INTEL & SIEMENS 2ND SOURCE PACT

Intel Corp. and Siemens jointly announced a cooperation agreement in the field of microcomputers, encompassing microcomputer semiconductor products and related software and support systems.

The agreement covers a cooperation for both current and future microcomputer systems. It provides the means to establish alternate sourcing of each other's microcomputer products.

Both companies reported that they felt the agreement would accelerate their development and promote the use of this new technology.

FAIRCHILD & OLYMPIA SIGN F-8 AGREEMENT

Fairchild Camera & Instrument Corp. has entered into a license agreement with Olympia Werke A.G. involving patents, patent applications and know-how associated with Olympia's microprocessor system. The agreement specifically includes Fairchild's F-8 microprocessor and gives both Fairchild and any second source they designate a broad license with respect to Olympia's microprocessor technology.

TWO SINGLE CHIP MICROPROCESSORS

The Essex International SX 200 Microprocessor is a complete P-channel MOS 4-bit single chip micro designed to provide the advantages of a computer architecture into a low cost IC.

According to the company, the single chip provides all of the necessary control functions of a CPU, memory and I/O. Using 41 instructions, the 8K-bit ROM is mask programmed to control I/O, logic, arithmetic and data flow functions. The 256-bit RAM provides 64 storage locations for data. In addition to data storage, there are 16 individually settable, resettable and testable flag bits for

(Cont'd on page 2)

ROCKWELL PPS-8 ASSEMBULATOR

Rockwell Int'l has announced off-the-shelf availability of a new "Assemulator" which it described as a "total system development tool" for its 8-bit PPS microcomputers.

The new instrument facilitates assembly, debugging and modification of PPS programs while enabling real-time software check-out of systems with peripherals, encoding of PROMs and EROMs for field testing of prototypes, the generation of ROM mask codes, and can even be used for acceptance testing of Rockwell's devices and boards.

Complete with software and comprehensive programming and operating manuals, the instrument, which is designated the PPS-8MP, sells for $3,450.

The PPS-8MP software consists of a ROM-resident supervisory program providing utility and debugging functions, and RAM-resident assembly and text editing programs.

The assembly program automatically translates the designer's source symbols and addresses into powerful, multi-function PPS-8 instruction machine codes.

(Cont'd on page 2)

Last month, suit was brought in New York against Fairchild and Dr. David Chung by General Instrument Corp. claiming Fairchild had acquired information about Olympia's microprocessor system from Dr. Chung, a former General Instrument employee. The complaint alleged this information was used in the design of the F-8 microprocessor.

Fairchild, which had denied the allegations, said the Olympia-Fairchild agreement includes a complete release for any possible use of Olympia's information in the F-8 microprocessor or otherwise.

T W O S I N G L E C H I P M I C R O P R O C E S S O R S

Improving program control. The outputs are programmable via a PLA, of which twelve are individually settable and resettable under program control and seven others which output in parallel.

Data input can be in BCD or, if desired, the SX 200 will directly interface with capacitive type touchplates.

The SX 200 is a low-end device intended principally for applications in the home appliance industry. The microprocessor is compatible with touch-plate controls and can be synchronized with the AC power line for direct control of such power devices as SCRs.

A second 4-bit microprocessor, Bitsy, is similar to the SX 200 but lacks its touch-plate compatibility and power-line synchronization. A PROM programmable hardware emulator is available and software support includes a FORTRAN assembler and simulator.

Bitsy contains 256 words of memory, 2-working 6-digit registers, a 6-digit accumulator, 42 instructions and I/O programmable decoding. Quantity pricing for the SX 200 is under $6 and under $3 for Bitsy.


Supplementing the assembly program is character-oriented text editing software providing extensive search, replace, insert and delete commands enabling easy modification of the source program. The assembly and text editing software is supplied on tape and is loaded into the machine's RAM with a TTY or TI 733 ASR tape reader, or with an optional high speed reader.

S Y S T E M D E V E L O P M E N T F L O W

The supervisory program is stored in ROM which is supplied on a plug-in module in the assemulator. Debug and utility functions include independent I/O re-assignment, break pointing, single stepping, selective tracing, and register or memory examination and modification.

After field prototyping is completed, the PPS-8MP may be used to generate the tapes used to define the ROM mask. The system can also emulate any chip on a system's board, and techniques have been developed by which it can be used for acceptance testing of incoming devices and boards.

Components of the basic machine are a PPS-8 CPU, 6K bytes of RAM which are switch selectable in 2K byte segments for use in any
proportion of instruction or data storage, four-wire port and mating plug for ASR-33 TTY type terminals, RS232-C compatible port for TI 733 ASR type terminals, hexadecimal control keyboard, hexadecimal memory address and I/O bus display, power supply and chassis with slots for a variety of additional modules.

According to Rockwell, one of the most powerful options for the PPS-8MP Assembler is a floppy diskette operating system (FDOS—scheduled for availability early in 1976). The FDOS option includes an intelligent disc controller packaged with dual disc drive and a powerful software extension of the basic supervisory program.

**NATIONAL INTRODUCES SC/MP**

National Semiconductor Corp. has officially introduced the SC/MP microprocessor. SC/MP is a programmable 8-bit parallel processor implemented on a single integrated circuit chip. It contains one 8-bit accumulator, four 16-bit pointer registers (one of which is dedicated as the program counter), an 8-bit status register, and an 8-bit extension register. With all of this built in, SC/MP can directly address up to 65K bytes of memory.

The architecture of SC/MP is designed with on-chip timing circuits, eliminating expensive cumbersome clocks. It also offers TTL compatibility for easy interfacing with other components within a system.

Architecturally, SC/MP employs a unified bus system in which the CPU, memory and peripheral devices are all connected to a common data bus. This configuration enables memory reference instructions to reference peripheral devices. It also allows multiple SC/MPs to be tied to the bus for daisy chain operation; when one SC/MP stops transmitting or receiving, it notifies the next SC/MP in line that it can take over. In addition, SC/MP architecture provides serial data and control streamlining under software control and has built-in programmable delay.

SC/MP is priced at $10 in quantities and samples are now available from the factory.

**OEM Microcomputer System Cards**

Microcomputer Associates Inc. has announced a new series of OEM Microcomputer System Cards. The new System Cards are designed as low cost, stand-alone cards with full microcomputer capability including PROM and RAM memory and I/O.

The series consists of four cards, each based around different microprocessors: the 8080A, the 6502, the 6800 and the 2650.

Each card contains a crystal-controlled clock, 1K x 8 static RAM, 2K x 8 PROM sockets or 4K x 8 mask ROM sockets, 24 bidirectional I/O lines, fully buffered address/data lines, DMA capability, interrupts, full temperature range operation (0°C to 70°C), and a small size of 4.25" x 7". Each card is fully assembled and tested.

The cards offer a unique interconnection technique for minimizing the cost of expensive card cages and backplanes should additional cards be needed. Other card sizes are available with minimum order.

