

# MICROCOMPUTER DIGEST

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## 2650 NOW BEING SHIPPED AND SAMPLED

Signetics has announced that their 2650 NMOS microprocessor (also known as PIP) is currently being delivered in sample quantities to selected customers. The single chip microprocessor employs the same low-threshold, ion-implanted, N-channel, silicon gate process that Signetics uses to manufacture their 1K and 4K RAMs. (cont'd on page 2)

## NEW $\mu$ P EXECUTES PDP-8/E INSTRUCTIONS

Intersil has formally introduced their IM6100 12-bit microprocessor which executes the PDP-8/E instruction set.

The IM6100 consists of six 12-bit registers, a programmed logic array (PLA), an arithmetic and logic unit (ALU) and associated gating and timing circuitry. It provides all control signals necessary to interface directly with standard memory components, swift registers, I/O devices and a stand-alone control panel that has its own memory, separate from the main system memory. (cont'd on page 3)

## INSIDE THIS ISSUE

ELECTRONIC WARFARE--Second of a three part series discussing  $\mu$ P in EW. See page 5.

MICROCOMPUTER EDUCATION--A three part story discussing the type of services available and what to expect from a 3 to 5 day course. Story on page 6.

COURSES--Upcoming microcomputer courses for August, September and October on page 16.

1980 FOREIGN MICROPROCESSOR MARKET to exceed that of the United States. Story on page 18.

## NEC MICROCOMPUTERS, INC.

The latest entry in the microprocessor/semiconductor memory sweepstakes is NEC Microcomputers, Inc.

Although a wholly-owned subsidiary of Japan's giant Nippon Electric Company, Ltd., NEC Microcomputers is completely staffed and run by Americans. The company's product line includes microprocessors and associated memories, system and interface components, and support software. Memory components include both MOS and bipolar RAMs, ROMs and PROMs. (cont'd on page 3)

## THE \$9.98 COMPUTER ON-A-CHIP

A microprogrammable processor designed for low-cost processor and controller applications is now available from American Microsystems, Inc. The S9209 mask-programmable P-channel silicon gate MOS/LSI chip contains all the essential elements of a microcomputer-on-a-chip (arithmetic and control sections, program storage, data storage, and I/O facilities). (cont'd on page 4)

## UK MICROPROCESSOR ACTIVITY

Dr. J. P. Stuary, Warren Spring Labs  
(Extracted and reprinted with permission from Euromicro)

Interest in microprocessor applications began in the UK with the introduction of the 4004 microprocessor in December, 1971, and increased rapidly as other microprocessors were announced. Today there are at least 25 different microprocessors available or promised by a wide range of manufacturers. (cont'd on page 4)



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**SPECIAL FEATURES:**

**2650 NOW BEING SHIPPED AND SAMPLED**

(from page 1)

The 2650 instruction set includes arithmetic, logical, I/O, and branch instructions for a total of 75 commands. In addition, a decimal adjust instruction provides the chip with BCD arithmetic capability. There are eight addressing modes; register to register, immediate, relative, relative indirect, absolute, absolute indirect, absolute indexed, and absolute indirect indexed.

The 8-bit architecture features an 8-bit tri-state, bidirectional data bus, and a 15-bit, tri-state address bus. There are seven general purpose registers, an 8-bit parallel ALU, and a two byte status register. Six of the general purpose registers can be used for indexing. To minimize system chip count, an on-chip subroutine return address stack automatically saves the instruction address register for eight levels of subroutine nesting.

A true vectored interrupt capability aids the 2650 system designer in implementing interrupts. The interrupting device supplies a pointer which directs the 2650 to the appropriate interrupt service subroutine. The pointer can specify one of 64 subroutine starting addresses, and the subroutines can be located anywhere in the 32K byte address space.

Additional chip features include external sense and flag lines, tri-state address and data bus, TTL compatible inputs and outputs, a TTL compatible single-phase clock input, and operation from a single 5 v supply. The 2650 is a static device, thereby allowing the clock to be stopped indefinitely in the "low" state.

Signetics is fully supporting their 2650 microprocessor with a cross assembler and a



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simulator which are now installed on National CSS and GE timeshare facilities. Signetics also developing a prototyping system and has completed design of a 2650 evaluation board.

A host of support chips for use with the 2650 are being offered, included are the 8T series of tri-state buffers and inverters as well as MOS and bipolar RAMs and ROMs. Signetics will soon be shipping their 82S100 FPLA which will aid designers in special application interfaces to the 2650.

Reliable sources at Signetics have told MICROCOMPUTER DIGEST that the 2650 will be available in production quantities in the third quarter this year. Price in small quantities will be \$165 for the microprocessor. The price drops to under \$100 for large quantities, or when mixed with a large order of support circuits.

## NEW $\mu$ P EXECUTES PDP-8/E INSTRUCTIONS

(from page 1)

The advantage of such a stand-alone or "plug-in" control panel is that it can be connected into the system whenever panel functions are needed, and disconnected without disturbing the system.

The IM6100 uses a single 5 V supply, and has an on-chip crystal controlled oscillator, eliminating the need for clock generators and level translators. The device operates with standard MOS RAMs, PROMs and FPLAs, using no more than six standard 54/74 TTL packages for interfacing. The IM6100 is supplied in a 40-pin package and is priced at \$395 in 1-24 quantities.

To complement the IM6100, Intersil plans to introduce four additional LSI CMOS devices this year: a universal asynchronous receiver-transmitter (UART), a 1K x 12 ROM, a parallel interface element and a 256 x 4 RAM. All will be manufactured as part of Intersil's standard CMOS LSI product line. Intersil presently supplies two 256 x 1 CMOS RAMs and a 1024 x 1 CMOS RAM.

In addition to the above products, Intersil also has three PC boards--a 4K x 12 non-volatile CMOS RAM board, a CPU/TTY board and a control panel board--for microprocessor evaluation, software generation and prototyping.

Four application notes on memory system design, peripheral interface, control panel interface and software are also available.

Intersil's product marketing manager, Ronald P. Hammer, feels that one of the best features of the system is that it uses the existing PDP-8E software which is in common use throughout the world.

## NEC MICROCOMPUTERS, Inc.

(from page 1)

Spearheading NEC Microcomputers' product line will be the uCOM-8 microprocessor and UPD411D-3 4K RAM and associated driver.

The uCOM-8 is an N-channel, silicon gate, 8-bit microprocessor which is software compatible with Intel's 8080; however, it represents a significant improvement over the 8080.

It has multi-byte interrupt instruction capability for improved interrupt handling with much simpler programming. It can do BCD subtraction as well as addition for improved decimal subtraction with a shorter instruction sequence. It also executes register-to-register transfers 20% faster than its 8080 counterpart.

