 3000 sole source product."

Steve Sharp, schottky product line manager at Signetics, added "We chose the 3000 devices to form the basis of our set for two reasons. First, they are highly manufacturable since they are the same process as our 74LS devices, and we feel the 2-bit slice provides optimum design flexibility for low cost, high speed systems. For example, the MCU (3001) can stand alone in a hardwired controller application. The CPE (3002) can be used as a register and arithmetic unit with customer designed SSI/MSI control logic. Combining the MCU and CPE together provides an extremely powerful high speed TTL/LSI microcomputer."



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Preliminary data sheets and application notes for the processor and support circuits will be available in April. Sample quantities of the 3001 and 3002 are scheduled for July with production quantities in August. Signetics also intends to produce the 3214 Priority Interrupt Control Unit during the fourth quarter.

Asked about the PIP 2650 microprocessor, Signetics said the device should be ready within six to eight weeks. Only a few minor timing problems had been holding up introduction of the chip.

## JAPAN DEVELOPS FASTER 8080 EQUIVALENT

(from page 1)

The new chip operates at a clock frequency of 2.5 MHz, nearly 25% faster than the 8080. The chip contains approximately 4,500 transistors and measures 211 x 183 mils compared to Intel's 191 x 164 mils.

Features include an instruction set of 78 commands, 1.6 us execution time, DMA capability to 65,536 bytes, unlimited subroutine nesting and one-level interruption. Input/output pins are TTL-compatible with the 7400 series devices.

The two companies hope to capture their share of the growing Japanese microprocessor market which is expected to exceed \$3 million a month. For the present, there are no plans to export the microprocessors.

Company spokesmen said the chip is ready in sample quantities for \$200. Other devices to be introduced this year will include a static N-channel RAM of 1024 bits, a dynamic N-channel 4K RAM, an N-channel 8K ROM, an 8-bit input/output port, and a 4-bit bidirectional bus driver.

## 4-BIT SLICE I<sup>2</sup>L $\mu$ C ANNOUNCED BY TI

(from page 1)

A 16-bit system would require four 0400 microprocessors, four CROMs, a sequencer, two interrupt packages, seven I/O circuits and three clock drivers. Another plus factor is that emulating a 16-bit mini with an LSI version would require no new software development.

Architectural features of the 0400 include

a full parallel access available to control data and address I/O; symmetrical ALU with 16 operations, implemented with full-carry look-ahead; eight general registers, program counter, two 4-bit working registers for single and double length operations; scale-shifting multiplexers with end conditions handled on the chip itself, and one-chip control transformation generated by a factory-programmable logic array.

The device requires a single-power supply, minimum 0.85 volts. As the chip is current-operated, any maximum voltage can be used so long as the supply current is limited. The 0400 dissipates 112 mW with a nominal 150 mA supply current.

The processor is capable of a 4-bit ADD in 500 ns, a 16-bit ADD in 650 ns, and a 16-bit multiply in 20 us. Overlapping fetch and execute instructions are allowed. All chip inputs are TTL-compatible and can be used with any TTL-compatible memory.

TI says they have solved all production problems and have been in production quantity for over a year. TI would not say who their customers are, nor would they discuss processing technology.

## INTEL INTRODUCES 4/MOD 40

(from page 1)

The Intellec 4/MOD 40 has 5K bytes of memory, expandable to 12K bytes. The memory is PROM, data RAM and program RAM available in 4K byte segments. The system has 60 instructions which include conditionals, logicals, and binary, decimal and I/O operations. Cycle time is 10.8 us.

In addition to power supplies, I/O connectors, console and displays, the basic 4/MOD 40 system has four microcomputer modules, CPU, RAM, memory controller and PROM programmer. A front control panel provides easy monitoring and controlling of the entire operation of the system.

For application program development, the Intellec 4/MOD 40 has two systems software products, a PROM resident system monitor and a RAM resident assembler.

With the system monitor, the user can display and modify memory contents, read and

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punch object tapes, assign system peripherals, program and verify PROMs, and perform other functions which significantly reduce program debug and development time.

The RAM resident assembler translates source code into object code that will execute on the Intellec 4/MOD 40 or any MCS-40 system. The assembler collects information from the source program; builds an internal symbol table; outputs a listing of the assembled program, including error messages; and punches an object program tape. Paper tape editing capabilities are also contained on the assembler.

The 4-bit 4040 CPU microprocessor is the heart of the CPU module (Imm 4-43) and is supported by the system clock, 1K 8-bit bytes of PROM memory, 320 4-bit bytes of data RAM memory, three 4-bit input ports, and eight 4-bit output ports. The RAM module (Imm 6-28) contains a 4K x 8 memory array for program RAM. Data RAM (320 4-bit bytes included in CPU module) can be expanded to 2560 4-bit bytes using an optional Imm 4-24 module. The CPU's 1K PROM memory can be expanded to 4K 8-bit bytes using the optional Imm 6-26 or Imm 4-22 modules.

To allow for complete "hands-on" simulation of the entire user system, the I/O ports can be expanded to 16 4-bit input ports and 48 4-bit output ports using the optional I/O module, Imm 4-60.

The RESET IN/OUT, STOP/STOP ACKNOWLEDGE, and INTERRUPT/INTERRUPT ACKNOWLEDGE control signals, along with all I/O ports, are available at the back panel so the user can interrupt, halt and reset the resident CPU with his own interface.

Program interrogation and alteration can be done with the front panel console, a teletype, or other Intellec compatible peripherals. The front panel console has the facility for manually writing data into memory, displaying memory contents, monitoring CPU bus contents, "freezing" system status, single-stepping the program, and verifying program flow. The teletype and Intel's high speed paper tape reader, Imm 4-90, serve as vehicles to input and output paper tapes and execute the system monitor.

The Intellec 4/MOD 40, available from Intel's Microcomputer Division, is priced at

\$2,845 in unit quantities.

Ed Note: We will feature Digital Equipment Corp.'s MPS microcomputer next month.

## RESIDENT PL/M+ COMPILER FOR IMP-16

Phil Roybal, microprocessor product marketing manager, reports that National Semiconductor has just completed "the world's first resident IMP-16 compiler for PL/M+." This eliminates the need for users to rely on timeshare systems and large in-house computers to generate object tapes for PL/M+ programs. Even more significant, PL/M may emerge as an industry standard microcomputer language.

Roybal said that National's PL/M+ is essentially the same language as Intel's plus a few extensions and modifications. He added that PL/M programs written for Intel's microcomputers could be used on National's IMP family with "minor modifications". National has also announced a resident conversational assembler for the IMP-16. The conversational assembler will permit interactive, keyboard input of source statements and on-line editing of the stored source file. When the user is ready, he can assemble the program and, if there are errors, he can again access the stored source file for re-editing and reassembly. Prices for these software packages have not been announced.