A spokesman for MAI states that "the cards are designed to satisfy 90% of small-to-medium OEM requirements and can be used as the main processing card by 75% of the large OEMs. Furthermore, by offering the cards with several microprocessors, they can be used to replace a wide range of existing designs already based around existing microcomputer software, such as for the 8080 and 6800."

(cont'd next page)
MAI states that "there are numerous firms with end-user experience that could use an OEM Microprocessor System Card but do not have the time or expertise to develop their own boards.....these are the people we are interested in."

To further support this new series of cards, MAI has available 4K x 8 RAM cards, 2K, 4K or 8K x 8 PROM cards, I/O cards and power supplies in addition to extensive software applications support should the user need help in "bringing up" their microcomputer-based products.

Typical applications include industrial process control, intelligent instruments, data communications, "smart" controllers, small business systems and video games.

Prices start at $375 in single unit orders and $295 in 100's. Quantity and OEM discounts are available upon request. Delivery is 30-45 days ARO.

**INTEL SINGLE BOARD COMPUTER**

The Single Board Computer, a complete computer system contained entirely on one small, plug-in circuit board, has been introduced by Intel Corp.

The new computer, SBC 80/10 Single Board Computer, is designed to be used as a complete one-board computer subsystem. It provides processing power, memory storage capacities, and I/O facilities required for most OEM processing and control subsystem applications, said Bill Davidow, manager of microcomputer products.

The key to the SBC 80/10's versatility is its programmable parallel and serial I/O, which allows OEMs to use the same SBC in different equipment models or entirely new generation equipment requiring different I/O configurations and data transfer techniques, by simply changing a few program instructions and plugging in appropriate line drivers and terminators.

The SBC sells for $295 in quantities of 100 and $495 in single unit quantities. The board measures 6.75" by 12".

The board contains a complete central 8080A processor subsystem with all required control circuitry, crystal-stabilized system clock, system bus control, high current drivers for expanding memory and I/O capacities via the system bus, 1K static RAM, up to 4K of ROM, parallel I/O with 48 I/O ports, serial I/O with programmable USART, RS232C and TTY interfaces.

Davidow noted that the board is the first OEM computer to be assembled almost entirely with LSI devices. These include the 8080A microprocessor, 8251 UART, two 8255 Programmable Peripheral Interface units, eight 8111 1K-static RAMs, four optional 8708 8K EPROMs or interchangeable 8308 masked ROMs.

Standard boards and cardcage assemblies are available to expand SBC 80/10 memory and I/O capacity. The SBC-016 16K RAM board, SBC-406 6K PROM board, and SBC-416 16K PROM board can all be used to expand SBC 80/10 memory. The SBC-508 general purpose I/O board provides an additional 32 input and 32 output lines. The SBC-104 combination memory and I/O expansion board provides 4K bytes of RAM, ca-
Mostek has announced lower prices on the company's 2-chip F8 microcomputer family. The MK 3850 CPU and the MK 3851 PSU (Program Storage Unit) were reduced from $64 to $28 in 100-999 quantities and from $85 to $55 in single unit quantities.

Van Lewing, Mostek's microcomputer marketing manager, emphasized that this price reduction now allows a user to define a complete F8 system with 1K ROM, 48-bit I/O ports, one timer, 64 bytes of RAM and 2 interrupts for less than $45 for 1000 sets.

Mostek's F8 evaluation kit, dubbed "The Survival Kit," remains at $297 unassembled and $397 assembled. Since the recent announcement of this kit, a FORTRAN IV cross-assembler which runs on 16-bit computers has been added at no cost to the package.

MICROCOMPUTER-BASED PRODUCTS:

2650 Software Development System

The µPal 265 SDS Software Development System by Processor Applications Ltd., is the latest software development tool designed for the Signetics 2650 microprocessor. According to Dan Nesin, president, the hardware design has been optimized to provide maximum versatility and reliability to the user at minimum cost.

At the system's heart is a Signetics 2650 microprocessor which resides on the CPU card together with the µPal Monpal system monitor. The monitor is contained in 2K bytes of PROM. An I/O interface card contains all the necessary logic to interface the 265 to a TTY, CRT or a high speed paper tape reader. An EIA RS232C interface is provided as well as a control line for an external device such as an ASR-33 reader.

The 8K memory card, which completes the basic system, is fabricated with popular static RAMs and can be strapped to reside anywhere in the 2750 usable memory space.

Nesin said the µPal Fixit editor is a character string editor available standard on paper tape or purchasable in PROM. The resident version does not have to be loaded for each use.

The µPal assembler is contained in 5K bytes of memory. Variable length symbols are used to optimize space with the assembler supporting approximately 380 4-character labels in the basic system.

The assembler also allows (1) the symbols to be defined externally and (2) large programs to be segmented on tape for ease of storage and future editing. Left and right margin control is provided to allow assembly of source tape dumps from timesharing or source computers other than the µPal 265 SDS.

The µPal SDS is priced at $5,550 and delivery is 30 days.

MULTI-MICROPROCESSOR NETWORK

Codex Corp. has unveiled a family of multi-microprocessor implemented computers dedicated to communications and capable of processing more data than previously assigned to front-end processors.

In addition to handling message management and network protocol, the new 6000 Series of Intelligent Network Processors are capable of replacing conventional time-division multiplexers while adding error control and providing a higher level of data compression.

The INF series is complemented by a wide choice of peripherals and price is dependent upon system configuration.

SOURCE 700

MSI Data Corp.'s new programmable off-line remote data terminal, designated the SOURCE 7600, was announced by Gary E. Liebl, vice president of marketing.

The new source data entry terminal incor-
microcomputers, which is permanently programmed with a full set of basic programming commands to allow the onsite, non-technical operator to create original formats for data input. A special "Free Form" mode allows the terminal to accept and then transmit narrative, unformatted data as well, so that special instructions and other messages can also be communicated to and from the computer center.

One cassette drive is standard; a second cassette is optionally available for greater convenience in loading programs, editing and duplicating cassettes.

The machine incorporates both a full typewriter keyboard and a separate accounting-style 10-key touchpad for rapid entry of numeric data. A 32-position LED display permits the operator to edit each line of data while still buffered before it is printed on the 32 character journal tape. An external line printer can be interfaced to the SOURCE 7600.

SOURCE 7600 will be available in production quantities in April 1976; delivery is 60 days ARO. The unit is priced from $3500 to $4500, depending upon optional features, in quantities up to 10; discounts are available.

WINCE MICROCOMPUTER

Wintek Corp. has unveiled their Wince control module, a single card microcomputer system incorporating the M6800 microprocessor. The 4½" x 6½" PC board contains one M6800, clock, 512 or 1024 bytes of ER0M, 128 to 512 bytes of RAM, serial I/O (one ACIA UART compatible interface), and parallel I/O (one or two PIs—16 lines each). WINCE is fully expandable to 64K bytes of ROM, RAM and/or I/O. Firmware includes FANTOM—a debug/monitor program that allows loading, debugging and saving of user programs. Prices range from $238-$398 depending on configuration and quantity.

Other WINCE modules available now include a RAM module containing up to 16K bytes and a PROM programmer. The company reports that other WINCE modules are currently in development. Available software includes a cross assembler, simulator, and PL/W for the 6800.