The UPD411D-3 4K RAM is an MOS device fabricated with N-channel technology and is packaged in the industry standard 22-pin DIP. This device features a 150 ns access time. The UPD411D family includes four other 4K RAMs, with varying access times.

Rounding out NEC Microcomputers' memory line are TTL and ECL compatible bipolar devices with access times down to 8 ns and capacities up to 1K bits.

All marketing and sales support of the products are handled by the U.S. company. Sales are handled through reps and distributors, while technical support and applications assistance are provided by the NEC staff.

In addition to the components, NEC will provide full documentation, complete software support, program debug hardware, and applications engineering assistance.

The principals of NEC Microcomputers are: Dr. Roger H. Bender, president; George W. Muller, vice president and treasurer; Toshio Kurosawa, secretary.



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## THE \$9.98 COMPUTER ON-A-CHIP

(from page 1)

Although originally designed for single-chip calculators, the combination of these elements with a 33 command instruction set makes the S9209 useful in a wide variety of dedicated applications.

According to Alex Goldberger, applications manager, typical uses for S9209 include a credit verification terminal, special purpose industrial timer, portable data entry devices, low cost cash registers, small terminals and appliance controllers.

The S9209 contains permanent and temporary data storage, a 4-bit arithmetic unit, accumulators, registers, program counter and stack, I/O data lines, and other associated circuitry.

The S9209 may be used alone or, with a small amount of external hardware, several may be connected in tandem for applications that require increased capability.

The 6K ROM in the S9209 is organized as a 756 x 8 memory and contains the system's microinstructions. The 256-bit RAM is organized as four registers, each containing 16 4-bit words, and is used for temporary storage of information in the processor.

To support the development of custom programs for the device, a comprehensive set of support software is available, resident on AMI's in-house B6700 computer. Software includes a cross-assembler, a simulator and a test program generator. A hardware simulator is also available to verify device designs under actual operating conditions prior to release of the ROM pattern to manufacturing.

Samples are available from stock and unit price in quantities of 5,000 is approximately \$9.98. The circuit is available in either 28- or 40-pin DIP packages.

## UK MICROPROCESSOR ACTIVITY

(from page 1)

There are no microprocessors commercially available from British manufacturers. However, the British computer and electronics journals recently announced some activity from Ferranti, who are reported to be working

on the design of a single-chip microprocessor called the F100L. Apart from this, Smith Industrial described their work on an advanced microprocessor (TIMOS) at a short course on microcomputers at the Polytechnic of Central London in 1974. Although not of general commercial significance, it is interesting to note that the British Post Office described their own design of a single-chip microprocessor as early as 1971 and this device, the R15, may soon enter the telecommunications field.

In the industrial sector, there are already some commercial products on the market which use microprocessors, examples being: a matrix printer from the Data Recording Instrument Co. (DRICO) which uses an Intel 4004; the UNIMAC signal processing system from Data Laboratories Ltd., using the Intel 8008; and the control system of M and T Cruickshanks automatic metal-finishing plant, also based on the 8008. The fact that these systems are based on the earliest microprocessors is a clear reminder of the time it takes to get a new device into a production application and into the market.

Although UK industrial interests are at present concentrated on in-house projects towards commercial products and development aids, there is a steady increase in the number of systems houses, consultants and software houses who are able to offer their services in the development of microprocessor systems.

The British Government's microprocessor work is split between defense and industrial applications, though little information is publicly available on the defense work. The main center of activity in industrial applications is the Warren Spring Laboratory of the Department of Industry. The Control Engineering Division of this laboratory has been investigating industrial applications of microprocessors since early in 1972 and its work is aimed at bringing the economic and technical benefits of microprocessors to industrial applications in the process and related industries. Particular emphasis is being given to distributed process control, complex sequencing and advanced instrumentation. The bio-medical group and the on-line analytical instrumentation group are using



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microprocessors in a variety of instruments. The applications group have, during the past years, developed a number of hardware and software implementation aids including cross-assemblers, simulators, floating-point arithmetic packages and electronic system monitors.

United Kingdom university work in the field is, not unexpectedly, aimed at forward research on new areas of application and new techniques in the use of these low-cost microprocessor elements. The University College of Swansea is one of the most active groups in microprocessor systems and they are studying multiple microprocessor configurations in addition to their general application work dating from early 1972.

The microprocessor is clearly making a substantial impact on UK industry, although it is only now that the extent of this is becoming apparent in commercial products. Most people see these devices as filling an important gap in the spectrum of logical devices between hardwired logic and mini-computers. The cost of most microprocessors is now below an acceptance threshold level and this has opened up a large area of applications that were uneconomic for minicomputers and over-complex for hardwired logic.

## ELECTRONIC WARFARE

(SECOND IN A THREE-PART SERIES)

By H. Dean McKay, President AH Systems

Typical applications of microprocessors in electronic warfare systems include receiver controller; signal processor; signal recognizer; antenna controller; jammer programmer and control; power management; data formatter and link controller; and display device controller. Each of these sub-system elements might contain its own microprocessor with its own application program.

The receiver controller is probably the first area in which microprocessors have really made significant inroads into the electronic warfare area. There are currently several receivers in development stages utilizing microprocessors. Functions include: local oscillator tuning, bandwidth selection and auto-ranging for optimum dynamic range.

In bandwidth selection, use of the microprocessor as the receiver controller allows

much more flexibility than normally thought of in EW systems. For example, there is no need in this type of system to sequentially tune the local oscillator. Random RF selection or frequency hopping with smart programs allow significant improvement in intercept probability. In some cases three orders of magnitude improvement in intercept probability are possible with smart receiver tuning algorithms which allow the microprocessor to dwell on frequencies of interest and skip frequencies or bands that are either not practical or not likely threat frequencies. Frequency sampling ranges with synthesizer stabilities of one part in  $10^9$  are possible today at the rate of 1 millisecond per sample frequency. Future developments in I<sup>2</sup>L should make sampling rates of one sample in 200 us feasible.

A second application is signal processing which is classically done with a dedicated processing system. With the new high speed microprocessors, however, video filtering, fast Fourier transform, PRI, PRF and other signal processing functions can be implemented in software. Special signal processors can be implemented without changing hardware; again, increasing the overall system's flexibility.

A third application is in signal recognition. Since the microprocessor has sufficient memory and computation capability, pattern recognition is a particularly useful function which can be performed in the microprocessor. Microprocessors are currently being developed for carrier recognition, noise recognition and analysis of PRFs. Another significant advantage of the microprocessor is that, because of its low cost, a number of them can be used in parallel to look at extremely complex environments and to develop high level recognition schemes with good correlation capabilities.