Additional user support includes a new IMP software library and microcomputer training program under the direction of Bill Harding, microprocessor education manager. Courses will be of four days duration, Monday thru Thursday with Friday as an optional lab day and will be offered for introductory as well as advanced levels. The three courses, Fundamentals of Microprocessors, System Design and Advanced Programming, are to be conducted serially each month so that a student could attend all three in one month. But Harding recommends that a novice stop after each course for practical design experience. A PL/M+ course is also in the making and should be available by May or June.

New training facilities in National's Novus calculator building include eight training stations, each equipped with an IMP-16P, TTY and high speed peripherals. Classes are limited to 16 students and tuition is \$395.



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**TECHNOLOGY:****MK6800s ARE STOCKED BY DISTRIBUTORS**

Motorola's Microprocessor Product Marketing Manager, Van Lewing, reports nearing completion on their distributor program for both US and European vendors. The MK6800 evaluation kit, with parts in a packet for building a 6800 system, is being stocked on distributors' shelves and will be "very attractively priced", according to Van Lewing.

The 6800 MPU, PIA and other parts have been in production since last December. The ACIA communications chip is going into production this month. Motorola is currently delivering MK6800 devices 30 days ARO.

**WD BEGINS PRODUCTION OF LSI-11  $\mu$ C**

Western Digital has announced they will go into production of their 4-chip microcomputer manufactured and developed exclusively for Digital Equipment Corp. later this quarter. The company expects to be shipping thousands of chips every month soon.

The microcomputer consists of one Data chip (CP1611B), one Control chip (CP1621B), and two versions of the Microm chip, (CP1631B), that contain the large microinstruction ROMs. The chips operate at 3 MHz.

Speaking of the \$6.3 million dollar contract with DEC, A. B. Phillips, president and chairman of WD, said "We are pleased that our microprocessor chips will be members of DEC's rapidly growing PDP-11 computer family. This is not just a microprocessor like the popular 8080, but is equal to a powerful minicomputer with the instruction set and floating point arithmetic capability of the PDP-11/40 and the execution speeds of the PDP-11/05."

The company used the same N-channel process presently used with their RM1701H 4K RAM for the microcomputer.

**GA STILL PURSUING SOS  $\mu$ C**

General Automation has acknowledged that they are shopping for a manufacturer to supply microprocessors for their LSI-12, an 8-bit microcomputer. Rockwell International recent-

ly discontinued their effort towards building the SOS microprocessors for GA.

General Automation says they have been holding discussions with a number of companies, including Western Digital. Sources say that an award for the LSI-12 will probably be made within the next month. Another system, the LSI-16, a 16-bit microcomputer, will be contracted for manufacture around 4Q75.

**INDUSTRY'S 1ST FIELD PROGRAMMABLE PLA**

Intersil Inc. has introduced the industry's first Programmable Logic Array (PLA) which can be electrically programmed in the field. The IM-5200 PLA has 14 inputs, 8 outputs, and a total of 48 product terms. The device is programmed by an avalanche-induced migration method that involves blowing out a diode in the transistor structure. Typical propagation delay is 65 ns. Only a single 5V supply is required and the PLA is pin-compatible with National Semiconductor's 7576 mask programmable PLA.

The device is being sampled this month by customers.

**GE AND SSS AGREE ON SOS EXCHANGE**

An SOS technology-transfer agreement has been reached between General Electric and Solid State Scientific. Under the agreement, SSS will develop and market a CMOS/SOS 8-bit microcomputer designed by the GE Research & Development team.

SSS will manufacture and market chips as well as complete microcomputer systems, RAMs and ROMs. For all non-GE sales, SSS will pay a royalty fee. No further information on fee arrangements was disclosed.

GE will supply SSS with the design of their CRD-8 TTL/MSI microcomputer, a complete software library (previously prepared for GE's CRD-8), a fixed number of man-weeks of technical consultation during the development of the SOS microcomputer, and the design of a 16-bit microprocessor if GE develops one.

The microprocessor will include an arithmetic unit, all control logic, operational and buffer registers, and hardware multiply and divide functions.

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The microcomputer memory can be increased to 64K words in increments of 256 words. The system uses 4K ROMs and 1K RAMs.

The software package consists of a cross assembler and a loader runnable on Honeywell's 6000 and IBM's 370 Series. Other programs include test routines, a high-level language, and hardware multiply and divide.

Production of the microcomputer is scheduled for late 1975 at SSS's facilities in Montgomeryville, PA.

## EUROPE TECHNOLOGY CATCHING UP WITH US

Two major conclusions were evident at a recent technology conference in Paris, France. First, as markets soften, technology makes one giant step forward and, secondly, when the current economic crisis subsides, European companies will have considerably narrowed the technology gap between them and American companies.

Several firms, Plessey, Siemens, Philips and Thomson, described new techniques for manufacturing complex LSI circuits. It was also learned that a Philips French subsidiary, RTC, is developing an entire microcomputer family using integrated injection logic technology.

## MICROCOMPUTER BASED PRODUCTS:

### EAST COAST FIRM ANNOUNCES PROCOM I

Computer Products, Inc., has announced the introduction of PROCOM I, a general purpose microcomputer system. PROCOM I is offered as a new companion product to Computer Products' line of measurement and control electronic devices--the RTP 7400 series.

PROCOM I is designed for system design engineers to produce computer directed measurement and control systems found in a broad range of industrial applications such as power plant monitoring and control, process control and factory automation.

Initial applications include communications and control intelligence for remote computer-directed measurement and control systems. The PROCOM I and associated peripherals can communicate with other computers via standard telephone circuits in master-slave type com-

puter configurations.

The microcomputer, when acting as an intelligent terminal to a host computer, performs the communications tasks of error checking, transmitting and re-transmitting while using an IBM standard, experience-proven protocol. The system's firmware is also used to allow variable length scanning, blocking and routing of data to and from the RTP 7400 equipment. Remotely, PROCOM I can further support a standard teletypewriter or CRT terminal over a second serial port.

The basic computer chassis contains room for six cards; four standard cards and two option cards in a 3-1/2 inch high RETMA rack-mounted panel.