µC INTELLIGENT MATRIX PRINTERS

Sycor has unveiled an extension of its distributed computing concept, a new series of microcomputer-controlled, intelligent matrix printers of its own design and manufacture, for use on the Sycor 440 clustered terminal processing system.

The printers, operating at 60, 120 and 180 cps, use a microcomputer with 5K bytes of memory for real time control of all system dynamics, including print head needle timing, character registration, paper acceleration profiles, and adaptive print head acceleration and deceleration; and performs multiple task processing for simultaneous data transfer, line feed, keyboard scanning and indicator drive.

Lease pricing is available with the purchase price beginning at $5600. Deliveries are expected in the second quarter, 1976.

DISC-BASED MICROCOMPUTER

The boxed version of DEC’s LSI-11, the PDP-11V03, consists of the PDP-11/03 dual floppy drives, and offers a choice of the LA36 printer or VT52 CRT terminal. The microcomputer is supplied with the TR11 real time OS and total capacity of the floppy disc drives is greater than 500K x 8 with an average access time of 483 µs. Bidirectional transfer occurs at 10K.

The PDP-11V03 is priced at $9950. FORTRAN IV or BASIC is optional.
Cs Join U.S. Celebration

As 1976 quickly pushes forward, more and more spectators are joining the U.S.'s 200th birthday celebrations. The latest, microcomputers. A microcomputer has been tied to a digital voice synthesizer and recites the Gettysburg address. Another micro sews stars and stripes on flags. And if you're in Nevada, you can challenge the F8 microprocessor to the exciting game of Black Jack.

μC Data & Timing Generator

A microcomputer controlled data and timing generator Model RS-432 has been developed by Interface Technology for use in digital circuitry testing where unique digital patterns and special control timing signals are simultaneously required. The TS-432 achieves its sophistication by blending two concepts, digital word generation with microprocessors.

The microcomputer can be programmed to allow the user to generate serial or parallel data with specified output periods; generate data from selected blocks of word memory; generate data contingent upon special inputs such as levels, pulses or sense switches; as well as generate data continuously or in single shots.

The instrument is completely self-contained and requires no external clocks or DC power. The unit is priced at $4995 with delivery of 10 to 12 weeks.

μC-Based Multiplexer

A new 8080 microcomputer-based multiplexer from Computer Transmission Corp. (TRAN) accommodates up to 16 asynchronous, 8 synchronous digital data channels or a mix of both.

Intelligent Data Processing Terminal

Under development at General Computer/Systems, HAROLD is a transaction-oriented general purpose computer system with communications capabilities.

The system contains a DEC LSI-11 microcomputer, 40K of memory expandable to 256K, and will support up to eight 612 character CRT terminals. East CRT terminal is capable of running a different program simultaneously with the system running several background programs. Other features include cartridge discs, diskettes, printers, tape drives and card readers.

User programmable in ASNI compatible COBOL, the system will have its own disc operating system and will support sequential, relative and index files. In a Distributive Information Network, HAROLD will be able to accommodate 2100 users simultaneously.
8080 Microcomputer Card

Data Works Instrumentation is marketing their Model 226 8-bit microcomputer. The Intel 8080-based system contains DMA address and data-bus drivers, status latches, crystal clock and 8-bit vectored priority interrupt.

The output frequency can be divided down for serial data communications. A company spokesman noted that the firm is planning several new systems that will use other microprocessors.

µC Interface For Wang 600/700

Digital Laboratories is using a built-in microcomputer in their WU-7 to allow any Wang 600 or 700 programmable calculators to communicate between themselves, with other computers, terminals and many other devices at data rates from 110 to 9600 bps. The $2450 instrument performs code translation, formatting, buffering, serializing, etc., so that the simple I/O procedures of the calculators are retained.

Acquisition/Analysis/Control System

The PAC-10 Portable Data Acquisition, Analysis and Control System is currently available from Forth, Inc. The microcomputer-based system includes a full graphic terminal, 512K bytes of floppy disc storage system, 16-channel multiplexed A/D converter and digital I/O.

TI Terminal Polling System

A new system designed to query disbursed networks of Silent 700 Model 742 Programmable Data Terminals has been introduced by Texas Instruments.

The new 700 TPS Terminal Polling System consists of a TI 900 microcomputer with up to 64K bytes of RAM, a TI 9-track, 800 or 1600 BPI tape drive and a Silent 700 Model 733 ASR data terminal with dual magnetic tape cassettes. By using up to four built-in modems and auto call units, the system can poll as many as 200 model 742 terminals over as many as four telephone lines. Or, as an alternate configuration, the system can accommodate up to eight telephone lines with the addition of external modems and auto call units.

A major feature of the polling system is that it collects and stores data in an IBM compatible format. Following system start-up, the 700 TPS automatically polls and stores data on a 9-track tape in a format compatible for processing by a host computer. In turn, resulting output from the host computer can be redistributed automatically via the TPS to the terminal network.

Base purchase price for the TPS is $37,800 and the 12-month lease rate is $1,200, including maintenance. Deliveries will begin in March 1976.

Receive-Only Teleprinter

Marketed by Extel Corp., the RO Receive-Only teleprinter contains built-in service diagnostics that are controlled by a microcomputer. Selectable online, type choices include upper/lower case, expanded or boldface character and underlining. Continuous short-line printing needs no fill character.

Optionally available are 103, 108 or 113 type built-in modems; selective calling for most 5-, 6-, or 8-level procedures; 20-character answerback; page formatting; and national alphabet or special character sets.

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ADC Microcomputer

Series 70, based on an Intel 8080 microprocessor, is a complete general purpose microcomputer designed by Applied Data Communications for communications systems, test applications, process controls, monitoring, data acquisition and dedicated ROM operated device controllers.

The system offers 4K RAM expandable to 16K and 1K ROM expandable to 4K. Terminal communication is provided for TTY, CRT or modem through an asynchronous I/O with speed-select from 110 to 9600 baud. Peripheral communications is through two flat ribbon cables, and both DMA and non-DMA device controllers can be used.

Options include a front panel console, IBM compatible floppy disc for interfacing up to eight drives, a tape cartridge, programmable real time clock, line and character printers, 7- or 9-track magnetic tape, synchronous/asynchronous communications, general-purpose I/O card, and ROM programmer. Software support includes a debugger, assembler and an editor on the disc.

Modular µC Interfaces to PDP-11

Wyle Computer Products, a division of Wyle Laboratories, announced a new modular 8080 microcomputer system. The µP Series microcomputer system is designed with major sub-systems on individual logic cards to allow the designer flexibility in configuring memory and I/O structure. The card size is directly compatible with the existing Wyle logic and card line, allowing for interface development and packaging in the same card file with the microcomputer system. A unique aspect of the µP Series is the availability of an interface to the DEC PDP-11, which allows the PDP-11 to exercise full control over the microprocessor address, control and I/O busses. This, along with a proprietary Microprocessor On-Line Development System (MODS) and cross assembler, also available from Wyle, allows the user to completely develop and debug microcomputer software utilizing the larger system. A RAM/ROM memory module is available for program development directly on the microcomputer system.