Still another area is the use of the microprocessor as an antenna controller. Antennas are normally today's passive elements. Yet with microprocessors, major enhancements can be made in the antenna area, particularly for beam forming, DF steering and DF calculations. A microprocessor can be used as a controller for an antenna array by switch-

(cont'd next page)



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ing and sampling the strength of the signal received and the phase characteristics. The microprocessor can also be used to calculate the most probably angle of signal arrival. Moreover, the speed of the microprocessor is well suited to antenna control. Normally it is necessary to wait for receiver settling within the signal processor before the antenna is reconfigured.

Other applications include jammer, programmer and controller functions. The microprocessor can be used to select a jammer frequency, i.e., to tune a synthesizer under program control, and modulate the jammer with complicated pulse patterns by co-ordinating the jammer and the receiver. Look-through capability is quite practical. While this is an extremely difficult task with a single minicomputer, by delegating the task to a number of microprocessors, utilizing a central controller, look-through can be accomplished fairly simply. In addition to frequency control and modulation, the jammer processor can act as a power management controller with very precise control over jammer power at specific frequencies.

Editor's Note: Part 3 of H. Dean McKay's article on microcomputers in Electronic Warfare will discuss system architectures.

## MICROCOMPUTER EDUCATION

(FIRST OF THREE PARTS)

The past ninety days has witnessed a flurry of activity as five semiconductor firms announced the opening of their microcomputer training centers. Each of the centers offer lectures, hands-on lab, demonstrations, time-sharing and course literature.

In most cases, the training staff is prepared to travel to the customer's site for in-house classes. But on the surface, it appears that the maximum use of lab time and equipment will only be at the newly established training centers. (For a complete listing of the courses offered, consult MD's Education Department.)

Texas Instruments introduced their microcomputer course in April with a week-long, national telecast and are now conducting over a dozen seminars and workshops each month in various cities throughout the nation. The

course covers computer background, chip fabrication technologies, applications, limitations, chip architectures and sessions on how to use a microprocessor.

Recently, National Semiconductor opened three microcomputer training centers (Miami, FL; Dallas, TX; and Santa Clara, CA). Four courses are offered: Microprocessor Fundamentals, Advanced Programming, IMP-16 & PACE Applications, and Microprogramming. Each course consists of lectures, demonstrations, and hands-on sessions in fully-equipped labs. Class sizes are limited to 16 students to insure that each attendee has maximum access to all equipment.

Motorola's M6800 Microprocessor Course is a hands-on course consisting of lab and classroom sessions. Attendees are directed by experts using Motorola's latest equipment and training aids. Each student receives the 710-page M6800 Microprocessor Applications Manual, the second edition of the M6800 Microprocessor Programming Manual, as well as the regular course note binder. Group discounts are given when classroom facilities, terminals and timesharing are customer-provided.

Digital Equipment Corp. is now offering microcomputer training course at their facilities in Maynard, MA. The course covers all phases of the MPS 8-bit microcomputer and is geared for engineers who are involved in relay or solid-state logic and want to learn how to use microcomputers.

The latest microcomputer training center opened last month at Fairchild Semiconductor. The course is a complete 2 or 3 day, hands-on workshop designed to give F8 users an in-depth working knowledge of hardware and software design for the F8 microprocessor and the F8M MicroModule. Regularly scheduled courses will be held at the company's training center, but other locations will be selected according to student demands.

Intel continues to conduct 4040, 8080 and PL/M workshops at their Santa Clara, CA and Boston, MA training centers. The Boston course is conducted by the Arthur D. Little microcomputer group.

Rockwell offers a free 5-day PPS-4 and PPS-8 microprocessor workshop at their Anaheim, CA training center facility.



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## WYLE OPENS TECHNOLOGY CENTERS

In an effort to support their customers in every aspect of microcomputers, the Wyle Distributing Group (Elmar and Liberty) has opened two new Technology Centers.

Eldon Tucker, director of product management for Elmar Electronics, told MICROCOMPUTER DIGEST that the centers will be equipped with the latest development systems for each of their microprocessor lines. The center will also conduct educational classes and customers will be allowed to acquaint themselves with the various machines, run benchmarks and develop software.

The two Technology Centers are located at Elmar Electronics in Mountain View, CA and at Liberty Electronics in El Segundo, CA. The Elmar center currently has the new IMP-16 development system and Tucker stated that the company would be getting a Motorola 6800 in a week and the RCA COSMAC system in about a month.

"We are fully dedicated in this support," said Tucker. "The centers are self-contained and will be staffed with a full time field applications engineer, Bill Sharenberg, and a full time resident technician."

Microprocessor courses ranging from fundamental concepts to very technical, in-depth seminars will be held on a customer request basis.

The center's hours are 8-5 weekdays, and special arrangements can be made. A firm cost schedule has not been established according to Tucker, but one and two hour stretches would be free. Extended periods would be at a minimal price.

Asked what Elmar's strategy would be if demands for the center exceed its capability, Tucker replied, "Our main objective is generating a base of service for the customers. If it becomes an overbook situation, then we'll consider adding more systems to the center."

Elmar is a distributor for the National Semiconductor, Motorola, Fairchild, RCA and Intersil microprocessors.

# # # #

## TECHNOLOGY:

### SECOND SOURCE HUNT CONTINUES

A recent Electronic News article cited National Semiconductor as negotiating with Rockwell International, Advanced Memory Systems and Monolithic Memories, Inc. for second sourcing either National's PACE or IMP-16 microprocessor.

Floyd Kvamme, vice-president and general manager of National's semiconductor division, confirmed that talks were being held. But he added that no definite agreement had been reached. Both AMS and MMI are currently second sourcing National's 18-pin 4K RAM, the MM5270.

Kvamme said that National is committed to finding a second source for the IMP-16 by year end, but that no firm agreement has yet been reached with any manufacturer.

### TI TO OFFER TWO VERSIONS OF 4-BIT $\mu$ P

Texas Instruments reports that they will offer two versions of their single-chip, 4-bit microprocessor. The chips differ in the number of latched outputs for control and display functions. The TMS 1000 has 11 latched outputs, while the TMS 1200 has 13. Both devices are microprogrammable and include a standard 43 command instruction set.

TI also announced their hardware emulator, the HE-1, which will allow real-time development of TMS-1000 software and microprograms. An SE-1 evaluation unit is also being offered for system prototyping. The 64-pin device is electrically similar to the TMS 1000, but it replaces the 8192-bit ROM with buffers to allow use of an external memory for debugging.

Available software support includes a simulator and cross assembler for both the TMS 1000 and the TMS 1200. The programs are available on timeshare systems.

Price for the 4-bit microprocessor is \$10 in 10,000 quantities, with an initial cost of \$7,500 for the first 10 units. There may be additional charges for microprogramming if required.



