

MICROCOMPUTER DIGEST

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May, 1976

16-BIT NOVA MICROPROCESSOR

A new 16-bit, single chip, 40-pin Nova-compatible microprocessor has been unveiled by Data General. The N-channel silicon-gate MOS device features upward compatibility with Data General's Nova minicomputer software, an accumulator load time of 2.9 us, built-in hardware multiply-and-divide, real-time clock, refresh circuitry for 4K RAMs interleaved with the instruction cycle, and the Nova 3 hardware stack. (cont'd on page 2)

SIGNETICS/SMS 300 PACT

Scientific Micro Systems, Inc. and Signetics Corp. have announced a second-source agreement allowing Signetics to manufacture SMS MicroController components.

Covered under the agreement are the SMS 300 microprocessor, and the SMS 360, 361, 362, and 363 interface vector (IV) Bytes. These components are part of SMS' MicroController system designed for control and communications interfacing applications. (cont'd on page 2)

INTEL'S PROM-RAM-I/O CPU

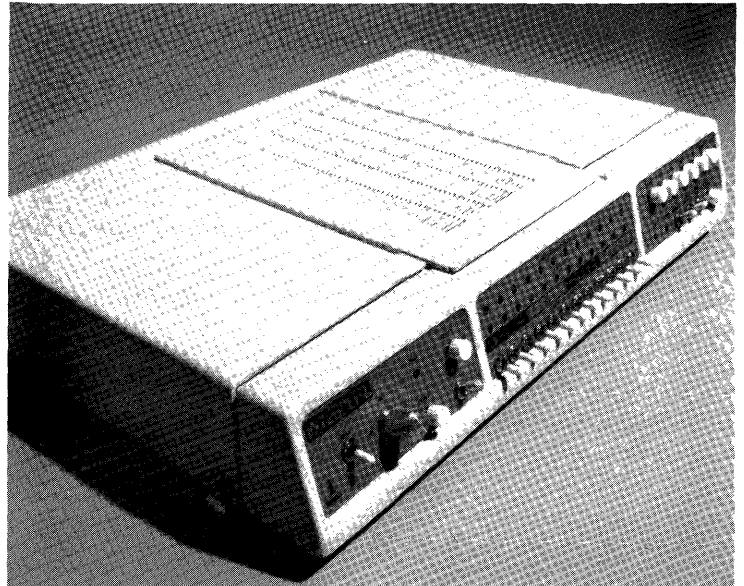
Details of Intel's 8-bit 8048 microprocessor are being slowly leaked out through various news articles and customers supplied with advanced information.

To date the chip is said to contain a 1K x 8 PROM (ultraviolet erasable), 64 x 8 static RAM, 8-bit CPU, a programmable interval or event timer and four 8-bit I/O ports.

The 40-pin chip uses only a single 5V supply. The PROM is used to store program in- (cont'd on page 2)

IM6100 μ C DEVELOPMENT SYSTEM

Intercept, a new Microcomputer Development System introduced by Intersil, utilizes Intersil's IM6100 12-bit CMOS microprocessor. The bench top Intercept duplicates all functions and timing of the microprocessor, making it useful for evaluating Intersil's entire family of IM6100 related devices in typical configurations. It provides easy access for I/O devices through a built in TTY interface, as well as plug-in capability for additional memory and a complete control panel for man-machine interface.



Since the IM6100 is compatible with Digital Equipment Corp.'s PDP-8 software, Intercept will operate with basic PDP-8/E papertape programs without any software or hardware modifications. (cont'd on page 2)



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SPECIAL FEATURES

16-BIT NOVA MICROPROCESSOR

The N601 will be marketed as an OEM product available in either single chip, OEM board, mini or prototyping system configuration. The N601 will be priced at \$225 in single unit quantities and \$95 in 100 lots.

Two special interface chips, the N636 bipolar transceiver and the N603 I/O controller, were designed to allow the N601 to simulate the 47-line all-parallel Data General I/O bus by software. The N636 interfaces the microprocessor to a serial bus while a N603 is required at each peripheral location to reformat the bus into the equivalent of the standard Nova I/O format.

Data General spokesman did note that a front panel console will not be offered for the micro and that Data General is not considering a second source supplier for the chip.

IM6100 μ C DEVELOPMENT SYSTEM

Intercept is housed in a desk top cabinet measuring 10-3/4" by 16 1/2" by 2-7/8". It provides a 9-pin connector for TTY interface, and two uncommitted 25-pin connectors at the rear of the case. The instrument has fully buffered tri-state TTL compatible bus structure with external access for user options. Power is provided by an integral 5V, 3A supply with 1A available for user options.

There are three component parts of Intercept. The first is a module, 6902-CPU TTY, which forms the nucleus of the system and contains the IM6100 microprocessor and a PDP-8/E compatible interface that includes the Intersil IM6402 UART and logic required to transfer data from the microprocessor to a TTY keyboard-reader and printer-punch. Since the module is intended for prototyping, it contains provisions for stopping the free running crystal oscillator and introducing an external TTL compatible clock.

A second module, 6901-M4KX12, is a 4K x 12 CMOS RAM unit consisting of 48 Intersil IM6508 RAMs.

The third component part of Intercept is the control panel unit, 6900-CONTRL, made up of the external housing and front panel controls of Intercept, plus a PC module containing control panel logic and memory.

Intercept is available on 4 weeks delivery, and is priced at \$2,850 per unit.

SIGNETICS/SMS 300 PACT

To aid in the development of SMS 300-based system, a real-time design support instrument called MCSIM (MicroController SIMulator) has been developed by SMS.

The 300 is a single-chip bipolar microprocessor featuring eight instructions, all of which execute within a 250ns cycle. The chip was designed specifically to handle complex communications and control tasks by directly addressing, manipulating and testing individual bits and groups of bits on the I/O interface.

The SMS IV Bytes are LSI components which provide efficient I/O for the SMS 300. When the CPU is coupled with the IV Bytes, they treat the addressed byte as an internal register. This allows simplified system architecture. By directly addressing 512 IV Bytes, up to 4096 I/O points can be accessed.

INTEL'S PROM-RAM-I/O CPU

structions and can be expanded by an additional 1K of external PROM. The on-chip RAM can also be expanded by 256 words externally. All locations in the RAM are indirectly addressable and eight designated locations are directly addressable. The address stack is located in the RAM.

The internal oscillator requires an external frequency source from either a crystal, series RC network or clock input.

The instruction set includes a repertoire of 11 direct register, 12 RAM, 6 direct I/O, 10 indirect I/O, 2 jump, 4 conditional jump and 26 accumulator instructions.

The chip's peripheral interface will allow the CPU to communicate with an external memory, 8080 peripheral devices or another 8048.

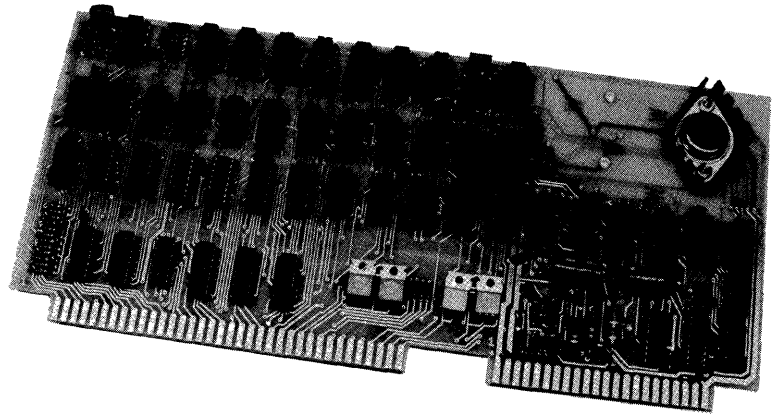
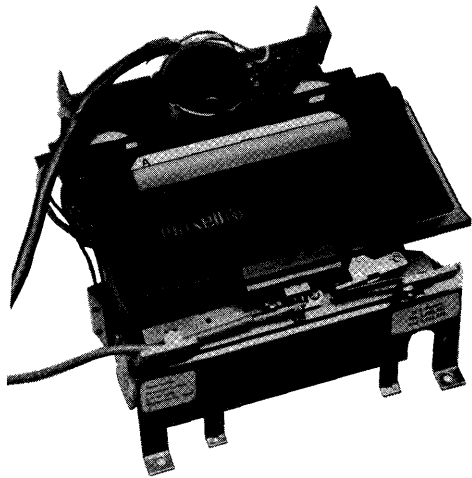
The microprocessor will be available in two
(cont'd on page 4)



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1,000,000 BYTES ON-LINE!



The Digital Group Cassette Storage System

The Digital Group Cassette Storage System gives you total magnetic tape data storage and retrieval for your microprocessor, capable of operating 1 to 4 computer-controlled Phi-Deck cassette transports. Within seconds (20 at most), your system zips to any of over one-quarter million 8-bit bytes per drive. And that really puts it all on-line!

The Digital Group Cassette Storage System is ideal for:

- Large data files — names, accounts, etc.
- Indexed computer-controlled program files
- Sorts
- Inexpensive mass storage
- Work files
- Indexed random retrieval
- Multi-pass compilers
- System residence

In addition, with a Digital Group System and a Phi-Deck transport, your total load procedure is reduced to a single action — turning on power. Everything else is automatic! Your Digital Group System is completely ready for use in a very few seconds. And you avoid a large investment in single-use PROM memory.

