

MICROCOMPUTER DIGEST

Copyright © 1974 by
Microcomputer Associates Inc.
Printed in U.S.A.

Volume 1, Number 6

December, 1974

INTEL UNWRAPS FASTER 4-BIT CPU

Following a short three years after introducing the industry's first LSI microcomputer, Intel Corp. of Santa Clara, CA has now introduced the MCS-40 microcomputer system based on the 4040, an enhanced version of its 4004 microprocessor. The company feels their new family will open a whole new era of low-cost intelligent microcomputer-based products.

The 4040, housed in a 24-pin package, is a single-chip, silicon-gate, P-channel MOS circuit which utilizes the 4-bit parallel data bus structure and the ALU design of the 4004.

The clock rate has been increased to 1 MHz (30% faster than the 4004) and the instruction set has been increased by 14 to a total of 60 instructions. This set includes the 4004's original 46 instructions as a subset. The new instructions now allow vector interrupt, halt, bank switching and logical operations.

(cont'd on page 2)

INSIDE THIS ISSUE

MONOLITHIC MEMORIES--New 4-bit microcontroller is available. Story on page 6.

HEWLETT-PACKARD--Introduces first microcomputer controlled CRT Terminal. Story on page 5.

COBILT'S microprocessor controlled wafer prober frees operators on weekends. Story on page 7.

SIGNETICS--Introduces dash one version of the 2606. Story on page 11.

COURSES--Upcoming Microcomputer Courses and Seminars for Dec., Jan., Feb., and March on page 16.

WEMA--Studies conclude 1975 to be year of limited growth for semiconductor industry. Story on page 18.

TI ANNOUNCES FIRST MICROCOMPUTER

Texas Instruments of Dallas, TX has revealed how they will enter the microcomputer business. The company will introduce, in the first quarter 1975, a family of LSI bipolar processors that will include both integrated injection logic and compatible Schottky TTL devices.

The family is geared for TI's minicomputer and peripheral customers. The bipolar family will include a 2048-bit Schottky TTL PROM organized as a 256 x 8 bit format with an access time of 45 ns and a 400 gate, 20 MHz first-in first-out Schottky memory that's organized as a 16 x 5 bit processor format.

(cont'd on page 3)

MICROCOMPUTER DEVELOPMENT SYSTEMS

This is the first in a series of articles on microcomputer development systems. Each month we will present the general characteristics and special features of an available system.

A development system is a tool that can be used in developing software as well as hardware for a microcomputer-based product. Most development systems available today are OEM microcomputers with full memory and I/O capability.

(cont'd on page 3)

STANDARD LANGUAGE SEEN EMERGING

In 1973, Intel introduced "Programming Language for Microcomputers" (PL/M) for their line of 8-bit microcomputers. Since then, no other manufacturer has introduced a new language or incorporated PL/M into their system. Hence the cost of software development for micros has remained costly and time consuming.

However, two recent announcements indicate a rising trend toward an industry standard.

(cont'd on page 5)



2368-C WALSH AVE., SANTA CLARA, CA 95050 • (408) 247-8940

Published monthly by Microcomputer Associates, Inc.,
M. R. Lemas, President. Subscription \$60.00 per year.
DARRELL D. CROW, Editor; LILLIAN LAU, Associate Editor;

BOB FULLER, 114 Glenmont Dr., Rochester, N.Y. 14617, Eastern
Correspondent; RAY HOLT, Applications Technical Advisor;
MANNY LEMAS, Applications Technical Advisor.

CONTENTS

SPECIAL FEATURES	Page
Intel Unwraps Faster 4-Bit CPU	1
TI Announces First Microcomputer	1
Microcomputer Development Systems	1
Standard Language Seen Emerging	1
H-P Announces New uC Terminal Line	5
4-Bit Microcontroller Available	6
EDITORIAL	
You Asked For It	2
TECHNOLOGY	
Western & DEC Have 3-Chip uC Mini	7
Rockwell Increases Chip Shipment	7
Blow Them Thar Lines	7
MICROCOMPUTER-BASED PRODUCTS	
Cobilt Introduces 3 Wafer Probers	7
Attache-Sized Programmer	8
Data Entry Simplified	8
EXORcisor Exercises uC Software	8
This Microcomputer Plots Every Move	8
Hotel Reservation System Employs uC	9
Intel Bipolar 3000 Kit Available	9
Zip Zip	9
uC Controls Nuclear Reactor	9
Data Acquisition System Gets Smart	9
Printer Under uC Control	10
MEMORIES AND PERIPHERALS	
8008/8080 Support Software Offered	10
Complex LSI & uC Tester Ready	10
Fast Dash For 2606	11
1K RAM For uC	11
Intersil Introduces IM7733	11
Large Selection of 1K RAM	11
PEOPLE, LITERATURE AND EVENTS	
EE Times uC Seminar Applauded	12
New Datachecker Training Manager	13
Wichita Consultant House Formed	13
Faggin & Ungermann Form New Firm	13
ISA Indicates Slow uC Acceptance	13
Industrial uC Conference in March	13
GM Says Micros In Autos By 1980	13
Full Semester In Just 8 Hours	14
uP Field Survey & Data Book	14
Machine Firm Acquires Comstar	14
Recent Literature	14
EDUCATION	
Microcomputer Courses, Seminars and Conferences For December Thru March ...	16

FINANCIAL	Page
Earnings	18
WEMA Sees 1975 To Begin Turnaround ...	18
NEREM Finds uC Companies "Holding" ...	19
COMPANY INDEX	19

EDITORIAL:

YOU ASKED FOR IT

Many of our readers have indicated a desire for MICROCOMPUTER DIGEST to list full addresses of companies covered in our stories. Beginning this month, a new section, "Company Index", will list addresses of companies mentioned in that issue. This section will be located on the last page for easy reference.

Addresses and phone numbers of sponsoring organizations for microcomputer courses and seminars will continue to be listed in our Education Department and will not be included in the Company Index.

Also, we are announcing discounted subscription rates for multiple subscriptions going to the same mailing address. All multiple subscriptions must be ordered on the same purchase order to receive the discount. For two subscriptions--\$90 (\$60 first, \$30 second). For orders with three or more subscriptions add \$20 each to the above figure.

I want to thank everyone who has written or called to express their suggestions and comments. We encourage our readers to continue this correspondence. Please address your letters to the Reader's Forum.



Editor

INTEL UNWRAPS FASTER 4-BIT CPU

(from page 1)

Interrupt control enables the microprocessor to switch from one operation or mode to another automatically when interrupted from memory or peripherals.

(cont'd next page)



2368-C WALSH AVE., SANTA CLARA, CA 95050 • (408) 247-8940

Published monthly by Microcomputer Associates, Inc.,
M. R. Lemas, President. Subscription \$60.00 per year.
DARRELL D. CROW, Editor; LILLIAN LAU, Associate Editor;

BOB FULLER, 114 Glenmont Dr., Rochester, N.Y. 14617, Eastern
Correspondent; RAY HOLT, Applications Technical Advisor;
MANNY LEMAS, Applications Technical Advisor.

Storage capacity for the 4040's CPU has been doubled allowing up to 8196 bytes of instruction memory. An 8 x 12 bit address register stack now enables up to seven subroutine levels to be nested. The 4004 had three levels. The expanded subroutine nesting permits more complex programs to be stored economically in ROM. Index registers have also been increased, going from 16 to 24.

The CPU is available with a host of support chips. Included is a 4201 clock generator, which permits single-step operation with either soft or hardware control.