The µP Series CPU module is priced at $170. Memory is priced at $100 for 1K RAM and $245 for the RAM/ROM module. Other modules are priced from $30.

4-Bit General Purpose Computer

The Automated Computer Systems-4040MC Microcomputer is a low cost, totally self-contained PCB modularized parallel 4-bit general purpose programmable computer. The 4040MC can be configured as an Assembler/Simulator-PROM programmer software development microcomputer system with supporting operating system software, or as a conventional microcomputer to be customized and programmed by the user for various applications.

The basic microcomputer contains five basic functional plug-in modules that are interconnected through a 14 PCB slot PC mother board card rack assembly housed in an air-cooled cabinet.

The functional modules include an Intel 4040 microprocessor CPU board, a combination 2K PROM/1280 word data RAM/16-buffer Output port board, an 8-port tri-state universal I/O board with handshaking capabilities, a plug-in switching regulated power supply module, and a full computer control/HEX display panel board. The interconnect mother board provides spare PCB connectors for user custom expansion using either additional basic functional modules or standard module options.

Single unit price is $2,115 and delivery is 45 days.

8080-Based Memory Module

The MI² Data Systems Inc. DESIGN 349 Memory Module is an Intel 8008 microcomputer-based message processing system. The standard 349 has its assembler program stored in 2K ROM and has a 2K RAM for data or additional program storage. The RAM can be expanded to 6K in 1K segments.

The 2K ROM containing the assembler program can be replaced with a ROM set of 256 to 2048 characters containing a special application-oriented program. This special program approach requires no initial loading from external memory.
ternal storage but is restricted to applications where program changes are not required.

The DESIGN 349 uses its internal 8008 to control its basic I/O and arithmetic functions for such applications as message storage, code conversions, data rate conversion, data formatting and data logging for peripherals.

Further expansion of the memory from 6K to 14K, in increments, is available as a factory option.

**Tenney Microcomputer Programmer**

Tenney Engineering is introducing a completely new programming module using microcomputer techniques. Offered as a standard option, the new programmer interfaces with all Tenney environmental test chambers and can be used in place of older cam, two-point or punched tape programmers.

With programmable memory, the instrument is digitally addressed in English terms. The microcomputer assumes command of temperature and humidity set-points, slope rate, dwell time, and secondary functions such as mode selection.

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**WHERE SHE STOPS . . .**

Determining where the wheels on a slot machine will stop is the major function of an Intel 4004 microcomputer now incorporated into a new series of electronic one-armed bandits manufactured by Allied Leisure Products. The machine will effectively look and operate the same as the mechanical types currently used in Nevada, reports the company. It will even have the same old familiar clunk-clunk-thanks sound.

**MICROCOMPUTER SOFTWARE:**

**F-8 Cross-Assembler**

A cross-assembler for the Fairchild F-8 microprocessor has been developed by Logic Systems. Designed to run on a PDP-8 microcomputer, the software will handle any size program up to a maximum of 600 labels.

Features of the program, according to the company, are free form input data, formatted list output, "Fair Bug" loader format, and a simplified instruction set. The assembler resides in 8K of memory.

**INTERMETRICS Develops M6800 PL/M**

Intermetrics has developed a high-level programming language, PL/M6800 for the Motorola 6800 microprocessor. The program produces optimized object code in a format directly usable by the Motorola Minibug/Mikbug and Exbug loader functions.

Intermetrics reported that the PL/M6800 compiler is compatible with Intel's PL/M language. The compiler is available on GE Information Services Timeshare Systems. The company also said the compiler will be available for purchase at a later date. The program runs on IBM 360 and 370 computers.

**8080 Assembler/Simulator**

Two software products available from FBE allow users to simulate products using the 8080 microcomputer on any 4K DEC PDP-8 minicomputer. Cal-80 is a three-pass symbolic assembler
that accepts 8080 instructions from paper tape and produces a PROM image tape and a formatted program listing. SIM-80 is an interactive simulator that emulates the 8080 on the PDP-8. Each program is available in paper tape for $15 or as a source listing for $50.

**UCC Supporting Popular µPs**

University Computer Co. (UCC) has announced that a series of assemblers, debuggers and support software for a number of popular microprocessor are currently available on their remote computing network.

Available simulators handling the ROM/RAM environment, simulated interruptions and I/O operations were designed to aid debugging of programs for the Intel 4040, 4004, 8080 and 8008, Fairchild F8 and others.

**NEC Timeshare Network**

A worldwide timesharing network for developing and simulating programs for the 8080 microprocessor has been announced by NEC Microcomputers. The service is accessed through GE's Mark III timesharing network. The library contains assemblers, debuggers, simulators and editors.

**8080 Resident Assembler**

An 8080 resident assembler that assembles a compatible subset of the Intel language and generates machine code directly into memory for immediate execution has been developed by Micro Systems Software.

Occupying less than 2K bytes of PROM or ROM, the language features all Intel-defined instruction mnemonics and special program pseudo-ops, including DB, DW, DS, ORG, EQU, and END. The assembler is priced at $495 and delivery is one week.

**µC Line Of Cross-Assemblers**

First Data has announced the availability of cross-assemblers for the Fairchild F-8, Intel 8080, TI TMS 8080, Motorola M6800 and the LSI-11 microprocessors.

**MEMORIES AND PERIPHERALS:**

**PROM Programmer Kit**

The 2708/2704 PROM Programmer Cramerkit just announced by Cramer Electronics, Inc. is a complete package of components, software and design documentation necessary to build a self-contained programmer for the popular 2708 1K x 8 and 2704 512 x 8 PROMs. All timing requirements of the PROM are taken care of by the hardware, allowing the programmer to operate asynchronously with the processor, thereby minimizing the required software.

**Floppy Disc System**

CDI has announced an Altair 8800 floppy disc system that is available in kit form. The system provides RS232C entry to any microcomputer and includes the CDI floppy disc operating system.

**Wire-Wrap µP Socket Board**

Cambion has introduced the first in a series of support wire-wrap microprocessor socket boards for use with the Motorola M6800 Evaluation Kit. Designated Cambion P/N 787-2000-03-03-00, the board accommodates all of the integrated circuits in the evaluation kit.

Included as part of the pre-wired board is a hand wire-wrap tool, a selection of pre-cut and stripped wire-wrap wire, the edge card connector, standoffs, and mounting hardware. Also included are insertion and withdrawal tools for both widths of integrated circuits (.3 and .6 inches).

Availability is current and unit price is $197.
Compact Data Printer

Series EDP1600, a small highly reliable electronic data printer, has just been announced by C-TEK, Inc. The EDP1600 features non-impact electro-sensitive print heads instead of the mechanical drums and print wheels normally associated with mechanical printers. An inexpensive means for converting 4-bit binary information to a permanent printed form, the EDP1600 was designed for coincidental printout with digital display in applications involving digital measuring sets, counters, calculators and computer end units.