MAJOR STORAGE SYSTEM COMPONENTS

1. Controlling and Formatting Interface — single card for 1 to 4 drives
2. Software Operating System
3. Computer-controlled Cassette Drive(s)

Selected Specifications

Data Rate: 800 bytes per second, 8K loads in 10 seconds
Media: High-quality standard audio cassettes
Search Speed: 100 inches per second
Tape Speed: 5 inches per second

Power Requirements: +12V to +20V at .7A peak and +5V at 1A plus 60ma per drive
Port Requirements: One 8-bit parallel input port plus two 8-bit parallel output ports
Cassette Drive is an enhanced Phi-Deck with a digital head, cast head bar, stronger capstan, and four-foot cabling.

SOFTWARE OPERATING SYSTEM

8080 based — 650 bytes
Error Detection: CRC
Retries after soft errors
Automatically bypasses hard errors
Block size = 1 to 256 bytes or multiple of 256 bytes

Functions supplied:

- Record multiple blocks
- Record 1 block
- Read 1 block
- CRC check
- Fast reverse
- Fast forward
- Search for block

For more information, drop us a line or call . . . but by all means, get on our mailing list.

Prices: Interface — full kit PHI-F \$135 ppd
Each Drive — assem. PHI-1 \$115 ppd



THE DIGITAL GROUP INC

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DENVER, CO 80206
(303)861-1686

basic versions. One will have a quartz window for multiple programming of the PROM while another will be window-less for one-time only programming.

TECHNOLOGY

RAYTHEON 2900 READY SOON

Raytheon Semiconductor will be offering later this month the first of their second-source 2900 bipolar microprocessor bit slice devices. Raytheon had entered the cross-license agreement in the latter part of 1975, with AMD supplying detailed technical assistance. No price has yet been announced.

12-LEAD TO MICROPROCESSOR

A London firm, Pye TMC Ltd., has announced their MOS microprocessor that is housed in a 12-lead TO-package. Designed specifically for telecommunications applications, the micro is different from other designs in that it functions only as a filter and does not depend on software for versatility.

The micro can emulate any filter and provides control over, amplitude, phase and group delay.

Pye has recently been awarded a \$240,000 contract by the Royal Aircraft Establishment to extend the device's capabilities into RF.

NEC ADDS TO 8080 FAMILY

Two high-performance 8080A microprocessors have been added to the uCOM-8 product line of NEC Microcomputers Inc. to give the company a 4-processor offering competitive with other firms in the microcomputer field.

The uPD8080A-2, with a clock frequency of 2.5 MHz, is 25% faster, and the uPD8080A-1, with a 3.0 MHz clock frequency, is 50% faster than NEC's standard 8080A processor, which has a 2.0 MHz clock. NEC also offers an economical 1.25 MHz clock processor, the uPD8080A-E.

Two unique features of the NEC microcomputers are a BCD subtraction as well as addition capability, and a register-to-register move instruction time of four clock periods.

Both new microprocessors are N-channel, 8-bit parallel units with TTL compatibility. Standard features of the NEC 8080A processors include a 78 instruction repertoire, software and pin compatibility with other 8080A type processors, multibyte interrupt handling, and automatic stack operation with 16-bit stack

pointer.

The capability of the NEC 8080A processors to accept, upon interrupt, an instruction of three bytes, means that a CALL instruction can be inserted so that any address in the memory can be a starting location for an interrupt handling routine.

This allows a separate location to be assigned for each interrupt operation, and, as a result, no polling is required to determine the interrupt sources. In essence, each interrupt is uniquely identified.

In addition, the Decimal Adjust Accumulator instruction in the repertoire operates correctly after subtraction, as well as after addition, so that BCD subtraction can be performed at the same speed as BCD addition. No special subroutine is required.

TRANSITRON DELAYS μ P

According to a recent article in Electronic News, Transitron's microprocessor will probably not be ready for formal introduction until September 1976.

Reasons cited for the delay involved complication in the firm's microprocessor development and bipolar Schottky process technique. The firm's 16-bit microprocessor will be implemented in six chips and complemented by a host of hardware and software support products.

MOS TECHNOLOGY DROPS 6501

MOS Technology has dropped their MCS6501 microprocessor which was pin-compatible with Motorola's MC6800. MOS Technology will continue to produce and market the MCS6502 and four other microprocessors in its 6500 family.

MICROCOMPUTER-BASED PRODUCTS

CONTROL μ C DESIGN SYSTEM

The 4060 microcomputer system from International Microsystems, Inc. has been designed to solve many of the problems facing the system engineer. Packaged in full or half size Cambion bin with a swingout front panel, the 4060 can easily be adapted as the center of a control system.

It comes ready to use with a prewired back plane, terminal I/O connectors and a triple voltage power supply which can be mounted either inside or outside the bin. The 4060 microcomputer includes Intel's 4040 on the 4041 CPU board, the 4050 terminal control

board, a front panel PC board supporting all control switches and a specially designed extender card.

The 4060 is supported with two software packages and is documented with five different manuals. Hardware debugging software is supplied as a preprogrammed PROM which allows the user to quickly test his custom interfaces using the front panel controls. The series 4000 System Monitor permits the loading and modification of software in RAM memory before committing the program to PROM memory.

A detailed manual is provided on each of the following: the 4041 CPU board, the 4050 terminal interface board, the series 4000 System Monitor, the series 4000 Test PROM and the 4060 microcomputer system.

International Microsystems is also offering the 4041-A CPU board with one test PROM, 8-2102 RAMs and sockets for 4 PROMs (\$295); 4045 Control board for terminal or TTY interface and front panel logic plus one unstuffed front panel printed circuit board (\$165); and the 4045 which includes a 4045 with front panel board ready to use with 3 hex LED displays, 1 hex switch, and 6 switches to monitor and control system (\$245). The complete 4060 is priced at \$1195.

SMART TAPE CARTRIDGE SYSTEM

An Intel 4040 microcomputer is the heart of a new tape cartridge system recently announced by VMF Industries. The unit is RS232C compatible and uses the 3M data cartridge.

A dual, 4-track system has been priced by the firm at \$5,000.

RUGGEDIZED MICROCOMPUTER

Intel Corp. has announced a program that allows low-cost microcomputer systems to be used in hostile temperature environments as well as in the normal commercial temperature range.

The MCS-40 microcomputer system components are now available with performance guarantees over the -40°C to $+85^{\circ}\text{C}$ temperature range. Guarantees, such as CPU speed, are similar to those of MCS-40 components specified for 0°C to 70°C operation. The system's key specification, CPU clock period range, has not been changed. It is guaranteed over the -40°C to 85°C range at 1.35 μs minimum to 2.0 μs maximum with supply tolerances of $\pm 5\%$ for both the 4040 and 4004.

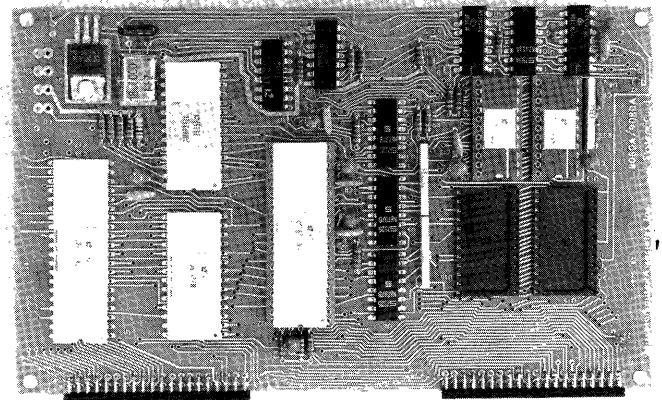
The guarantees of other components, such as the maximum access times of memory units, are compatible with those of the CPU. Some minor modifications have been made in the speed and drive currents of certain components.

In 100-up quantity, the cost of a typical basic system is \$45 (4040 CPU, 4201 Clock Generator and 4308 1-kilobyte ROM and I/O unit).

SINGLE BOARD OEM COMPUTER

Microcomputer Associates has announced that they have entered volume production of their 8080A/9080A OEM single board computer.

The 8-bit system features the microprocessor, crystal controlled clock, 1K x 8 RAM, 2K x 8 ROM sockets or 4K x 8 mask ROM, programmable peripheral interface, asynchronous/synchronous receiver transmitter, DMA capability, 24-bidirectional I/O lines, interrupt capability and +12, +5 and -10V supplies



The microcomputer is housed on a compact 4.25" x 7" PC card and is fully assembled and tested prior to shipment. The OEM board is fully guaranteed over the 0° to 70° temperature range.

The board is priced at \$375 in single unit orders and \$295 in 100 lots. Quantity and OEM discounts are available upon request. Delivery is 30-45 days ARO.

THE WAND HAS A BRAIN

The hand-held and controlled KT-3 OCR Wand uses a microcomputer to read typed or printed characters at a rate of 50 cps. Manufactured by Key Tronic, the character recognition unit, sells for \$3,250.