Replacing the 4004 memory and I/O interface is the new 4289 interface circuit. Changes in this circuit has resulted in devices with a long access time to be utilized in the system.

The system's basic memory device is the 4308 metal-mask ROM. It stores 1024-bits and is organized as four 256 byte pages. Also included in the family are three general purpose I/O arrays for use on ROM or RAM lines in control and data communications applications with devices such as printers and keyboards.

The remainder of the family consists of the 4001, a 256-bit metal-mask ROM; the 4316 metal-mask 2048 x 8 ROM; the 4702A erasable 2K PROM; the 4002, a 320-bit RAM and I/O device; the 4101 static 256 x 4 RAM; and the 4003 shift register.

The 4040 design emphasis has been to allow economic automation and programmable capabilities for products such as vending machines, point-of-sale equipment, business machines, industrial controls and instruments.

The 4040 is also attractive for multiple-microcomputer distributed intelligence networks. The MCS-40 could be used for diagnostics, custom-forms control, keyboard controls, control panels, large processor controls, and preprocessing functions.

The system is available on OEM quantities between \$20 and \$100 each depending on configuration.

TI ANNOUNCES FIRST MICROCOMPUTER

(from page 1)

In addition to the microprocessor itself, are octal latches and multiplexers, 70 MHz 8-bit shift registers, 100 MHz 4-bit asynchronous counters, octal bus-drivers capable of

managing 8-bit bus systems and new bipolar memories such as a 42 ns, 256-bit RAM and a 1024-bit inverted cell RAM.

TI says there will be no support software packages offered presently since the microprocessor is aimed at the established computer customer in an industry that already has a high level of software.

TI is optimistic that its customers will be able to penetrate the low-end n-channel controller market by using the devices with existing software.

MICROCOMPUTER DEVELOPMENT SYSTEMS

(from page 1)

Features characterizing these systems include resident assemblers; loader and editor programs; modular hardware construction for expandability; and external logic for CPU control and register/memory display.

These systems are often used where short design development time requirements are necessary, with design optimization occurring after production orders have been received. More typically, a development system is used as a stand-alone software aid different from the actual system development hardware.

Microcomputer development systems in general are characterized by the following:

- o Ease of use
- o Modularity (hardware and software)
- o Expandability (hardware and software)
- o Adequate software available for program checkout and debug
- o Tabletop enclosures
- o Economical initial development cost
- o Can be used to build up a personalized system
- o Allows individuals or small companies to enter the microcomputer-based product market.

The first microcomputer development system discussed in our series is the new "MicroPac 80" from Process Computer Systems, Inc., of Flint, MI.

MicroPac 80

The MicroPac 80 was developed as an OEM microcomputer for industrial and process control applications. It is packaged in a
(cont'd next page)



2368-C WALSH AVE., SANTA CLARA, CA 95050 • (408) 247-8940

Published monthly by Microcomputer Associates, Inc.,
M. R. Lemas, President. Subscription \$60.00 per year.
DARRELL D. CROW, Editor; LILLIAN LAU, Associate Editor;

BOB FULLER, 114 Glenmont Dr., Rochester, N.Y. 14617, Eastern
Correspondent; RAY HOLT, Applications Technical Advisor;
MANNY LEMAS, Applications Technical Advisor.

complete self-contained tabletop or rack-mountable enclosure with all input/output signals terminating on terminal strips at the rear of the enclosure. The basic system includes the following hardware:

- o CM4400--CPU module
- o CM4501--4K bytes of RAM memory
- o CM4503--4K bytes of PROM sockets (1K PROM memory included)
- o PM5080--TTY interface and Teletype MOD Kit
- o PM5100--Control Panel
- o PM5001--I/O Module (16-bits)

Software includes a loader, assembler, operating system, editor, debugger, trace, I/O and TTY driver, and diagnostics for all hardware modules. Several additional optional features are available and will be discussed later.

The CPU module incorporates an Intel 8080 CPU into the standard microprocessor module. This includes the 8-bit parallel CPU with a repertoire of 78 instructions, seven working registers, unlimited subroutine nesting and multiple interrupt capability. Memory can be expanded up to 65K bytes in increments of 4K RAM and/or 1K PROM. Each memory board has switches to allow selection of memory addressing.

The control panel allows hands-on operation of the CPU. It has interrupting capability which may be enabled or disabled. It is entirely software driven, using standard programs with the system. With the standard control panel driver, the contents of memory registers, program counter and stack pointer can be examined and modified. The panel contains 12 control switches, 16 data switches, 17 display LEDs and a key lock switch for security. It includes START, STOP, CONTINUE, and RESET functions.

The input/output module provides an interface with TTL compatible process or peripheral devices. It contains 16-bits of digital input and 16-bits of digital output with halt and interrupt capabilities. Data outputs are fully buffered allowing output data to be stored on the module. The standard teletypewriter (TTY) controller module provides an interface with any TTY or any other asynchronous (110-2400 baud) serial device.

MicroPac 80's development software is completely resident, that is, it runs on the MicroPac 80 itself. The basic operating system (BOS 80) permits the user to control the execution of programs and operations through a TTY keyboard. It contains a loader, punch routine and drivers for the standard hardware. The assembler (MAS 80) permits generating tape from source language programs for execution on the CPU. This program requires a minimum of 4K bytes of RAM and runs under BOS 80 control. The interacting software debugging program (DEBUG 80) checks out and debugs programs for use on the CPU. The program permits multiple break point insertions and has the capacity to alter or display memory or registers. The program tracing tool (TRAC 80) can trace up to 8 points in a program with each point traced having up to 8 variables displayed, such as register, memory and status. The text editor (EDIT 80) modified source language programs for use with a TTY under the BOS 80 operating system. A BPNF program facilitates punching in the BPNF format required for earlier versions of PROM burning equipment.

Any combination of up to 256 process input/output modules, analog or digital or both, can be added using up to a maximum of 16 standard chassis. The digital interfacing includes 16-bit TTL input/output modules, 16-bit high and low level digital input/output modules (available optically isolated), 8-channel interrupt expanders and relay outputs, 16-bit up/down counters, real time clocks (available with power fail, auto restart), interval timers and stepper motor outputs. Standard off-the-shelf analog interfacing includes 2-channel D/A converters (12-bit), 16-channel A/D converters (12-bit) and DC excited transducer controllers.

Optional hardware features include a CRT keyboard and interface, a Remex dual cassette tape system and interface, a 132 column Centronics line printer and interface, an ASR-33 teleprinter, and a 300 CPS high speed paper tape reader. Complete documentation on all hardware and software is available.

Basic system prices begin at \$2995. Delivery is 60-90 days ARO. Quantity pricing and applications information should be directed to Arthur D. Harmala, manager of Product Applications.



2368-C WALSH AVE., SANTA CLARA, CA 95050 • (408) 247-8940

Published monthly by Microcomputer Associates, Inc.,
M. R. Lemas, President. Subscription \$60.00 per year.
DARRELL D. CROW, Editor; LILLIAN LAU, Associate Editor;

BOB FULLER, 114 Glenmont Dr., Rochester, N.Y. 14617, Eastern
Correspondent; RAY HOLT, Applications Technical Advisor;
MANNY LEMAS, Applications Technical Advisor.

STANDARD LANGUAGE SEEN EMERGING

(from page 1)

This microcomputer higher level language standard would pave the way for more efficient and less expensive microcomputer-based products.