The Standard Series EDP1600 prints 16 numeric characters per line from 4-bit binary TTL inputs at up to two lines per second. ASCII alphanumerics are also available. Characters are numeric 5 x 7 dot matrix type.

Single quantity prices start at $550 and OEM discounts are available. Delivery is stock to 30 days.

Microcomputer Power Supply

The Boschert Associates' Model OL80 is a 4 output, 2 lb. switching type power supply designed to power microcomputer systems. The four output voltages are +5V at 10A max, ±12V at 2A max and either -9 or -5V at 2A max. Total power output is 80 watts max. The supply has overvoltage, overcurrent and reverse voltage protection.

The supply is priced at $199 for small quantities and delivery is 30 days ARO.

New LSI Bus Transceiver

Five new devices have been added to Advanced Micro Devices' integrated components line. They include a pair of high-speed, large scale factory programmable memories designed for computer related systems or to enhance the speed effectiveness of MOS microprocessor designs and a three-part series of LSI bus transceivers for the AM2901 bipolar microprocessor family.

The five memories are the AM9208 512 x 8 ROM; the AM9216 2K x 8 ROM; the AM2905 quad two input bus transceiver with open collector outputs and three-state receivers; the AM 2906, a quad two-input bus transceiver with open collector outputs, three-state receivers and a four-bit parity checker/generator; and the AM2907, a quad bus transceiver with open collector outputs, three state receivers and a parity checker/generator. Prices start at $6.50 to $25.00 in 100 quantities.

μC Support Circuits

Datel Microelectronics has introduced four new circuits for use in microcomputer-based products. They include a $49 12-bit, 8 μs A/D converter; a $24 12-bit, 300 ns D/A converter; a $16.50 5 μs, .01% setting time, sample and hold circuit; and a $5.95 300 ns, 8-bit D/A converter. All prices are for 100 quantity.

High Accuracy A/D Converters

A new two-package microcircuit pair, designated 8052A and 8053A, introduced by Inter-
sil, Inc. provides the circuitry for an analog-to-digital converter capable of up to ±40,000 counts, with a price, according to Intersil, that makes it competitive with ±2,000 count devices.

The 8052A provides signal conditioning circuits, including buffer amplifier, integrator, comparator and voltage references on chip. The 8053 provides the A/D switch network, plus switch drivers, on chip.

**HI-PERFORMANCE 4K RAM**

Mostek's latest 4K RAM entry features 200 ns access time and 10% tolerance on all supplies. The new circuit, designated MK 4027, features Schottky-TTL compatibility, memory system performance matching that of 160 ns, 22-pin 4K's because the MK 4027 eliminates the 40 ns delay of the 12V clock driver.

In addition to improved performance characteristics, Mostek's MK 4027 also incorporates direct interfacing capability with TTL, low capacitance inputs and outputs, on-chip address and data registers, two methods of chip selection, and compensates for system timing skews in the column address timing.

Also, the MK 4027 offers a unique cycling operation called page-mode for successive memory operations at multiple column locations at the same row address with increased speed of 135 ns access and decreased power.

The MK 4027 is available in a 16-pin ceramic package and is prices at $24.20 in 100 quantities.

**LOW COST DATA ACQUISITION SYSTEM**

A low cost data acquisition module series, designated DATAX-OEM, has been introduced by Data Translation Inc. The new series offers four models, starting at $130 (in 100s) for the DT 820, an 8-channel, 8-bit resolution module offering a throughput rate of 50 KHz. The top of the line DT835 features a throughput rate of 30 KHz, 16-channels, 10-bit resolution for $150.

The DT825 has 16 channels, 8-bit resolution and 50 KHz throughput at $140. The DT830 features 8 channels, 10-bit resolution at a throughput of 30 KHz for $140.

Each model is a complete D/A system containing an input multiplexer, differential instrumentation amplifier, sample/hold amplifier, high speed A/D converter, and all control and programming logic. Linearity of all models is ±1 LSB, multiplexer operation can be either sequential or random, and analog signals either unipolar or bipolar.

**AMD INTRODUCES 4K RAMS**

Advanced Micro Devices has announced a new pair of 4K dynamic RAMs. Available in a 22-pin package with separate data input/output circuitry or in an 18-pin version with common data I/O circuitry. AMD says the devices were developed as superior plug-in replacements for similar parts manufactured by Intel and TI as well as others.

Designated the AM9050 (18-pin) and AM9060 (22-pin), these silicon gate MOS memories feature access times to 200 ns and maximum power dissipation of 750 mW. Both devices require only a single clock and all inputs and outputs except clock are TTL compatible.

The RAMs are available for immediate delivery from Hamilton/Avnet, Cramer and Schweber Electronics. Prices in 100-up quantities begin at $15.30.

# # # # #

If you are not already a subscriber, why not begin so as not to miss any uC news.
MOS EQUIVALENTS OF BIPOLAR 1K RAMS

The first MOS equivalents of 1024-bit bipolar high-speed RAMs have been introduced by Intel Corp. The new Intel 2115 and 2125 family can operate as fast as their bipolar counterparts, at the same power supply voltage (+5V) and logic levels. However, they cost less and reduce memory system power dissipation by 35% or more.

The Intel 2115 and 2125 are TTL compatible, pin-for-pin replacements of the 93415 and 93425 1K bipolar RAMs. Both are fully decoded, 16-pin designs. The 2115 has open-collector outputs while the 2125 has three-state outputs.

The family was introduced in two speed grades and a low power version. The -2 devices have a maximum access time of 70 ns while the non-dash memories have access time of 95 ns. The 2115L and 2125L have a maximum current of 65 mA with an access time of 95 ns. Prices begin at $12.75 for plastic DIPs in 100 quantities.

PEOPLE, LITERATURE AND EVENTS:

OEM Memory Systems

A new business operations center to service OEMs has been formed within the Memory Systems Division of National Semiconductor Corp. Heading the new operation is ROBERT H. WELCH, formerly the director of OEM marketing for the division. Reporting to Welch is a two-man marketing team consisting of DONALD L. MILLER, who becomes director of OEM marketing, and DOUGLAS J. FELDER, who has been named manager of standard product lines.

GI Launches Suit Against Fairchild

Citing that Fairchild developed its F-8 microprocessor technology from confidential information obtained from a former employee, General Instrument Corp. filed suit against Fairchild Camera & Instrument Corp. last month.

The suit seeks a permanent injunction against Fairchild's production and sale of the F-8 microprocessor, as well as compensatory and punitive damages.

In its complaint, GI claims that in 1973 Fairchild hired David Chung, former GI manager of microprocessor development programs, who at that time was working on an 8-bit microprocessor system that GI alleges was the source of the F-8. After joining Fairchild, Chung spearheaded its F-8 development program.

Chesapeake Microcomputer Club

John R. Gilchrist of Micro Processors Unlimited and Philip N. Hisley have announced the formation of a new microcomputer club in the Washington D.C.-Baltimore area. The Chesapeake Microcomputer Club has its first meeting in December with over 100 enthusiasts crowding the halls. The club meets every second Wednesday of each month. (301) 667-9690

One Day Microprocessor Course

A one-day short course in microprocessors will be offered by the IEEE on Saturday, March 27, 1976. The session, which will run from 9:00 AM to 4:30 PM, will be held at the Mecca
Exposition Convention Center, Milwaukee WI.