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## 16-BIT MIL SPEC MICROCOMPUTER

The Autometrics group of Rockwell International has developed a 16-bit microcomputer that meets full military temperature specifications.

Designated the uP-16, the system consists of a two-chip microprocessor, a control and an arithmetic device. The system uses the same memory and interface circuits as Rockwell's PPS-4 and PPS-8 microprocessors.

A spokesman for the Autometrics group said that the uP-16 will be sold only as a microcomputer card. The module consists of the microprocessor, 8,192 bits of ROM program memory and 512 16-bit words of data memory. The entire board will house 15 MOS devices.

Typical add time is 5 us and a 16-bit multiply can be executed in 95 us. The instruction set consists of 76 commands.

The microcomputer is slated for the military's Navstar Global Positioning Satellite. Orders are now being accepted for prototype units. Production quantities of the modules are scheduled for the fourth quarter this year and prices will range between \$2000 and \$2500 for 1000 and up quantities.

## MICROCOMPUTER-BASED PRODUCTS:

### μC LEAN BURN TESTER

Arthur E. Douyard, general manager of the Chrysler Huntsville Electronics Division, has announced that Chrysler will use a microprocessor in a service diagnostic tool to test the corporation's own electronic lean burn engines. Last month Chrysler announced their microprocessor controlled electronic spark advanced diagnostic equipment.

With the lean burn system, 1976 Chrysler cars with 400 and 440 cubic inch V-8 engines will be able to meet current emission standards without catalysts, provide greater fuel economy than comparable 1976 models, and operate with unleaded or leaded fuel.

The lean burn tester simulates the actual EPA-approved emissions test cycle for each engine, including highway and stop-and-go city driving. Through the driving simulation, the microprocessor induces the lean

burn system into operating as though the engine were running.

To test a typical lean burn engine, a dealer mechanic first disconnects three engine plugs that lead to the lean burn system. He then hooks up the diagnostic tester to the lean burn system and turns on the ignition switch to get electrical power from the car's battery.

Each test cycle takes about five minutes and involves four checkout sequences. At the end of the test, the mechanic uses the diagnostic unit to reset engine timing.

### DEC TO EXTEND LINE WITH PDP 11/03

Digital Equipment Corp. has packaged their four-chip LSI-11 microcomputer into a box unit designated the PDP 11/03.

The system contains a control chip, data chip, two microcoded ROMs, serial interface, power supply, rack-mountable enclosure, and front control panel. Options for the microcomputer include extended arithmetic chip, serial line interface module, parallel line interface module, and four expansion memory modules.

The system is available in either a 4K semiconductor RAM version for \$2,495 or in a 4K core configuration for \$2,925. DEC reports that orders are now being taken for deliveries in September.

Sources within DEC have confirmed reports that the company is actively pursuing second source agreements for the 4-chip system now manufactured by Western Digital. No one would identify the companies contacted, but they did indicate that DEC would be receiving chips from one or more companies before the end of the year.

### μC REPEATING STATION DRAWS 5 W

A new military system for retransmitting digital radio messages uses a National IMP-16 microprocessor with a derated clock rate to achieve a 60% power reduction. Developed by Collins Radio Corp., the battery-operated repeating stations, including receiver interface, IMP-16 processor, 2K of RAM, 2K of ROM and TTY interface, function on less than 5 watts.



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Basically, a repeating station is a remote unit that receives messages and retransmits them to another receiver beyond the range of the original transmitter. In military applications, low power consumption is a prime consideration.

Complicating the network system is the fact that several repeaters might intercept the message--some possibly in the opposite direction from the receiver to the ultimate destination. For this reason, each message carries a header which identified its destination and thereby identifies which repeater should retransmit it. Further, the initiating transmitter listens for the retransmission to acknowledge that the message had been received and properly processed to the next station.

In the Collins unit, software routines identify the message and routing, and perform other operations according to flags in the header. According to Larry Padgett, a design engineer with Collins, the problem boiled down to finding a way to handle this relatively complex processing without the power burden of a minicomputer or a cumbersome hardwired logic system.

According to Padgett, "The only solution was a microprocessor approaching minicomputer capabilities but at a fraction of the cost and power consumption."

"We made a survey of available microprocessors and ran through a few design exercises with the more promising machines," Padgett continued. "Finally, we narrowed it down to the National IMP-16 because of its 16-bit word length and its advanced software capabilities."

The big 16-bit word length of the IMP-16 reduces the number of steps required for processing operations; therefore, Collins could afford to reduce the standard 175 ns clock rate of processor to 500 ns. This was accomplished by using a lower frequency crystal. In slowing the clock rate, Collins effectively reduced the power requirements.

Under software control, overall power requirements are further reduced by turning off the microprocessor's CPU during inoperative periods. The system is programmed to turn the processor off after a specific time interval. A second time interval checks the

system to insure that the CPU is not being turned off in the middle of an operation and to set a memory address to receive the next block of transmissions. New incoming transmission triggers the program to turn the CPU back on.

Padgett pointed out that the overall power demand of the system is in the magnitude of 5 watts. This compares to between 15 and 20 watts pulled by a standard IMP-16. "When you consider the CPU accounts for about 3 to 3.5 watts of this power, you immediately appreciate the value of turning it off when it is not needed," he added.

## COMPUTER GRAPHIC OUTPUT PLOTTER

The ability to handle 22" x 34" drawings with plotting speeds up to 800 increments per second are two of the features offered by Glaser Data Co.'s new DP-1600 Computer Graphic Output Plotter. The device attains an accuracy of .004".

A built-in microprocessor controls and simplifies all drawings. The slope generator requires that only the two end points of the line be specified. An internal 55 character symbol generator is also incorporated so that software and data transmission needs are further reduced. Elaborate precision drawings can be made with minimum memory requirements.

Typical applications include mapping, drawing, plotting, diagramming, modelling and other graphics for construction, engineering business or scientific purposes. The DP-1600 is Glaser's second microcomputer-based plotter. (MD Dec. 1974).

Price of the DP-1600 is \$14,000, FOB Palo Alto, CA. Delivery is 60 to 90 days ARO.

## RESTAURANT & BAR $\mu$ C POS TERMINAL

Three new microcomputer documentor systems designed for restaurant food, cash control and bar systems have been announced by Addressograph Multigraph Corp.

The Documentor System 3213 is a keyboard-operated, microcomputer based, counter-top, management control system featuring a standard software package that can be adapted to  
(cont'd next page)



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practically any restaurant application.

The 3213 automatically calculates and records cash received, taxes, discounts, special sales promotion coupons and a myriad of essential management record details such as cost of goods sold, profits, percentages, inventory levels and more.