National Semiconductor has just announced they will have available by Spring 1975 a higher level language, PL/N, for their IMP-16 microcomputer series. The language is described as a superset of PL/M. In addition, sources have revealed Motorola is currently evaluating a higher level language for their M6800 microcomputer that would be a subset of PL/M. However, no date was given for the introduction of the language.

Although Toshiba is also known to be developing a PL/M-like language for its TLCS-12 microcomputer, it is National's and Motorola's announcement that could push PL/M to emerge as a standard language for microcomputers.

H-P ANNOUNCES NEW μ C TERMINAL LINE

Hewlett-Packard's System Data Division of Palo Alto, CA has introduced the first in a new series of microcomputer controlled terminals.

Jim Doub, project engineer, says the Model 2640A CRT terminal is a general purpose terminal that allows both page mode and character mode operations for complex data entry applications and timesharing uses.

Features of the system include the Intel 8008 microcomputer, up to 8192 bytes of 4K RAM that can store over 400 lines of data which can be viewed 24 lines at a time by scrolling, four plug-in character sets, off-line data preparation, editing capability, self-test and a unique modular construction.

An easy-to-read display generates characters with a high-resolution (9 x 15) dot matrix. The four character sets include the standard Roman font, math and line drawing character set, and a Greek character set.

The microcomputer controls all system functions and constantly scans the keyboard for an entry. Once data has been entered, the microcomputer transfers it to the display memory for storage until the CRT is ready.

The memory has many features which include the ability to store over 400 lines locally. Lines that have rolled off the screen can be easily recalled with a single keyboard entry.

Spaces to the right of a line feed are not stored. The memory can be expanded up to 8K characters in 2K or 4K blocks.

The terminal can operate as a stand-alone system or as a terminal link to a main computer. If the main computer shuts down, the terminal retains over 400 lines of characters.

Full editing capabilities allow users to verify and correct data before transmissions to a central computer. The Model 2640A transmits one or a block of characters at a time. Asynchronous data transmission of ASCII characters is RS-232C compatible at selectable rates up to 2400 baud. Before transmission, an operator enters or corrects data off-line using character/line insert or delete.

A self-test feature allows checks on the terminal's RAM to verify the firmware operation and character sets which are displayed on the screen. A diagnostic module that plugs into the terminal's backplane is used to pinpoint the defective part.

Tom Waitman, system firmware designer, noted that because of the modular construction and unique design of the 14 logic cards, trouble shooting has been greatly reduced. A technician just removes one of the logic cards and sends the old one back to the factory to be repaired. The cards are inexpensive and the operator has very little down time.

Waitman also commented that they chose to use a microcomputer in the system, not so much to add extra features, but because it resulted in the most economical design technique.

Doub added that H-P was not limited to using just Intel's microcomputer either. By redesigning the CPU and I/O logic board, they could use any available 8-bit microcomputer.

Doub mentioned H-P was evaluating several second generation microcomputers in order to increase the present data transmission rate.

Doub said the system would be available early in 1975 and that prices would begin at \$2640 in quantities of six or more. Additional memory is \$250 for 2K characters and \$375 for 4K characters.

To illustrate the simplistic design of the system, the design group invited three high-level executives to participate in a race to see who could most quickly assemble the terminal from scratch. The winner: Mr. Bill Hewlett, in just 35 minutes.



2368-C WALSH AVE., SANTA CLARA, CA 95050 • (408) 247-8940

Published monthly by Microcomputer Associates, Inc.,
M. R. Lemas, President. Subscription \$60.00 per year.
DARRELL D. CROW, Editor; LILLIAN LAU, Associate Editor;

BOB FULLER, 114 Glenmont Dr., Rochester, N.Y. 14617, Eastern
Correspondent; RAY HOLT, Applications Technical Advisor;
MANNY LEMAS, Applications Technical Advisor.

4-BIT MICROCONTROLLER AVAILABLE

Monolithic Memories Inc. of Sunnyvale, CA is marketing their 4-bit expandable bipolar microcontroller. The device is designed to be used as a 4-bit processor slice of a conventional central processing unit (CPU). It can also be used in peripheral controllers, or as the heart of a microcomputer, terminal or computer.

Features of the 6701 include 36 instructions, arithmetic, logic and shifting; overflow detection; active high or active low logic; 16 directly addressable two-port, general purpose accumulators, a separate Q register for scratch pad or accumulator extension; direct data in and accumulator operations; separate low fan input bus; and tri-state output bus.

The microcontroller will handle the data flow section of most computers since it is expandable to any word length in increments of 4-bits without significant speed degradation. The 16 general purpose accumulators give the microcontroller the type of CPU found in high performance 16-bit minicomputers or 24- or 32-bit computers.

Basically, the device can be thought of as a general purpose 4-bit RALU (register and arithmetic logic unit) with a separate A operand, B operand, data-in and data-out ports. If required, accumulators or registers can be added with off-chip packages tied to the microcontroller's data-in bus.

Manufactured with an advanced Schottky bipolar single layer metal process, the microcontroller requires only 5 volts, ground, and all inputs and outputs are totally TTL compatible. The chip is packaged in a standard 40-pin dual-in-line ceramic package.

Instruction time is typically 200ns and allows multiple operations in one cycle as the instructions are more complex than found in normal microinstructions.

Two ROMs on the chip provide a total of 352 bits for decoding 8-input instruction lines into 17 control lines which open and close data paths for instruction execution. The microcontroller is offered with a standard instruction set; however, the ROM can be custom coded for special customer requirements.

Since the chip's RAM is double decoded, a 16-word by 4-bit multiple port memory is used to fetch two operands simultaneously. The RAM's two address inputs operate independent of each other and thus can allow one side of the RAM to be read or written into independent of the other side.

On the RAM's output are latches which allow data on the input to appear on the latch outputs until the clock goes low and then hold the data. The latches permit parallel accessing of the RAM and ROMs without two delays since the access time of the ROM is masked by the delay through the RAM. The latches also eliminate race conditions when the RAM data is fetched and updated in one cycle.

Input multiplexers into the ALU under ROM control permit the entry of data in the A channel of the RAM into the A port of the ALU, and the B channel of the RAM or the Q register into the B port of the ALU. The ALU is of the conventional type, except true complement elements have been added in the input ports to allow for a totally symmetrical ALU.

The tri-state output multiplexers are controlled by a tri-state control signal which permits processing to be performed in the microcontroller without tying up the data out bus.

Multiplexers between the Q register and the RAM allow for data from the ALU to be transferred into either directly or with one bit shifted. Both the RAM shifter and the Q shifter employ bidirectional shift-in/shift-out pins to permit expansion to more than 4-bits, i.e., from chip to chip.

The Q register functions as an accumulator or extension register. It normally holds the least significant half of the double length product of a multiplication or stores bits shifted off the beginning or end of a word during left or right shift. The Q register can shift on itself and be loaded from the ALU while any instruction is being executed. Its shift control pins are in common with RAM shift control pins to allow shifting from one to another in one cycle. The Q register can also be used as a program counter or scratch pad, intermediate register.

The microcontroller is available off-the-shelf. Price and availability can be obtained by contacting MMI.



2368-C WALSH AVE., SANTA CLARA, CA 95050 • (408) 247-8940

Published monthly by Microcomputer Associates, Inc.,
M. R. Lemas, President. Subscription \$60.00 per year.
DARRELL D. CROW, Editor; LILLIAN LAU, Associate Editor;

BOB FULLER, 114 Glenmont Dr., Rochester, N.Y. 14617, Eastern
Correspondent; RAY HOLT, Applications Technical Advisor;
MANNY LEMAS, Applications Technical Advisor.