The heart of the PROCOM is an Intel 8080 microprocessor on a CPU card with clocks, 2048 bytes of PROM, 512 bytes of RAM and supporting logic. The parallel I/O card contains control and interface logic to convert the PROCOM I bus to the standard RTP 7400 equipment I/O bus. The serial card incorporates two complete full duplex serial I/O ports. One contains the necessary circuitry to implement the EIA RS-232-C interface including standard modem control signals. The other port accommodates both RS-232-C and 20 mA TTY current loop signals. The serial I/O card also contains a 400 Hz firmware readable real time clock. The power supply board provides the 5 volt supply required by the microcomputer and has sufficient capacity to support computer options including extra memory. The power supply was developed specifically for microcomputer usage and includes two switching regulators with current and overvoltage protection.

Asynchronous communications rates using common carrier equipment typically range from 75 baud to 1800 baud. For private line and inplant communications systems capable of higher rates, up to 19,200 baud is possible while still using the standard IBM 2260 line protocol.

The firmware was designed by Scientific Systems Services and they are presently developing FORTRAN coded host computer software modules for remote measurement and control using the PROCOM I/RTP 7400 systems.

PROCOM I is priced at \$2995 and will be available early this year.



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## GOODYEAR & AF TO CONDUCT $\mu$ C STUDY

Goodyear Aerospace Corp. and the Air Force Avionics Laboratory at Wright-Patterson AFB have entered into an agreement for an 11-month study on how microcomputers can be used to improve warfare signal processing systems.

Goodyear project engineer, Richard Ries, will supervise the \$95,000 study for the Air Force. The study includes development of microcomputer systems using microprocessors as a base to provide improved electronic warfare processing capability.

## HP'S $\mu$ C TERMINAL NETS \$1M BACKLOG

Hewlett-Packard has begun deliveries of their new microcomputer controlled Model 2640A CRT terminal against an order backlog of more than \$1 million.

First shipments were made in January to Longs Drug Stores, Walnut Creek, CA, which has placed an order for 20 of the terminals.

Customer response has been very encouraging, and according to Edward R. McCracken, marketing manager, HP Data Systems Division, "Since beginning to accept orders on December 1, we have received twice as many orders as we had projected."

McCracken said that early customers represented a wide variety of applications in industry, business, government and education, with a strong trend toward on-line data entry and order entry applications. In addition, several major OEM customers have purchased evaluation units.

Longs operates a chain of 82 drug stores in California and Hawaii. It will use the new terminals with an HP terminal control system and recently installed HP-3000 minicomputer system for data entry and updating accounting files.

## NEW $\mu$ C FEATURES HIGH SPEED PERIPHERALS

A new software development system utilizing a microcomputer and high speed peripheral devices has been announced by Mycro-Tek.

The Mycro-Tek High Speed Development System enables users to reduce man-hour costs by as much as 80% for average programs. According

to the manufacturer, the system can pay for itself during the first microcomputer project.

The system utilizes an Intellec Mod 80 microcomputer, peripheral devices which include a high-speed CRT terminal, high-speed dual cassette tape unit, and a silent 30 cps thermal line printer for hard copy of program listings. The CRT terminal can display 1920 characters in an 24 x 80 matrix.

The system can be configured with a wide variety of microcomputers and a full set of standard software, literature and specifications are available upon request. The microcomputer will be available April 15, 1975.

## TRI-PROCESSOR DISPLAY TERMINAL

Ontel Corp. has introduced their OP-1, an intelligent terminal display system utilizing three microprocessors. The system was designed for the OEM market and provides communications and multiple I/O processing. The terminal contains a display microprocessor, an I/O microprocessor and the central microprocessor.

With the central microprocessor, the OP-1 can be programmed for such applications as reservations, inventory, ticketing, sales and typesetting. Additional features include RAM memory expandable to 16,834 bytes; asynchronous program controlled, communications up to 9600 bps; and non-glare CRT.

Price is set at \$2,285 in 100 up quantities. Delivery is 90 days ARO.

## WANG ENTERS $\mu$ C-MINI INTO NEW MARKET

A new front-end processor has been built by Wang Laboratories which uses the Intel 8080 microprocessor as its heart. The system marks Wang's minicomputer entry into the remote batch terminal market.

The Wang 2200 will be tied to IBM mainframes under 3780 emulation through Hasp and RJE software. Plans are being made to tie the mini-front-end combination to Control Data, Honeywell and Univac mainframes.

Initial entries will concentrate on IBM 3740 and 3780 remote batch terminal markets. The system is priced from \$8,000 to \$10,000.



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## OCR PAGE READER AVAILABLE

A new page and document reader has been introduced by SCM Corp. The reader is controlled by a microcomputer and features a stationery scanner with photodiode arrays.

Called OCR 2001, the unit includes on- and off-line correction, an automatic feeder/stacker, a full alphanumeric keyboard/CRT and diagnostic software. The system is capable of reading OCR-A, OCR-B, and mark sensing at up to 300 lpm. Optional interfaces allow the OCR to output directly to 7- or 9-track mag tape, paper tape/punch and serial communication lines.

## µP CONTROLLED MEMORY SUBSYSTEM

Dicom Industries is offering their OEM mass memory subsystem that features microprocessor control. The Model 176 digital cassette is an ANSI/ECMA-compatible, single-transport, magnetic tape device. The system interfaces to any minicomputer and can function as an on-line, automatic, synchronous or asynchronous device.

The memory consists of a tape transport module, servo-drive module, microprocessor controller/formatter with byte-parallel interface and first-in-first-out character buffers.

The cassette memory system is presently available and prices begin at \$975.

## NC SYSTEM ADDS MICROS FOR EFFICIENCY

General Electric's new softwired numerical control for machining centers has combined hardwired techniques and a 16-bit microcomputer to provide a new dimension in machine productivity and performance.

Called the Mark Century 1050, the system was designed and manufactured by GE's Industrial Control Products Department last year. The microcomputer allows the control system to be specifically tailored to the numerical control application. Self-contained diagnostics identify potential problem areas in the machine as well as the control--assuring maximum uptime and high productivity. Computations take place in the microcomputer at speeds which can accommodate even the most

advanced high-speed machines with power to spare.

The Mark Century 1050 uses National Semiconductor's IMP-16 microcomputers. However, the microcomputer is not in complete control. Instead, GE designed the controller combining advantages of software, firmware and hard-wired technology. They prefer to view the system as including a microcomputer, not depending on it.

The 1050 is a machining control center intended for four or more axes of control. A control board is used for each axis and additional axes can be added with a new piece of executive software in the microprocessor and installing another control board. A minimum system would contain nine boards, central microcomputer (CPU), I/O, arithmetic and several axis boards which may or may not contain microprocessor chips. The complexity of the axis determine the need for microprocessing.

The microcomputer uses the system's main bus, shuffles data in and out of memory, feeds data and monitors the status of all boards.

Price for the system ranges between \$10,000 and \$15,000, depending upon configuration. The system is available and GE has two brochures available on request that describe the control system, "Mark Century 1050 Microprocessor CNC" and "Mark Century 55TX Numerical Control."