The system consists of a master unit and up to four optional remote slaves. The master unit contains the microcomputer CPU module, memory and built in power supply. The units are lightweight and compact, occupying very little counter space. Each keyboard has 88 item keys, 10 numeric keys and 14 control keys.

The other two Documentor Systems, 3214 and 3215 are also keyboard actuated and have many similar features. The 3215 system is designed to operate with automatic bar dispensers, while the 3214 is operated as a stand-alone unit.

Both systems are designed for multi-purpose accounting functions such as itemized customer receipt; information calculation and storage; itemized management reports; transaction display; and cash drawer control.

Prices and deliveries depend on customer requirements. For further information contact the Data Systems Division of Addressograph Multigraph Corp.

## 5065 DEVELOPMENT SYSTEM ANNOUNCED

Mostek Corp. will unveil their GEMS-8 microcomputer sometime next month. The 8-bit system was originally designed to aid engineers in developing 5065 software and hardware products. But the company now says that the system's processor board can be built right into the customer's product as is.

The development system contains the microprocessor board, crystal oscillator, clock generator, logic, sockets for PROMs, 1K x 8 memory, TTY interface and 12K of 4K RAM memories.

Mostek will also use the GEMS-8 in two hardware development systems to be announced later this year. These systems will allow users to program Mostek's line of calculator chips.

## INSTRUMENTS To Use LSI-11

Digital Equipment Corp. has made their first delivery of their prototype LSI-11 microcomputer to General Radio for use in a new line of test equipment.

William Thurston, General Radio president, said his company plans to introduce their first microcomputer-based product early in 1976. He cited DEC's generous software support as a major reason for their decision to use the LSI-11. The test equipment product, Model 2230, will use the LSI-11 for resistance, capacitance, inductance and dc voltage measurements.

General Radio had reportedly been conducting tests using National Semiconductor's IMP-16A microprocessors for the measurement instruments. GR is also considering Motorola's M6800 microprocessor for its sound level meters.

## $\mu$ P INCREASES GAS MILEAGE 40%

The latest word from RCA's chairman, Robert Sarnoff, is that microprocessors installed in medium and large cars could produce an annual savings of more than 500 million gallons of gas in the U.S. alone. This equals about 27 million barrels of crude oil or one month's proposed oil import cutback presently sought by the U.S. government.

Sarnoff said, "Working with the automotive industry, as we are, the electronics industry should be able to mass produce these microprocessors by the million at a cost of no more than \$100 a unit." He explained that a microprocessor "installed in a car with the appropriate link-ups will automatically adjust both choke and throttle for maximum starting efficiency. It will run the motor at the right fuel mixture for highest fuel savings, and automatically shift gears at precisely the right time for optimum fuel efficiency."

# # # #

Check to make sure your renewal to MICROCOMPUTER DIGEST has been sent. Not sure? Call us.



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## 8080 EMULATION INSTRUMENT

A new 8080 emulation instrument announced by Santek Systems will allow microcomputer designers to develop and analyze hardware and software for any 8080 based microprocessor system.

With this instrument, the Econ 80, the user will be able to display and alter register contents from an operator console as well as control the system's operating mode.

Prototype boards are available for interfacing the unit with any system; multiple power supply options are also being offered. Santek reports they are willing to provide custom interfacing and software for the 8080 systems.

The Econ 80 is priced at \$4000 or can be leased on a month-to-month basis for \$400. A one year lease agreement is available at \$300.

## MMI-300 GP MICROCOMPUTER

The Monolithic Memories 300 is a general purpose microcomputer system which has a 16-bit word length and provides 16 accumulators. The system is supplied with interrupt, DMA, and power restart logic. The MMI 300 is microprogrammed and operates at 300 ns. The microprogrammed instruction set has an emulation of the NOVA minicomputers manufactured by Data General Corp. The 300 can operate in direct, indirect indexed, base page, and relative addressing modes. It can directly address 32K words of memory, and it executes NOVA instructions in .9 to 2.4 us.

The system is designed for applications in both military and industrial environments. It can be used as a stand-alone development system or as a CPU subsystem. Software support includes loader, exerciser and debug packages.

All of the Nova's programs can be used to develop user end-products on the MMI 300. Donald Winstead, manager of new business at MMI, said the software support packages are available from Data General, Tymshare and UCS.

The heart of the MMI 300 is a set of four MMI 5701 microcontrollers. In addition to

the ALU, the 5701 has 16 multiport registers, an extension register, full shift register capability, appropriate multiplexer functions to allow operation on four variables, a carry output, an overflow flag, a zero detect flag, a non-zero detect flag, carry generate and propagate functions, and a control ROM containing the basic instructions for the chip.

The system operates on a single 5 V supply and the device is guaranteed to function over the military temperature range with a minimum clock cycle time of 250 ns. The industrial temperature range limit is 200 ns.

The MMI 300 microprogram uses less than 8 of 16 registers available in the four 5701 microcontrollers. An expanded instruction set can be implemented in the MMI 300 CPU as a customer option.

The CPU is housed on a single printed circuit card that controls all peripheral equipment and program sequences. The card also performs all data handling, logic and arithmetic functions and provides 23 I/O TTL-compatible signals allowing simplified DMA, interrupt and I/O interfacing capability. Power consumption is 3.5 A at 5 V.

Three memory options are: (1) a 3K x 16 RAM memory card with MOS semiconductor storage elements having 150 ns access time; (2) an 8K x 16 ROM card with socket-mounted, electrically programmable bipolar ROM storage elements; and (3) a 4K x 16 read/write memory card with MOS semiconductor storage elements having a 450 ns access time. A front panel that provides Start, Stop, Reset, Continue, Deposit, Deposit Next, Examine, Examine Next, Instruction Step, Micro Step, ACC Examine, and ACC Deposit functions is also available with the system. Power consumption is 3.5 A for the CPU card; 700 mA for the 8K x 16 ROM card; and 800 mA for the 150 ns and 450 ns RAM cards. Thus a three-card system consisting of CPU, RAM and ROM will consume less than 25 W.

## MICROPAC 80 PRICE REDUCED

PCS has reduced the base price of their MicroPac 80 from \$2,995 to \$2,650. PCS reports the lower prices reflect reduced semiconductor costs and increased shipments.



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## XEROX 800 PURCHASE AVAILABLE

Xerox Corp. has announced that their new microcomputer-based 800 electronic typing systems can now be purchased as well as leased.

Purchase prices are \$9,800 for the single-card unit and \$11,100 for the single-tape model. Dual-card units will be sold for \$11,400 and dual-tape models for \$11,780.

The 800 had been available only on a rental basis since October 1974 (MD Dec. 1974) at prices ranging from \$195 to \$310 a month. Rental customers who wish to convert to direct sale will receive a credit of 70% of the first six months rental costs and 35% of the following six months rental toward the sale price.