A text editing terminal system has been added to the OP-1 user programmable microcomputer-based terminal series by Ontel Corp. The system provides high speed text processing and work wrap-around capability. Up to 12K bytes of memory are available as a working buffer.

Similar to Ontel's other OP-1s, this unit is controlled by three LSI microprocessors, a display, and an I/O microcomputer. The basic OP-1 text editing system is priced at \$2,325 in 100 quantities.

REMOTE PROCESSORS

The System 600 series, just introduced by Entrex, is a new family of remote processors for master file inquiry, security, batch and interactive communications. The systems are microcomputer controlled.

System 600/20 is a single terminal system with a 32K CPU and 630K floppy disc. The 600/30 uses up to eight terminals, a 48K CPU and 315K floppy disc and 4.8M disc. The 600/50 can simultaneously control up to 16 terminals and uses a 64K microcomputer system with 264M disc memory.

The 600/20 leases monthly for \$677; \$1,261 for the 600/30 and \$3,148 for the 600/50.

MOSTEK LOWERS F8 PRICES

Mostek Corp. has announced lower prices for its F8 microcomputer evaluation package (Survival Kit), from \$195 to \$147 unassembled (MK79001) and from \$250 to \$185 assembled (MK79002).

The Survival Kit includes the F8 CPU, Program Storage Unit (PSU), Static Memory Interface (SMI), 1K x 8 RAM Fortran IV Cross Assembler for 16-bit computers, 2.0 MHz crystal, two CMOS buffers, and a 6.75" x 5.5" printed circuit board.

120CPS μ C TERMINAL

Tally Corp. has introduced its new 120 cps Model 1200 dot matrix serial printer. The 132 column data processing unit, second in a series of low cost serial printers, features a new low noise cover for exceptionally quiet operation.

Designed for reliable operation, the Model 1200 uses a minimum of moving parts, stepper motor print head advancement and 8080A microcomputer controlled electronics. Other unique

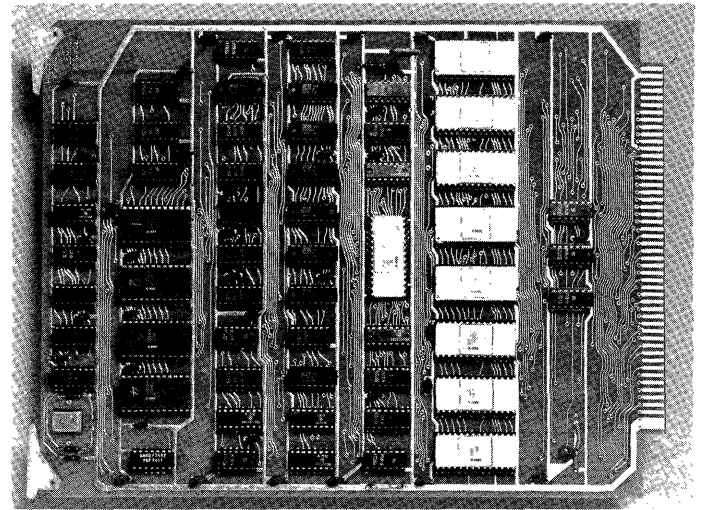
features include dual tractor engagement above and below the print line for positive paper advancement and positioning, and a convenient snap-in ribbon cartridge for easy ribbon replacement. Slew speed in 10 inches per second.

The Model 1200 prints an original plus four carbon copies and handles form widths from 4 to 15 inches. Specifications include 6 lines per inch line spacing, 10 characters per inch character set and a 9 x 7 half-space matrix character. Options include an upper/lower case 96 character set and a 2-channel VFU.

The printer will offer a selection of interface controllers for data communications applications, for direct plug compatibility with popular minicomputers and for emulation of other printers.

Unit price for the Model 1200 starts at \$2575. Quantity discounts are available. Delivery is 90 days ARO.

300 BIPOLAR μ C HEART OF ADAM



Logical Machine Corp. has added a new "microprogram" to their ADAM computer line. The "microprogram," as the company terms the processor, is an Intel 3000 bipolar microcomputer that is now directly controlling the entire ADAM computer.

The ADAM business computer requires no pre-prepared software and uses English as its language. Only two PC boards are used; the CPU and an Intel Main Memory module containing 32K bytes. A diagnostic microprogram on a special set of ROM is included for automatic system checkout.

ADAM is priced at \$39,995 in single unit quantities.

NEW SERIES OF 8080 μ C'S

Featuring tape cassette, I/O, software and an optional printer, Information Control Corp. has introduced a series of 8080A-based microcomputers. The systems are available in either assembled or kit versions. Prices for the basic systems begin under \$1,000.

2640 SHORT-TERM LEASE

Hewlett-Packard Company is now implementing a short-term lease program for its 2640 and 2644A CRT data-terminal product line.

Under the program, customers may select from leases of 6, 12 and 18 months in length. The amount of monthly payments, depending on lease duration, are 8%, 5-1/4% and 4-3/4% of product list prices respectively. During the lease, HP will provide full weekday service at no additional cost.

After its initial term has expired, the lease may be continued on a month-to-month basis and may be terminated any time by the customer giving a 30-day notice.

MICROCOMPUTER CONCEPTS

Microcomputer Concepts, Inc. is currently offering several hardware and software microcomputer systems.

These include an IMP-16 microcomputer system with floppy disc operating system. Interfaces are available for RS232C, floppy disc, high speed printer, high speed tape reader, high speed tape punch, serial digital transmission, cassette tape deck, hexadecimal entry/display, core memory adapter, and CRT.

An IMP-4 microcomputer system is also offered with interfaces for RS232C, keyboard input, core memory adapter, telephone dialer, printer character generator, universal I/O port, multiplexed display output, cassette tape deck, bulk tape deck, capacitance switch input, and memory expansion page register. The PACE microcomputer system available includes interfaces for RS232C, relay/solenoid drivers, BCD column printer, 15-bit I/O port, keyboard input, non-volatile memory adapter, and display output.

Stock software packages for the IMP-16, IMP-4 and PACE microcomputers include FDOS, debuggers, assemblies, text editors, PROM programming software, linkage editor, and peripheral exchange packages.

Microcomputer Concepts has developed several microcomputer-based products for applications in navigation systems, process control, intelligent terminals, electronic games, and communications.

μ C-BASED TERMINAL

Data Terminals and Communications (DTC) has announced the DTC-302 Hy-Writer KSR hard-copy terminal. Utilizing the Diablo Hytype II printer and an LSI microcomputer-based controller that is upward compatible with the popular and still available DTC-300/S, the 302 Hy-Writer offers a user even more flexibility in data rates, error checking and terminal interlock features.



The 302 Hy-Writer is capable of print speeds of 45 cps. This, together with a new buffer optimization and monitor technique, allows the 302 Hy-Writer to operate at optional data rates to 1200 baud.

Price of the DTC Hy-Writer is \$3,490 in single quantities with delivery in 15-20 days ARO.

MICROCOMPUTER SOFTWARE

2900 HIGHER LEVEL LANGUAGE

Zeno Systems, Inc., of Santa Monica, CA, announces the availability of a high-level programming language compiler called DAPL for programming the Advanced Micro Devices 2900 family of 4-bit bipolar microprocessors.

DAPL is the first high-level programming language for this class of 4-bit microprocessors. Zeno will soon have the language avail-

(cont'd on page 8)

able for other popular microprocessors, including the Monolithic Memories 6700 and the Texas Instruments SBP-0400. DAPL provides four levels of programming capability, covering the complete range from simple bit patterns through register transfer notation. DAPL also provides extensive error checking facilities as well as the ability to handle various device dependent considerations such as PROMs and PLAs.

Other DAPL features include microprograms up to 8192 words by 256 bits, free form syntax, flexible commenting formats, and commands for formatting the source program listing, paper tape output in a format acceptable to most PROM writers, commands for conveniently locating program segments at specific word or ROM boundaries, a symbolic macro substitution facility, a complete variable cross-reference listing, special features for supporting PLAs, and the ability to use DAPL as an assembler for an arbitrary machine implemented using bipolar slice architecture.

Zeno Systems has also announced the availability of an advanced macro cross-assembler for the MOS Technology 6500 microprocessor which operates on both IBM 360/370 and DEC PDP-10 computers. The ZSI assembler is written in assembly language in both cases and is more cost effective than competing packages written in FORTRAN.

The assembler is functionally equivalent to the software provided by the manufacturer with the additions of normal arithmetic capability.

RELOCATABLE ASSEMBLER/LOADER

A new relocatable MACRO assembler and linking loader is now available from Process Computer Systems, Inc. Used with the firm's MicroPac 80 microcomputer, the software package can combine separately assembled subprograms into a single operating program.

According to Vice-President Gary Johnson, the new MAS-80R relocatable MACRO assembler and RLL-80 relocating and linking loader eliminate the need to assign absolute memory addresses for each sub-program at assembly time.

With the PCS assembler/loader package, a user can divide a large program into relatively small segments and subroutines. He then assembles these separately, so each takes a minimum of assembly time, even with TTYs. Once he debugs a segment, he never needs to assemble it again. As program development proceeds,

only those segments that need changing are re-assembled, and the RLL-80 loader combines the new relocatable object modules with those previously checked out.