TECHNOLOGY:**WESTERN & DEC HAVE 3-CHIP μ C MINI**

In cooperation with MOS manufacturer Western Digital Corp., Digital Equipment Corp., of Maynard, MA has developed a three-chip microcomputer set that emulates DEC's low-end PDP-11/05 minicomputer.

The three chips, a data chip, control chip and Microm (microprogrammed read-only memory) will be the heart of DEC's LSI-11 computer to be introduced soon. All of the N-channel, silicon-gate devices will be housed in 40-pin packages.

Features of the system include a 3.3 MHz clock and a 300ns microinstruction cycle time (10% slower than the bipolar PDP-11/05). The microcomputer can handle either 8- or 16-bit data while the internal data path is only 8-bits wide with the memory port 16-bits wide.

DEC designed the microprogram to emulate the PDP-11/05. The basic instruction set requires two Microms.

Minimum system configurations would consist of a data chip, a control chip and a 512-word by 22-bit Microm yielding 80 microinstructions. Up to four Microms (2,048 words) can be accessed by the microinstruction bus, and DMA access is also provided.

The system incorporates a dual bus configuration with one 18-bit microinstruction bus connecting the MOS chips and the other 16-bit data and address bus communicating with the memory and I/O systems.

The data chip houses the instruction and data acquisition access port as well as the register and all logic needed for data manipulation. The device has 26 high-speed 8-bit registers, an 8-bit ALU, and a microinstruction register.

The control chip interprets macroinstructions and generates starting addresses for microinstruction routines. All control and timing signals are provided by the control chip which has seven interrupt levels.

Western Digital is also working on a single-chip microprocessor which is expected to be available sometime next spring.

ROCKWELL INCREASES CHIP SHIPMENT

General Automation has reported they are now receiving an increased quantity of silicon-on-sapphire processing chips for its new microcomputer from Rockwell. There had been indications that Rockwell was experiencing difficulties in producing the chips, but recent changes at Rockwell have proved quite rewarding.

BLOW THEM THAR LINES

Until recently most programmable logic arrays have been mask-programable, but Signetics of Sunnyvale, CA is trying a new idea. They have been working on a field-programmable logic array that can be programmed simply by applying current to blow nichrome lines in the desired program configuration. The device will have 16 inputs, 8 outputs and an access time of 50ns. Signetics is expected to introduce the PLA sometime in the second quarter of 1975.

MICROCOMPUTER-BASED PRODUCTS:**COBILT INTRODUCES 3 WAFER PROBERS**

A new three-product family of wafer probing systems which uses a microcomputer for control functions has been developed by Computervision Corporation's Cobilt Division of Sunnyvale, CA.

Designated as the "Autoprobe" series, the new systems include the Model CP-4000 for automatic probing of individual wafers; the CP-4000 with CL-412 "Autoload" subsystem for wafer loading and unloading; and the CP-4400, which can test and classify as many as 100 wafers without operator intervention.

Both of the automatic loading/unloading versions utilize belt transport mechanisms to transfer wafers between the probing stage and conventional 25-wafer linear carriers. Modular construction permits periodic upgrading from the CP-4000 to the CP-4400 with minimum hardware modifications.

According to T. Roland Fredriksen, engineering manager for the new line, key features of the completely automatic CP-4400 system consists of a laser sensing (cont'd next page)



2368-C WALSH AVE., SANTA CLARA, CA 95050 • (408) 247-8940

Published monthly by Microcomputer Associates, Inc.,
M. R. Lemas, President. Subscription \$60.00 per year.
DARRELL D. CROW, Editor; LILLIAN LAU, Associate Editor;

BOB FULLER, 114 Glenmont Dr., Rochester, N.Y. 14617, Eastern
Correspondent; RAY HOLT, Applications Technical Advisor;
MANNY LEMAS, Applications Technical Advisor.

and position-alignment system and a 16-bit microcomputer. The laser is part of a proprietary pattern recognition system which uses coherent light to locate the wafer and test pad positions. The microcomputer provides all the control logic for both the prober alignment and position system and the loading system.

The three Autoprobe systems are designed for wafers of up to 4" diameter and can accommodate as many as six device inkers at one time. The system will be available by the end of the first quarter of 1975.

ATTACHE-SIZED PROGRAMMER

ProLog Corp. of Monterey, CA has developed the Series 90 Universal microprocessor controlled PROM programmer that is half the size and cost of counterparts presently on the market.

The system consists of a master control unit, Intel 4004 microcomputer, "personality" modules to handle various types of PROM, keyboard, six-digit hexadecimal display, sockets for master and copy PROMs, and a receptacle and connector for the personality modules.

Personality modules are available for the 1702A, 5202A, 5704 and 5204 MOS PROMS; and the 3601, 5603 A, 82S126 and the 3604 PROM.

Device programming is accomplished by keyboarding data into the copy PROM. One hexadecimal character defines the four bits entered at each address. Both address and data are displayed prior to actual programming. For duplication, the master PROM is automatically programmed into the copy PROM.

The entire programmer fits into a small attache case and weighs a mere 18 pounds. The Series 90 Universal PROM programmer is priced at \$1800.

DATA ENTRY SIMPLIFIED

A computerized pen capable of recognizing 16 handwritten characters, all ten digits and six control symbols, has been announced by Xebec Systems Inc. of Sunnyvale, CA. Initially developed by Stanford Research Institute, the pen, designated Alphabec-70, translates handwritten characters into code for computer processing.

The standard code is ASCII; however, users

can devise their own code for four of the control symbols.

A microcomputer system recognizes the written characters and while they are written by sensing the up-down movements of the special ball-point pen. A readout device displays the symbol and an audio response system voices the character for immediate verification.

Vendors of the system believe the pen may replace many of the 700,000 keyboard data-entry devices now used. The system will be available by the first quarter of 1975.

EXORCISOR EXERCISES μ C SOFTWARE

A new microprocessor development system has been announced recently by the manufacturer of the M6800 microprocessor.

Motorola's EXORcisor is seen by the company as a means to assemble and debug system designs without actually constructing all hardware necessary for a full system. The company says that once the software designer is finished using the prototyping system, the end item poses no real problem.

The EXORcisor has only two pushbuttons, abort and restart. A terminal with keyboard and typewriter is used to communicate with the microprocessor system.

The system immediately goes into the XBUG or system debug routine when power is applied. Once the program is running, the operator pushes the ABORT button to get into XBUG and types in MAID (Motorola Active Interface Debug) and the address to get a printout of the data at the address. By adjusting hexadecimal switches on the RAM and I/O cards addressing of the memory can be modified.

THIS MICROCOMPUTER PLOTS EVERY MOVE

A plotter which uses a line-slope microprocessor for controlling pen movements has been introduced by Glaser Data Co. of Palo Alto, CA.

The plotter increases accuracy by having the microcomputer control all pen movements between two defined points. Up to 55 different alphanumeric characters can be produced by the internal symbol generator.

Prices begin at \$11,000 and delivery is from 60 to 90 days ARO.



2368-C WALSH AVE., SANTA CLARA, CA 95050 • (408) 247-8940

Published monthly by Microcomputer Associates, Inc.,
M. R. Lemas, President. Subscription \$60.00 per year.
DARRELL D. CROW, Editor; LILLIAN LAU, Associate Editor;

BOB FULLER, 114 Glenmont Dr., Rochester, N.Y. 14617, Eastern
Correspondent; RAY HOLT, Applications Technical Advisor;
MANNY LEMAS, Applications Technical Advisor.