## MEMORIES AND PERIPHERALS:

### NATIONAL ANNOUNCES 1702A REPLACEMENT

A direct pin-for-pin replacement for the Intel 1702A programmable-and-erasable 2048-bit PROM is now available from National Semiconductor Corp., according to Bruce Moore, product marketing manager.

The device, known as the MM1702A, is organized into 256 8-bit words and is a static, fully decoded, non-volatile memory. The MM1702A is manufactured by a P-channel silicon-gate process that employs floating-gate avalanche MOS technology. National's process makes the PROM erasable as well as compatible with bipolar logic devices. The PROM can be completely programmed within two minutes.

Price per unit is \$27 when ordered in 100 lots. Large quantities are now available from stock and franchised distributors.

### μC DATA ACQUISITION MODULE

Data Translation has announced their first microcomputer data acquisition module, the Datab II. The module is intended for use with the latest, low-cost microcomputers.

With the Datab II, microcomputer users will be able to translate 12-bit analog measurements directly with the module's 8-bit bus-oriented structure. The translation of the data and address is done in a two byte se-

quence. The first byte consists of 8 bits of the 12-bit data word and the second byte consists of a 4-bit address and the remaining 4 bits of data.

Features of the Datab II include 20% less power consumption, pin-to-pin compatibility with the Datab I, full 12-bit resolution, 16-channel multiplexer, signal conditioning amplifier, high speed sample/hold amplifier, 12-bit A/D converter, and all control and programming logic.

Price begins at \$475 for the 25 KHz model and \$575 for the 50 KHz model. Delivery is 4 weeks ARO.

Data Translation is also offering their DT1721 data acquisition system designed specifically for the National Semiconductor IMP microprocessor series. The low-cost analog system features a 12-bit A/D converter, a sample-and-hold amplifier, up to 64 channels of analog multiplexing, and an isolated power supply.

The system is housed on an 8.5" x 11" IMP compatible board. The DT1721 is priced at \$725 in unit quantities and delivery is from stock to two weeks.

### TWO PRODUCTS ADDED TO MICROPAC LINE

PCS, Inc. has introduced two new components which expand the capabilities of its MicroPac microcomputers. One component is a real time clock and power fail interrupt module; the other is a battery pack.

The battery pack provides backup power to support the RAM memory present on the MicroPac RAM memory module, and will support up to five memory modules.

The real time clock and power fail interrupt module detects power failure at least 500 us before operation halts due to low power and notifies the CPU so that a systematic shutdown program can be executed.

### PERTEC INTRODUCES 2 DISC DRIVES

Pertec Corp. has announced the availability of two new moving-head, non-removable media disc drives for microcomputer-based systems. The drives can store 6M and 12M bytes.

To aid with data control and transfer  
(cont'd next page)



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between as many as four disc drives, Pertec also offers an optional disc formatter.

Price for the 6M byte D1400 drive with power supply in 100 quantities is \$1,925 each; the 12M byte D1600 is \$2,100.

## SOFTWARE SUPPORT INCREASED

Microtec has added to its line of microprocessor support products, a set of macro-assemblers for the Intel 4004, 4040 and 8080 microprocessors. These programs are written in Fortran IV and will operate on any computer system that has a word length greater than or equal to 16 bits and 16K words of main memory. Most programs that were developed using Intel's assemblers can be assembled with the Microtec macro-assemblers without modification.

Symbolic addressing, relative addressing, constant generation and other features are provided by the assembler.

The programs are priced at \$800 and will be delivered on computer readable media along with a manual, a source listing, and a test program and its output listing.

## HIGH-SPEED 16K N-CHANNEL ROM

Nitron has introduced a custom, preprogrammed high-speed 16K N-channel ROM, the MCM6590, which uses a single mask to provide memory organization with a programmable chip select option.

The ROM is primarily designed for use with microprocessors. It can be preprogrammed with six character conversion codes: ASCII, Selectric, EBCDIC and a modified 8-bit Hollerith, Selectric to ASCII, EBCDIC to ASCII and a modified Hollerith to ASCII, as well as 128 USASCII characters using mixed character fonts of 5 x 7 and 7 x 7 dot matrices with extra check bits.

Typical access time is 450 ns, with a maximum of 800 ns. Pricing in 100 quantity is \$23.95.

## 3780 GAINS FORTRAN COMPILER

The Isyx 3780, a small Intel 8080 microcomputer-based business computer system, is now available with a Fortran compiler that

accepts a subset of Fortran IV. The compiler functions under the floppy disc-based operating system directly on the 3780. The compiler sells for \$450.

## MM2102 ENTERS VOLUME PRODUCTION

National Semiconductor went into volume production this month on the industry-standard MM2101 family of 1K static MOS RAMs.

The MM2101 is organized as a 256 x 4 device and employs normally-off N-channel transistors in its fully static circuitry. The RAM requires only a single 5 V supply and no clocks or refresh circuitry. Typical access time is 500 ns.

Large quantities are immediately available from stock and from distributors. Price per unit in plastic DIPs is \$4.00 in 100-lots.

## INTEL CUTS 2102 PRICES

Intel has reduced prices on their 2102-type 1K RAMs from \$6 to \$4 in OEM quantities of 100 to 999. Intel would not comment on 2102 prices for larger OEM volume breaks, but several sources have pegged the figure in the \$2 to \$2.50 range.

The price has also been reduced on Intel's newly introduced 256 x 4 static RAM to \$4 in the 100 to 999 OEM quantity. The lower prices were seen as a new strategy by Intel to bring prices of the 256 x 4 RAM more in line with the 1K static RAM.

## PEOPLE, LITERATURE AND EVENTS:

### A/S MYCRON NOW OFFERING MYCRO-1

A new Norwegian Company has been formed to develop, manufacture and sell microcomputer modules and assemblies. The company, A/S Mycron, is owned by Simrad, a Norwegian electronics firm that recently acquired most of Data Industri's assets and personnel.

Mycron will manufacture and market its version of a microcomputer card that contains the Intel 8080, 2K EROM, 1K PROM, 1 UART, 8 interrupt input lines and buffered bus connections for a 16-bit address bus with an 8-bit bidirectional data and I/O bus. This

(cont'd next page)



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single card on a double size European standard board, 16 x 23 cm, also has space for one 2K ROM circuit. Additional modules including a floppy disc controller and a PROM resident BASIC interpreter are also available.

Price of the main microcomputer module, MYCRO-1, is \$1,200 in single unit quantities.

## ADL FIRST $\mu$ P CONFERENCE TEXT

Arthur D. Little, the research and consulting firm, has published a report, Microprocessors: Economics/Technology/Applications, based on their First National Microprocessor Conference. The conference was held in conjunction with the New York Management Center in December, 1974.