If a user attempts to assemble a large program with so many symbols that it exceeds his RAM capability, the MAS-80R/RLL-80 pair solves the problem by segmenting the program. Further, when different programmers code different program segments, the assembler/loader permits them to use identical symbols when those symbols are local to their segments. Only the global symbols must be unique.

The MAS-80R relocating assembler and RLL-80 relocating and linking loader are now available, only as a set for \$100.

RESIDENT DOS MMI 8080 COMPILER

Control Logic is nearing completion of its resident disc-operated compiler for the firms MMI 8080 program development system. The high-level language is a subset of FORTRAN IV.

The company reports that the language will allow users to pack more statements into a line of code than assembly language and to significantly reduce software development time. However, the compiler will not generate as tight a program as assembly codes. Control Logic will also be generating assembly language loops that can be patched to the compiler.

The 16K FORTRAN compiler with dual diskette drive will be priced at approximately \$11,000.

8080 SDK RESIDENT ASSEMBLER

Microcomputer Technique, Inc. has announced the development of an assembler for Intel's 8080-based System Design Kit (SDK) microcomputer. MTI's assembler is resident and features full compatibility with existing assemblers, relocatable object code, and one, two, or three-pass operation. The assembler can process complex expressions, and a full range of error diagnostics is provided, including the capability to detect a symbol table overflow.

The resident assembler occupies less than 4K bytes of storage, and the object code it produces can be run on any 8080-based microcomputer.

The MTI assembler is available from stock on four preprogrammed PROM chips for \$450. wiring specifications and a brief operations manual will also be provided.

CONTROL DATA OFFERING SOFTWARE

Cross-assembler and simulation software for Intel, Motorola and Fairchild microcomputers are now available on Control Data Corp.'s Cybernet services network.

The cross-assemblers are reported to provide output consisting of a symbol table, source listing and an object module while the simulators duplicate a ROM/RAM environment to allow programmers to observe the output at various points. All software is offered in either batch or timeshare modes and will support second-source products of the above mentioned microcomputers.

Charges are 33 cents per CPU time unit and a connect charge of \$10 per hour.

TINY BASIC

Tiny Basic or Dr. Dobb's Journal of Computer Calisthenics and Orthontia was originally intended to be a three-issue publication disseminating information about Tiny Basic.

Bob Albrecht, president of Peoples' Computer Company (publishing firm), reports that the response has been so overwhelming that Dr. Dobb's Journal will now become a regular monthly publication.

Tiny Basic is a subset of BASIC, an interpretive language that is extremely easy to implement on microcomputer systems with minimal memory. Tiny Basic statements consist only of LET, IF, RETURN, LIST, PRINT, GO TO, END, RUN, INPUT, GO SUB, and CLEAR.

The magazine is totally subscription supported; \$10 per year.

MEMORIES AND PERIPHERALS

NEC OFFERING THREE RAM FAMILIES

Three families of high-speed, low-cost N-channel MOS RAMs and a CMOS RAM will have been introduced by NEC Microcomputers Inc.

The uPD5101C-E is a 22-pin ultra-low-power static CMOS device organized 256 x 4 with an access time of 1000 ns. All inputs and outputs are directly TTL compatible. Data is read out non-destructively and has the same polarity as the input data. This CMOS RAM has separate data input and output terminals and is ideally suited for low power applications in which battery operation, or battery backup for non-volatility, are required. When in

standby, the uPD5101C draws only 10 μ A from a single 2-3V supply.

The uPD2101ALC family of 22-pin fully decoded static RAMs is organized 256 x 4, has separate data I/O terminals, and is pin compatible with the CMOS uPD5101C-E. It has full TTL compatibility and features access time of 250, 350 and 450 ns. A single chip-enable (\overline{CE}) pin is provided for selection of an individual device in systems with bussed outputs. Only a +5V power supply is required. In standby mode, with the power lowered to 1.5V, power dissipation is reduced to 42 mW maximum. Output data is the same polarity as input data, and is non-destructively read out.

The uPD2102ALC family of 16-pin fully decoded static RAMs is organized 1024 x 1, has separate data I/O terminals, and access times of 250, 350 and 450 ns. This family has the same chip-enable pin, I/O polarity and power supply characteristics as the uPD2101 family.

The uPD2111ALC family of 18-pin fully decoded static RAMs is organized 256 x 4 and has common data I/O terminals. Access times are 250, 350 and 450 ns. This family of devices also has the same single chip-enable pin, I/O polarity and power supply characteristics as the uPD2101 family.

MICROCOMPUTER CORE MEMORY

The second microcomputer core memory in Ampex's new family designed for terminal, peripheral and microcomputer applications has been announced. Data access times of 450 ns for the MCM-4300 provides non-volatile storage of 2K, 1K, 512 or 256 x 4. OEM pricing is \$99.95.

μ C STAND-ALONE CORE MEMORY

Plessey Microsystems' new stand-alone core memory for microcomputers is compatible with National Semiconductor's IMP-16 and PACE micros. The PN-NP8 memory is available in either an 8K x 16 or a 16K x 8 configuration.

UNIVERSAL PROM PROGRAMMER

The Data I/O Programmer V is a universal PROM programmer for all PROMs currently on the market. The unit can easily be adapted to any manufacturer's PROM by inserting a new "personality card." Each personality card is a PC board designed specifically for a particular set of PROM characteristics.

(cont'd on page 10)

The complete Programmer consists of a programmable microcomputer controller, power supply, control panel, socket panel comprised of 16 each, 24 pin positive locking programming sockets and one master ROM socket, display, mode select panel for selection and LED display of test programming modes, LED indicators for display of specific ROM status and provisions for paper tape reader mounting. The entire system is packaged in a low silhouette housing and is ready for "gang" programming of up to 16 MOS PROMs of any manufacturer specified at time of order.

Programmers range from 32x8 to 512x8 and include all x4 configurations. Expanded memory and expanded address versions are available.

Accessories include translator cards for converting different tape codes to binary, mark-sense card reader module, data interfaces, production sequences and paper tape perforator.

The basic Programmer V is priced at \$3,400.

2900 MICROPROGRAM SEQUENCER

A second microprogram sequencer for use in bipolar microprocessors or for computer control systems is now available from Advanced Micro Devices.

The Am2911 is a 4-bit element that can generate, increment or store addresses. It is designed for use in any controller, either a state machine or a microprogram situation.

Previously AMD had introduced the Am2909 sequencer that differs from this device in that it has two 4-bit input fields and n-way branching. The 45 ns circuit is designed for high-speed and pipelined microprogrammed systems, especially those built with the company's 2900 bipolar microprocessor and is priced as low as \$7.77 in 100-up quantities.

8080 SUPPORT CHIPS

Three support circuits for use in 8080A microprocessor applications have been announced by NEC Microcomputers Inc. All are available for immediate delivery from stock.

The uPD8212D, an 8-bit I/O port, and the uPD8216D, a bi-directional 4-bit bus driver, are compatible with Intel products, and provide users with their first alternate source for these microcomputer products.

The other new product is a very fast programmable UART, the uPD369D/C, that uses N-channel aluminum gate MOS technology. Functionally identical to the 1602, the NEC UART

has the advantage of operating at transmission speeds up to 50,000 baud. Receiver margins are 43% at the 50K rate.

The uPD369D/C is externally programmable to control word length, baud rate up to 50K, odd/even parity generation/verification, parity inhibition, and data word format. All inputs and outputs are DTL/TTL compatible. The UART operates from standard NMOS power supplies of +12, +5 and -5 volts, and is packaged in a 42-pin ceramic or plastic DIP.

IMP/PACE DATA ACQUISITION SYSTEM

Data Translation has introduced a completely new data acquisition interface system for the National Semiconductor IMP and PACE microcomputers. The new system is designed to fit in one standard slot of the IMP or PACE prototyping system or in the IMP-16C.



The DT1722 data acquisition system requires no additional interfacing and plugs directly into the computer. Modules from Data Translation's own DATA X II series are utilized to

allow up to 64 analog inputs to be accommodated on the single slot board with power supplied from the computer mainframe. A full 16-channel system sells for \$1195.

CMOS MEMORY BATTERY

The Catalyst & Research Corp. is offering a new battery which appears to be able to power a CMOS volatile computer memory for 10 years or more.

The battery is the firm's "Lithode" lithium/iodine solid electrolyte battery, which is presently used in cardiac pacemakers. The battery has a normal output of 2.8V and sells for \$45 to \$50 each.

The company is also equipped to design new, lower cost batteries for high volume users.

DATA I/O CALIBRATOR

Data I/O has developed a unique calibration system consisting of a single Universal Calibrator, with a Program Adapter for each personality card set. Use of the Calibrator ensures Data I/O Programmer compliance to each PROM manufacturer's specifications, thus enabling the PROM user to know within minutes if incidents of low programming yield are device oriented or due to programmer calibration.

The calibration system uses the PROM Programmer itself for all power and control features. The customer supplied DVM (Fluke 8000A or equivalent) is connected to test points on the Universal Calibrator, and the PROM Programmer controls are operated to select the measurement desired. The calibration procedures that accompany each Program Adapter have been approved by the respective PROM manufacturers.