HOTEL RESERVATION SYSTEM EMPLOYS μ C

NCR has introduced its new 797 hotel/motel system that is built around a programmable terminal supplied by Ontel Corp., of Plainview, NY.

The terminal which is built around the Intel 8008 microcomputer is designed to work off-line, and can operate as a stand-alone unit. In addition to the Intel chips, Ontel uses microprocessors from other manufacturers to control I/O functions and the 14-inch CRT.

Features of the machine include a 93-key board with 37 function keys, and capability of hooking up to four peripheral units. The system will use 10 megabytes of NCR 656 disk storage.

Software will be developed by Caesar's World, Inc. of Los Angeles, CA, which has just formed a new company called CWI Software Services to provide software packages for hotels with over 150 rooms.

INTEL BIPOLAR 3000 KIT AVAILABLE

Digital system designers can now update their knowledge of microcomputers with Intel's new WF-3000 bipolar microcomputer system development kit.

The kit consists of enough computing elements to construct high performance, 16-bit central processors or controllers. Included in the kit is a set of 3000 series Schottky LSI devices, several supplemental 3000 series devices, documentation and design aids.

One design illustration in the kit is a 16-bit CPU with one microprogram control unit and eight central processing elements that can execute over three million microinstructions per second.

The kit is available now and prices begin at \$720 for single unit quantity.

ZIP ZIP

Telecommunications Industries, Inc. of McLean, VA, has developed the TELEPOST, a microcomputer controlled communications system, which is used by Western Union Mailgram to deliver messages anywhere in the world within one day.

The TELEPOST terminal can be installed in an office, is silent and has a standard keyboard. It requires only minimal operator training.

Messages from the terminal are transmitted via a standard telephone to a host TELEPOST computer where they are formatted and batched for regular transmission as MAILGRAMS, or as international telegrams. The messages arrive in the destination city the same day and are delivered in the morning of the next business day.

Addresses and standard letters can be stored indefinitely. The operator can address 9900 letters and send them with only a single key entry. The company says that the cost of sending a message via TELEPOST is less than the cost of preparing and sending a letter by First Class mail.

μ C CONTROLS NUCLEAR REACTOR

At the Industry Applications Society Meeting last month in Pittsburgh, PA, Babcock & Wilcox described their nuclear reactor which uses an Intel 8008 microcomputer experimentally to control the one megawatt reactor. The company sees the typical application of microcomputers in reactors for safety control and impurity concentration monitoring.

In an application example, the company illustrated that reactivity response stored in the microcomputer RAM could prevent power overshoot when the reactor is powered up. This is accomplished by holding a control rod to a predicted position to effectively hold the reactor power at a stationary point.

DATA ACQUISITION SYSTEM GETS SMART

Added flexibility and increased performance in data acquisition has been the result of incorporating a microcomputer in Esterline Angus's new PD2064 Key Programmable Data System.

According to the company, the system gathers analog and digital data, measures the conditioned signal, supplies the time base, engineering units, and outputs the data on a self-contained printer at any scan rate up to 25 channels per second. Up to 248 channels can be programmed, quickly and easily with the simple keyboard.

(cont'd next page)



2368-C WALSH AVE., SANTA CLARA, CA 95050 • (408) 247-8940

Published monthly by Microcomputer Associates, Inc.,
M. R. Lemas, President. Subscription \$60.00 per year.
DARRELL D. CROW, Editor; LILLIAN LAU, Associate Editor;

BOB FULLER, 114 Glenmont Dr., Rochester, N.Y. 14617, Eastern
Correspondent; RAY HOLT, Applications Technical Advisor;
MANNY LEMAS, Applications Technical Advisor.

Features of the system include keyboard, printer, high/low alarm logic, I/O, formatting functions, RAM/ROM/PROM memory, microcomputer, and signal guard and noise isolation.

Microcomputer memory is available for special options such as ratios, rates of change, standard deviation, all math functions and dedicated system programs with keyboard override.

PRINTER UNDER μ C CONTROL

To increase efficiency and speed in correspondence typing and word processing requiring extensive text-editing capabilities, Xerox has designed their new 800 system with only two components, an electronic typewriter and a microcomputer control console.

Printing speeds reach as high as 350 words per minute and under microcomputer control, the carrier, print wheel, and platen can be positioned directly to any location on the paper from any other location. The printer can also be directed to print left to right or vice versa. Formatting text for both 10 and 12 pitch is also provided by the microcomputer.

Also included in the control console is a magnetic tape cassette or magnetic card transports (for document memory) and system power supply.

Lease prices begin at \$195 per month dependent upon memory and options. Units are now available for lease.

MEMORIES AND PERIPHERALS:

8008/8080 SUPPORT SOFTWARE OFFERED

A series of programs to assist the microprocessor applications design engineer is now available on a national timesharing system through National CSS of Sunnyvale, CA. These programs provide on-line support for program development for the Intel 8008 and 8080 microcomputers. Included are a macro assembler program and a microcomputer simulator program for each microcomputer type, and two utility programs for converting the assembler-produced object file to a PROM tape.

The programs are functionally compatible

with the Intel supplied versions, but offer additional features that increase the user's effectiveness.

The programs are implemented in IBM/360 assembler language which provides according to NCSS significant reductions in user costs over FORTRAN-implemented counterparts.

The programs are accessed through a communications terminal which is connected by standard telephone lines to National CSS Data Centers.

In utilizing the system, the user creates his assembly language source file using the EDIT facility of NCSS or he has keypunched cards read into the system. The source file is then input to the appropriate assembler program which translates the symbolic instructions into machine-language instructions, assigns program storage locations, and performs other auxiliary functions necessary to produce an executable machine-language program. If errors are detected by the assembler, the user invokes the EDIT facility, makes the necessary corrections to the source file, and re-submits the file to the assembler.

Once correct, the user invokes the appropriate simulator, sets initial test conditions and monitors his program's execution sequences. Using simulator commands, he broadens or narrows the scope of the recorded events and programs execution paths to suit his purpose and, if necessary, inserts patches into the program.

COMPLEX LSI & μ C TESTER READY

A 120-pin, 10 MHz test system for microprocessors, RAMs, and complex LSI components has been announced by the Systems Technology Division of Fairchild Camera & Instrument Corp. of San Jose, CA.

The system, designated the Sentry 1200, is capable of testing and characterizing the most complex semiconductor products, from device through assembly, regardless of technology and/or component level.

The system can include three separate test stations to provide high-speed functional DC and AC parametric testing within the same test plan. Dedicated pin electronics, located at the device under test, permit flexibility for any pin definition and a minimum of pin-to-pin skew.

(cont'd next page)



2368-C WALSH AVE., SANTA CLARA, CA 95050 • (408) 247-8940

Published monthly by Microcomputer Associates, Inc.,
M. R. Lemas, President. Subscription \$60.00 per year.
DARRELL D. CROW, Editor; LILLIAN LAU, Associate Editor;

BOB FULLER, 114 Glenmont Dr., Rochester, N.Y. 14617, Eastern
Correspondent; RAY HOLT, Applications Technical Advisor;
MANNY LEMAS, Applications Technical Advisor.

The Sentry 1200 is available with up to eight independent timing generators programmable for both delay and width and with resolutions of ± 160 picoseconds. The test period may range from 100 ns (10 MHz) to 40 ns (25 MHz).