The 200-page report includes the reprints of papers on subjects such as case studies of microprocessor applications in computers, calculators and numerically-controlled machine tools. Other material includes the impact of microprocessors on users; the criteria for using microcomputers; how microprocessors can reduce manufacturing costs; new personnel skill required for the effective application of microprocessors; comparisons between systems and the significant differences; economic trade-offs and methods to be used in software developments; and selection criteria for various classes of applications.

The report is priced at \$145; discounts are available for multiple orders.

## HOME BREW CLUB GAINS $\mu$ C EXPERTISE

Amateur and professional microcomputer buffs in the San Francisco Bay Area are invited to join the PCC Homebrew Computer Club. The club was formed to bring computer enthusiasts together to exchange information, ideas, equipment and parts, and to assist each other in microcomputer projects.

The club has an Altair 8800, and a number of members are building their own microcomputer system. The recent \$500 microcomputer kit offered by Mits, Inc. has attracted a great number of hobbyists to form clubs such as the Homebrew Computer Club.

Editor's Note: To help us keep informed, have your  $\mu$ C club officer contact us.

## PCS INTROS $\mu$ C WORKSHOP

PCS has scheduled a series of seven monthly MicroPac 80 workshops during 1975. Each five day workshop provides attendees with hands-on experience necessary to handle and design products and systems with the PCS MicroPac 80 microcomputer. (For a full listing of courses, refer to MD's Education Department.)

## NEW STUDIES TRACE $\mu$ C & SEMIS

Two new microcomputer marketing studies have recently been completed. One, compiled by Darling and Alsobrook, a management consulting firm, is a four-volume, 1600-page report that covers just about every aspect of the semiconductor industry. The report concludes that the microprocessor's main application area in the next few years will be intelligent peripherals and dedicated processors. However, the study notes that the data processing peripheral market could easily become the largest user of micros within the next few years. No title or price was given for this study.

The other study, by International Data Corp., is a sponsor/participation service that analyzes the potential microcomputer market to 1980. The study discusses the impact of microprocessors in the minicomputer area, total market in dollars and units for micros and the survival of semiconductor manufacturers for the next five years. The price to sponsor/participants for the study is \$3,500.

## MICROPROCESSOR DESIGN COURSE

A comprehensive five-day microprocessor design course presented by A H Systems provides design considerations and techniques for the use of microprocessors in systems. An independent unbiased survey will be presented on all available microprocessors, their configurations, costs, advantages and disadvantages. The survey will include comparisons aimed at answering "Which microprocessor is the most cost effective for my specific application?".



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A H Systems will present this seminar or specific microprocessor in-depth seminar at your customer's facility, subject to advance reservations and the availability of their seminar staff.

## RECENT LITERATURE

"The Microprocessor Handbook"  
Staff, Texas Instruments  
April 1975

This illustrated handbook is an excellent source for the newcomer to the microprocessor field. The book was originally published for use with TI's nationwide telecast on microprocessors. The book includes lecture material and pictures of slides as well as additional material concerning the architecture, selection and use of microprocessors. The center of the book features an excellent chart outlining microprocessor design stages.

Digital computer history and architecture are traced from the early 1950's highlighting potential microprocessor applications. This section coupled with the chapter on basic chip fabrication technologies illustrate how microprocessors have evolved to today's design. Basic computer architectures and system configurations are compared to potential applications and heavy emphasis is placed on the use of microprocessors in communications.

Chip architectures discussed include TI's TMS1000 and SBP 0400, Intel's 8008 and 8080, National Semiconductor's IMP-16, Rockwell's PPS-4 and PPS-25, and Motorola's 6800.

"Programmable Controllers: The Tractors of the Computer Industry, Part 1 & 2"  
Kirtland Olson  
Digital Design May & June 1975

Programmable controllers used in process control have been given greater impetus recently with the advent of microprocessors. This two part article examines the microprocessor's ability to bring intelligence almost to the sensor itself, offering automated industry increased capability and flexibility at a low and often reduced cost.

Olson examines the use of controllers in replacing drum controllers, mechanical timers and relays. The author sees programmable controllers offering a new and highly desired

feature for industrial automation--distributed intelligence. He outlines the advantages of distributed networks and illustrates how control operations can be speeded, complex operations performed while at the same time remaining flexible for system changes with minimum down time.

Software, higher level languages and design tradeoffs are discussed. But most attention is spent in defining the particular application areas where programmable controllers will soon (3-5 years) become industry's workhorse.

"A Look at Trends in Microprocessor/Microcomputer Software Systems"  
Dr. Ralph Martinez, Naval Electronics Lab  
Computer Design June 1975

An excellent and realistic appraisal of current microcomputer software development methodology highlighted by a description of NELC's unique interactive minicomputer-based microcomputer development system. Dr. Martinez briefly, but clearly, summarizes today's development methods and at the same time defines the terms common to this sector.

Advantages and disadvantages of each method are discussed and several recommendations for improving the effectiveness of software development tools are directed to the microcomputer manufacturers. Several interesting related topics are also discussed such as modifying existing cross assemblers to run on 16-bit machines.

NELC's system provides an interactive software development environment with the microcomputer system connected directly to a minicomputer I/O bus. The configuration offers not only software but hardware development aids as well. For example, the minicomputer can collect, process and store both analog and digital microcomputer data during real-time tests.

In short--highly recommended reading.

## CORRECTION

Last month MICROCOMPUTER DIGEST mistakenly reported that Computer Automation had reduced prices on their LSI-11 microcomputers. The article should have said that Computer Automation had reduced prices on their LSI-2 microcomputers. DEC manufactures the LSI-11.



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**EDUCATION:**

MICROCOMPUTER COURSES, SEMINARS, CONFERENCES. Date, title, cost, location, sponsoring organization (addresses on page 17).

