

MICROCOMPUTER DIGEST

Volume 2, Number 4

October, 1975

CDP1800 μ P COMMERCIALY AVAILABLE

RCA Solid State Division has announced commercial availability of the CDP1800 microprocessor family, including the CDP1801 CMOS 8-bit microprocessor, the Microkit hardware support kit, microprocessor manuals, and software development packages, according to Bernard V. Vonderschmitt, vice president and general manager. "The CDP1800 family includes the previously described, but not commercially available COSMAC microprocessor, now designated as the CDP1801," Mr. Vonderschmitt said.

(cont'd on page 2)

IBM ENTERS MICROCOMPUTER MARKET

IBM has pounced on the juicy microcomputer market with the introduction of their Model 5100 portable desk-top computer. The computer includes the CPU, video display, keyboard and cartridge tape unit and a toggle switch that allows the machine to be programmed in either BASIC or APL.

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INSIDE THIS ISSUE

ADVANCED MICRO DEVICES' long awaited 8080 second source device is now available. Story on page 7.

DIGITAL EQUIPMENT CORP. introduces newest floppy disc microcomputer system. Story on page 7.

MOSTEK offering their second-sourced F-8 micro in a \$297 kit. Story on page 8.

COURSES—Upcoming microcomputer courses for November, December and January on page 19.

GNOSTIC CONCEPTS new multiclient study forecasts 11.3% growth for 1976. Story on page 20.

EUROPEAN MICROCOMPUTER USAGE seen to explode 60-fold by 1984. Story on page 21.

ROCKWELL & NATIONAL μ P 2ND SOURCE PACT

Rockwell International and National Semiconductor have signed a comprehensive agreement making each an alternate competitive source for the other's microprocessors. The move bolsters the product line of each while enlarging the total sales potential of their combined products in the microprocessor marketplace, which is expected to be as much as a half-billion dollar annual market by 1980, according to the companies.

(cont'd on page 3)

LSI-11 CHIPS OPEN TO THE PUBLIC

Western Digital has announced that the three chip microprocessor used in Digital Equipment's LSI-11 microcomputer system will now be available to all customers. The MCS 600 microprocessor will be priced at \$250 in 100 quantities. The set consists of a control chip for logic decoding, a data register chip, and a control ROM of 512 x 22 for the microinstructions. The LSI-11 microcoded instruction set will not be included. Instead, Western Digital will offer each customer three options.

(cont'd on page 4)

MICROCOMPUTER DEVELOPMENT SERIES

By Hal Elgie, Stanford University

Ease of application is the precept of Intersil Corp.'s recently introduced 6900 series of microcomputer development aids. Based on their new IM6100 CMOS microprocessor, the 6900 series features software and hardware compatibility with the popular PDP 8/E mini-computer.

Presently, the 6900 series consists of three PC cards, 4K x 12 CMOS RAM, CPU/TTY and a control panel. Four more cards are slated for introduction in the fourth quarter of this year.

(cont'd on page 4)



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SPECIAL FEATURES:

CDP1800 μ P COMMERCIALY AVAILABLE

(from page 1)

The CDP1801 architecture permits simple, fast, mostly one byte instructions, all executed in a single instruction cycle. The sixteen, 16-bit registers on-chip can be used as program counters, data pointers or for data storage. One register serves as a built-in data pointer for DMA, an unusual feature among available microprocessors.

The traditional CMOS low-power requirement of this microprocessor (60 mW typically at



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2MHz) permits use of a single unregulated power supply of 3 to 15 volts. Supply voltage tolerance of CMOS permits use in battery-powered systems, making the CDP1801 particularly appropriate to automotive and portable equipment applications. CMOS noise immunity, or tolerance to ambient electrical interference, typically amounts to 45% of supply voltage. The CDP1801 is able to operate over the full temperature range of -55° to +125°C.

The Microkit is a hardware support kit containing the CPU, 1K RAM, 512 words ROM, space for additional memory and user-designed interface cards, I/O decoders, and I/O interface for a TTY or other terminal, and power supply. The kit is thus a complete prototyping system. A Microkit with a resident editor, assembler and debug board option with a user-supplied terminal provides a complete, independent system for producing debugged programs.

More powerful software development aids are available that offer assembly, editing, simulation and debugging. This program is available either on the General Electric time-sharing network or as a FORTRAN IV tape for installation on an interactive computer.

A microprocessor manual, describing the CDP1801's architecture, instruction set, I/O interfacing, and programming techniques is available as well as manuals on the various software design aids.

The CDP1800 family is now available from stock, with the CDP1801 full-voltage (15V) chips available at \$56 and the CDP1801C 5V chips at \$40 in single quantities.

IBM ENTERS MICROCOMPUTER MARKET

(from page 1)

The memory is expandable from 16K to 64K in 16K increments. The purchase price ranges from \$9,000 to \$20,000 depending on memory and options.

The CPU card consists of a single chip MOS microprocessor whose architecture is similar to the company's system 360 mainframe. The unit is a stored program processor and implementation of APL and BASIC is made in a single 48K ROM chip.

A 3M-type cartridge in the tape unit can store up to 204K characters of data and permit exchange of data and programs between

other 5100 Portable Computers using the same programming language. A standard feature provided on the 5100 permits users to attach external TV monitors for displaying information to groups in large offices, conference rooms and business work areas.

Hard copy output is provided from the IBM 5103 optional printer at 80 cps in a 132-print position matrix. The printer handles single sheets, multiple copies or continuous single or multipart paper. The 5100 CRT features a 16 x 64 display which includes all the special characters used in both APL and BASIC.

ROCKWELL & NATIONAL μ P 2ND SOURCE PACT

(from page 1)

Charles V. Kovac, vice president and general manager of Rockwell's Microelectronic Device division, and E. Floyd Kvamme, National's vice president and general manager of the Semiconductor division, jointly announced the agreement in New York on Sept. 3, 1975.

The agreement covers all current microprocessor products of each firm; provides options on second-sourcing modifications, and establishes machinery for periodically reviewing new microprocessor developments toward possible additional agreements.

Termed a "supported, alternate source" agreement, the pact is believed to be one of the most comprehensive consummated to date in the microprocessor field.

In addition to establishing competitive second sources for their microprocessors, the agreement provides each company with the broadest microprocessor line in the industry, ranging from 4-bit, low cost systems to high performance 16-bit systems.

Rockwell is in volume production with its PPS-4 microprocessor and is beginning volume manufacturing of its PPS-8 system.

Additionally, Rockwell has developed a modification of its 4-bit system, designated PPS-4/2, which the company describes as a "very low cost" design for electronic retail systems and process controllers.

National was the first to offer a single chip 16-bit microprocessor, the PACE. The firm also has a bit-slice microprocessor, the IMP family, available in 8- and 16-bit configurations. National is also developing

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their GP/CP, CMP-8 and SCAMP, all 8-bit microprocessors aimed at specific market segments.

Each firm will provide the other with complete applications support for their lines, including extensive software documentation and training programs.

Both firms also produce an extensive number of associated I/O circuits and memories and these are expected to complement each other's microprocessor lines. The agreement does not include the National FIPS microprocessor which is a second source device for Intel's 4040.

The microprocessor market is estimated at \$80 to \$90 million for 1975, and is expected to grow to between \$350 and \$500 million by 1980.

LSI-11 CHIPS OPEN TO THE PUBLIC

(from page 1)

The instruction set can be microcoded to emulate other machines, or the customer can design their own instruction set or use a standard instruction set that Western Digital will introduce shortly.

The standard instruction set will be in a special minicomputer language similar to the one used by Data General. It will be supported by cross assemblers and other software aids. A PROM simulator will be provided to those customers that choose to develop their own instruction sets.

DEVELOPMENT SERIES

(from page 1)

The 6902 CPU/TTY interface board incorporates the IM6100 microprocessor and all the necessary logic required to interface it to a standard TTY. The processor executes the same instruction set as the PDP 8/E. In addition, it provides a subset of the 8's omnibus signals allowing all regular programmed I/O transfers and program interrupt transfers for the PDP 8/E to operate without any hardware or software modification. The DMA structure of the IM6100 is similar but not compatible with that of the PDP 8/E. The only other deviation from PDP 8 compatibility is the unavailability of the Extended Arithmetic Element (EAE) and the User Flag (UF).

The 6901 4K x 12 CMOS RAM board provides the designer with a non-volatile system mem-

ory. Three penlight nickel cadmium batteries are included on the board to power the memory when the main supply is turned off. This feature frees the designer from reloading a program whenever he wants to work on it. It also protects against power failure.

The 6900 system features an extremely versatile control panel (functioning identically to that of the PDP 8/E). The 6903 is a dedicated, completely independent control panel with its own memory. Unlike most microcomputer control panels, Intersil's requires no main memory to operate. The user system does not "see" the control panel; consequently, the panel can be connected or disconnected at will.

The 6903 is also supplied with a PROM containing a bootstrap loader for a paper tape reader, and other software can be implemented very easily since any software resident on the control panel is executed using RAM on the panel, leaving the main memory undisturbed. This "transparent" control panel should be extremely useful in maintaining microprocessor based production systems with limited control panels. One control panel would be enough to service many dedicated systems.