OKIDATA PRINTER

A new 132-column matrix printer that offers significantly greater speed at substantially lower prices has been introduced by Okidata Corp. A new proprietary print head utilizes 22-pin drivers and uses state-of-the-art constant current drivers to more than triple head life.

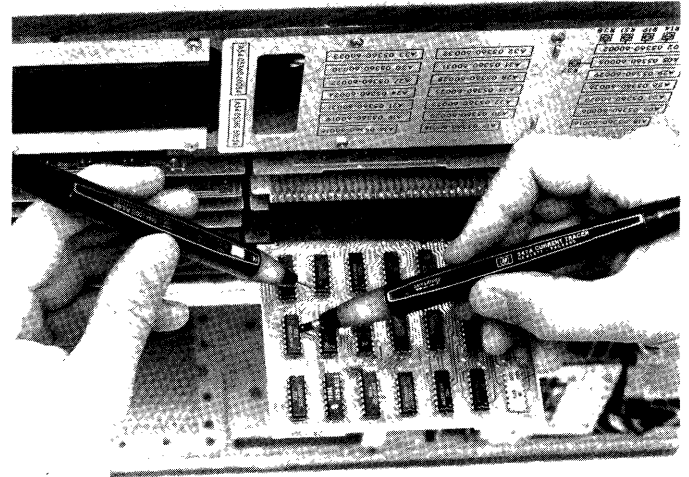
The company's newest printer is a desktop or pedestal-mounted model that produces 132 columns of 5 x 7 matrix characters at 125 lpm or 265 cps continuously with no limitation on the duty cycle. It is available with OEM parallel and RS232 serial interfaces. The

Okidata 132-column printer sells for under \$1,700 in quantities of 100, and is available 60 days ARO.

Standard features include: ASCII set with full upper and lower case, 6- or 8-lines per inch switch selectable, elongated and extended characters, 12 ips paper slew rate, electronic 12-channel VFU and 11 switch-selectable form lengths, ability to use international power sources, operator controlled self-test feature and 5-ply fanfold paper from 5" to 16" wide.

H-P DIGITAL LOGIC PROBES

Two new hand-held probes designed to speed and simplify digital logic circuit troubleshooting have been introduced by Hewlett-Packard. The first, an ultra-sensitive Model 547A Current Tracer, locates low-impedance faults by tracing the flow of current pulses rather than voltage changes in circuit conductors.



The Model 546A Logic Pulser, a miniature pulse generator, electrically stimulates circuits for stimulus-response testing. An important new feature of the 546A is its ability to supply pulse streams of 1, 10 or 100 Hz or bursts of exactly 10 or 100 pulses as well as single pulses. The 547A Current Tracer or the recently introduced Model 545A Logic Probe can be used as the response indicator for the circuit under test.

The price of the H-P 547A is \$350 and \$150 for the 546A probe. Delivery is from stock.

SINGLE BOARD ANALOG I/O SYSTEM

A complete single-board analog input and output system, built to be exactly compatible with Intel's new single board SBC 80/10 micro-

computer, has been announced by Data Translation, Inc.

The new system, the DT1751, offers a 16-channel high speed data acquisition system, at the input, 2 digital-to-analog converter channels at the output, and a program I/O and interrupt interface to the SBC 80/10, as well as to Intel's MDS-800. The Intel microcomputer together with the DT1751 form a complete computerized data acquisition and analog output system for monitoring and control applications in industrial and laboratory processes. The DT1751 is available in two weeks ARO and is priced at \$795 in 100 quantity.

The DT1751 analog I/O board is mechanically and electrically compatible with the MDS-800. Application software can be developed in the MDS-800 system and subsequently run with the SBC 80/10 in OEM applications. Further, the interrupt portion of the interface has external trigger capability for synchronizing data measurements with some process event.

All analog circuitry within the DT1751 utilizes standard DATAx modules. At the input is a DATAx II data acquisition modules, complete with an over-voltage protected MUX, Sample/Hold, and 12-bit A/D converter. An added feature is a programmable gain amplifier for extending resolution of analog measurements to 14-bit resolution. The analog outputs comprise two channels of high current drive 12-bit D/A converters, capable of driving 50 feet of cable to 0.1% in less than 1 μ sec. Applications where actuators and servo amplifiers must be controlled, can be driven directly with these D/A converters. Additionally, a Z-axis control is included for the analog outputs for point plotting applications of CRTs, pen plotters, and XY recorders.

SCAN DATA OCR SYSTEM

The first optical character recognition (OCR) system capable of reading intermixed alphanumeric handprint direct from source documents has been announced by Scan-Data Corp.

A typical Scan-Data 2250/1 OCR System, with alphanumeric handprint recognition capability, costs between \$8,000 and \$10,000 a month on a two-year lease.

At the same time, the company announced the Area Scan feature, which increases flexibility of forms read by Scan-Data OCR systems. Area Scan enables the system to read larger sections of a form without paper movement, providing improved flexibility in field-scanning sequence.

μ C FLOPPY SYSTEM KIT

A microcomputer-based Floppy System Kit has been introduced by Sykes Datatronics. The kit includes a controller and up to four floppy disc drives. Search and sequencing functions are under direct control of the microcomputer.

The firm has listed the unit at \$1398.

μ C ANALOG I/O COMING

Burr-Brown reports that they are nearing completion on plug-in analog I/O systems for Motorola's EXORcisor and Intel's Intellec MDS 800 and SBC 80/10 single board computer.

The company expects to have the products ready within the next 60 days.

PEOPLE, LITERATURE AND EVENTS

MICRO AND MINI SYSTEMS

Micro and Mini Systems, a symposium discussing research results and practical applications of micro and minicomputer systems, will be held on May 27 at the National Bureau of Standards (NBS), Gaithersburg, Maryland.

Preceding the symposium, the IEEE Computer Society will present a tutorial on minicomputers and microprocessors. The tutorial, May 26 at the Holiday Inn in Gaithersburg, will review recent developments in both minicomputer and microprocessor technology.

The symposium will feature morning and afternoon parallel sessions.

Morning session 1 will include five different topic areas within the realm of applications including, "On-Line Ticket Office Machine for Public Transportation Systems" and "Application of Mini's and Micro's in AFOS."

Morning session 2, "Systems," will include discussion of "Transient Fault Recovery in the Distributed Computer Network," "A Microcomputer Development and Evaluation Tool," a "Method for Implementation of Transparent Sharing of Peripherals by Two Processors."

Advance registration for the symposium and the tutorial closes May 7, 1976.

Advance registration fees for the symposium are \$15 for IEEE, IEEE Computer Society, or NBS members, \$20 for non-members, and \$7.50 for full-time students. Registration at the symposium will be \$20 and \$25.

Advance registration for the tutorial is \$40 for members, \$50 for non-members, and \$20 for full-time students. Late registration will be \$50 and \$60. There will be no late registration for students at either meeting.

For further information write: Trends and Applications 1976, P.O. Box 125, Columbia MD 21045; or call: (301) 439-7007.

MICROCOMPUTER WORKSHOP

A three-day Microcomputer Interfacing Workshop based on the popular 8080 microprocessor will be held September 23-25, 1976. This course is sponsored by the V.P.I. and S.U. Extension Division of the Continuing Education Center in Blacksburg VA. The workshop will include programming and interface construction with over 12 operating microcomputers for participant use. For more information contact Dr. Norris Bell, V.P.I. and S.U. Continuing Education Center, Blacksburg VA 24061, (703) 951-6328.

CALL FOR PAPERS

Authors are invited to submit original papers on microprogramming to the Ninth Annual Workshop on Microprogramming (MICRO-9), to be held in New Orleans LA, September 27-29, 1976. MICRO-9 will bring together people from industry, government, and academia who are interested in problems relating to microprogramming. The workshop will be dedicated to short informal presentations, discussion groups, and case study tutorials.

Topics to be covered by MICRO-9 will include, but will not be limited to, high level language support via firmware, operating systems support via firmware, performance measurement and evaluation, system architecture, microprogram coding and optimization, hardware/firmware/software tradeoffs, teaching about microprogramming, fault diagnosis and recovery, and microprogramming applications.

Preliminary copies of proposed papers, not to exceed twenty double spaced typewritten pages, should be submitted by May 15, 1976. Accepted papers will be due in final form August 1, 1976. The preliminary manuscripts should be sent to: Prof. Peter Kornerup, MICRO-9 Program Chairman, Computer Science Dept., University of Southwestern Louisiana, Box 4-4330, Lafayette LA 70504. (318) 233-3850, Ext. 538.

WYLE ADDS SIGNETICS LINE

The Wyle Distribution group has announced that all five locations (3-Liberty; 2-Elmar) will now be handling Signetics' line of microprocessors and semiconductors. May 1 is the effective date.

INTEL ISRAEL, LTD.

Intel has formed a subsidiary in Haifa, Intel Israel Ltd., to explore the production and marketing potential of MOS/LSI devices with the Ministry of Commerce and Industry and the leading systems suppliers in Israel.