August

- 1 PROM Programming--A Systems Approach Free San Jose, CA Data I/O Corp.
- 4- 7 IMP-16 PACE Applications \$395 Santa Clara, CA National Semiconductor
- 4- 8 Advanced Computer Memory Technology \$345 Los Angeles, CA University of Southern California
- 4- 8 Computer Architecture and Organization \$345 Los Angeles, CA University of Southern California
- 4- 8 Microcomputer Systems Design II: Applications, Programming & Implementation--Through Actual Experience \$375 Los Angeles, CA University of Southern California
- 5- 7 Microcomputers in Instrumentation Systems \$200 Baton Rouge, LA Louisiana State University
- 5- 7 M6800 Microprocessor Course \$430 Rochester, NY Motorola, Inc.
- 5- 8 ICS International Microcomputer Educational Congress \$175-\$425 Philadelphia, PA Integrated Computer Systems
- 11-13 MCS-8080 Microcomputer Workshop \$350 Santa Clara, CA and Boston, MA Intel
- 11-13 Microprogramming: Concepts, Trends and Applications \$320 Washington, D.C. George Washington University
- 11-14 Advanced Programming \$395 Santa Clara, CA National Semiconductor
- 11-14 Microprocessor Fundamentals \$395 Santa Clara, CA National Semiconductor
- 11-15 Applications of Microprocessors and Digital Techniques to the Design of Control and Information Processing Systems \$345 Los Angeles, CA University of Southern California

- 11-15 MicroPac 80 Workshp \$400 Flint, MI PCS, Inc.
- 11-15 Microprocessors--Hardware, Software Applications \$445 Newport Beach, CA Opto-Logic Corp.
- 12-14 M6800 Microprocessor Course \$430 Tulsa, OK Motorola, Inc.
- 14-16 PL/M Microcomputer Workshop \$350 Santa Clara, CA and Boston, MA Intel
- 18-20 MCS4/4040 Microcomputer Workshop \$350 Santa Clara, CA and Boston, MA Intel
- 18-21 IMP-16 PACE Applications \$395 Miami, FL National Semiconductor
- 18-22 Microcomputer Series Training Course \$375 Maynard, MA Digital Equipment Corp.
- 19-21 M6800 Microprocessor Course \$430 Washington/Baltimore Area Motorola
- 25-28 Advanced Programming \$395 Miami, FL National Semiconductor
- 26-28 M6800 Microprocessor Course \$375 Phoenix, AZ Motorola, Inc.
- 26-28 2nd USA-Japan Computer Conference Tokyo, Japan AFIPS

September

- 8- 9 MCS-8080 Microcomputer Workshop \$350 Santa Clara, CA and Boston, MA Intel
- 8-12 MicroPac 80 Workshop \$400 Flint, MI PCS, Inc.
- 9-11 COMPCON Fall Washington, D.C. Contact: M. Smith, T. J. Watson Research Center
- 9-11 M6800 Microprocessor Course \$430 Wichita, KS Motorola, Inc.
- 11-13 PL/M Microcomputer Workshop \$350 Santa Clara, CA and Boston, MA Intel
- 12 How To Profit From Microprocessors \$35 Palo Alto, CA Pro-Log Corp.
- 12-16 Engineering In The Ocean Environment International Conference Washington, D.C. IEEE



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September

- 15-17 MCS4/4040 Microcomputer Workshop \$350  
Santa Clara, CA and Boston, MA Intel
- 16-18 M6800 Microprocessor Course \$430  
Dayton, OH Motorola, Inc.
- 16-19 Western Electronic Show & Convention  
San Francisco, CA WESCON
- 23-26 ICS International Microcomputer Educa-  
tional Congress \$175-\$425 Paris,  
France Integrated Computer Systems

October

- 1 PROM Programming--A Systems Approach  
Free San Jose, CA Data I/O Corp.
- 5- 8 Electronic & Aerospace Systems Conven-  
tion Washington, D.C. EASCON
- 6-10 MicroPac 80 Workshop \$400 Flint, MI  
PCS, Inc.

SPONSORING ORGANIZATIONS AND CONTACTS

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

Data I/O Corp., 1376 N. 4th St., San Jose,  
95112 (408) 287-8755

Digital Equipment Corp., Educational Services  
Group, Maynard, MA 01754 (617) 897-5111

EASCON, 1629 K St., N.W., Suite 700, Wash-  
ington, D.C. 20006

George Washington University, Continuing  
Engineering Education, Washington, D.C.  
20052 (202) 676-6106

IEEE, 345 E. 47th St., New York, NY 10017  
(212) 752-6800

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

Louisiana State University, Baton Rouge, LA  
70800 (504) 388-5241

Microcomputer Associates Inc., 10440 N. Tan-  
tau Ave., Cupertino, CA 95014 (408) 247-8940

Motorola M6800 Course, Ron Bishop, BB102,  
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962-2345

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FINANCIAL:**ZENTEC SIGNS \$1 MILLION AGREEMENT**

Zentec Corp. has announced that they have signed a two year agreement with Deltaconsult of Frankfurt, Germany.

According to the agreement, during 1975 Deltaconsult will take over 150 of Zentec's 9000 Series programmable terminals for use with Deltaconsult's graphic arts minicomputer system. Dennis Daniels, vice-president of marketing for Zentec, stated that the total value of the contract is in excess of \$1 million.

**PHILIPS COMPLETES SIGNETICS PURCHASE**

U.S. Philips Corp. has completed their purchase of Signetics after a vote of approval by shareholders and the Justice Department. (MD, April 1975) The \$43.8 million transaction was effective June 10.

According to the original proposal, each common share was converted into \$8 cash from  
(cont'd next page)



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Signetics, and Sign Development Corp., a wholly-owned subsidiary of U.S. Philips Corp., was merged into Signetics Corp. U.S. Philips Corp., now the sole shareholder of Signetics, is a subsidiary of U.S. Philips Trust, the beneficiaries of which are shareholders of N.V. Philips, The Netherlands.

Signetics was previously 80% owned by Corning Glass Works.

## PRELIMINARY MERGER TALKS

Preliminary discussions are being held concerning the acquisition of Rockwell International Corp. by Gulf Oil Corp. Company officials declined to elaborate on the talks other than to say that the discussions were at a "very preliminary stage."

Gulf Oil reported 1974 revenues of \$18.2 billion, while Rockwell posted 1974 sales at \$4.4 billion.

In the joint announcement, the companies reported that the discussions were being conducted along several possible avenues, including Gulf's acquisition of Rockwell's assets, the purchase of Rockwell's securities, or possible joint ventures in high-technological areas.

## 1980 FOREIGN $\mu$ C MARKET TO EXCEED U.S.

The foreign microprocessor market will exceed the total U.S. market by 1980. This analysis was made by Dr. Harry Sello, technical director for Fairchild Camera & Instruments International division, before 80 attendees of the 1975 International Symposium on Military and Industrial Microprocessor Systems.

Dr. Sello apportioned his \$860 million figure for 1980 into: \$200 million for Western Europe, \$200 million for Japan, \$100 million for other non-communist countries, and \$360 million for the U.S.

He also predicted that European and Japanese manufacturers would close the technology gap with the U.S. before 1980.

The symposium was hosted by A H Systems in San Diego, CA, June 3-6.

###

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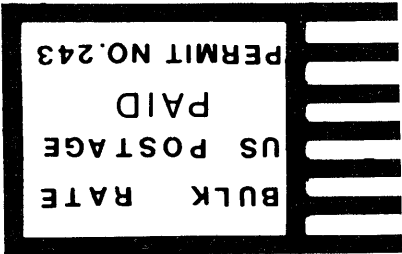
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