All of the 6900 series cards run off of a single +5 V supply, with a minimum system consisting of a 6901, a 6902 and a 6903 drawing around 2A. The cycle time of this system is 1 us, thus a memory-to-accumulator add (TAD) instruction is executed in 5 us.

The introduction of several new cards is planned by year end. A 4K x 12 NMOS RAM board will provide an inexpensive, but volatile main memory. Since only 4K words of memory are directly addressable by the processor, a memory extender board will be available. This option allows expansion of the main memory from 4K to a maximum of 32K. Two boards will facilitate program storage. The first is a high speed paper tape reader/punch interface. The other is a DEC compatible floppy disc interface, using standard IBM formatting.

The IM6100 is part of an all-CMOS family of Intersil ICs. Already available are the IM6508 1024 x 12 ROM and the IM6403 UART for serial interface applications. Intersil plans to introduce the IM6101 Parallel Inter-

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face element (PIE) to simplify interfacing to the Omnibus I/O structure of the IM6100.

An all-CMOS microcomputer system offers several advantages over other designs. A single unregulated supply between +4 and +11 V is all that is required to power such a system. A CMOS microcomputer with the IM6100, 1K of RAM, 1K for ROM, a UART and a PIE draws only 40 mW at +5 V. Another cost saving feature of the IM6100 is the inclusion of an on-chip oscillator. An external crystal is the only component required to clock the processor.

A unique application area is that of telephone line powered instruments/peripherals. The telephone line provides about 40 V of 20 mA, more than enough to power a CMOS system. Line powered microcomputers may also find application in telemetry and security systems as well as in the telephone system itself.

The designer will have no problem in finding software for the 6900 system. Practically any program that will run on a PDP 8/E will run on Intersil's development system. DEC maintains a program library of over 700 programs for the 8/E, ranging from assembly language routines to operating systems. DEC's sophisticated operating system, the OS/8, will run on the 6900 system without modification. Three versions of FORTRAN IV and two versions of BASIC are also available. All DEC programs are thoroughly debugged and documented. The designer can also write his own routines in widely used PDP 8 assembly language and assemble it using one of several assemblers available.

The basic 6900 board set with a 6901 4K x 12 CMOS RAM card, a 6902 CPU/TTY card and a 6903 control panel is priced at \$3050. Individual card prices are \$1860 for the 6901, \$775 for the 6902, \$765 for the 6903, \$254 for the 6904 (INT), \$49 for the 6905 (wire-wrap), and \$95 for the 6906 (extender). Deliveries are within two weeks.

WESCON—MICRO WRAP UP

WESCON 75, the 24th annual Western Electronic Show and Convention, was held September 16-19 at Brooks Hall and Civic Auditorium in San Francisco, CA. This year's show gave evidence to the industry's recovery following an extended economic recession. The entire

WESCON exhibit space was sold out weeks in advance to more than 300 U.S. and overseas manufacturers who demonstrated their new equipment in 500 displays. Attendance was officially tagged at 30,300, WESCON's highest since 1969, and the highest ever for a WESCON presented in San Francisco.

The show was highlighted by numerous dazzling displays of microcomputer products, which included the following.

General Instruments kicked off their marketing of the now commercially available CP-1600 microprocessor with the introduction of the Series 1600 Microprocessor System. The system is a complete hardware and software development system for the CP-1600.

MOS Technology demonstrated their newly announced 8-bit microprocessor priced at \$20 in single unit quantities. The family includes the 6501 and 6502 microprocessors which are pin compatible with the M6800.

WESCON was the first U.S. public display of Panafacom's new three chip 16-bit microprocessor.

And right on the heels of Intersil's introduction of the IM6100 microprocessor, Douglas Electronics Inc. introduced the LSI-80 built around Intersil's IM6100. The microcomputer looks like a PDP-8 to user's programs and peripherals. The LSI-80 is available in either system or card form. The CPU board is priced at \$350.

Representatives from Fairchild, Motorola, RCA, General Instrument, Rockwell, Intersil, MOS Technology and MOSTEK demonstrated their development systems and microcomputer cards at the overcrowded booths of Semiconductor Specialists, Hamilton/Avnet and Elmar Electronics.

The \$249 JOLT microcomputer was demonstrated by Microcomputer Associates. The kit is a new fully-tested microcomputer complete with an on-board Debug MONitor (DEMON) program. The JOLT CPU includes an 8-bit MOS Technology 6502 microprocessor, which requires no clock, can directly address 65K of memory, has two index registers, 58 instructions with 11 addressing modes, two interrupts and includes both single step and address halt capability.

Cramer Electronics and Microcomputer Tech-
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nique, Inc. shared a booth and demonstrated their Cramerkits. The kits are a complete package of components, software and design documentation for building microcomputers based on the 8080 or M6800 microprocessors.

E & L Instruments demonstrated their Mark 80 microcomputer system which is directed at the product development and educational markets. The company publishes Bugbook III, an instructional text providing the fundamentals of microcomputer architecture interfacing, and programming using the Mark 80 as an instrument for teaching.

RAMTEK chose WESCON to debut their MM80, an In Circuit Emulator (ICEBOX) for the 8080 microprocessor. The system replaces the 8080 in the user's system and allows the designer to examine, alter and control the 8080 system.

Micro Gen, demonstrated by Interface Technology, is a programmable microcomputer and a digital word generator which provides a complete data control signal interface for the users logic chip, card or system. Memory is expandable from 64 to 4K words, and the word width is expandable from 16- to 64-bits.

Three microcomputer-based instruments were unveiled at the WESCON show by Dana Labs. They include the Model 55 General Purpose Interface Bus (GPIB) which translates parallel information into an ASCII code format that can be transmitted via an interface bus; the new Series 9000 Microprocessing Timer/Counter at a base price of \$2995 that is capable of measuring frequencies up to 100 MHz. The Model 9035 has a base price of \$3495 and a frequency range of up to 512 MHz.

On display at the John Fluke booth was the second instrument in the Summa II series of Data Loggers using microcomputer control. The Summa 2200A logs up to 60 channels in the mainframe and up to 100 channels with a scanner extender chassis. Features include a scan counter with interval scanning from 1 to 99 minutes. Range, function and channel-skip can be programmed for 10 individual channels or in blocks of 10 to 100 channels. Prices begin at \$2865.

Fluke also exhibited their new 11 MHz signal generator, Model 6011A, which uses a microcomputer to enable the user to set and recall frequencies faster and with a higher

degree of accuracy than conventional oscillators, counters and level meter set ups.

Macrodyne, Inc. used a microcomputer in their ERDAC, a self-contained electronic transient-capture and tape recording system that captures, digitizes, records, displays, measures, and recalls multiple electrical signals, in one instrument.

A digital cassette data terminal, Model 5000 which uses the Intel 4040 microcomputer, was exhibited by MFE Computer Access Systems. The unit can store up to 155,000 characters per cassette and has selectable baud speeds from 110 to 24000, asynchronous.

Electronic Products Associates displayed their Micro-68 system that uses the Motorola M6800 microprocessor. The system was designed primarily for training, prototype and system design uses. The Micro-68 comes complete with its own power supply, keyboard and display. The full system including 512 words of PROM and 128 words of RAM is priced at \$430.

Burr-Brown Research Corp. displayed their Microcomputer I/O Systems which were introduced last June, and Micromux, a remote data acquisition system designed for process control industries. Micromux is ideally suited to monitoring thermocouples, environmental variables, equipment maintenance functions, levels, pressures and other process signals. The 16-channel system is priced at \$2790.

The Norland Instruments NI 2001 was demonstrated for the first time on the West Coast. It is the first programmable calculating oscilloscope controlled by a microcomputer. The scope requires no computer instructions or programming experience. Pre-programmed fixed function buttons on the keyboard perform exact calculations of rise times, integrals, differentials, peak areas, RMS values, peak-to-peak measurements, n-point averaging, frequency and square roots.

Data I/O had their entire line of PROM programmers on display which included System III, V and VI; and X. The programmers are universal PROM programmers which can be made to handle different PROM types by changing one PC board in the chassis. The System X is Data I/O's new PLA programmer.

Fairchild Systems Technology division introduced a semiconductor test system that
(cont'd on page 23)



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TECHNOLOGY:**AMD MARKETING 8080 REPLACEMENT**

The AM9080A is AMD's pin-for-pin plug-in replacement for the Intel 8080 and Texas Instrument 8080 microprocessor. Advanced Micro Devices is now marketing the device at \$29.95 in 100-piece quantities.

The 9080A meets MIL-STD-883 requirements and AMD is offering a host of peripheral chips that they claim is faster than Intel's. A company spokesman said the 9080A can be used with all existing software and 8080-based systems.

MOTOROLA DROPS 6800 PRICES 60%

Motorola has cut prices on their M6800 microprocessor and clock oscillators. The 6800 has been reduced to \$69 for all quantities under 100 and the MC6870 oscillator was dropped to \$33 in single unit quantities. The MC6871A, MC6871B and K1117A oscillators were halved to \$36 in single unit quantities.