PEOPLE ON THE MOVE

Advanced Micro Devices has added three distributors with five outlets to its sales organization in order to "more effectively compete in selected local markets." The three new distributors are CENTURY ELECTRONICS, BELL INDUSTRIES and RAE ELECTRONICS.

The Memory Systems Division of Intel Corp. has expanded its marketing force by filling two newly created management positions. ROBERT J. CASCARINO has been named international marketing manager, end user products and DAVID B. SCOTT has been named product marketing and planning manager.

Prices of Advanced Micro Devices' standard MOS and bipolar microprocessors have both been reduced to \$21. The new pricing, effective April 1, is for 100-unit quantities of the Am9080, and for AMD's proprietary bipolar microprocessor, the Am2901.

BRIAN MATLEY has joined Micro Consultants in the position of vice president of engineering and chief technical officer.

ROBERT E. McHENRY has been appointed director-Consumer Product Systems and Customer Service for the Microelectronic Device Division of Rockwell International Corp.

ROBERT A. PECOTICH has just been appointed marketing manager of microprocessor systems at National Semiconductor Corp., according to Gene Carter, director of microprocessing marketing.

JERRY KORSBON was named midwest regional memory specialist for the Memory System Division of Intel.

DONALD D. WINSTEAD, formerly of MMI, has been named director of marketing for the Microsystems Division of Fairchild.

DR. ANDREW GROVE, executive vice president of Intel, has been elected chief operating officer responsible for the company's daily activities. WILLIAM DAVIDOW was elected a corporate vice president and DR. GORDON MOORE retained his position as president and chief executive.

MICHAEL A. EBERTIN has left Rockwell International to join National Semiconductor and will be responsible for integrated circuit product development, definitions, and operation strategies.

ROGER BADERTSCHER has joined Zilog, Inc. as director of its Components group. Badertscher was formerly Intel's 16K MOS RAM project manager.

AL F. FRUGALETTI, director of distribution for Intersil, Inc., has announced the appointment of HARVEY ELECTRONICS as distributor for upper New York State.

EXTENSYS CORP. has relocated their facilities to 592 Weddell Dr, Suite 3, Sunnyvale CA 94086 (408) 734-1525.

U.S.—LOW COST ELECTRONIC AREA

By 1980, the United States will have become a low cost manufacturing environment for certain electronic products, according to a recent multiclient study by Arthur D. Little, Inc.

The forecast indicates that the United States labor force will become more competitive as overseas labor costs rise. By 1980, labor costs in a number of countries will meet, and in some instances exceed, U.S. levels.

The study includes the low, high and most likely expectations for manufacturing electronic products in each of 15 countries through 1980. The forecasts cover 9,450 combinations of such variables as inflation and exchange rates; wages plus bonuses and fringe benefits for eight skill levels; the impact of automation and changing technologies; and all 16 basic materials used in the manufacture of these products, including steel, aluminum, copper and plastics. ADL even foresees the strategy of investing in low labor cost countries becoming obsolete by 1980.

"The Worldwide Cost of Manufacturing Electronic Products, 1975-1980" includes 550 pages of scenarios on the political, economic and industrial environments in each of the 15 countries and chapters on each of the major forecasts. The report, the data base and the computer software have been released to 14 multinational sponsors in the U.S., Europe and Japan, and are now available to additional sponsors for a subscription fee of \$17,500.

MICROCOMPUTER DESIGN



Microcomputer Design, a book on practical design with microprocessors, is now available from Martin Research in a revised paperback edition.

Originally published in 1974 as a loose-leaf manual, Microcomputer Design has been extensively revised to include schematics and circuit descriptions for 8080-based microcomputers. Features include efficient bus architecture; interfacing to interval timers, A/D converters, keyboards, I/O devices, and vectored interrupt designs applicable to all 8-bit CPUs. 416 pages; U.S. price, \$25.

SEMI-ANNUAL μ C REFERENCE

A new semi-annual reference text from D.A.T.A. Inc., is designed to provide users with detailed information for microprocessors, microcomputers, interfaces and memories.

The text lists systems and devices for efficient comparison of characteristics as well

as featuring a quick review of product and support availability for on-line hardware and software of each manufacturer. D.A.T.A. also provides cross-referencing throughout to permit users to trace each manufacturer's products and service support to the degree desired.

Other features include:

- o Glossary of common terms and definitions,
- o System, CPU architecture, logic, pin connection and outline drawings to aid in preliminary design considerations,
- o Detailed instruction sets of each microprocessor device for evaluation of system strengths and flexibilities, and
- o Cross reference data-to-manufacturers listings through a component cross-index section.

A \$54.50 subscription rate entitles the reader to a complete updated version every six months.

MODERN DATA SURVEY

The Fifth Annual Minicomputer-Microcomputer Market Survey has been completed by Modern Data Services, Inc. The report noted that an increasing number of microcomputer-based products were reaching production lines, but that the majority of designs were still in development.

The \$295 report showed that Intel has retained its leadership, but that Motorola was making substantial gains.

Beginning with the May issue, Modern Data magazine will be changing its name to Mini-Micro Systems.

INTRO TO μ C AND μ P

According to Wiley-Interscience, the book, Introduction to Microcomputers and Microprocessors, provides the basic knowledge required to comprehend data sheets and other literature supplied by manufacturers. The text cites 120 examples and uses problems conducive to self-study.

Chapter titles include, Perspective, Basic Structure of Microcomputers and Microprocessors, Basic Programming Techniques, Input and Output, Arithmetic Operations, Arithmetic and Logic Circuits, The Main Memory, The Control Unit, and additional features.

Introduced in March 1976, this book is priced at \$10.50 and available from John Wiley and Sons.

PACE-SC/MP HANDBOOKS

A complete technical handbook on the "PACE" single-chip, 16-bit microprocessor is now available from National Semiconductor Corp. The new 96-page handbook describes both the full-feature CPU and the entire complement of hardware and software items that comprise the "PACE" system.

The PACE Technical Description shows in detail the family of support chips, application cards, software support (including program examples), and microprocessor development systems. Applications as well as operations are described. Also included are product and instruction summaries, and a brief description of the training and specialist program provided by National Semiconductor as after-sales support.

A handbook providing a complete technical description of the single-chip 8-bit "SC/MP" is also available from National Semiconductor. This 65-page handbook, which includes 6 tables and 35 illustrations, starts with a general introduction to "SC/MP" for non-technical users and follows up with complete details for preparation of preliminary design of "SC/MP"-based applications.

Each handbook is priced at \$3 and may be obtained by sending a check (California residents add 6% sales tax) to the Marketing Services Department

RECENT LITERATURE

"Microprocessors and Microcomputers"

Branko Soucek

John Wiley and Sons, text

This book is written as a textbook for students and is excellent both for study and as a reference source. The book describes the general programming and interfacing techniques common to all microcomputers and then concentrates on detailed descriptions of several microprocessor families.

The book is divided into three parts. Part I deals with microcomputer programming and interfacing techniques. It explains digital codes, logical systems, microcomputer organization, logical systems, microcomputer organization, simple hexadecimal programming, assembly language programming, and the use of MACRO's and high-level languages. It then

(cont'd on page 16)

concentrates on interfacing techniques and explains I/O transfer modes, DMA, interrupt, and interfacing components and chips.

Part II provides detailed descriptions of the 4004, 4040, 8008, 8080, M6800, PPS-4, PPS-8, IMP-4/8/16 and PACE microprocessors. For each microprocessor family a detailed description of available chips, I/O busses, instruction sets, and addressing modes is given. A large number of programming and interfacing examples is included.

Part III concentrates on the most newly developed microprocessors, memory, and I/O chips of which many can compete with minicomputers. Systems described include the LSI-11, F-8, SMS MicroController, 3000 bipolar and the Im6100 microprocessors. High-speed microcomputer-based systems for control applications are also discussed as well as bipolar LSI circuits that simplify the construction of microprogrammed CPU and device controllers.

The text is available from John Wiley and Sons for \$23.

"Assembly Level Programming for Small Computers"

Walter J. Weller
D.C. Heath and Co., text

Assembly level programming for Small Computers is recommended by MD for those designers of microcomputer systems that are having difficulty programming. This is a how-to-do book that maximizes one's knowledge and skill in assembly programming.

The book's main emphasis is on programming minicomputers, however the material covered maintains its generality of application and can easily be applied to microcomputers. Computer Automations's Alpha Series minicomputer is used as the example.

Selection of application areas for discussion include real-time control, monitoring, and data acquisition problems. Examples are taken from actual applications and represent real solutions encountered in these situations. When appropriate, more than one solution is presented. The first represents the most obvious solution with succeeding solutions describing better or more efficient solutions understandable in light of the first solution presented.

Chapter topics include discussion of binary representation; binary operations and arithmetic; minicomputer structure and operations; assembly program; memory reference instructions; register change, shift, and immediate instructions; extended addressing

modes--indirect and indexed addressing; programs and subprograms; fixed point arithmetic--integer and fraction; multiple precision schemes; multiplication and division; floating point arithmetic; using the teletype; handling arrays of data; table reference schemes; units of memory smaller than a word; conversion of input numbers to binary, conversion of binary numbers to output form; processing data stacks; communications with the real world; interrupts; automatic data transfers; and pointers on debugging.