## µC PROTOTYPE BOARDS READY

Rockwell International has announced that prototype boards for their PPS-8 microcomputer are now available. The minimum system configuration includes a microprocessor, 2K x 8 ROM, 256 x 8 RAM, DMA controller and clock.

The p-channel MOS microprocessor consists of an 8-bit parallel adder/accumulator for logic and arithmetic operations, five 8-bit registers for memory addressing and data manipulation, a pointer for a RAM data stack, processing logic for a priority interrupt structure, and logic for DMA.

The instruction set includes 90 commands and a load or store instruction can be executed in 4 us. Multifunction instructions for decimal arithmetic operations can be performed at the rate of 12 us per digit. A



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table search requires 12 us per byte. The microprocessor can accept three levels of priority interrupts and can service more than 15 independent I/O circuits for each level.

Prices begin at \$600 to \$700 for prototyping evaluation boards which are currently available.

## SAFeway TESTS NATIONAL'S POS SYSTEM

The United States' largest supermarket chain, Safeway Stores, has announced they will test National's Datachecker POS system. The test system will consist of a specially-configured Datachecker system with scanning capability. Extensive hardware and software alterations have been incorporated to meet Safeway's requirement.

Although details of the contract were not disclosed, it is believed that only one system is involved. Safeway spokesmen said the chain will not confine its orders to one supplier. Other firms contacted for bids by Safeway include IBM, Univac and Dymo, now owned by Data General.

## AUTOMATED TV STATIONS

At a recent IEEE meeting in England, F. H. Steele, IBA's director of engineering, highlighted the meeting with his paper, "Some Applications of Digital Techniques to Television Broadcasting". The paper described an IBA experimental digital automatic measurement device for computer monitoring of unattended transmitters that use microcomputers to achieve a drastic cost reduction.

The experiments not only demonstrated the value of computerized remote-monitoring of television stations, but indicated where costs could be significantly reduced.

The system sampled waveforms obtained from each video frame. Prior sampling had been required at a rate of 13 million/second, but only 25/second was required with the new system.

The computer controlled the sample position on the television line and performed the necessary measurements and corrections needed.

IBA is continuing its study of computer monitoring at its Engineering Center in Crawley Court, near Winchester, England.

## TEKTRONIX TO OFFER $\mu$ C SCOPE

In a recent interview with Electronic Engineering Times, Bill Walker, Tektronix vice president, revealed that his company was in the process of developing two different microcomputer-based oscilloscopes. Walker said, "I'd be amazed if any of our competitors assumed we weren't working with microprocessors."

Although Walker would not discuss specific microprocessor-driven test instrument designs, he did mention a few possible applications. For example, a scope that digitizes the entire waveform at one time or one that would work with only a few preselected points in time or amplitude. Tektronix's full-waveform digitizers now use a minicomputer, but a micro replacement is almost a certainty.

The article mentions that Walker foresees a whole new line of microcomputer instruments possible before the end of 1975. Included are microprocessor-driven DVMs, counters and spectrum analyzers. He also foresees combinations of instruments in a single package, all controlled by a microcomputer. With a printer output, variables such as peak, rms, or average voltage changes with time could easily be monitored. PROMs and ROMs would handle basic subroutines, while the operating program would probably have to be loaded in by paper tape.

One of the most basic considerations of all microcomputer-designed instruments noted by Walker was its dependence on good software and firmware. Bad software would render an instrument as useless as a scope without control knobs, he noted.

## MEMORIES AND PERIPHERALS:

### SAN DIEGO FIRM OFFERS 8080 PERIPHERALS

MicroMation has announced two new products, a dual cassette system and an 8K RAM memory board which can be used with either the Intel 8080 or Intellec 80 microcomputer system.

The MM2000 dual cassette system consists of a plug-in interface board, the microcomputer mainframe, program PROM, and dual cassettes. User programs can be written and read from the tapes. Source programs on one

(cont'd next page)



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tape can be assembled or edited, and output to the second cassette. The program in the PROM interfaces to the Intel Assembler, Editor and Monitor.

The MM1000 memory board has 8K of 8-bit bytes, dynamic refresh logic, bus interface, and address select logic. The four most significant address bits are selected by jumpers on the board so that the board can be located in any Intellec slot. A unique refresh scheme is used which does not effect microprocessor activity, and therefore cannot disrupt such routines as time delays which depend on the microprocessor's CPU cycle time.

The MM1000 sells for \$895 in single unit quantity and for \$695 for 10 to 24. The MM2000 is priced at \$950 for single units and at \$650 for 10 to 24 units. Delivery is stock to 60 days.

## SVG ANNOUNCES CENTER OPEN & EQUIPPED

The Sorrento Valley Group has announced the opening of their microcomputer development center. The San Diego, CA facility will allow users to fully develop, design and debug microcomputer hardware and software without the high initial investment. The center will be open daily and may be utilized on an hourly or monthly basis.

An Intellec 80 system, based on Intel's 8080 microcomputer, is currently available at the facility and is supported by a teletypewriter. Additional peripherals such as high speed paper tape, dual cassette mag tape, CRT display, and a high speed printer will be added in the near future.

SVG will supply technical support for the system in the form of group training sessions, software packages and application consulting.

## FAMOS 4K PROM BEING DELIVERED

National Semiconductor is now shipping their 4096-bit PROM which uses a silicon-gate p-channel process with floating-gate avalanche MOS (FAMOS) technology.

The 512 x 8 device features an access time of 750 ns and can be programmed in 30 seconds. The PROM has tri-state outputs, operates at +5 and -12 volt supplies, and is fully TTL compatible.

## WD ANNOUNCES 16-PIN 4K RAM

Further impetus for an industry standard pin configuration for the 4K RAM has been given by Western Digital's latest entry, a 16-pin 4K RAM. The device is scheduled for introduction in April, with production quantities to be available shortly thereafter.

Western's device will be fully compatible with both Mostek's and Intel's fast 4K RAM. A 22-pin device will also be introduced to replace the 300 ns 4K RAM presently in production at Western Digital. The new 22-pin device will have an access time of only 200 ns.

Prices have not been set but it is believed they will range between \$10 and \$12 for 100,000+ quantities.

## INTEL OFFERS 16K CCD DEVICE

Intel Corp. introduced a 16,384-bit charged couple device memory last month. The 2416, a 64 x 256 serial memory device is packaged in an 18-pin DIP. The memory will be used as a semiconductor replacement for drum and disc memories.

Sample quantities are currently available from distributors.