SIGNETICS ADDS TO BIPOLAR μ C LINE

Signetics has added two devices to their line of bipolar microcomputer products which they are second sourcing from Intel. They are the N3001 Microprogram Control Unit (MCU) and the N3002 2-bit slice Central Processing Element (CPE). Both devices feature a 45 ns clock cycle time and significantly cooler operation.

Pricing in the 100 to 999 lot for the N3001 is \$22.50 and \$12 for the N3002. The company is also offering complete 8-bit and 16-bit designers evaluation kits for \$100 and \$172 respectively.

SOS μ P SEEN BY YEAR END

Although Rockwell and Inselek have aborted their plans for an SOS CMOS microprocessor, Solid State Scientific reports a target date by year end for their processor. The device is patterned after GE's 8-bit CRD TTL/MSI microprocessor (see MD, March 1975).

SSS reports that their as yet unnamed microprocessor will be sampled in the fourth quarter of this year with production quantities by the middle of next year.

The microprocessor, which is being developed for in-house use by GE, will also be

offered commercially. The microprocessor features a 350 ns cycle time at 5 V. It has a microprogrammed architecture and typical instruction execution time is less than 2 μ s. The chip can address up to 65K of memory and treats I/O as memory. The instruction set consists of 249 commands.

The SOS processor uses silicon-gate, deep depletion mode processing for high functional density. SSS will also introduce a host of SOS support chips, including 4K ROM, RAMs and a DMA chip.

MICROCOMPUTER-BASED PRODUCTS:**DEC UNVEILS UNDER \$10K DISC SYSTEM**

A new \$9,950 disc-based microcomputer system has been unveiled by Digital Equipment Corp. at WESCON. Based on the LSI-11 microcomputer, which uses the instruction set of the PDP-11/40, the PDP-11V03 includes dual floppy disc drives as a mass storage device, offers a choice of either an LA36 keyboard terminal printer or a VT52 video terminal as an input/output communication device, and comes with the RT11 real-time operating system. Users can add FORTRAN IV or BASIC.

The VT52 video terminal features full cursor control, full upper and lower case ASCII character set, 24-line screen, adjustable baud rate from 110 to 9,600, dot matrix and a separate numeric pad. The terminal sells for \$1,360 in lots of 100.

The LA36 Decwriter II terminal printer can be attached to any central processor with a current loop or RS232C interface. The terminal features output characters in upper and lower case, 30 cps output, a catch up feature that stores characters during a line feed and causes the head to print at 60 cps until the storage has been emptied. One hundred lot pricing is \$1,310 each.

IMP USED IN GLOBAL NAVIGATION SYSTEM

Airborne Navigation Corp. has incorporated an IMP-16 microcomputer from National Semiconductor into what is probably the most sophisticated global-scaled navigation system for aircraft in the general aviation class.

Operating on very-low-frequency signals from ten transmitters strategically located around the world, the IMP-16 monitors the

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signals and determines which are usable. Then, utilizing at least three signals, it determines an accurate position by measuring phase displacement from the respective stations and calculates the vector diagram. Navigation quality is a function of how many stations are being received, their locations and signal strengths.

The microcomputer recomputes the aircrafts position over 100,000 times a second to assure an accurate position recording.

\$297 MOSTEK F-8 KIT

Mostek Corp. has introduced their F-8 microcomputer design kit for \$297 each. The kit includes the MK3850 CPU, MK3851 program storage unit and the MK3853 memory interface. It also includes a 1K x 8 RAM, two CMOS buffers and a 2 MHz crystal.

The design kit is fully documented. The program storage unit contains the Designer's Development Tool (DDT-1) program which permits program loading, storing, modification, debugging and hexadecimal arithmetic when used with a teletypewriter.

MODULAR MICROCOMPUTER KIT

A modular microcomputer kit based on the Intel 8008 microprocessor and priced at \$440 is now available from Scelbi Computer Consulting. The microcomputer is constructed using a basic set of PC cards and can be interfaced to a wide variety of peripherals. These include an oscilloscope display driver, ASCII keyboard and an audio-type recorder.

The \$440 chassis kit includes five boards: CPU, data buffer, input card, front panel controller and a 256 x 8 memory card. The memory is expandable to 16K. Available programs include peripheral support, calculator packages, assemblers and editors.

HP DESIGNS CUSTOM 16-BIT μ C CHIP

Hewlett-Packard has designed their own 16-bit microprocessor to control their latest 9817A printer/plotter. The instrument is a companion to the firm's new 9815A calculator which uses a Motorola M6800 microcomputer and is priced at \$2900.

HP is said to have designed its own microprocessor because off-the-shelf devices were not fast enough to handle all electromechani-

cal printer elements such as stepping, ribbon and hammer motors. The microprocessor calculates each character positioning using a new HP developed technique. The printer can justify left or right and can also double as a precision plotter, positioning any character within 1/120th of an inch horizontally and 1/96th of an inch vertically. The printer is priced under \$4000 with deliveries beginning in November.

The N-channel MOS microprocessor is being manufactured at their Loveland, CO semiconductor facility.

4-BIT μ C LESS THAN \$100

Quoting prices under \$100, Pro-Log Corp. is marketing their PLS-401A, 4-bit 4004-based microcomputer card designed for use in dedicated control and data processing.

The card includes the 4004 microprocessor, crystal-controlled clock, an 80-character RAM with 320 character capacity, external power-on reset, 16 TTL input lines, 16 TTL and 4 MOS output lines. Up to four 256 word instruction PROMs with 1024-word capacity may be purchased with each card.

NEW MMI DIVISION OFFERS 3 SYSTEMS

Monolithic Memories' new microcomputer division will be offering three microcomputer families. These include the System 100 which will compete in the slow microprocessor market with CPU card prices at less than \$250. The System 300 will be software compatible with Data General's Nova series. The companies System 600 will consist of the same software and performance as the System 300, but will be packaged in the 15" x 15" form factor of existing minicomputers. All three systems will be software compatible with each other.

NCR USES CUSTOM μ P IN NEW TERMINALS

NCR Corp. has announced the 7200 Model 1 data entry terminal, the first in a new line of microcomputer-based terminal families.

The terminal has a 9-inch CRT screen which displays the standard 64 ASCII character set. The top half of the screen can accommodate 128 characters. The lower half is used for operator messages or system status messages. The terminal can be ordered with either a



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keypunch or typewriter-style keyboard.

Cassettes used with the terminal are ANSI-compatible and can be read into the full line of NCR computer systems, starting with the NCR 299 Series up through the Century Series. Each data cassette can store over 300,000 characters. The recording density is 800 bpi.

The single-chip microprocessor used in the terminal features a 5 us instruction cycle, four addressing modes and a repertoire of 78 hardware commands. The microcomputer directs all buffer allocation, data formatting, and input/output traffic between the terminal and its peripherals, error interception, operator guidance and data verification.

The terminal is being manufactured by NCR's Terminal Systems Division. Prices begin at \$5,300 and deliveries are scheduled for November.

INDUSTRIAL ALTAIR 8800

Mits, Inc. has introduced their Altair 8800 Industrial Development System, a complete software development and PROM programming system built around the Intel 8080 microprocessor.

The unit is equipped with the 8080, 8K dynamic RAM memory, teletype or standard RS232 interface, PROM programmer, 256 x 8 PROM memory card, loader on PROM, slots for two additional plug-in cards, room available in the basic unit for eight added slots, and software on cassette or punched tape.

Software in the 8800-IDS includes a resident assembler, text editor, system monitor, BASIC and diagnostic.

The price is \$2,800 FOB Albuquerque. Delivery is in 60 days ARO.

µC KEYBOARD PRINTER TERMINAL

An Intel 8008 microcomputer based keyboard printer terminal has been introduced by Anderson Jacobson. The terminal sells for \$3,700 and leases for \$185 on a month to month lease.

Features of the AJ 830 terminal include electronic keyboard, 10 or 12 pitch capability, high-speed, daisy-wheel printing, and can operate at either 30 cps or 45 cps. The printer can provide up to five copies of the original hardcopy output.

NEW TWIST IN SEWING MACHINES

At the heart of the new Singer Athena 2000 sewing machine lies a cold and calculating microprocessor. The 8-bit device controls all machine settings and automatically adjusts to the selected stitch length and width and the fabric in use. The microprocessor replaces as many as 350 mechanical parts.

Hugh Morris, director of communications at American Microsystems, Inc., says that the Singer designed chip is being manufactured exclusively by AMI.

MA KETTLE SHOULD SEE THIS!

A new family of washing machines controlled by a microcomputer is about to be introduced by ITT Semiconductors in Great Britain. The Model 7150 is the first of a line of microcomputer controlled automatic home appliances being planned by the company.

The 28-pin microprocessor utilizes up to 20 programming and timing combinations for nine machine programs that are standard in Europe. The 7150 is mask-programmable and is used with two ROMs. The chip is priced in volume at \$6, and \$10 to \$20 for a complete system.