The \$14.95 text is now available from D.C. Heath & Co.

"Introduction to Microcomputers and Microprocessors"

Arpad Barna and Dan I. Porat
John Wiley and Sons, text

This small 106-page text quickly covers the hardware and software aspects of micros. The book is not a tutorial and will not provide readers with the necessary knowledge for designing complete microcomputer systems.

The book does provide a quick overview of this technology for those persons who need to know what a microprocessor is, its potential, application areas and etc. without the need to be competent system designers. Each chapter is self-contained to allow selection of material for specific interests without extensive cross-referencing.

The book is a good introduction and is priced at \$10.95.

Chapter headings include basic structure, programming techniques, I/O, arithmetic operations, memory, control unit and software support.

"EDN Microprocessor Design Series--Volume II"

Staff
EDN Magazine, text

Twenty-two magazine articles from EDN's 1975 series of uP Design have been reprinted and bound into a single edition.

The articles are divided into four main sections: Directories and Market; Evaluations and Comparisons; Software and Programming; and Design and Applications. Favorites included EDN's microprocessor scorecards, benchmarks and software for the hardware designer.

The book is available for \$6.95 and EDN reports that copies of Volume I are still available (1974 reprints).

EDUCATION

MICROCOMPUTER COURSES, SEMINARS, CONFERENCES.
Date, title, cost, location, sponsoring organization (addresses on page 18).

May

- 24-25 Military and Aerospace Microprocessor Systems \$395 Philadelphia PA Integrated Computer Systems, Inc.
- 24-26 Series 3000 \$350 Santa Clara CA Intel Corp.
- 24-27 Advanced Programming \$395 Dallas TX National Semiconductor Corp.
- 24-27 Microprocessor Fundamentals \$395 Santa Clara CA National Semiconductor Corp.
- 24-27 SC/MP Applications \$395 Miami FL National Semiconductor Corp.
- 25-27 How To Design With Programmed Logic \$300 Denver CO Pro-Log Corp.
- 25-27 SEMICON/West San Mateo CA Contact: Golden Gate Enterprises
- 26-27 Bit-Slice Microprocessors, PLA's and Microprogramming \$395 Philadelphia PA Integrated Computer Systems Inc.
- 27 Symposium On Trends And Applications 1976: Micro and Mini Systems Gaithersburg MD IEEE Contact: M. Abrams, National Bureau of Standards

June

- 1- 2 Military and Aerospace Microprocessor Systems \$395 San Diego CA Integrated Computer Systems, Inc.
- 2- 4 MCS-4/40 \$350 Santa Clara CA Intel Corp.
- 3- 4 Bit-Slice Microprocessors, PLA's and Microprogramming \$395 San Diego CA Integrated Computer Systems, Inc.
- 7-10 IMP-16/PACE Applications \$395 Santa Clara CA National Semiconductor Corp.
- 7-10 MCS-80/ICE-80 \$350 Boston MA & Santa Clara CA Intel Corp.
- 7-10 Microprocessor Fundamentals \$395 Dallas TX National Semiconductor Corp.
- 8- 9 Military and Aerospace Microprocessor Systems \$395 New York NY & San Francisco CA Integrated Computer Systems

- 10-11 Bit-Slice Microprocessors, PLA's and Microprogramming \$395 New York NY & San Francisco CA Integrated Computer Systems, Inc.
- 14-16 Microprocessors and Microcomputers \$485 Bethesda MD The Institute for Advanced Technology
- 14-16 PL/M \$350 Santa Clara CA Intel Corp.
- 14-17 Advanced Programming \$395 Miami FL National Semiconductor Corp.
- 14-17 IMP-16/PACE Applications \$395 Dallas TX National Semiconductor Corp.
- 14-17 SC/MP Applications \$395 Santa Clara CA National Semiconductor Corp.
- 15-16 Military and Aerospace Microprocessor Systems \$395 Asbury NJ Integrated Computer Systems, Inc.
- 15-17 How To Design With Programmed Logic \$300 Pittsburg PA Pro-Log Corp.
- 15-17 M6800 Microprocessor Course \$430 Nashville TN & \$375 Phoenix AZ Motorola
- 17-18 Bit-Slice Microprocessors, PLA's and Microprogramming \$395 Asbury NJ Integrated Computer Systems, Inc.
- 21-23 M6800 Microprocessor Course \$430 Philadelphia PA Motorola
- 21-24 Advanced Programming \$395 Santa Clara CA National Semiconductor Corp.
- 21-24 IMP-16/PACE Applications \$395 Miami FL National Semiconductor Corp.
- 21-24 MCS-80/ICE-80 \$350 Santa Clara CA & Boston MA Intel Corp.
- 21-24 SC/MP Applications \$395 Dallas TX National Semiconductor Corp.
- 22-23 Military and Aerospace Microprocessor Systems \$395 Washington DC Integrated Computer Systems, Inc.
- 24-25 Bit-Slice Microprocessors, PLA's and Microprogramming \$395 Washington DC Integrated Computer Systems, Inc.
- 28-29 Military and Aerospace Microprocessor Systems \$395 Seattle WA Integrated Computer Systems, Inc.
- 28-30 Series 3000 \$350 Santa Clara CA Intel Corp.
- 28- 2 How To Design With Programmed Logic \$350 Monterey CA Pro-Log Corp.

29- 1 M6800 Microprocessor Course \$430 Las Vegas NV Motorola

30- 1 Bit-Slice Microprocessors, PLA's and Microprogramming \$395 Seattle WA Integrated Computer Systems, Inc.

July

6- 7 Military and Aerospace Microprocessor Systems \$395 Toronto, Ont. Integrated Computer Systems, Inc.

8- 9 Bit-Slice Microprocessors, PLA's and Microprogramming \$395 Toronto, Ont. Integrated Computer Systems, Inc.

SPONSORING ORGANIZATIONS AND CONTACTS:

Golden Gate Enterprises, 1333 Lawrence Expy, Santa Clara CA 95051 (408) 241-8100

Institute for Science & Public Affairs, 6003 Executive Blvd, Rockville MD 20852 (301) 770-8576

Integrated Computer Systems, Inc., PO Box 2368, Culver City CA 90230 (213) 559-9265

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

Motorola M6800 Training, Ron Bishop, BB102, PO Box 2953, Phoenix AZ 85062 (602) 962-2345

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

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

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

FINANCIAL

EARNINGS

<u>Adv. Memory Systems</u>	<u>1976</u>	<u>1975</u>	<u>%</u>
March 26			
Share Earnings	\$.52	\$.18	188.9
Earnings	1,357K	439K	209.1
Sales	9.889K	7,681K	28.7
6 Months			
Share Earnings	\$.98	\$.30	226.7
Earnings	2,517K	745K	237.9
Sales	19,556K	15,184K	28.8

<u>Adv. Micro Devices</u>	<u>1976</u>	<u>1975</u>	<u>%</u>
March 28			
Share Earnings	\$.25	\$.01	2400.0
Earnings	669K	12K	5475.0
Sales	10,636K	6,438K	65.2
Year			

Share Earnings	\$.54	----	----
Earnings	1,434K	2,472K	158.0
Sales	34,387K	25,815K	33.2

<u>Amer. Microsystems</u>	<u>1976</u>	<u>1975</u>	<u>%</u>
April 3			
Share Earnings	----	\$.09	----
Earnings	-3,851K	192K	-2105.7
Sales	14,694K	15,202K	-3.3

<u>Data General</u>	<u>1976</u>	<u>1975</u>	<u>%</u>
March 13			
Share Earnings	\$.42	\$.35	20.0
Earnings	4,018K	2,866K	40.2
Sales	34,089K	24,639K	38.4
6 Months			
Share Earnings	\$.79	\$.70	12.9
Earnings	7,519K	5,682K	32.3
Sales	63,112K	48,758K	29.4

<u>Digital Equipment</u>	<u>1976</u>	<u>1975</u>	<u>%</u>
March 27			
Share Earnings	\$1.53	\$.95	61.1
Earnings	18,922K	11,229K	67.0
Sales	191,234K	134,642K	42.0
9 Months			
Share Earnings	\$3.83	\$2.39	60.3
Earnings	46,586K	28,580K	63.0
Sales	504,293K	373,232K	35.1

<u>Electronic Arrays</u>	<u>1976</u>	<u>1975</u>	<u>%</u>
March 31			
Share Earnings	\$.07	----	----
Earnings	131K	-639K	-120.5
Sales	4,919K	3,177K	54.8
Year			
Share Earnings	\$.21	\$.15	40.0
Earnings	383K	254K	50.8
Sales	16,673K	15,958K	4.5

<u>Fairchild Camera</u>	<u>1976</u>	<u>1975</u>	<u>%</u>
April 4			
Share Earnings	\$.04	\$1.11	-96.4
Earnings	197K	5,904K	-96.7
Sales	96.616K	71,728K	34.7