A 24-bit Central Processing Unit (CPU), combined with an 18-megabit disc, provides the capability for generation, storage and control of complex text plans.

Pricing for the Sentry 1200 starts at \$350,000 for a basic configuration and availability is six months ARO.

FAST DASH FOR 2606

Bill Sanderson, marketing manager for Signetics' MOS Products Division in Sunnyvale, CA, announced a new RAM whose operating speed matches that of small memory systems used in microcomputers and complex LSI systems.

"This new RAM is the 'dash one' version of our model '2606', which was introduced earlier this year," said Sanderson. He added, "the essential difference between the two is in speed. The 2606 offers access and read cycle times that are less than 750 ns, while the 2606-1 performs each of these functions in less than 500 ns."

The 2606-1 is an N-channel, ion-implanted, 256 x 4 RAM with common, shared input-output pins. The device was designed specifically for operation in bus-structured systems that are fairly small, and for this reason it is manufactured in a standard 16-pin DIP package. The device operates from a single +5V source and dissipates approximately 200 milliwatts.

The 2606-1 is easy to use with a multiplexed data bus because the inputs and outputs are shared through logic circuitry right on the chip. The RAM can be used with microprocessors, microcomputers, minicomputers, scientific calculators, computer print-out equipment, POS and CRT instruments, and add-on memory cards.

Price for the RAM begins at \$11.65 in lots of 100. Samples are now available and large quantities can be delivered 8 weeks ARO.

1K RAM FOR μ C

An experimental high-speed static 1024-bit RAM has been announced by Toshiba of Japan which they say is highly compatible with microcomputer systems.

The circuit operates with a single power supply and requires no timing circuits. The device uses a new silicon gate technology and has a typical access time of 300ns with read/write cycle time of 600 ns.

Toshiba's experimental RAM is organized as 256 x 4-bit words, but the company says they will be offering the device as 1- and 4-bit words soon.

INTERSIL INTRODUCES IM7733

Intersil, Inc. of Cupertino, CA has announced they are now delivering their IM7733, a static 1024-bit shift register which uses N-channel silicon gate MOS enhancement mode technology. The device is a 1024 x 1 array, fully TTL/DTL compatible, and requires a single +5V supply and no external pull-up.

An on-chip generator controlled by a single TTL/DTL compatible input generates the three clock phases used in the static register cells. The push-pull output buffer provides good capacitance drive and fanout of two TTL loads.

The two data inputs, along with a "stream select" control input permit external recirculation. The clock to output data delay is typically 100 ns.

The IM7733 is pin for pin compatible with the Signetics and AMD 2533, National's MM5058 and Texas Instruments' TMS 3133.

Prices in quantities of 100-999 begin at \$9.90.

LARGE SELECTION OF 1K RAM

Several semiconductor manufacturers will be introducing 1024-bit CMOS memories either this month or early in 1975. Among them are Intel, RCA, Intersil Inc., Inselek, Rockwell International and AMI.

Intel is expected to introduce a 1 K RAM organized as 256 x 4 with access time at 450 ns later this month. The silicon-gate device will operate from a single +5 volt supply.

(cont'd next page)



2368-C WALSH AVE., SANTA CLARA, CA 95050 • (408) 247-8940

Published monthly by Microcomputer Associates, Inc.,
M. R. Lemas, President. Subscription \$60.00 per year.
DARRELL D. CROW, Editor; LILLIAN LAU, Associate Editor;

BOB FULLER, 114 Glenmont Dr., Rochester, N.Y. 14617, Eastern
Correspondent; RAY HOLT, Applications Technical Advisor;
MANNY LEMAS, Applications Technical Advisor.

Intersil's CMOS RAM is also a silicon-gate device, but has been organized as 1024 x 1. The company says a 256 x 4 RAM will come later. Typical access time is 300 ns, but the company says that at 10V, access time can be very fast, like 80 ns.

RCA will have samples in February of their CMOS/SOS RAM which operates at a single power supply of 10V and an access time of 125 ns.

All companies see the 1K RAM as a vital part of the microcomputer family.

PEOPLE, LITERATURE AND EVENTS:

EE TIMES μ C SEMINAR APPLAUDED

by John Gilchrist, President
MicroProcessors Unlimited
Glen Burnie, MD

Seminars sponsored by Electronic Engineering Times on microprocessors are truly professional productions. Master planner, coordinator, and host of these seminars is Jerry Eimbinder, a pro in the field.

Literally, a ton of technical spokesmen were flown in from across the U.S., representing no less than ten IC manufacturers. For a one day summary of the technical marketplace of microcomputers, with state-of-the-art disclosures, the quality could not be better. One would be well advised to consider attending next year. Seminars were held in LA, DC, Waltham, MA, and Oak Brook, IL. The price: \$45 including luncheon, and a well organized secretary.

Rockwell International seems to have the slickest, most comprehensive and complete microcomputer chip set available. Chips are modular and appear to plug together without TTL interfacing, including CPU chip, ROM chips, combination ROM/RAM chips, clock generator chip, keyboard and display chip, priority interrupt chip, printer controller chip, and UART and modem chip. A non-volatile RAM and a CRT driver chip are slated for '75 introduction. J. E. Bass declared Rockwell has reversed its former sales policy and is marketing its chips to customers of any size, and offers a free, week-long seminar on microcomputer design in Anaheim, CA.

Motorola and AMI are second sourcing each other. Their projected 6800 chip family ap-

pears similar in concept to Rockwell's; however, it uses single 5V NMOS technology. Peripheral chips are presently limited to I/O chips and UART chips. The current prototyping system has no resident assembler.

Hash Patel of Intersil was candid about projected pricing of the Intersil CMOS microcomputer which is virtually software-identical with the PDP8/E and operates over the full mil-temperature range and consumes ultra low power. It should be available in spring '75 and should sell for around \$395. But in 2 or 3 years the price should drop to around \$50 according to Patel.

RCA's COSMAC is still in development. When available in '75 you can choose three flavors of prototyping systems, one for a dual IT cassette terminal, another for TTY, and one with a floppy disc. Card options will include a CRT interface, A/D, D/A, and cassette interface. Of course, the COSMAC is good for the mil-temperature range and requires very low power.

John Freeman of Microsystems International Ltd., gave technical details of the lowest cost microcomputer prototyping system available to date. Build your own 8008 system with stuffed and tested PC cards purchased from MIL for under \$1600, including 2K RAM, a resident 7 PROM monitor, and a 1702/1702A PROM programmer. Unloaded PC cards are also available. Local MIL reps have free texts with complete schematics, PC layouts, and monitor software listings. MIL plans to upgrade the kit to accommodate an 8080 CPU. MIL will also second-source the 8080 chip according to Freeman.

Glen Christman of Intel said that he has found microprogramming of the new 3000 Schottky bipolar microcomputer to be no more difficult than assembly language macroprogramming of the 4004, 8008, or 8080. Intel plans to provide the full, classic Intel support of its new product; hardware and software which includes PL/M programming.

National Semiconductor has a resident desktop compiler being readied for their IMP-16. It loads into an 8K x 16-bit memory. It will be PL/M+, a powerful, powerful tool. The National Microprogramming system will eventually be capable of microprogramming even the new IMP-4 microcomputer. Expect a 10 or 15% price drop of the new IMP-4 device around January, 1975, according to National.