Intel has also built a 4096-bit RAM that has an access time of 80 ns, three times faster than the fastest 4K RAM presently on the market. With its 80 ns access time, the 4K RAM matches the speed of 7001-type 1024-bit RAMs. The device is fully compatible with emitter-coupled logic.

## IMP-8 & IMP-16 HIGH SPEED TAPE READER

iCOM, Inc., manufacturers of microcomputer peripherals, has introduced Model R8016P, a new high speed paper tape reader which is designed for direct interface with National Semiconductor's IMP-8P and IMP-16P microcomputers. The R8016P reader allows programming more than eight times faster than by teletype.

Outstanding features of the R8016P reader include complete plug compatibility with the IMP card reader interfaces via a 40-line ribbon cable that directly interfaces with the National unit, assembler program loading in less than 120 seconds, use of photo-electric



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character detector, and a complete software package that works with the National software. The software replaces the teletype reader but will allow reverting to the teletype reader if the R8016P is disconnected or the power is off.

The software for the R8016P reader is supplied on paper tape to be loaded into customer supplied PROMs, with optional loaded PROMs available, and includes a driver contained in PROMs on the TTY/CARD READER circuit board with diagnostic and BNPf PROM tapes.

The unit is priced at \$895 and delivery is in 2 to 4 weeks.

## RENTAL AGENCY OFFERS $\mu$ C EQUIPMENT

In an effort to help designers cut the cost of microcomputer system development, Electro Rent is offering for rent a full line of Intel Intellec series programming equipment. This will enable engineers to develop and debug microcomputer programs without buying the equipment or paying high timesharing costs.

Terms are the same as for any other Electro Rent equipment, 12% of the purchase price per month, with up to 40% credit towards an out-right purchase.

## DISTRIBUTOR ANNOUNCES $\mu$ C LINE

Semiconductor Specialists has announced that they are the first electronic distributor to offer MIL microprocessors, RAMs, ROMs, and microcomputer development systems as well as microprocessor services.

The firm will provide software testing on their timeshare terminals for compiling, debugging and simulating programs. Their system development equipment is available to check out user's microprocessor hardware. SS also says that they will deliver or ship programmed PROMs within 24 hours at a cost of only 1¢ per word when the programs are supplied on their format.

# # #

Editor's Note: Check your subscription expiration date. You won't want to miss TI's announcement next month to second source the Intel 8080. Subscribe today.

## PEOPLE, LITERATURE AND EVENTS:

### '75 NATIONAL COMPUTER CONFERENCE

The 1975 National Computer Conference will be held in Anaheim, CA from May 19-22. The NCC, sponsored by the American Federation of Information Processing Societies, is the largest annual conference and exposition devoted to the computing and data processing community.

The '75 NCC will offer a total program for all computer professionals, educators, and business management personnel. Conference programs will place emphasis on a variety of application areas and the latest developments in computer science and technology.

More than 250 companies will exhibit their products and services in more than 900 booths. AFIPS expects that the conference will have a strong international flavor.

### $\mu$ C SYMPOSIUM DATE CHANGED TO JUNE

AH Systems Inc. has announced that their 1975 International Symposium on Military and Industrial Microprocessor Systems will be held in June, rather than at the end of April.

The symposium was slated to run from April 29 to May 1 in the new Marriott Hotel at the Los Angeles International Airport. Instead, the symposium will be held from June 3-6 at the Towne & Country Hotel in San Diego, CA.

The program will consist of a seminar on bit slice microprocessors and microprogramming, militarized microprocessors, panel discussions on international markets, workshops in microprocessor system design, sessions in advanced technology and a survey of the microprocessor market.

### $\mu$ P DEBUTS MORNING TV COURSE

Microprocessors will be the new star next March on early morning commercial TV in 17 major cities. The one week, half-hour show will be presented by Texas Instruments and will concentrate on microcomputer design techniques. Exact dates for the show have not been announced.



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## MICROCONTROLLER SEMINARS OFFERED

Scientific Micro Systems has been traveling across the U.S. presenting product seminars on their recently introduced MicroController. The one-day seminar discusses control applications of the microprocessor in data communications, automated instrumentations and process control. In the seminars, the basic control problem and microcomputers are evaluated on a cost/performance basis.

Admission is free, but enrollment is limited. The company will still present two more sessions this month, March 4 in Los Angeles and in Orange County, CA on March 11.

## GHEST TO HEAD MMI $\mu$ C EFFORT

Clive Ghest has been named to head Monolithic Memories Inc.'s microprocessor and microcontroller product line. In his newly created position, he will report directly to company president Zeev Dori.

Ghest was formerly microprocessor program manager for Advanced Micro Devices.

## BURKE TO RETIRE

Walter Burke, chairman of the board of Fairchild Camera & Instrument Corp., has announced that he will retire as chairman and director after the annual shareholders' meeting May 2, to pursue personal interests.

He said he will be succeeded by Roswell L. Gilpatric, former deputy secretary of defense and a Fairchild board member since 1967.

Gilpatric is presiding partner of Cravath, Swaine & Moore, the New York law firm which has served for many years as the company's outside counsel.

## SMS NAMES ROSS DISTRICT SALES MANAGER

Scientific Micro Systems, Inc. has announced the appointment of Lawrence G. Ross Western District Sales Manager, a newly created post.

Reporting to Robert A. Lanford, SMS sales manager, Ross will be directly responsible for sales of the newly introduced MicroController microcomputer line.

## DESIGN NOTE FOR BIPOLAR MICROPROCESSOR

Scientific Micro Systems, Inc. is offering a free application note which should be helpful to system designers who use bipolar microprocessor devices like the Intel 3000, the Monolithic Memories 6701 and the Texas Instruments SBP 0400.

The publication describes how simple hardware can be combined with the SMS 1000A ROM simulator to create a powerful design support instrumentation to reduce the firmware development of bipolar systems. More specifically, the note details methods for simulating, in-circuit, the high speed ROM and PROM devices used in bipolar microprocessor systems--while simultaneously debugging microinstructions and/or macroinstructions.

Topics include: Functional Partitioning of Microprocessors; Components of Design Support Instrumentation; Implementing Design Support Instrumentation; Pipeline vs. Serial Processing; and Expanded Support Instrumentation. Discussions are accompanied by detailed block diagrams which depict, among other things, an example of microprogram debug instrumentation for the Intel 3000.

## MAG DISC CONTROLLER APPL NOTE

Intel has announced the availability of a new application note, "Disc Controller Design Uses New Bipolar Microcomputer LSI Components". The publication was presented at last month's IEEE Computer Elements Conference by Glen Louie, applications research engineer. The application note describes how, by using bipolar elements, Intel was able to reduce the number of ICs required from 150 to 67 and operate at the required 2.5 MHz clock rate. The major reduction was accomplished with 22 of the series 3000 bipolar chips.