COMPUTER TERMINAL MONITOR

A dedicated computer terminal monitor that uses a microcomputer to process and store transaction information is now available from Questronics Inc. An optical coupler system permits attachments near the terminal without internal connections and without interference with terminal operation. A 4-digit LED display indicates response times or number of transactions and an LED indicator warns of power loss. The time base is a crystal oscillator.

HIGH-SPEED BARE CIRCUIT BOARD TESTER

Algorithm Technology, Inc., manufacturers of high speed bare circuit board testers, announced the introduction of a new high speed microcomputer-based controlled wiring analyzer for back plane panels, card racks, cables and harnesses, and other wired assemblies. The unit is expandable in 64 node increments.

The 65,000 test-point system is fast and
(cont'd next page)



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provides GO/NO-GO indications of good or bad assemblies in less than one second for a 50,000 point back panel or other wired unit. Programming takes approximately ten seconds for the 50,000 point assembly.

The system can be programmed from an optional cassette or from other external sources, but a known good unit or the cassette input is required. Error listing is done at the rate of 1 to 40 errors per second depending on the optional printer selected.

Prices begin at \$13,120 and vary according to configuration. Delivery is 90 to 120 days.

8080 DATA ENTRY SYSTEM

Citing second source capabilities and low-volume production prices, Mr. Donald Feddersen, president of Entrex, has announced the company will introduce a new data entry system in January using the 8080 microprocessor from Intel.

Feddersen declined to say what the microcomputer would do other than a variety of control functions including terminal, communications and peripheral controls. He did note that it will have more capability than the company's System 580, now at the high performance end of the Entrex line.

MICROCOMPUTER-CONTROLLED KEYPUNCH

Incorporating an optional RS232C interface, a microcomputer-controlled 80 column keypunch device has been introduced by Tab Products.

The TAB 501 data entry microcomputer is capable of data transmission through a modem or cable, and can be tied into any type of data entry or processing system. Depending on the options, the 501 can read, punch, print, verify and interpret either on-line or off-line. Features include up to 220 columns of constants from memory, up to 28 program levels with automatic sequencing, instant verification, automatic error correction and high-speed character duplication.

Pricing for the microcomputer based keypunch begins at \$6,285.

μC IN MEASUREMENT SUBSYSTEMS

Analogic has selected Intel microprocessors for three of their newest measurement subsystems currently in final development

stages. Included are a 4040-based load cell manipulating subsystem, a 4040-based low-speed data acquisition and control system, and an 8080-based multichannel data acquisition system.

The company said they expected to release the products toward the end of the year and were not yet prepared to disclose prices. The systems will be standard products for the company.

GENERAL AUTOMATION UNWRAPS μC FAMILY

General Automation has unveiled a new series of microcomputers. The boards are based on a single chip N-channel MOS silicon gate microprocessor manufactured by Synertek Inc., a partially owned subsidiary.

The GA-16/110 cycles in 450 ns and sells for \$585. The Model 220 uses the same CPU board, but adds a second board for hard-wired TTY interface and special I/O. The 220 price is \$975. The Model 330 cycles in 400 ns and is implemented on large boards as a minicomputer with 4K x 16 core memory. The 330 is priced at \$3,250. The top model, 440, lists for \$8,950, cycles in 240 ns with 16-bit memory and is designed to speed up processing in high level languages. This board can address up to one million words of memory and uses Schottky devices.

PROGRAMMABLE LOGIC CONTROLLER

Eagle Signal has introduced the first microcomputer-based programmable logic controller. The system is built around an Intel 8080A microprocessor. The firm has developed their own control language that allows users to communicate in PLC languages, which rely on relay symbols.

The microcomputer can be programmed by either a mini-based CRT terminal or a manual programmer which is also built around an 8080 microcomputer. Set points can be entered through an integral data-entry and display unit without changing the program and the unit can handle up to 2,048 inputs and outputs.

ELECTRONIC CRANE USES MICRO

The Martin-Decker Company has incorporated a microcomputer in their new electronic Crane Load Moment Indicator (CLM) system. The mi-



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microcomputer monitors the crane load and computes and displays all crane operating data for the operator. The microcomputer is custom programmed to define the load limit parameters of each customer's specific make and model of crane, along with different combinations of boom length and load block reeving. Up to 15 crane-configuration tables, one for each boom length and reeving combination, can be stored by the micro.

DATA LOGGER FAMILY INTRODUCED

A new Fluke line of data loggers uses microcomputers to control the systems instrument operation and provides users with programmable features.

The first unit, Summa II, 2240A can scan 60 channels in the mainframe and up to 1,000 with extender options. Resolution can be to 1 μ V and 0.1°C or F. Keyboard entry allows the user to program range, function, skip, alarm limits, data/time, time interval and fixed data, all from the front panel.

The data logger has several alarm scan modes. When pre-programmed values are exceeded, the data logger generates an alarm output. Scan intervals range from 1 second to 24 hours. Intervals are keyboard-selectable, thus the unit can be programmed to begin scanning at any chosen moment in a 24 hour period. Similarly, output devices can be set to record all data, interval data, or alarm only data.

Prices begin at \$4,295 and delivery is 60 to 90 days ARO.

PPS-BASED SPECTROPHOTOMETER

A microcomputer-based Infra-Red spectrophotometer built with Rockwell International's PPS-4 4-bit microprocessor has been introduced by Perkin-Elmer.

The company used the microcomputers to increase accuracy and test repeatability of the instruments while increasing the ranges of possible analyses. The microcomputer uses 4K words of memory and can operate in a stand-alone mode or be interfaced with an external computer.

The units are priced at \$16,400 each and delivery is 10 weeks ARO.

μ C FOR EDUCATION & SYSTEM DEVELOPMENT

Designed to be used as both a learning aid and a microcomputer development system, the Micro Primer 4/8 can be used for any 4- and 8-bit microprocessor on the market.

The Primer 4/8 consists of the microprocessor, memory circuits for program and data storage, and a front panel with controls and indicators to address and display the memory contents and conditions of the microprocessor. The user can enter memory address and instructions in machine language and display contents on the front-panel as well as increment, decrement or force-load of program memory address. The system includes single step operations.

Conversion from a 4-bit unit to an 8-bit microcomputer is accomplished by changing the PC board containing the microprocessor and changing the front panel harness assembly. The Primer is manufactured by Technitrol and is priced at \$2000. Delivery is 4 to 6 weeks.

PLAN GETS SMART

Zentec Corp. has announced that they will supply a number of their microcomputer video display terminal/printer systems to Stanford University for use in the California "Public Library Automation Network" (PLAN).

The 9002B microcomputer terminal will retrieve any record in the library's data base by Library of Congress card number; all personal names in the record, including series authors; any word in all corporate and conference entries; and any word in the title, series title, or added title. Subject headings and call numbers can also be used to retrieve titles that have been cataloged by the Stanford University Libraries.

MICROCOMPUTER SOFTWARE:

TYMSHARE EXPANDS μ C SOFTWARE

Tymshare, Inc. has expanded the microcomputer programming software available over the company's international data communications network, TYMNET. The new software includes an assembler/simulator for the TI TMS1000, TMS8080 and the Motorola M6800 microprocessors. The microchip programming aids, devel-

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oped by TI, run on Tymshare's TYMCOM-370 while the Motorola assembler/simulator package was designed for the TYMCOM-X systems.

UCS & GE ADD 6800 CAPABILITY

The following M6800 software support is available through the United Computing Systems, Inc. Network, General Electric Information Services International Network and the Motorola Timeshare Service.

- o MPCASM—A cross assembler that converts symbolic source code to machine-language with listings;

- o MPSSIM—An interactive simulator which simulates the execution of machine-language instructions assembled with MPCASM;

- o HELP—Provides real-time documentation of the software, including abbreviated operating procedures; and

- o MPBVM—A "build virtual-machine" program for simplifying file management operations.

8080 ONE PASS ASSEMBLER

MicroSystems Software has developed a one pass assembler that runs in resident mode in an 8080 development system. This program assembles a compatible subset of the Intel language and generates machine code directly into memory for immediate execution if desired. The assembler occupies less than 2000 bytes of memory and can be placed in either ROM or PROM.

The assembler may be customized to the particular user environment prior to delivery. The resident assembler is priced at \$495 and delivery is within one week.

8080 RESIDENT ASSEMBLERS

Two resident assemblers for the Intel 8080 based systems have been introduced by Extensys Corp. They include a full assembler compatible with Intel's 8080 assembly language, and a basic assembler without MACROS or operand expressions. Both assemblers can be ordered with options for producing relocatable code or run-time symbolic debugging. The basic assembler runs in 1300 bytes and the full assembler occupies less than 2K bytes of memory. Both of the assemblers operate in one pass.

The symbolic debugging option makes it possible to insert code patches, breakpoints

and data, using familiar symbolic designations without remembering absolute hex codes and addresses.

In addition to the two assemblers, a de-assembler is offered which produces assembly level listings of Intel programs and serves as a useful tool for cleaning up or redocumenting old programs.