2368-C WALSH AVE., SANTA CLARA, CA 95050 • (408) 247-8940

Published monthly by Microcomputer Associates, Inc.,
M. R. Lemas, President. Subscription \$60.00 per year.
DARRELL D. CROW, Editor; LILLIAN LAU, Associate Editor;

BOB FULLER, 114 Glenmont Dr., Rochester, N.Y. 14617, Eastern
Correspondent; RAY HOLT, Applications Technical Advisor;
MANNY LEMAS, Applications Technical Advisor.

NEW DATACHECKER TRAINING MANAGER

National Semiconductor Corp. of Santa Clara, CA, has announced the appointment of Norman R. Agostino as manager of customer training development for National's Datachecker electronic checkout system for supermarkets.

Agostino will be responsible for developing and directing a detailed customer training program for supermarket personnel in the theory and operation of the Datachecker system.

The new self-instructional program, entitled "Touch and Sell", allows the user to proceed at his own pace, and consists of a film strip and tape cassette package. The "touch" method teaches the user to ring grocery items while looking only at the item--not the Datachecker keyboard.

Also being developed by Agostino's group is a software training program which, when loaded into the system controller, will allow the terminal to interact with the user in a training mode.

Agostino was previously director of Instructional Products at Learning Systems Development Corp., where he developed programmed instruction packages for a number of supermarket chains.

WICHITA CONSULTANT HOUSE FORMED

A new microcomputer systems applications house, Mycro-Tek Inc., has been formed in Wichita, KS. The group will be headed by Stan Brannan, who is also a microcomputer lecturer for Integrated Computer Systems, Inc., of Los Angeles, CA.

The firm will provide consulting services to companies interested in microcomputer selection and design, as well as product development and software support. According to Brannan, Mycro-Tek has extensive lab facilities for design and development of microcomputers and is able to assemble and test a wide variety of microprocessor products.

Brannan was formerly in charge of technical research in microcomputers at the Boeing Company's Wichita Division.

FAGGIN & UNGERMANN FORM NEW FIRM

A new microprocessor testing firm is being launched by Frederico Faggin, former manager of Intel's MOS microprocessors and Ralph Unger-

mann, also a former Intel employee.

Faggin will head the new, as yet unnamed and unincorporated company, as president, and Ungermann of Ungermann Associates, Los Altos, CA, will be executive vice-president.

Ungermann Associates will be incorporated into the new firm which will still continue to provide logic simulation and test pattern generation products and services along with microprocessor system development testing.

Faggin had headed microprocessor development at Intel for the 4004, 4040, 8008 and 8080 CPU chips along with associated memory circuits and timing circuits for watches. He had previously been with Fairchild's R&D department where he and others, developed the MOS silicon gate process.

ISA INDICATES SLOW μ C ACCEPTANCE

Smart instruments will definitely be a reality, according to participants of the recent Instrument Society of America show held in New York last month.

But few manufacturers are actively developing systems using the microchips. Manufacturers are keeping informed of all microcomputer developments but they agreed that until prices come down and more evidence on actual availability surfaces, they prefer not to make major commitments. Thus smart equipment may not be much of a reality until sometime late in the 70's.

INDUSTRIAL μ C CONFERENCE IN MARCH

The 1975 Industrial Applications of Microprocessors Conference, sponsored by the Industrial Electronic and Control Instrumentation Group, will convene at the Philadelphia Sheraton on Tuesday and Wednesday, March 11-12.

Current and advanced developments in applications of microprocessors to solve industrial problems will be emphasized in four sessions. Topics will include process control, numerical control, minicomputer replacement, terminals, displays, and traffic control.

GM SAYS MICROS IN AUTOS BY 1980

At the recent International Colloquium on Automotive Electronic Technology in Troy, MI, General Motors' new (cont'd next page)



2368-C WALSH AVE., SANTA CLARA, CA 95050 • (408) 247-8940

Published monthly by Microcomputer Associates, Inc.,
M. R. Lemas, President. Subscription \$60.00 per year.
DARRELL D. CROW, Editor; LILLIAN LAU, Associate Editor;

BOB FULLER, 114 Glenmont Dr., Rochester, N.Y. 14617, Eastern
Correspondent; RAY HOLT, Applications Technical Advisor;
MANNY LEMAS, Applications Technical Advisor.

president, Elliot M. Estes announced the beginning of efforts towards the computerized automobile.

Called the Omega, the single-chip microprocessor system is designed to control all functions on an automobile. Fuel and air mixtures, ignition patterns, and emission control systems will be under Omega's control such that the microprocessor would constantly adjust engine parameters for optimized engine economy. The system will also provide computing necessary for wheel-lock control, cruise control, diagnostics and multiple integrated displays. Furthermore, Omega is designed to provide power and data for all control functions via a single cable, with the computer apportioning voltages where required.

The Omega microprocessor was designed by GM and built by Rockwell International. Estes noted that introduction of the computer car in 1980 is a very real possibility.

FULL SEMESTER IN JUST 8 HOURS

An advanced engineering videotape course on the architecture, software and applications of microprocessors will be available early in 1975 from the Texas Instruments Learning Center in Dallas, TX. The 8-hour course allows designers to evaluate the contributions of technology to design objectives, determine options and trade-offs, and achieve more cost-effective designs.

TI says an evaluation kit that contains a 30 minute videotape of lesson excerpts, course outline and prices is available on a no-commitment, 10-day trial basis by writing the company or calling (214) 238-3894.

µP FIELD SURVEY & DATA BOOK

A comprehensive book analyzing all of the currently available microcomputers is now available. AH Systems, Inc. of Chatsworth, CA says the study is intended to provide an unbiased comparison of elements in the new, dynamic field of microprocessors. The book "Microprocessor Field Survey and Data Book", contains an evaluation of over 30 different microprocessors and microcomputers from a systems point-of-view. Included are data on benchmark programs, hardware comparisons, LSI technology, software support, instruction set

capabilities, pricing, and availability.

The survey is available from AH Systems at a single copy price (including three quarterly updates) of \$495. Additional copies, on the same order, are available for \$55 each, and a set of view graphs of the executive summary is available for \$75 per set.

Editor's note: MICROCOMPUTER DIGEST will review this book next month.

MACHINE FIRM ACQUIRES COMSTAR

Comstar Corp. of Minneapolis, MN, a producer of microcomputer control and automation systems, has been purchased by Warner & Swasey Co. of Cleveland, OH. The company was purchased for \$300,000 plus the assumption of certain liabilities.

Warner & Swasey, a manufacturer of machine tools, construction equipment and textile machines, said they had purchased 33% of Comstar last August for an undisclosed amount.

RECENT LITERATURE

Improved Solid-State Memories & Microprocessors Altering The Structure of Computers
by Jim McDermott, Eastern Editor
Electronic Design October 25, 1974

This article briefly surveys the effect of memories and microcomputers on computer architecture. Quotes from several personalities in the large systems area substantiate the article. Dr. Ugo O. Gagliardi from Honeywell Information Systems Technical Office believes that the first impact of microprocessors on large systems will be in the I/O controller. Furthermore, he sees the large computer emerging as a central-memory system with many processors addressing it.

Intelligent terminals, off-the-shelf interfaces, such as Motorola's Peripheral Interface Adapter (PIA), and the limitations of present microprocessors are also discussed.