## MIRCO FOUNDERS FORM NEW $\mu$ C HOUSE

A new microcomputer application company has been formed by Robert G. Fulks and Robert E. Anderson, former founders of Mirco Systems. The company, Omnicomp, will provide microcomputer design and consulting services, with emphasis on the automatic test systems.



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## RECENT LITERATURE

"Distributed Function Microprocessor Architecture"

Alan J. Weissberger, National Semiconductor  
Computer Design November 1974

This general information article discusses the use of microcomputers to decentralize the processing functions of real-time computer systems. Through a planetary master-slave network, microcomputers are providing these functions at remote sites. These intelligent networks are used for data acquisition, measurement and test, supervisory control and computer communications.

Mr. Weissberger gives a general account of microcomputer usage in such systems and then describes National's IMP-16 in this environment.

"Pitfalls to Avoid in Applying uP"

Lee J. Mandell, Litton Data Systems  
EDN January 20, 1975

Based on past mistakes in designing microcomputer-based products, the author offers a few suggestions for readers to consider. Mandell advises:

1) Conversion of all hardware into microcomputer software may endanger other design criteria such as system performance, processing speed or program-size minimization.

2) Don't be afraid to resort to redundant discrete logic at your I/O interfaces. This will free up the CPU from being monopolized by time consuming repetitive tasks.

3) Do not be overly concerned about writing tight programs. They are not always the most cost-effective.

4) Microcomputers are quite adaptable to system self-check programs.

He says that "Many times, one can program in subroutines to isolate the cause of faults that the self-check exposes."

"The Emerging Microcomputer"

Edward K. Yasaki, Sr. Associate Editor  
Datamation December 1974

A light overview article depicting the origin of microcomputers, their advantages, capabilities and drawbacks. Mr. Yasaki quickly brings into focus the present day role of micros in the electronic industry, summarizing

applications and marketing capabilities and then briefly discusses minicomputer replacement. The article is filled with numerous quotes from notables in the microcomputer industry.

"User Microprogram Development For An LSI Processor"

Alan J. Weissberger, National Semiconductor  
EDN December 20, 1974

An excellent article analyzing the flexibility afforded microcomputers through user microprogramming. The article is centered around National Semiconductor's IMP microcomputer family which offers users either a standard instruction set or variations of customer defined instructions. A Control ROM implements user specified instructions using microinstruction subroutines. The article is an excellent presentation for potential microprocessor users who have not thoroughly examined customized firmware for their particular application.

"A Technology Profile: Microprocessors & Microcomputers, Part I"

Modern Data January 1975

Modern Data issued a warning to the world 18 months ago to prepare for the microprocessor revolution or else be buried through their indifference. To capsulize the events since and provide readers with a firm basis for understanding microprocessors, Modern Data is presenting a two part series.

The first article, "Inside Microprocessors", written by Scott McPhillips of Microcomputer Technique, Inc., details the history of microprocessor technology. In selecting a micro for a particular application, he suggests deciding which technology you would like to work with (PMOS, NMOS, Bipolar or I<sup>2</sup>L) and then study the vendor's memory circuits per your requirement. The theory is that memory chips are usually manufactured using the same process as microprocessors. If the company produces good memories, odds are they will produce a good microprocessor.

The second article, "Microprocessors: The Inevitable Technology", by Jerry Ogden of Microcomputer Technique, Inc., describes the Intel 8080 and National GPC/P microcomputers. Mr. Ogden presents a number of good

(cont'd next page)



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definitions concerning micros and microprogramming and then focuses on basic architectures available today. Included are several tables listing microcomputer characteristics and selection criteria.

The final article, "Microcomputer Programming", by Douglas Cassell of Control Logic, Inc., is a gem for hardware design engineers and high-level language programmers. The article assumes we know nothing, defines everything, and then presents a run-down on the programming process for microcomputers.

## BOOK REVIEW

The book, "Microcomputer Design" by Donald P. Martin, president of Martin Research Ltd., is an excellent tutorial concentrating on designing microcomputer based systems using Intel's 8008 and 8080 with most of the emphasis on the 8008. The only prerequisite is that the reader be familiar with digital design and TTL logic.

The author states that the 8008 microprocessor's capabilities have "been underestimated, ironically because of the over-design of the standard circuits. Seeing the rather large array of integrated circuits supporting the 8008, many designers are switching to more advanced CPUs when they are considerably more costly."

"If the speed and other advantages of a more expensive microprocessor are truly needed, then of course that microprocessor should be used. But in many applications, the 8008 is at present the most cost-effective microprocessor for several reasons. First there are over two years of production and design experience behind the 8008. Second, volume costs are low and the unit is second-sourced. Third, effective hardware design can cut the 8008's support circuitry to a minimum."

Hence, the principal purpose of the book is to acquaint designers with the simplest microcomputer designs with the fewest possible standard devices for any application.

Chapters 1-4 introduce the 8008 and 8080 architectures, timing, instruction sets, and capabilities. The author points out that no attempt has been made to duplicate manufacturer's literature. Hence he recommends the novice begin with Intel's 8008 manual.

Chapters 5-26 are the grit. Here, various design techniques are presented under chapter themes. They could collectively be grouped into nine subtopics: timing, bus structures, input/output, memory, interrupts, peripherals, software, testing and application examples.

Of special interest are topics such as: additional circuits required for a basic 8008/8080 microcomputer; expanding input and output ports; adding instructions to the 8008; expanding other capabilities of the 8008; DMA designs; interrupt and priority interrupt designs; register and status saving techniques; interval timers; software techniques; and designing for easy testing.

Specific application examples include: peripheral interface designs; interval timers, clocks and counters; digital displays; keyboards; FIFO stacks; A/D and D/A converters; a nine-chip microcomputer; a twenty dollar microcomputer; a seven-chip microcomputer; and a nineteen-chip microcomputer.

Martin Research is introducing a series of inexpensive microcomputer modules for prototyping, testing, and instructional purposes. The MIKE 1, described in Chapter 25 of Microcomputer Design, is currently available. A series of modules known as the MIKE 2 is currently under development and will be available for sale near the end of the first quarter, 1975. An 8080 microcomputer is planned for introduction in the second quarter of 1975. The price will be "highly competitive."

Martin Research continues to offer one 8008 microprocessor with each copy of Microcomputer Design for \$100.00. They also offer a 'blue-chip special': \$110.00 for the book plus one 8008-1, factory-tested for 12.5 microseconds instruction cycle time (60% faster than the standard 8008). Alternately, the book alone is available for \$75.00 with quantity discounts. Users can be placed on Martin Research's mailing list for bulletins on request.