Future products include resident assemblers for the Motorola 6800, resident PL/M compilers and FORTRAN and BASIC interpretive systems.

Price for the basic assembler is \$300 and for the full assembler \$450. The relocation and symbolic debugging options are \$50 and \$100 respectively. The de-assembler is priced at \$175.

TWO-PASS FORTRAN COMPILER

Mini-Software, Inc. is marketing a resident two-pass FORTRAN compiler which executes in any 16K Intel 8080 microcomputer system. The compiler, a subset of FORTRAN IV, supports integer variables that are 5 bytes each and floating-point variables that are 6 bytes each.

CROSS-ASSEMBLER FOR INTEL LINE

Optimum Systems, Inc. has announced the availability of a new microprocessor cross assembler for the Intel 4004/4040 and 8008/8080 chips. Access to the cross assembler is provided through low-speed or high-speed terminals around the clock. The company claims cost savings of more than 50% over competitive services as a result of low terminal connect charges and efficient assembly language coding of the assembler.

Features include improved diagnostics, improved ability to patch the object code, cross-reference listing and statement numbering, simple user interface and powerful SUPERWYLBUR text editing capability.

PROCESS CONTROL COMPILER

The Comstar Microcomputers group of the Warner & Swasey Co. has introduced a new version of its process control compiler which handles the instruction set for their System 4A and B microcomputers. The new compiler may be used for data entry through a TTY, a Silent 700 Dual Cassette ASR Terminal, or



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similar terminals.

Eight new compiler commands have been created specifically for compilation from a data terminal to permit such functions as the creation on tape of an entire PCL program or the adjustment of the amount of delay following a carriage return.

The basic compiler is priced at \$3,595 and delivery is 30 days ARO.

MIL-8080 SOFTWARE

Robert Swartz, a business executive and amateur programmer, is offering, for \$20, a package containing MIL's Monitor-8 software listing, debugging hints, schematics, parts placement lists and a cassette interface schematic and software.

The Monitor-8 is a 2-1/2K mnemonic assembler and editor for the 8080 compatible device once manufactured by now-defunct Micro International Ltd.

Another Canadian-based firm, Space Circuits, continues to supply PC boards for the MIL-8080 device. Price for a set of seven boards, including CPU, I/O, RAM and ROM is \$86.70 per set, or \$13 each. A backplane board, priced at \$24.75 is also available which interconnects with the other boards and contains PROM programming electronics.

MYCRO-TEK OFFERING CROSS ASSEMBLERS

An ANSI standard FORTRAN IV cross assembler for 8080-based microcomputer systems has been introduced by Mycro-Tek, Inc. The program can be executed on any 16-bit or larger computer whose compiler supports this language.

The cross assembler generates an assembled program listing and a hexadecimal object tape, compatible with Intel's MCS-80. The major features of the assembler are: no disc access required; will run on an 8K machine; accepts ANSI standard FORTRAN IV logical unit numbers for I/O devices; two-pass assembler; and complete documentation. The price for the assembler is \$300 and delivery is 30 days ARO.

MEMORIES AND PERIPHERALS:

MOS TECH 6530 PERIPHERAL DRIVER

MOS Technology has introduced a peripheral driver IC containing a 1K ROM, 64 bytes of RAM, 16 programmable I/O pins and a program-

mable timer. The NMOS 6530 can interface with either the MOS Technology 6500 series or Motorola's M6800 microprocessors.

Although the device can be used with either of the above, whenever a customer switches CPUs, the ROM sections will need to be re-coded. The 6530's timer is settable under the microprocessor's program in increments of up to 256 times the basic time interval. The basic time interval is programmable as 1, 8, 64 or 1024 times the basic clock speed.

The 6530 is intended to drive TTYs, card readers and tape cassettes. Complex systems will require additional 6530 drivers.

PROM & PROGRAMMER ANNOUNCED

Nippon Electric Co.'s new MU PD 454D PROM features a typical access time of 450 ns. Writing in the PROM is accomplished by injecting hot electrons, and erasing by injecting positive holes into the ROM device. The company reports that typical erase time has been cut to 30 seconds with the new method. Initial sample prices are set at \$50 each. PROM programming equipment will be sold between \$667 and \$1000.

FLOPPY DISC CONTROLLER CHIP

Rockwell International Corp. has introduced a new LSI floppy disc controller (FDC) chip as part of its PPS-8 microprocessor series. The 40-pin chip can be used with eight PPS-8 microprocessors, and about ten additional LSI and discrete devices to form an IBM-compatible floppy disc control system for around \$200 in 1,000 lots.

The FDC chip itself is priced at \$125 in 1-24 quantities, \$100 in 25-99 quantities and \$80 in 100-999 quantities. Prototype chips are now available with production quantities scheduled for next month.

The disc controller can operate at either single or double density and can easily be used in products already based on the firm's PPS-8. The firm reports that one or more floppy discs can be connected to existing PPS-8-based equipment using the FDC chip at a cost of less than \$75 in 1,000 quantities.

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AMI DROPS 6605 RAM

American Microsystems Inc. has revealed that they are dropping their 6605 4K RAM, a second source device for Motorola's RAM. AMI said this was due to the die's large size which resulted in poor yields. However, Intersil has quickly announced that they will second source the 6605. Their agreement with Motorola includes reducing the size of the die.

AMI is currently second sourcing the TI and Mostek 4K RAMs. Intersil reportedly plans to introduce a 16-pin design of their own early next year.

NATIONAL SAMPLING 4K RAM

National Semiconductor reports that their new 18-pin MN5270 4K RAM has been successfully sampled by two large computer users. The 4096 x 1 device uses a fully decoded N-channel silicon gate process and features tri-state lines, common input and output lines. The RAM is TTL compatible and access time is 200 ns with cycle time at 400 ns. Power requirements are -12 V, -5 V and Gnd.

National is currently entering production on the RAM with prices and deliveries soon to be announced. The company is also offering the RAM in a 22-pin configuration.

A spokesman for the company noted that National is on the verge of announcing blue and green I/O and peripheral support chips for the PACE microprocessor. The chips will be quite similar to the series marketed for the IMP microprocessors.

INTERSIL ADDS TWO 4K PROMS

Two 4K PROMs have been added to Intersil's product line of TTL programmable ROM memories. The 512 x 8 IM5605 has open collector outputs and the IM5625 is tri-state. Typical read cycle time for both memories is 45 ns at 25°C.

Both devices are available over the commercial (0°C to +75°C) temperature range in ceramic DIP packages. Pricing is \$40.05 (1-24); \$32.05 (25-99); and \$26.70 (100-999). The PROMs are in volume production and available from stock.

CCD ANALOG SHIFT REGISTER

Fairchild Camera and Instrument Corp. has introduced a new charge-coupled analog shift register, the CCD311, a 130/260-bit integrated circuit which performs the function of a wide-range variable analog delay line. Delay is determined solely by the frequency of an external clock signal. The circuit eliminates the need to convert analog signals to digital form for delay within digital delay systems and then to reconvert to analog form.

The CCD311 is available now from factory stock. Pricing for 100 to 999 quantities is \$49, with production volume pricing as low as \$15.

INTERSIL INTRODUCES 4K RAM

The IM7507 is a new 4096 x 1 dynamic N-channel MOS RAM being introduced by Intersil, Inc. It is direct pin-for-pin replacement for TI's 4060, and Intel's 2107A and 2107B. The RAM is available in three speed options. Pricing for the 22-pin DIP RAM in 100-999 quantities is \$24.95.

M6800 FLOPPY DISC SYSTEM

A low-cost floppy disc system, which plugs directly into Motorola's M6800 EXORciser with all of the necessary hardware and software to permit immediate operation, is now in production at iCOM.

The system, which consists of from one to four floppy disc drives, an IBM compatible formatter/controller and a desk-top cabinet with power supplies, cooling and cabling, is completely compatible with the M6800.

With iCOM's FDO\$, it is possible to immediately perform such operations as disc-to-disc edits, disc-to-disc assemblies, program load and go, program merge, disc-to-paper tape, paper tape-to-disc and more. All software (FDOS, assembler and editor) are provided on an IBM diskette so that no media conversions are required.

The unit quantity price is \$2350 for a single disc system and \$3000 for a dual unit. Lot prices in small OEM quantities are as low as \$1840. Delivery is 30 days ARO.



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IMP-16 & PACE CORE MEMORIES

Magnetic core memories specifically designed for National Semiconductor's IMP-16 and PACE microprocessors are now available from the Litton Memory Products Division in either 4096 x 16 or 8192 x 16 configurations. Cycle time is 1.4 us and access time is 550 ns.

Principal advantages of using core over semiconductor memories are greater reliability in industrial environments and the protection it offers from loss of data caused by power swings or uncontrolled shut-downs.

5203 & 1702A PROM PROGRAMMERS

Two MOS PROM programmers priced at under \$1000 have been announced by PROM Programmers Inc. The production models introduced are the MM5203 and 1702A. Both offer read/modify/write modes priced at \$850 and copy/verify modes at \$650. Interactive temperature sensing is provided on the MM5203. Delivery is 30 days ARO and all units are warranted for one year for parts and labor.