<u>General Instrument</u>	<u>1976</u>	<u>1975</u>	<u>%</u>
Year-February 29			
Share Earnings	\$.78	\$1.39	-43.9
Earnings	7,189K	11,545K	-37.7
Sales	375,811K	400,813K	-6.2
<u>Intel</u>	<u>1976</u>	<u>1975</u>	<u>%</u>
March 31			
Share Earnings	\$.71	\$.54	31.5
Earnings	5M	3,692K	35.4
Sales	45,500K	30,365K	49.8
<u>Intersil</u>	<u>1976</u>	<u>1975</u>	<u>%</u>
April 3			
Share Earnings	\$.02	----	----
Earnings	55K	-690K	108.0
Sales	7,538K	5,293K	42.4
<u>Mostek</u>	<u>1976</u>	<u>1975</u>	<u>%</u>
April 2			
Share Earnings	\$.14	\$.08	75.0
Earnings	580K	341K	69.9
Sales	12,574K	14,963K	-16.0
<u>Motorola</u>	<u>1976</u>	<u>1975</u>	<u>%</u>
March 31			
Share Earnings	\$.60	\$.27	122.2
Earnings	16,898K	7,630K	121.5
Sales	346,966K	303,881K	14.2
<u>Nat'l. Semiconductor</u>	<u>1976</u>	<u>1975</u>	<u>%</u>
March 7			
Share Earnings	\$.27	\$.25	8.0
Earnings	3,555K	3,120K	13.9
Sales	74,651K	48,116K	55.1
9 Months			
Share Earnings	\$1.09	\$1.01	7.9
Earnings	14,455K	12,453K	16.1
Sales	236,931K	178,297K	32.9
<u>Raytheon</u>	<u>1976</u>	<u>1975</u>	<u>%</u>
March 28			
Share Earnings	\$1.18	\$1.06	11.3
Earnings	17,900K	15,901K	12.6
Sales	572,416K	529,949K	8.0
<u>RCA</u>	<u>1976</u>	<u>1975</u>	<u>%</u>
March 31			
Share Earnings	\$.44	\$.21	109.5
Earnings	34,300K	17,000K	101.8
Sales	1,257M	1,090M	15.2

<u>Rockwell Int'l.</u>	<u>1976</u>	<u>1975</u>	<u>%</u>
March 31			
Share Earnings	\$.79	\$.56	41.1
Earnings	29,400K	21,100K	39.3
Sales	1,306M	1,200M	8.9
6 Months			
Share Earnings	\$1.49	\$1.16	28.4
Earnings	55,800K	43,300K	28.9
Sales	2,494M	2,351M	6.1
<u>Texas Instruments</u>	<u>1976</u>	<u>1975</u>	<u>%</u>
March 31			
Share Earnings	\$.93	\$.61	52.5
Earnings	21,287K	13,992K	52.1
Sales	369,367K	332,757K	11.0
<u>Western Digital</u>	<u>1976</u>	<u>1975</u>	<u>%</u>
January 3			
Share Earnings	----	----	----
Earnings	-790K	-761K	-3.8
Sales	2,467K	1,775K	40.0
6 Months			
Share Earnings	----	----	----
Earnings	-1,136K	-460K	147.0
Sales	5,504K	5,555K	-0.9

84% μ C BUYERS SATISFIED

Eighty-four percent of surveyed microprocessor buyers are satisfied with the speed and software of current products, according to the results of a joint study by International Data Corp. and Computer Design magazine. The study entitled Survey of Microprocessor Buyers indicates that three out of every five buyers surveyed were incorporating microprocessors/microcomputers into completely new products rather than in improved versions of existing ones.

According to the study, process control was the major function begin performed by microprocessors/microcomputers and users commented that increased versatility with cost reduction were the major benefits.

Eighty percent of the study's respondents stated that microprocessors represented 25% or less of their total equipment cost and 25% said that microprocessors accounted for only 5% or less of the total cost.

The study indicates that the most important technical criteria for selecting a microprocessor were its instruction set, interface compatibility, and speed. Its availability topped the list of non-technical reasons for purchase.

(cont'd on page 20)

Software development costs, according to the report, represented an average of 42% of total equipment development costs. More than 80% of current programming and software was being performed in-house, by both programmers and logic designers. Software development systems were in use by 52% of the surveyed sites. Principal software problems were associated with debugging and assemblers.

The study data indicates that Intel dominates both the microprocessor and related memories' markets with a saturation of 67% of the microprocessors, 50% of the RAMs, 44% of the ROMs and 70% of the PROMs.

Eighty percent of the surveyed respondents were using the peripherals with their microcomputer-based equipment and were buying them from more than 150 different companies.

For more information on Survey of Microprocessor Buyers, which costs \$395, contact William Sellers, International Data Corp., 214 3rd Ave, Waltham MA 02154 (617) 890-3700.

AMI FORSEES 48% μ P GROWTH

U.S. producers of microprocessors will see their markets increase an average 48% per year through 1979, according to a recent study by American Microsystems, Inc. According to AMI forecasts, the ROM, PROM and RAM market will average 113% annual growth.

AMI's director of research, Sam Wauchope, estimates worldwide sales of microprocessors and supporting circuits will rise from \$64 million in 1975 to \$298 million in 1979, with U.S. firms then accounting for 87 percent of the total.

Ancillary memories in the same period will jump from \$11 million to \$190 million, with the U.S. accounting for 80 percent.

The total microprocessor, I/O circuit and memory markets by 1979, AMI predicts, will reach \$488 million, more than six times 1975's \$75 million.

All figures represent non-captive production, Wauchope noted.

WORLDWIDE SEMI SHIPMENTS

Worldwide shipments of semiconductors by U.S.-based manufacturers declined by almost \$600 million in 1975, a drop of about 18.5% from 1974 totals, according to WEMA, the trade association serving the electronics industries.

The WEMA report represents the first definitive look at the severity of the decline suffered by the semiconductor industry last

year. It is based on actual shipment data from 49 semiconductor companies, plus market research estimates for those few companies which did not supply detailed data.

Statistics were compiled by WEMA for a three-year period beginning with 1973 to show shifts in the market since that time and to provide a comparative data base for the Association's new monthly reports of semiconductor bookings and shipments. The first monthly report (Jan. 1976) will be available at the end of March.

According to the report, semiconductor sales last year were just over \$2.6 billion, compared with \$3.2 billion in 1974 and \$2.7 billion in 1973.

By geographic market segments, the report shows that shipments to all domestic customers both manufacturers and distributors, rose from \$1.9 billion in 1973 to \$2.1 billion in 1974, but dropped 18.2% to \$1.7 billion in 1975.

The drop was even greater in the major foreign markets for U.S. semiconductors. Shipments to Western Europe were off 20.7% to \$630 million in 1975, compared with \$795 million in 1974 and \$591 million in 1973. The Japanese market, which accounted for \$122 million in 1973 and \$129.5 million in 1974, dipped 21.2% to \$102 million in 1975.

Shipments to all other international markets combined accounted for \$145 million last year, a 7.7% decline from \$157 million in 1974. The same markets in 1973 represented \$138 million in business.

EXPLOSIVE TERMINAL GROWTH

Explosive growth will mark the programmable terminal printer market from 1974 to 1980 when the number of printers installed will increase six-fold, according to International Data Corp.'s report entitled "Terminal Printer Market."

This report, compiled by IDC's Computer Output Program staff, predicts that programmable terminals (both stand-alones and clustered systems) will increase from 47,300 installed in 1974 to 303,000 installed by 1980. These units employ multipart forms and are similar to small business computers and accounting machines in forms usage, thus offering a new market segment with little replacement risk.

COMPANY ADDRESSES FOR THIS ISSUE

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

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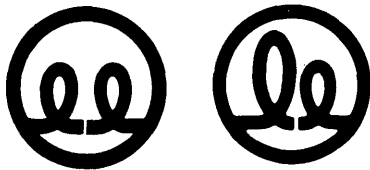
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Some session titles (and organizers) to date would include:

1. Distributed Processing with Minis.
(Dan Zatyko - General Automation)
2. Military Applications for Microcomputers.
(Joe Genna - Delco Electronics)
3. The Effect of LSI Technology on Memory Systems.
(Dan Bowers - Bowers Engineering)
4. Interfacing the Analog World to Minis/Micros.
(Larry Brown² - Caltech)
5. Integrating OEM Peripherals into Computer Systems for End-use.
(Martin Himmelfarb - Digital Design)
6. Microcomputer Software and Hardware Development Aids.
(Dave Millet - NEC Microcomputers)

7. History to Current Development of Memory Peripherals for Mini and Micro Computers.
(Bill Frank - Cal Comp)
8. The Make or Buy Decision.
(Robert Van Naarden - DEC)
9. Microcomputer Applications; Logic Replacement; Minicomputer Replacement, New Products.
(Jerry Ogden - Microcomputer Techniques)
10. Industrial Applications for Microcomputers and Microcontrollers.
(Jan Ebel - Control Logic)
- 11.-20. Being organized.

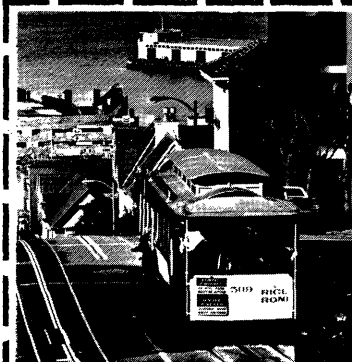
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