The course will present an overview of microprocessor basic organizations, programming characteristics and hardware availability. Emphasis will be on application in industrial control of data acquisition situations.

The registration fees for IEEE members is $65, IEEE student members is $30 and $75 for non-members. For additional information or registration forms, write: Educational Registrar, IEEE, 445 Hoes Lane, Piscataway NJ 08854.

**People On The Move**

NORMAN GRANNIS, vice-president and general manager of American Microsystems' Standard Product division has been named corporate vice-president of systems engineering, concentrating on MOS applications for new electronic systems. GEORGE AVERY, vice-president and general manager of AMI's Custom Products division, will now head both the Custom and Standard Product divisions.

ANDREW ALLISON has joined Advanced Micro Devices as MOS microprocessor marketing manager, a new post. Allison was formerly the ROM/PROM marketing manager for Fairchild.

DYNAMIC MEASUREMENTS has franchised Semiconductor Specialists to handle their line of microcomputer power supplies in 11 locations in the mid-U.S. while signing agreements with Harvey Electronics for distribution at five locations in the Northeast.

Fairchild Camera & Instrument Corp. has announced the formation of a new Microsystems Division. The new group, headed by DAVID L. MAHN, former general manager of the Communications Equipment Unit, will have the responsibility for all of Fairchild's microprocessor and microcomputer activities.

Fairchild has also announced several key executive assignments and a restructuring of its semiconductor products organization:

GEORGE D. WELLS has been named vice president and general manager of the Domestic Components Group, consolidating divisions dedicated to semiconductor components and logic devices.

THOMAS A. LONGO has been appointed vice-president and chief technical officer of the corporation. Dr. Longo previously was vice-president and general manager of the Memory and Logic Group. He will now be responsible for all research and development programs of the company, including the central laboratory, and for technical liaison among its various divisions.

WILLIAM D. BAKER has left Monolithic Memories to become the new group director of microprocessor operations at National Semiconductor.

JAMES MORETON has joined Monolithic Memories Microcomputer Group and will head the firm's effort in microcomputer and small systems that are software-compatible with Data General's Nova microcomputer.

NEC MICROCOMPUTER, INC. has franchised Harvey Electronics to distribute their microprocessor and memory products in Lexington; Nor­wald CT; Woodbury NY and Fairfield NJ. Harvey also handles the Fairchild, Motorola, National, Harris, and Intersil line of microprocessors.

NEC also appointed GEORGE M. WOLFE & ASSOC. to cover sales in the Carolinas.

DONALD A. MITCHELL has been named president and chief operating officer of Plessey, Inc., U.S. subsidiary of the English firm. Mitchell is the former president of Rockwell International's Microelectronics group.

PRO-LOG CORP. has changed their address to 2411 Garden Rd. in Monterey CA.

MICROCOMPUTER ASSOCIATES INC. has relocated to 2589 Scott Blvd., Santa Clara CA.

ROBERT V. KNOX has been appointed vice-president of engineering of the Microelec­tronic Device division of Rockwell International. After announcing that 1975 saw the shipment of their 1,000,000th microcomputer system, the Microelectronic Device Division announced the appointment of ROBERT BROWNING to the new post of manager, OEM System Marketing. He will be responsible for expansion of the division's sales of MOS/LSI systems and subsystems as board assemblies.

LARRY HOBBS has been appointed the Nation­al Semiconductor product manager at Bell Industries for the San Francisco Bay Area. Hobb's responsibility includes the entire National microprocessor line as well as related products.
MICROPROCESSOR STUDY

EDN is offering their second annual Microprocessor Study. According to EDN, the $400 report discusses the market potential of microprocessors and related peripherals for the next few years. The study culminates $20,000 and seven months of intensive research by the publishing company.

RECENT LITERATURE

A rather large number of magazine articles in the past 60 days have concentrated on microprocessors/microcomputers. Rather than just review a few, we have decided to list them.


The PLA: A Different Kind of ROM. Albert Hemel. Electronic Design 1 January 5, 1976, page 78.


When It Comes to Floppys, There Is Much to Know Before You Buy. Woody Floyd. EDN January 5, 1976, page 18.


EDUCATION:

MICROCOMPUTER COURSES, SEMINARS, CONFERENCES. Date, title, cost, location, sponsoring organization

March
1  Microcomputer Profile $165 Los Angeles CA Technology Service Corp.
1  State of Art in Current Microcomputer Technology $165 Los Angeles CA Technology Service Corp.
1-5 Microcomputer Congresses—Intensive Short Courses $220-$395 Boston MA Integrated Computer Systems, Inc.
2-4 Microprocessors & LSI in Telecommunications and Applications $495 Chicago IL Integrated Computer Systems, Inc.
3  Microcomputer Profile $165 Chigaco IL Technology Service Corp.
3  PROM Programming—A Systems Approach Free San Jose CA Data I/O Corp.
3  State of Art in Current Microcomputer Technology $165 Chicago IL Technology Service Corp.
4  Software Development Techniques for Microcomputers Chicago IL Integrated Computer Systems, Inc.
4-6 ACM Conference on Programming Micro/Minicomputers New Orleans LA Bell Telephone Laboratories
5  Microcomputer Profile $165 Ottawa Ontario Technology Service Corp.
5  State of Art in Current Microcomputer Technology $165 Ottawa Ontario Technology Service Corp.
8  Basic Microcomputer Theory $40 Kansas City KS Microcomputer Training Labs
8  Microcomputer Profile $165 Boston MA Technology Service Corp.
8  State of Art in Current Microcomputer Technology $165 Boston MA Technology Service Corp.
8-9 Intel Microprocessors $225 Mt. View CA Elmar Electronics