MICROPAC PROM PROGRAMMER

Process Computer Systems, Inc. has introduced a new low-cost independent PROM programmer for use with the company's MicroPac microcomputers. Packaged in a self-contained desktop enclosure, the PB1000 PROM programmer is able to program one PROM chip from RAM or duplicate from another PROM. Programming time is typically two minutes. No price or delivery dates were given by PCS.

SUPPORT BOARDS FOR ALTAIR

Processor Technology Co. is offering plug compatible memory and I/O boards for the Altair 8800 microcomputer system. The boards are available in both kit and assembled versions. A 2K PROM module retails as a kit for \$50 and assembled for \$75. A 4K byte, low power, static RAM memory is \$215 for kit and \$280 assembled. Kit prices for the assembly language operating system firmware module is \$250, simulator expansion module \$95, video display module \$160, and extender board module \$35. Delivery is from stock to three weeks ARO.

\$110 MODEM KIT

The Ven-Tel Company is marketing a modem kit for \$110. The heart of the kit is an LSI hybrid chip which consists of all the EIA inputs and outputs, 20 ma current loop input for direct connection to TTYs, and all functions for operating a D/A device. The kit includes the chip, acoustic coupler hardware and schematics.

DATA ACQUISITION MODULE

A 16-channel data-acquisition module compatible with microcomputer products is being marketed by Analogic Corp. The module consists of a 12-bit A/D converter with automatically trimmed resistors, a temperature-compensated sample and hold, differential amplifier, and programmable logic. The MP6812 is priced at \$295 in unit quantities and \$180 in one hundred lots. Delivery is off-the-shelf.

D/A CONVERTER SPECIFICALLY FOR μ C

Analog Devices has begun marketing its first D/A converter specifically built for microcomputer applications. The AD 7522 10-bit CMOS converter follows the company's previously announced AD7570 ratiometric A/D converter.

Double buffered digital inputs enable the device to output an analog signal while the microcomputer is loading a new value into the 7522's front buffer either serially or in parallel.

The 7522 is a 28-pin DIP device and is available in nine different versions for variations in voltages, bit capacity and temperature ranges. Prices begin at \$19.50 in unit quantities.

PEOPLE, LITERATURE AND EVENTS:

MODULE PRODUCTS GROUP FORMED

National Semiconductor Corp. has formed a Module Products Group under the direction of Martin J. Oudewaal. The Group will produce standard and custom modules of electronic subsystems that use National's LSI circuits, microcomputers, optoelectronic displays, keyboards, transducers, discrete transistors,

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memory circuits, and hybrid microcircuits. The modules will be sold to manufacturers of home appliances, entertainment systems, automotive products, telecommunications systems and military equipment.

TI EXPANDS EUROPEAN EFFORT

Texas Instruments has established a European Digital Systems Division headquartered in Nice, France with operating and marketing activities parallel to those of the U.S. Digital Systems Division. PIERRE CLAVIER has been appointed division manager for the European operations and reports to Mr. J. D. Zimmerman, group vice president.

ICS CONDUCTS PHILIPS COURSE

Philips, a \$10 billion electronic company, is taking a lead in introducing microcomputer devices in their consumer and electronic products. As evidence of this commitment, Philips has engaged Integrated Computer Systems (ICS) to conduct a series of in-house courses on microcomputer technology.

The courses include a Manager-Level Overview of Microprocessors, Microcomputers and Minicomputers; Microprocessors and Microcomputers—A Comprehensive Technical Introduction and Survey; Software Development and Applications Techniques for Microcomputers; and a special microprocessor seminar for corporate management.

The series of courses were conducted in the week of August 25, 1975 for over 250 Philip's personnel. Instructors were Dr. David Collins, president of ICS, Eric Garren, vice president; Stan Brannan, president of Mycro-Tek; and Manny Lemas, president of Microcomputer Associates Inc.

This move represented a continuation of the heavy prior commitment to microcomputer technology by Philips. The company has already developed several designs for applications utilizing a wide range of microprocessors. Philips' recent acquisition of Signetics provides them with in-house MOS and bipolar microprocessor capabilities.

FC&I To PURCHASE XINCOM

Fairchild Camera and Instrument Corp. has purchased substantially all of the assets of Xincom Corp., a manufacturer of semiconductor

memory test systems. Xincom Division will remain in Chatsworth, CA. The work force will remain substantially intact, with former president Brian Sear as division general manager.

PEOPLE ON THE MOVE

JOSEPH J. McDOWELL, one of the original founders of Monolithic Memories, Inc. has joined American Microsystems, Inc. as director of Microcomputer Products.

PHILLIP M. DRAYER, formerly manager of Memory Product Engineering at Texas Instruments, has joined AMI as manager of the firm's 4K RAM Product Engineering.

MICHAEL PAYNE has been appointed LSI engineering manager at the Transitron Electronic Corp. He will be responsible for a new bipolar memory product line and a 16-bit bipolar microprocessor scheduled for introduction later this year.

THOMAS A. LONGO, group vice-president of Fairchild Camera & Instrument Corp., will head the newly formed Memory and Logic Group, comprised of the Bipolar Memory, MOS Products and Digital Products divisions. He also has the charter to enter into end-product areas utilizing Fairchild's memory and logic technology.

GEORGE WELLS has been named group vice president of Fairchild's Analog and Discrete Products Group consisting of the Linear Integrated Circuits, Automotive, Diode and Transistor divisions.

MARTIN J. OUDEWAAL has been appointed head of National Semiconductor's new Module Products Group.

FRANK T. LYNCH is National's new marketing manager for high-performance microprocessors. He comes from Harris Computer System division and will report to Phil Roybal at NSC. One of Lynch's responsibilities will be the CMP-8 microprocessor.

JOHN A. TITUS is the new general manager of Tychon, the newly formed microcomputer system research, development and consulting division of E & L Instruments. The new division will concentrate on research and development of new microcomputer and peripheral products as well as provide users with consulting aid in the integration of their microcomputer-based systems.



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JACK MATTIS has switched from Signetics to Fairchild to assume the position of marketing manager for the F-8. He will report to ALAN GREGORY, general manager of Fairchild's MOS division, who is also from Signetics.

STEVEN J. ANDELMAN has been promoted as product marketing manager for Analog Devices systems development group. The group is reportedly working on an 8080-based data acquisition system.

THOMAS P. CUTLER has joined Dialog Systems as the new marketing vice president in charge of the company's speech word recognition system which can be built around either an LSI-11 microcomputer or a PDP-11/04 minicomputer.

ALBERT NAUMANN, assistant general manager of Lockheed Electronics Co., Inc.'s Aerospace Systems division, was elected 31st president of the Instrument Society of America.

CHUCK TROIANI has joined National Semiconductor as manager of interface product marketing. He held a similar position at Fairchild's Semiconductor Division.

HANK BODIO has joined Monolithic Memories Inc.'s new MMI/Systems division as director of engineering. He was formerly Intel's engineering manager.

BILL SLAYMAKER has also joined MMI/Systems as product marketing manager for the 600, 300, and 100 microcomputer systems.

FRANK YATES III has been appointed regional manager for the central region for General Instrument's rotating memory products division.

TYMSHARE TO ACQUIRE QUELEX DATA

Tymshare, Inc. has announced it has reached an agreement in principle to acquire all of the assets and specified liabilities of Quelex Data Systems, Inc. for an initial cash payment of approximately \$1,500,000 and additional payments based upon the combined performance of the acquired business and Tymshare's Valcomp division over a period of three years. The transaction is subject to the execution of a definitive agreement and to certain conditions to be fulfilled prior to closing.

BYTE

A new magazine exclusively aimed at the home computing market has gained wide accep-

ance. BYTE is an excellent publication, full of good articles for the microcomputer hobbyist as well as a commercial marketplace for those selling hobby kits, systems and components. The magazine is published by Wayne Green, who also publishes a popular magazine for radio hams. Subscription for BYTE is \$12 a year.

ELECTRONICS BOOK SERIES

Electronics Magazine is offering a collection of their past articles bound in a single volume and organized to present the design and application of microprocessors. The book, priced at \$8.95, contains practical information on available microprocessors, technology, end-products and application notes. (Ed Note: MICROCOMPUTER DIGEST will review this book in an upcoming issue.)

PRACTICAL SYSTEM DESIGN COURSE

Practical system design using the Intel 8080 and the Motorola 6800 is the subject of the ACM Fall 1975 Study-Course #1. The two-day course will be held on Oct. 18 and 25 at Rickey's Hyatt House in Palo Alto, CA. Floyd Nordin, microprocessor systems consultant, will be the instructor.

Participants should be familiar with the two microprocessors and assembly language. Tuition is \$20 for members of the Bay Area chapters of the ACM and \$25 for non-members. For reservations call Dave Kelly, Programming Methods Inc., (415) 964-9900.

ALTAIR USERS GROUP NEWSPAPER

Mits Inc. has announced that they are publishing an Altair Users Group newspaper called Computer Notes. The newspaper will keep readers abreast of new developments in the Altair computer line as well as helpful hints in the form of articles written by Mits engineers and programmers. Subscriptions are \$10 a year.