# # #

Ed's Note: Don't miss a single exciting issue of MICROCOMPUTER DIGEST. Check to make sure you have renewed your subscription.



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**EDUCATION:**

MICROCOMPUTER COURSES, SEMINARS, CONFERENCES. Date, title, cost, location, sponsoring organization (addresses on page 16).

March

- 3- 5 Intel MCS80 Workshop \$350 Boston, MA and San Jose, CA Intel Corp.
- 3- 7 Microcomputer System Design I: Hardware, Software and Applications \$345 Los Angeles, CA Univ. of Southern California
- 4 SMS Microcontroller Product Seminar Free Los Angeles, CA Scientific Micro Systems
- 4- 6 Microprocessors/Microcomputers \$410 Boston, MA Integrated Computer Systems, Inc.
- 8 Microcomputer Software--The State-of-the-Art \$30-\$35 Santa Clara, CA Univ. of Santa Clara
- 10-11 How to Write Software \$275 Boston, MA and Chicago, IL Microcomputer Technique, Inc.
- 10-12 Intel PL/M Workshop \$395 Boston, MA and San Jose, CA Intel Corp.
- 10-14 Integrated Circuit Applications Conference \$45-\$90 Los Angeles, CA Electronic Engineering Times
- 10-14 Microcomputer Systems Design II: Applications, Programming and Implementation--Through Actual Experience \$345 Los Angeles, CA Univ. of Southern California
- 11 SMS Microcontroller Product Seminar Free Orange County, CA Scientific Micro Systems
- 11-12 Industrial Applications of Microprocessors Philadelphia, PA IEEE Contact: Robert Mayer, Sun Oil Co.
- 11-13 Microprocessors/Microcomputers \$410 Detroit, MI Integrated Computer Systems, Inc.

- 12-14 How to Select a Microprocessor \$395 Boston, MA and Chicago, IL Microcomputer Technique, Inc.
- 17-19 How to Design Microprocessor Systems \$425 Boston, MA and Chicago, IL Microcomputer Technique, Inc.
- 17-19 Intel MCS40 Workshop \$350 Boston, MA and San Jose, CA Intel Corp.
- 17-19 Micro, Mini & Midicomputer Systems Structure, Implementation and Application Washington, DC AIIE Seminars
- 18-20 Microprocessors/Microcomputers \$410 Seattle, WA Integrated Computer Systems, Inc.
- 20-21 How to Program Microprocessors \$275 Boston, MA and Chicago, IL Microcomputer Technique, Inc.
- 25-28 Minicomputers/Microcomputers \$425 Copenhagen, Denmark Integrated Computer Systems, Inc.

April

- 1- 8 Microprocessors/Microcomputers and Minicomputers \$185-\$325 Paris, France Integrated Computer Systems
- 7- 8 How to Write Software \$275 Philadelphia, PA Microcomputer Technique, Inc.
- 7- 9 Micro, Mini & Midicomputer Systems Structure, Implementation and Application Chicago, IL AIIE Seminars
- 9-11 How to Select a Microprocessor \$395 Philadelphia, PA Microcomputer Technique, Inc.
- 13-16 Microcomputers I: Basic Concepts and Applications \$395 St. Charles, IL National Engineering Consortium, Inc.
- 14-15 How to Write Software \$275 Toronto, Ont. Microcomputer Technique, Inc.
- 14-16 How to Design Microprocessor Systems \$425 Philadelphia, PA Microcomputer Technique, Inc.
- 16-18 How to Select a Microprocessor \$395 Toronto, Ont. Microcomputer Technique, Inc.



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April

- 16-18 Microcomputers II: Architecture, Software and Systems \$395 St. Charles, IL National Engineering Consortium, Inc.
- 17-18 How to Program Microprocessors \$275 Philadelphia, PA Microcomputer Technique, Inc.
- 21-23 How to Design Microprocessor Systems \$425 Toronto, Ont. Microcomputer Technique, Inc.
- 21-23 Micro, Mini & Midicomputer Systems Structure, Implementation and Applications Chicago, IL AIIE Seminars
- 22-24 The Society for Information Display International Symposia Washington, DC
- 24-25 How to Program Microprocessors \$275 Toronto, Ont. Microcomputer Technique, Inc.
- 30- 2 Workshop on the Advanced Architecture and Application of Microcomputers Pacific Grove, CA Fairchild Systems

May

- 6- 8 Microprocessors and Systems Applications San Francisco, CA Automata-Benwill Courses
- 13-15 Microprocessors and Systems Applications Los Angeles, CA Automata-Benwill Courses
- 19-22 1975 National Computer Conference Anaheim, CA AFIPS
- 20-22 Microprocessors and Systems Applications Boston, MA Automata-Benwill Courses
- 27-29 Microprocessors and Systems Applications New York, NY Automata-Benwill Courses

June

- 2- 7 Microprocessors/Microcomputers and Minicomputers \$185-\$325 Brussels, Belgium Integrated Computer Systems, Inc.

- 3- 5 Microprocessors and Systems Applications Houston, TX Automata-Benwill Courses
- 3- 6 1975 International Symposium on Military and Industrial Microprocessor Systems San Diego, CA AH Systems, Inc.
- 10-12 Microprocessors and Systems Applications Chicago, IL Automata-Benwill Courses
- 17-19 Microprocessors and Systems Applications Washington, DC Automata-Benwill Courses

SPONSORING ORGANIZATIONS AND CONTACTS

AFIPS, 210 Summit Ave., Montvale, NJ 07645  
(201) 391-9810

AH Systems, Inc., Dr. G. A. Nelson, Program Director, 9710 Cozycroft Ave., Chatsworth, CA 91311 (213) 998-0223

AIIE Seminars, Dept. K, P.O. Box 25116, Los Angeles, CA 90025 (213) 826-7572

Automata-Benwill Courses, c/o Benwill Publishing Corp., 167 Corry Rd., Dept. A, Brookline, MA 02146 (617) 232-5470

Electronic Engineering Times, Integrated Circuit Applications Conference, P.O. Box 1021, Melville, NY 11746 (516) 829-5880 #53

Fairchild Systems, T. A. Laliotis, 4001 Miranda Ave., Palo Alto, CA 94304 (415) 998-0123

Integrated Computer Systems, Inc., 4445 Overland Ave., Culver City, CA 90230 (213) 559-9265

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

Microcomputer Associates Inc., 2368-C Walsh Ave., Santa Clara, CA 95050 (408) 247-8940

Microcomputer Technique, Inc., 11227 Handlebar Rd., Reston, VA 22091 (803) 620-9676