8-9 Survey & Application of Microprocessors $300 Chicago IL Yourdon, Inc.
8-10 IECI 76 Conference of Industrial Applications of Microprocessors, Process Measurement, and Failure Mode Analysis Philadelphia PA IEEE
8-10 Microprocessors and Microcomputers $485 New York NY Institute for Science & Public Affairs
8-11 MCS-80/ICE-80 $350 Boston MA and Santa Clara CA Intel Corp.
9  Microcomputer Profile $165 New Carrollton MD Technology Service Corp.
9  State of Art in Current Microcomputer Technology $165 Washington, D.C. Technology Service Corp.
9-11 Compdesign/76 $120 New York NY Computer Design
10 Basic Microcomputer Theory $40 Kansas City KS Microcomputer Training Labs
11 Microcomputer Profile $165 Dallas TX Technology Service Corp.
12 Basic Microcomputer Theory $40 St. Louis MO Microcomputer Training Labs
12-13 Microcomputer Interfacing Workshop $175 Reston VA Departments of Chemical Engineering and Chemistry VPI and SU
12-13 Microcomputer Interfacing Workshop Blacksburg VA American Chemical Society
14-19 Microprocessors and Minicomputers—Interfacing and Applications Blacksburg VA American Chemical Society
15 Adhesives for Industry Conference $165 San Diego CA Technology Service Corp.
15 Intel S.B.L. Microcomputer $125 Palo Alto CA Elmar Electronics
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<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
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<tbody>
<tr>
<td>15</td>
<td>Microcomputer Profile $165 San Diego CA Technology Service Corp.</td>
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<td>15-18</td>
<td>MCS-80/ICE-80 $350 Boston MA Intel Corp.</td>
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<tr>
<td>15-26</td>
<td>LSI-11 &amp; PDP-11/03 Hardware and Interfacing $750 Maynard MA Digital Equipment Corp.</td>
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<td>16-18</td>
<td>Hands-On Microprocessor Workshop $495 San Diego CA Wintek Corp.</td>
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<td>15-17</td>
<td>3000 Bipolar Microcomputer Course $350 Santa Clara CA Intel Corp.</td>
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<tr>
<td>17</td>
<td>Intel S.B.C. Microprocessor $125 Denver CO Elmar Electronics</td>
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<tr>
<td>21-26</td>
<td>Digital Electronics for Automation and Instrumentation Blacksburg VA American Chemical Society</td>
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<td>22</td>
<td>Basic Microcomputer Theory $40 Chicago IL Microcomputer Training Labs</td>
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<td>22-24</td>
<td>3000 Bipolar Microcomputer Course $350 Boston MA Intel Corp.</td>
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<td>22-24</td>
<td>Motorola 6800 $375 Mt. View CA Elmar Electronics</td>
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<td>22-25</td>
<td>MCS-80/ICE-80 $350 Santa Clara CA Intel Corp.</td>
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<td>24-26</td>
<td>2650 Intensive Design and Applications $425 Chicago IL Microcomputer Training Labs</td>
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<td>25</td>
<td>Microcomputer System Hardware $125 Mt. View CA Elmar Electronics</td>
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<td>26</td>
<td>Advanced Microprocessor Programming $125 Mt. View CA Elmar Electronics</td>
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<td>29-30</td>
<td>Intel Memories $225 Palo Alto CA Elmar Electronics</td>
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<td>31-2</td>
<td>Hands-On Microprocessor Workshop $495 Florida Wintek Corp.</td>
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<td>31-2</td>
<td>Microprocessors and LSI in Telecommunications Applications $495 Chicago IL Integrated Computer Systems, Inc.</td>
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<td>2</td>
<td>Laboratory Automation: Micro-, Mini-, or Midicomputers? Chicago IL American Chemical Society</td>
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<td>3-4</td>
<td>Basic Microcomputer Theory $40 Tampa FL Microcomputer Training Labs</td>
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<td>5</td>
<td>Survey and Application of Microprocessors $300 San Francisco CA Yourdon Inc.</td>
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<td>5-7</td>
<td>Hands-On Microprocessor Workshop $495 Austria Wintek Corp.</td>
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<td>5-8</td>
<td>MCS-80/ICE-80 $350 Boston MA and Santa Clara CA Intel Corp.</td>
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<td>6-8</td>
<td>Microprocessors and LSI Telecommunications and Applications $495 Dallas TX Integrated Computer Systems, Inc.</td>
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<tr>
<td>7</td>
<td>Basic Microcomputer Training Labs $40 Atlanta GA Microcomputer Training Labs</td>
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<tr>
<td>7</td>
<td>PROM Programming—A Systems Approach Free San Jose CA Data I/O Corp.</td>
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<tr>
<td>8</td>
<td>Software Development Techniques for Microcomputers Dallas TX Integrated Computer Systems, Inc.</td>
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<tr>
<td>9</td>
<td>Basic Microcomputer Training Labs $40 Raleigh NC Microcomputer Training Labs</td>
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<td>12-14</td>
<td>MOS/LSI Logic Design Techniques $320 Washington, D.C. George Washington University</td>
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12-23 LSI-II & PDP-11/03 Hardware and Interfacing $750 Maynard MA Digital Equipment Corp.

13-14 Microprocessors and LSI Telecommunications and Applications $425 San Francisco CA Integrated Computer Systems, Inc.

13-15 Compdesign/76 $120 Chicago IL Computer Design Magazine

15 Software Development Techniques for Microcomputers San Francisco CA Integrated Computer Systems, Inc.

19-21 3000 Bipolar Microcomputer Course $350 Santa Clara CA Intel Corp.

19-22 MCS-80/ICE-80 $350 Boston MA and Santa Clara CA Intel Corp.

19-30 LSI-II & PDP-11/03 Hardware and Interfacing $750 Sunnyvale CA Digital Equipment Corp.


26-28 MCS-4/40 $350 Santa Clara CA Intel Corp.


SPONSORING ORGANIZATIONS AND CONTACTS

American Chemical Society, Educational Activities Division, 1155 16th St NW, Washington DC 20036

Bell Telephone Laboratories, Lawrence J. Schutte, Rm 6B-302, Naperville IL 60540 (312) 690-2000

Computer Design Magazine, Compdesign/76 Registration, 797 Washington St, Newton MA 02160

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

Digital Equipment Corp., Educational Services Dept., 146 Mail St, Maynard MA 01754 (617) 897-5111

Elmar Electronics, 2288 G Charleston Rd., Mt. View CA 94040 (415) 961-2611

FINANCIAL:

Earnings

Adv. Memory Systems 1976 1975 %

Dec. 26 Share Earnings $.46 $.12 +283.3

Earnings 1,160K 306K +279.1

Sales 9,667K 7,503K +28.8


Dec. 28 Share Earnings $.15 ---- ---

Earnings 397K -403K +198.5

Sales 8,908K 6,045K +47.4

9 Months Share Earnings $.29 ---- ---

Earnings 765K -2,484K +130.8

Sales 23,751K 19,377K +22.6

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<table>
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<tr>
<th>Company</th>
<th>Year</th>
<th>1975</th>
<th>%</th>
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<td>Amer. Microsystems</td>
<td>1976</td>
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<tr>
<td>Jan. 3</td>
<td>Share Earnings</td>
<td>$1.19</td>
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<tr>
<td>Earnings</td>
<td>-1,071K</td>
<td>416K</td>
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<td>18,365K</td>
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<td>Year</td>
<td>Share Earnings</td>
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<td>Earnings</td>
<td>-610K</td>
<td>3,660K</td>
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<tr>
<td>Sales</td>
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<td>75,324K</td>
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<td>DEC 27</td>
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<tr>
<td>Share Earnings</td>
<td>$1.35</td>
<td>$.81</td>
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<td>9,763K</td>
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<td>Sales</td>
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<td>Share Earnings</td>
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<td>27,664K</td>
<td>17,251K</td>
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<td>Sales</td>
<td>313,059K</td>
<td>238,590K</td>
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<td>Electronic Arrays</td>
<td>1976</td>
<td>1975</td>
<td>%</td>
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<td>Dec. 31</td>
<td>Share Earnings</td>
<td>$0.01</td>
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<tr>
<td>Earnings</td>
<td>16,000</td>
<td>23,000</td>
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<td>Sales</td>
<td>4,220K</td>
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<td>9 Months</td>
<td>Share Earnings</td>
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<tr>
<td>Earnings</td>
<td>252K</td>
<td>893K</td>
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<td>Sales</td>
<td>11,754K</td>
<td>12,781K</td>
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<td>Fairchild C &amp; I</td>
<td>1976</td>
<td>1975</td>
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<td>Dec. 28</td>
<td>Share Earnings</td>
<td>$.21</td>
<td>$.79</td>
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<td>1,165K</td>
<td>4,129K</td>
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<td>Sales</td>
<td>81,368K</td>
<td>78,891K</td>
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<td>Share Earnings</td>
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<td>$5.00</td>
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<tr>
<td>Earnings</td>
<td>13,073K</td>
<td>27,032K</td>
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<tr>
<td>Sales</td>
<td>291,542K</td>
<td>384,933K</td>
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<td>General Instrument</td>
<td>1976</td>
<td>1975</td>
<td>%</td>
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<tr>
<td>Nov. 30</td>
<td>Share Earnings</td>
<td>$.25</td>
<td>$.56</td>
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<tr>
<td>Earnings</td>
<td>2,164K</td>
<td>4,410K</td>
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<td>Sales</td>
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<td>Share Earnings</td>
<td>$1.52</td>
<td>$1.52</td>
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<tr>
<td>Earnings</td>
<td>4,664K</td>
<td>12,018K</td>
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<tr>
<td>Sales</td>
<td>288,913K</td>
<td>332,956K</td>
<td>-13.2</td>
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<td>Harris Corp.</td>
<td>1976</td>
<td>1975</td>
<td>%</td>
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<td>Dec. 31</td>
<td>Share Earnings</td>
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<td>Earnings</td>
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<td>Sales</td>
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<td>121,496K</td>
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<td>6 Months</td>
<td>Share Earnings</td>
<td>$.83</td>
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<tr>
<td>Earnings</td>
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<td>8,490K</td>
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<tr>
<td>Sales</td>
<td>243,974K</td>
<td>228,625K</td>
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<td>Intel Corp.</td>
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<td>1975</td>
<td>%</td>
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<td>Dec. 31</td>
<td>Share Earnings</td>
<td>$.66</td>
<td>$.44</td>
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<td>Earnings</td>
<td>4,599K</td>
<td>2,997K</td>
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<td>Sales</td>
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<td>31,284K</td>
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<td>Year</td>
<td>Share Earnings</td>
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<td>$2.96</td>
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<tr>
<td>Earnings</td>
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<td>Sales</td>
<td>136,788K</td>
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<td>Mostek Corp.</td>
<td>1976</td>
<td>1975</td>
<td>%</td>
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<td>Dec. 31</td>
<td>Share Earnings</td>
<td>$.02</td>
<td>$.05</td>
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<td>Earnings</td>
<td>62K</td>
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<td>Year</td>
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<tr>
<td>Sales</td>
<td>47,119K</td>
<td>60,060K</td>
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<td>Motorola</td>
<td>1976</td>
<td>1975</td>
<td>%</td>
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<td>Dec. 31</td>
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<td>$.15</td>
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<td>Year</td>
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<td>$2.52</td>
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<tr>
<td>Earnings</td>
<td>41,127K</td>
<td>70,728K</td>
<td>+41.9</td>
</tr>
<tr>
<td>Sales</td>
<td>1,311M</td>
<td>1,367M</td>
<td>-4.1</td>
</tr>
<tr>
<td>Nat'l Semiconductor</td>
<td>1976</td>
<td>1975</td>
<td>%</td>
</tr>
<tr>
<td>Dec. 14</td>
<td>Share Earnings</td>
<td>$.43</td>
<td>$.32</td>
</tr>
<tr>
<td>Earnings</td>
<td>5,659K</td>
<td>3,827K</td>
<td>+47.9</td>
</tr>
<tr>
<td>Sales</td>
<td>79,894K</td>
<td>55,061K</td>
<td>+45.1</td>
</tr>
<tr>
<td>6 Months</td>
<td>Share Earnings</td>
<td>$.83</td>
<td>$.77</td>
</tr>
<tr>
<td>Earnings</td>
<td>10,900K</td>
<td>9,333K</td>
<td>+16.8</td>
</tr>
<tr>
<td>Sales</td>
<td>162,280K</td>
<td>130,181K</td>
<td>+24.7</td>
</tr>
<tr>
<td>------------------------</td>
<td>---------------------</td>
<td>---------------------</td>
<td>-----</td>
</tr>
<tr>
<td>Plessey Co.</td>
<td>$.42</td>
<td>$.53</td>
<td>-20.8</td>
</tr>
<tr>
<td>RCA Corp.</td>
<td>$.43</td>
<td>$.21</td>
<td>+104.8</td>
</tr>
<tr>
<td>Texas Instruments</td>
<td>$.91</td>
<td>$.92</td>
<td>-1.1</td>
</tr>
</tbody>
</table>

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AES Data, Ltd, 570 McCaffrey St, Montreal Que Canada N4T 1N1 (514) 739-2711
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Cambion Division, Cambridge Thermionite Corp, 445 Concord Ave, Cambridge MA 02138 (617) 491-5400
CDI, Westlake Village CA 91360
Chesapeake Microcomputer Club, 236 St David Ct, Cockeysville MD 21030 (301) 667-9690
Computer Transmission Corp, 2352 Utah Ave, El Segundo CA 90245 (213) 973-2222
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C-Tek, Inc, 4 Railroad Ave, Wakefield MA 01880 (617) 246-1720
Data Translation Inc, 1096 Concord St, Framingham MA 01701 (617) 879-3595
Data Works Instrumentation, 9748 Cozycroft Ave, Chatsworth CA 91311 (213) 998-8985
Datel Microelectronics, Division of Datel Systems, Inc, 1020 Turnpike St, Canton MA 02021 (617) 828-8000
Digital Equipment Corp, One Iron Way, Marlboro MA 01752 (617) 897-5111
Digital Laboratories, 377 Putnam Ave, Cambridge MA 02139 (617) 876-6220
EDN Magazine, Cahners Publishing Co, 205 E 42nd St, New York NY 10017 (212) 689-3250
Essex International Semiconductor Group, 564 Alpha Dr, Pittsburgh PA 15238 (412) 782-0200
Extel Corp, 310 Anthony Trail, Northbrook IL 60062 (312) 564-2600
Fairchild Camera & Instrument, 464 Ellis St, Mt View CA 94040 (415) 962-5011
FBE, Seattle WA 98100
First Data Corp, Waltham MA 02154 (617) 890-6701
Forth Inc, Manhattan Beach CA 90266 (213) 372-8493
Forth Inc, Manhattan Beach CA 90266 (213) 372-8493
General Computer/Systems Inc, Addison TX 75001 (214) 233-5800
General Instrument Corp, Microelectronics, 600 W John St, Hicksville NY 11802 (516) 733-3000
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