IEEE REPOSITORY INDEX

A cumulative index to the IEEE Computer Society Repository has just been published and is available from the society's publications office. The volume contains an author and subject index of nearly 1600 papers, reports and documents from 1966-1973.



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The Repository is a collection of technical papers and documents relating to computer science and engineering that is maintained as a service to the information processing community. It is presently growing at a rate of about 300 entries per year. Updates to the index are planned at appropriate intervals.

The cumulative index is priced at \$12 for IEEE Computer Society members and \$16 for non-members.

RECENT LITERATURE

"When To Use Higher-Level Languages In Microcomputer-Based Systems"

Jim Gibbons, Ryan-McFarland Corp.
Electronics August 7, 1975

This article discusses the use of compilers versus assembly programming to generate code for microcomputers. The author feels that the time is quickly approaching when it will be cheaper to develop a compiler and hand it to the customer along with the microcomputer for the customer to develop his own program. He maintains that excessive costs in assembly programming cannot be justified in applications where only a few products are produced. A cost analysis of using a compiler versus an assembler is given along with a few suggestions on designing a compiler for microcomputers.

"Basic uP Test Tool: The Portable Debugger"

Jim Barnes, Verne Gregory, Motorola Semiconductor
EDN August 20, 1975

The authors have described a very basic low cost microprocessor tester that can be used even when the microprocessor is in the user's product. The particular tester described was used for the M6800, but the principles applied can be easily adopted to any microprocessor. The article concerns itself mostly with features needed for such a tester along with limitations imposed by low cost systems. This particular test instrument was constructed with less than \$50 in parts.

"European Industrial Robots"

Frost & Sullivan, August 1975

This lengthy report analyzes the European market for current and advanced industrial robots from 1975 to 1985 and contains infor-

mation obtained through interviews, questionnaires, product data and R&D data from laboratories in the U.S., UK and Japan. The report identifies market areas, robot applications and machine evolution. Microcomputers are noted to be used in the artificial intelligence of these systems, however it is not a discussion of design criteria. The report is useful for identifying possible microcomputer applications in future robots.

"Using A Microprocessor: A Real-Life Application Part 1"

James D. Logan, Paul S. Kreager, Washington State University

Computer Design September 1975

A very enlightening article that presents the complete implementation of a microcomputer-based system. This is the first of two parts and describes the hardware required, along with the microcomputer, the interconnections and functions of other components. Although the article is based on the M6800, the details on its implementation and accompanying description of how problems encountered in its development were overcome should prove helpful to those developing their own systems, whether based on this microprocessor or on others.

"Design Your Own Microcomputer By Using Bipolar/LSI Processor Slices"

David C. Wyland, Monolithic Memories
Electronic Design 20 September 27, 1975

An excellent article describing the design of a 16-bit microprogrammable microcomputer that uses 24 ICs. It has an instruction set of 18 commands, cycle time of 300 ns and instruction execution time of 0.9 to 1.2 us. Mr. Wyland's discussion centers mostly around microprogramming the bipolar slices. The particular chip used in the example is MMI's 6701 4-bit microcontroller.

#

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EDUCATION:

MICROCOMPUTER COURSES, SEMINARS, CONFERENCES. Date, title, cost, location, sponsoring organization (addresses on page 20).

October

27- 7 LSI-11 Training Course Maynard MA
Digital Equipment Corp.

November

2- 7 Microcomputers—Principles and Applications \$595 Oak Brook IL National Engineering Consortium Inc.

3 PROM Programming—A Systems Approach Free San Jose CA Data I/O Corp.

3- 5 SEMICON/Europa Zurich Switzerland Golden Gate Enterprises Inc.

3- 6 Microprocessor Fundamentals \$395 Miami FL National Semiconductor

3- 7 Advanced Programming \$395 Dallas TX National Semiconductor

3- 7 MicroPac 80 Workshop \$400 Flint MI PCS Inc.

5- 7 How To Put Microprocessors To Work For You \$395 Cleveland OH Microcomputer Technique

5- 7 Microprocessor Software Development \$395 Glendale CA R. V. Weatherford Co. Contact your local branch.

6- 7 MCS-80 Workshop Los Angeles CA Hamilton/Avnet Electronics

10-13 IMP-16 PACE Applications \$395 Miami FL National Semiconductor

10-13 Microprocessor Fundamentals \$395 Santa Clara CA National Semiconductor

11 6800 vs 8080—A Side by Side Comparison \$135 Dallas TX Integrated Computer Systems

12-14 How To Put Microprocessors To Work For You \$395 Palo Alto CA Microcomputer Technique Inc.

12-14 Military Microprocessor Systems \$395 Dallas TX Integrated Computer Systems

17-20 Advanced Programming \$395 Miami FL National Semiconductor

17-20 IMP-16 PACE Applications \$395 Santa Clara CA National Semiconductor

18 6800 vs 8080—A Side by Side Comparison \$135 Boston MA Integrated Computer Systems

18 1975 Western Microcomputer Show Palo Alto CA Contact W. R. Dunn

18-20 How To Design With Programmed Logic \$300 Denver CO Pro-Log Corp.

18-20 Microcomputer Application Workshop San Diego CA Naval Electronics Lab

19-21 How To Put Microprocessors To Work For You \$395 Long Island NY Microcomputer Technique Inc.

19-21 Military Microprocessor Systems \$395 Boston MA Integrated Computer Systems

19-21 1975 Systems Engineering Conference Las Vegas NV American Institute of Industrial Engineers

24 6800 vs 8080—A Side by Side Comparison \$135 Ottawa Ont. Integrated Computer Systems

25-27 Military Microprocessor Systems \$395 Boston MA Integrated Computer Systems

December

1 PROM Programming—A Systems Approach Free San Jose CA Data I/O Corp.

1- 4 Advanced Programming \$395 Santa Clara CA National Semiconductor

1- 4 IMP-16 PACE Applications \$395 Dallas TX National Semiconductor

1- 4 Microprocessor Fundamentals \$395 Miami FL National Semiconductor

1- 5 How To Design With Programmed Logic \$300 Monterey CA Pro-Log Corp.

3- 5 How To Put Microprocessors To Work For You \$395 Philadelphia PA Microcomputer Technique

8-11 Advanced Programming \$395 Dallas TX National Semiconductor



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- 8-11 IMP-16 PACE Applications \$395 Miami FL National Semiconductor
- 8-11 Microprocessor Fundamentals \$395 Santa Clara CA National Semiconductor
- 8-12 MicroPac 80 Workshop \$400 Flint MI PCS Inc.
- 8-19 LSI-11 Training Course Maynard MA Digital Equipment Corp.
- 10-12 How To Put Microprocessors To Work For You \$395 Denver CO Microcomputer Technique
- 14-19 Microprocessors & Minicomputers—Interfacing and Applications \$325-\$360 Blacksburg VA American Chemical Society
- 15-18 Advanced Programming \$395 Miami FL National Semiconductor
- 15-18 IMP-16 PACE Applications \$395 Santa Clara CA National Semiconductor

January

- 5 PROM Programming—A Systems Approach Free San Jose CA Data I/O Corp.
- 5- 8 Advanced Programming \$395 Santa Clara CA National Semiconductor
- 5- 8 Microprocessor Fundamentals \$395 Dallas TX National Semiconductor
- 12-15 IMP-16 PACE Applications \$395 Dallas TX National Semiconductor
- 19-22 Advanced Programming \$395 Dallas TX National Semiconductor
- 19-22 Microprocessor Fundamentals \$395 Miami FL National Semiconductor
- 26-29 IMP-16 PACE Applications \$395 Miami FL National Semiconductor

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American Institute of Industrial Engineers, 25 Technology Park/Atlanta, Norcross GA 30071 (404) 449-0460

Data I/O Corp., 990 E Arques, Ste 106, Sunnyvale CA 94086 (408) 732-8246

Digital Equipment Corp., Phil Landry, Educational Services Dept., 146 Main St, Maynard MA 01754 (617) 897-5111 X4900

Dunn, W R, 3855 Corina Way, Palo Alto CA 94303 (408) 984-4499

Golden Gate Enterprises Inc., 1333 Lawrence Expy, Santa Clara CA 95051 (408) 241-7400

Hamilton/Avnet Electronics, Dick O'Melveny, 10950 Washington Blvd, Culver City CA 90230 (213) 558-2665

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

Microcomputer Technique Inc., 11227 Handlebar Rd, Reston VA 22091 (703) 620-9676

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

National Semiconductor Corp., Microprocessor Training Center, 2900 Semiconductor Dr, Santa Clara CA 95051 (408) 732-5000 X7183

Naval Electronics Lab, W J Dyka, Code 4050 San Diego CA 92152 (714) 255-6454

PCS Inc., 5467 Hill 23 Dr, Flint MI 48507 (313) 767-8920

Pro-Log Corp., 852 Airport Rd, Monterey CA 93940 (408) 372-4593

FINANCIAL:

11.3% GROWTH FOR 1976

The electronic industry should pull out of the current recession in 1976 to an 11.3% upsurge, according to Gnostic Concepts Inc.'s new 517-page electronic industry econometric forecast. The upsurge should be felt by nearly all sectors in the electronic industry. Briefly:

- o Military electronics should grow 7.6% in 1976 with a significant decline in 1977-78,
- o Industrial electronics should begin to grow in 1976 to wind up the year with a 16.48% increase,



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- o Instrumentation should show a 12.7% growth,
- o Telecommunications will remain weak in the first part of 1976,
- o Microcomputers and minicomputers should finish 1975 with a 10% increase to be topped by a 30% growth in 1976,
- o No growth in medium mainframes are expected,
- o Large frame computers should increase 8%,
- o Business/retail electronics should recover strongly by the fourth quarter of 1976, and
- o IC sales are projected to increase by \$75 million to a total of \$550 billion for 1976.