National Engineering Consortium, Inc., Oakbrook Executive Plaza #1, 1301 West 22 St., Oak Brook, IL 60521 (312) 325-5700



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Scientific Micro Systems, Jere O'Donnell,  
520 Clyde Ave., Mt. View, CA 94043 (415)  
964-5700

Sun Oil Co., Robert Mayer, Bishop Hollow Rd.,  
Newtown Square, PA 19073 (215) 356-1800

The Society for Information Display Interna-  
tional Symposia, 664 Sepulveda Blvd., Los  
Angeles, CA 90049

Univ. of Santa Clara, Div. of Continuing  
Education, Santa Clara, CA 95053 (408)  
984-4518

Univ. of Southern California, Continuing  
Engineering Education, Powell Hall 212,  
University Park, Los Angeles, CA 90007 (213)  
746-2311

FINANCIAL:EARNINGS

<u>Adv. Memory Systems</u>	<u>1974</u>	<u>1973</u>	<u>%</u>
Dec. 27			
Share Earnings	\$.12	\$.02	+500.0
Earnings	306K	31K	+887.0
Sales	7,503K	7,375K	+1.7

<u>Adv. Micro Devices</u>	<u>1974</u>	<u>1973</u>	<u>%</u>
Dec. 29			
Share Earnings		\$.27	N/R
Earnings	-232K	676K	-62.1
Sales	5,744K	7,063K	-18.5
9 Months			
Share Earnings		\$.65	N/R
Earnings	-457K	1,603K	-71.5
Sales	21,086K	17,790K	+18.5

<u>Amer. Microsystems</u>	<u>1974</u>	<u>1973</u>	<u>%</u>
Dec. 28			
Share Earnings	\$.19	\$.60	-68.3
Earnings	416K	1,378K	-69.8
Sales	18,365K	17,127K	+7.2
Year			
Share Earnings	\$1.64	\$2.16	-24.1
Earnings	3,660K	4,796K	-23.7
Sales	75.324K	58,099K	+29.6

<u>Computer Automation</u>	<u>1974</u>	<u>1973</u>	<u>%</u>
Dec. 29			
Share Earnings	\$.19	\$.24	-20.8
Earnings	321K	402K	-19.4
Sales	5,114K	4,248K	+20.4
6 Months			
Share Earnings	\$.31	\$.48	-35.4
Earnings	516K	798K	-34.0
Sales	10,251K	8,153K	+25.7

<u>Digital Equipment</u>	<u>1974</u>	<u>1973</u>	<u>%</u>
Dec. 28			
Share Earnings	\$.81	\$.85	-4.7
Earnings	9,763K	9,924K	-1.6
Sales	126,837K	96,904K	+30.8
6 Months			
Share Earnings	\$1.44	\$1.43	+0.7
Earnings	17,251K	16,462K	+4.8
Sales	238,590K	178,410K	+33.7

<u>Electronic Arrays</u>	<u>1974</u>	<u>1973</u>	<u>%</u>
Dec. 31			
Share Earnings	\$.01	\$.03	-66.7
Earnings	21K	46K	-54.3
Sales	3,327K	2,906K	+14.5
9 Months			
Share Earnings	\$.53	\$1.82	-70.9
Earnings	893K	2,693K	-66.8
Sales	12,781K	12,509K	+2.2

<u>Hitachi Ltd.</u>	<u>1974</u>	<u>1973</u>	<u>%</u>
6 Months			
Share Earnings	N/R	N/R	N/R
Earnings	78,300K	128,200K	-38.9
Sales	3,148M	2,599M	+21.1

<u>Mostek</u>	<u>1974</u>	<u>1973</u>	<u>%</u>
Dec. 31			
Share Earnings	\$.05	\$.54	-90.2
Earnings	211K	1,986K	-89.4
Sales	16,570K	12,760K	+29.9
Year			
Share Earnings	\$.97	\$1.80	-46.1
Earnings	3,894K	6,591K	-40.9
Sales	60,060K	41,405K	+45.1



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<u>Texas Instruments</u>	<u>1974</u>	<u>1973</u>	<u>%</u>
Year			
Share Earnings	\$3.92	\$3.67	+6.8
Earnings	89,621K	83,237K	+7.7
Sales	1,572M	1,287M	+22.1
<u>Western Digital</u>	<u>1974</u>	<u>1973</u>	<u>%</u>
Dec. 31			
Share Earnings	-\$ .73	\$.58	-225.9
Earnings	-1,008K	783K	-228.6
Sales	1,775K	3,477K	-48.9
6 Months			
Share Earnings	-\$ .51	\$.68	-175.0
Earnings	-706K	536K	-231.7
Sales	5,555K	5,293K	+4.9

## HEAVY COMPETITION SEEN FOR FLOPPYS

Venture Development Corp., a marketing consultant firm, has reported that price cutting and competition in the floppy disc market will yield a high revenue growth but will not be profitable until 1976.

In the microcomputer and minicomputer peripherals market, the company reports that 3100 units will be sold in 1975, increasing to 18,000 in 1980.

The success of floppies in this market is due to their low cost. They can be used in systems needing loaders, on-line file storage devices, buffer memories, off-line storage devices and random-access memories.

## AMI BUYS ALL OF AMI JAPAN

American Microsystems has announced they have purchased all of Rikei Corp.'s interest in AMI Japan and are now sole owner of the company. AMI says they have no immediate plans to manufacture in Japan and that AMI Japan is to become a wholly-owned subsidiary of AMI.

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will integrate four new and exciting addi-  
tions into our special features department.

Beginning with April, we will publish a  
quarterly Microcomputer Bibliography. The  
bibliography will list all microprocessor and  
microcomputer seminar proceedings, magazine  
articles, application notes, etc., and books  
printed since April 1974. A list of previous-  
ly published articles can be obtained by con-  
tacting Ann R. Ward at Bell Laboratories in  
Naperville, IL.

In June we will publish Microcomputer Di-  
gest's semi-annual Microcomputer Index list-  
ing all available and announced microprocessor  
chip sets. June and December will be the  
publication dates.

Also planned is a series of microcomputer  
application articles. We have been talking  
to a number of individuals in the industry to  
determine which applications would be of most  
interest. We would appreciate hearing your  
request and we also encourage interested in-  
dividuals to contact our editorial department.

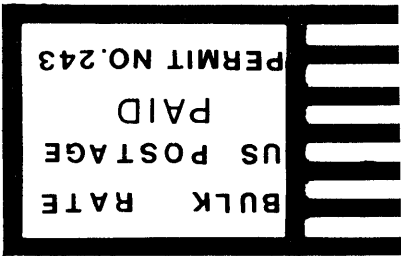
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