Although Gnostic Concepts reports a strong growth for 1976, the forecast does issue a warning that real growth would probably disappear in 1978, reflecting another recession and a return to double-digit inflation.

EUROPEAN MICROCOMPUTER USAGE

Microcomputer usage in Europe, at a \$10 million level in 1974 will explode 60-fold to become a \$600 million market by 1984, according to a new study by Frost & Sullivan, Inc. It was noted that cumulative shipments over the decade will tally \$2.5 billion. Of that total, microprocessor components will account for \$1 billion; memories for \$850 million with ROM memories at 29%, RAM memories at 71%; I/O interfaces for \$550 million; and other ancillary circuits for \$75 million.

The two-volume, 622-page study concludes that the microcomputer market is currently dominated by U.S. designs, but the first European and Japanese units are now becoming available, with the Japanese companies, in particular, promising to offer serious competition in Europe after 1975.

BRITISH COMPUTER SALES UP

The U.S. Chamber of Commerce has reported that computer and related equipment sales in Britain were \$1 billion for 1974 with an expected 15% increase forecasted for 1975. Exports were \$505 million and imports were \$830 million. The minicomputer and microcomputer are expected to grow about 20% annually.

COMPANY ADDRESSES FOR THIS ISSUE:

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

Algorithm Technology Inc., P O Box 1910, Prescott AZ 86301 (602) 445-8180

American Microsystems Inc., 3800 Homestead Rd, Santa Clara CA 95051 (408) 246-0330

Analogic Corp., 1G Audubon Rd, Wakefield MA 01880 (617) 246-0300

Analog Devices, Rt 1, Industrial Pk, Norwood MA 02062 (617) 329-4700

BYTE, Green Publishing Inc., Peterborough NH 03458 (603) 929-3873

Dedicated Computer Systems, 750 Westmount Rd West, Kitchener, Ont. N2M 1S3 Canada (519) 576-3808

Digital Equipment Corp., 1 Iron Way, Marlboro MA 01752 (617) 897-5111

Eagle Signal, 73G Federal St, Davenport IA 52803 (319) 326-8111

E & L Instruments, Derby CT 06418 (203) 735-8774

Entrex, Inc., 168G Middlesex Tnpk, Burlington MA 01803. (617) 273-0480

Extensys Corp., 1114 Abby Wood Ct, Los Gatos CA 95030 (408) 378-3460

Fairchild Integrated Circuits Group, 464 Ellis St, Mountain View CA 94042 (415) 962-3816

Frost & Sullivan, Inc., 106 Fulton St, New York NY 10038 (212) 233-1080

General Automation, 1055 S East St, Anaheim CA 92805 (714) 778-4800

Gnostic Concepts Inc., 2710G Sand Hill Rd, Menlo Park CA 94025 (415) 854-4672

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

IBM, 44 Montgomery St, 15th Fl, San Francisco CA 94104 (415) 545-2263

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Micro Systems Software, 335 W Olive #216, Sunnyvale CA 94086 (408) 735-1650

Mits Inc., 6328 Linn NE, Albuquerque NM 87108 (505) 265-7553

Monolithic Memories Inc., 1165 E Arques Ave, Sunnyvale CA 94086 (408) 739-3535

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

Mostek Corp., 1215 W Crosby Rd, Carrollton TX 75006 (214) 242-0444

Motorola Semiconductor, P O Box 2953, Phoenix AZ 85062 (602) 244-4826

Mycro-Tek, 6631 E Kellogg, Suite 214, Wichita KS 67207 (316) 686-3311

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Western Digital Corp., 3128 Red Hill Ave, Newport Beach CA 92663 (714) 557-3550

Zentec Corp., 2390 Walsh Ave, Santa Clara CA 95050 (408) 246-7662

MICROCOMPUTER STUDIES AVAILABLE:

EDN Microprocessor Design Series \$6.95

Microprocessor Reprints, EDN Magazine, 221 Columbus Ave, Boston MA 02116

Microcomputer Digest \$28

Microprocessors: Economics/Technology/Applications Arthur D. Little Inc., 25 Acorn Pk, Cambridge MA 02140 (617) 864-5770

Microprocessors, Electronics Book Series \$8.95 McGraw-Hill Publications Co., 1221 Ave of the Americas, New York NY 10020

Microprocessor Field Survey & Data Book \$495 for first copy, \$55 each additional copy. AH Systems Inc., 9710 Cozycroft Ave, Chatsworth CA 91311 (213) 998-0223

Microprocessor Handbook \$24.95 Texas Instruments, P O Box 5012, Dallas TX 75222 (214) 238-2011



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Minicomputer & Microcomputer \$595
Industrial Market For Microcomputers \$445
 Lucy Hendry, Frost & Sullivan, Inc., 106 Ful-
 ton St, New York NY 10038 (212) 223-1080

New Components and Subsystems for Digital
 Design \$75 Technology Service Corp., 2811
 Wilshire Blvd, Santa Monica CA 90403 (213)
 829-7411

Programmed Learning Course On Microcomputers
 \$99.50 Six volume set. Iasis Inc., 770
 Welch Rd, Suite 154, Palo Alto CA 94304
 Bob Warr (408) 329-0110

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 land, 1114 Abby Wood Ct, Los Gatos CA 95030
 (408) 378-3460

SYSTEMS APPROACH TO PROM PROGRAMMING: A free
 monthly course designed to answer the hows
 and whys of PROM programming and programming
 equipment, Data I/O, 960 E Arques, Suite 106,
 Sunnyvale CA 94086 (408) 732-8246

MICRO SYSTEMS SOFTWARE, 355 W Olive #216,
 Sunnyvale CA 94086 (408) 735-1650. George
 Fraine, Richard Ware. uP system support pro-
 grams (assemblers, simulators, etc.), engin-
 eering applications programming for uC.

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 for debugging microprocessor-based hardware.
 Also product development service. Arthur D.
 Little Inc., Acorn Pk, Cambridge MA 02140

EMPLOYMENT OPPORTUNITIES:

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 Canada and Europe. To develop uC software
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 lecturing preferred. Integrated Computer
 Systems, Box 2368, Culver City CA 90230
 (213) 559-9265 Ms. Morgan

WESCON—MICRO WRAP UP

(from page 6)

utilizes multiprocessor techniques. The Sen-
 tury II tests microprocessors and equivalent
 memory components. The company has booked 14
 orders for the \$250,000 to \$350,000 systems.
 This is the second such tester announced by
 Fairchild.

Data Products Memories Ltd. exhibited
 their high speed core memory systems with 8K
 and 16K capacities and a medium speed line
 printer for micro-and minicomputers, communi-
 cations systems and general purpose computers.

OEM Morsco presented their 4K x 8 memory
 card, compatible with the Altair 8800 and the
 8080A bus system. The card features a 400 ns
 access time and a \$200 price tag.

Speed and versatility in printing and plot-
 ting computer generated data electrostatically
 was demonstrated with the 5200 Electro-
 static printer/plotter by the Instrument Sys-
 tems division of Gould Inc.

Algorithm Technology, Inc. demonstrated
 their microcomputer-controlled wiring analyz-
 er for back plane panels, card racks, cables,
 harnesses and other wired assemblies expand-
 able in 64-node increments. The unit is
 priced at \$13,120.

The Digitrend 220 Data Logger that incor-
 porates an Intel 8008 microcomputer was dis-
 played by Doric Scientific Corporation along
 with four new options: Keytemp Model 4304
 remote manual access keyboard; Satellite
 Booster Option 266 for sensors over 3,000
 feet away; RTD Multiplexing Option 52 for 4-
 wire bridge inputs; and Alarm-Store Option
 Group for setting up to 4,000 individual
 alarm set points in a 1,000 point scanning
 system. Doric also introduced their latest
 LSI Series 400 digital temperature trendica-
 tor.

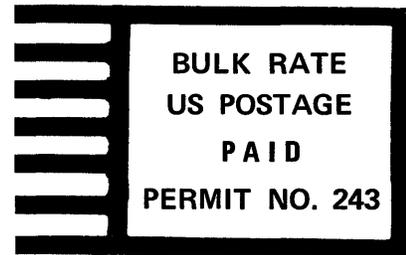


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