Improve Memory Systems With 4K RAMs
Raju Shah, T. C. Lo, Jeff Linden of American Microsystems
Electronic Design October 25, 1974

A very interesting article delving into the efficiency of 4K RAM chips in system design.
(cont'd next page)



2368-C WALSH AVE., SANTA CLARA, CA 95050 • (408) 247-8940

Published monthly by Microcomputer Associates, Inc.,
M. R. Lemas, President. Subscription \$60.00 per year.
DARRELL D. CROW, Editor; LILLIAN LAU, Associate Editor;

BOB FULLER, 114 Glenmont Dr., Rochester, N.Y. 14617, Eastern
Correspondent; RAY HOLT, Applications Technical Advisor;
MANNY LEMAS, Applications Technical Advisor.

The authors discuss problems associated with memory systems such as board layouts and refreshing. A thorough discussion of the cell structure of the AMI/MOTOROLA 6605 4K RAM is included.

Extending LSI-Processor Capabilities With Microprogramming

by George Reyling, Jr.

Electronic Design October 25, 1974

An excellent look into the benefits and capabilities of a microprogrammed LSI-processor. Advantages such as increased execution speed, more efficient and more extensive instruction sets and proprietary design are discussed as well as problem areas such as complexity of microprogram development and the requirement for detailed knowledge of microprocessor internal logic and timing. The author briefly discusses three microprogrammable LSI microprocessors as examples showing different approaches. Finally a section on developing microprograms using National Semiconductor's modified CROM and FACE (field-alterable control element) devices is presented. Readers interested in an introduction to microprogramming and in particular with the National GPC/P microprocessor chip set should read Mr. Reyling's article.

The Great Memory Battle Goes On, But Semiconductors Appear the Ultimate Victors

by Jules H. Hilder, Associate Editor

Electronic Design October 25, 1974

A thorough discussion of the present and future memory market. Mr. Hilder discusses the core/semi memory battle, the 4K RAM, core technology, disc, bubble, CCD (Charge Couple Devices) and tape memories. Two interesting charts are included, 1) projected memory prices, and 2) memory performance. Past mid-75 CCD memories are estimated to be the leader in price while N-MOS will continue to lead in speed. Bubble and CCD memory are expected to make great strides in the next few years.

Microcomputers Unlock The Next Generation

by Charles J. Riviere and Patrick J. Nichols, Telcom, Inc.

Data Communications September/October 1974

The authors have concentrated on the communications application of microcomputers. Functions such as code conversion, error con-

trol and checking are areas where a microcomputer becomes cost/performance effective. Microcomputers in general are discussed as well as specific comparisons of the Intel 8080 microcomputer and the Varian V73 and Interdata-50 minicomputers. Comparison tables include 1) instruction execution times (add, logicals, jump, mult, div, etc.) 2) function execution times (code conversion and error checking) and 3) effectiveness of implementation of data communications functions (data compression, buffer management, scheduling, formatting, etc.).

It is interesting to note that of the 12 data communication functions listed five of them are "very cost effective" with a microcomputer implementation versus a minicomputer or hardwired device. Three of the five are best performed in the terminal than in the central processor. These include CRT buffering, data link handshaking and format control. The paper is certainly a must for designers of data communications equipment.

Microcomputer Software Makes Its Debut

by Howard Falk, Senior Associate Editor

IEEE Spectrum October 1974

A very good introduction into software as required for microcomputer product development. Mr. Falk very successfully covers microcomputer software problems followed by descriptions of assemblers, editors, loaders, debuggers, simulators and higher level languages. A special feature of the article is a two page table of "Some Currently Available Microcomputer Software." This is the best microcomputer software summary published to date. Because understanding software tools and problems is such an important part of using uC's, this article is highly recommended.

Digital Testing

Neal Vinson, president of Data Test Corp.

Digital Design October 1974

A two part article which covers testing problems facing large corporations. Summarized, they are to establish a life-cycle testing philosophy, make test programming a direct function of engineering, and provide compatible test equipment and programs to appropriate corporate levels. The second part examined test generation, fault diagnosis, manual and automated software generation, test techniques and assembly design problems.



2368-C WALSH AVE., SANTA CLARA, CA 95050 • (408) 247-8940

Published monthly by Microcomputer Associates, Inc.,
M. R. Lemas, President. Subscription \$60.00 per year.
DARRELL D. CROW, Editor; LILLIAN LAU, Associate Editor;

BOB FULLER, 114 Glenmont Dr., Rochester, N.Y. 14617, Eastern
Correspondent; RAY HOLT, Applications Technical Advisor;
MANNY LEMAS, Applications Technical Advisor.

EDUCATION:

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

December

- 2- 3 ADL National Microcomputer Conference
Boston, MA Arthur D. Little, Inc.
- 2- 3 Engineer's Introduction to Software \$275
Programmer's Introduction to Hardware \$275
Boston, MA Microcomputer Technique, Inc.
- 2- 4 National Telecommunication Conference
\$45/\$60 San Diego, CA Communication Society Conference Board.
- 3- 5 Microprocessors/Microcomputers \$375
Rome, Italy Integrated Computer Systems, Inc.
- 3- 6 Minicomputers/Microcomputers \$425
Washington, DC Integrated Computer Systems, Inc.
- 3- 6 Intel MCS-4 Workshop \$395 New York, NY and San Jose, CA Intel Corp.
- 4- 6 Microprocessor Design \$250 Cleveland, OH Pro-Log Corp.
- 4- 6 Microcomputers: Evaluation and Selection \$395
Microprocessors: Evaluation and Selection \$395
Boston, MA Microcomputer Technique, Inc.
- 4- 6 Minicomputer Workshop \$300/\$325
Santa Clara, CA The University of Santa Clara
- 4- 6 Microprocessors and Systems Applications \$325
Westbury, L.I., NY Automata Information Services
- 9 Intel Microprocessor Architectures \$150
National Microprocessor Architectures \$150
Boston, MA Microcomputer Technique, Inc.
- 9-11 Microprocessor Design \$250 Washington, DC Pro-Log Corp.
- 10-11 System Design Using Intel Microprocessors \$275
System Design Using National Microprocessors \$275
Boston, MA Microcomputer Technique, Inc.
- 10-13 Intel MCS-8/80 Workshop \$395 New York, NY and San Jose, CA Intel Corp.
- 10-13 Minicomputers/Microcomputers \$425
Ottawa, Ontario Integrated Computer Systems, Inc.
- 10-13 National Microprocessor Workshop \$395
San Jose, CA Compata, Inc.
- 12 Microprocessor Architecture: National IMP-16 and Motorola 6800 New York, NY IEEE Computer Society
- 12-13 Languages and Software for Intel Microprocessors \$275
Languages and Software for National Microprocessors \$275
Boston, MA Microcomputer Technique, Inc.
- 13 Program Portability, Converting a PL360 Program to the Univac 1108 SIGPLAN
- 15-18 Microcomputers I: Basic Concepts and Applications \$395
Oak Brook, IL Professional Growth in Engineering Institutes
- 15-20 NEC Winter-NEC Microcomputer Institute \$50
Miami, FL National Electronics Conference
- 16-17 Microprocessor Applications and Markets in Communication Systems \$295
Anaheim, CA Andy Hish Assoc.
- 16-18 Microprocessor Design \$250 Palo Alto, CA Pro-Log Corp.
- 16-18 Microprocessors and Systems Applications Waltham, MA Automata Information Services
- 16-19 Intel PL/M Workshop \$395 New York, NY and San Jose, CA Intel Corp.
- 17-20 Minicomputers/Microcomputers \$425
Tel-Aviv, Israel Integrated Computer Systems, Inc.
- 18-20 Microcomputers II: Architecture, Software and Systems \$395
Oak Brook, IL Professional Growth in Engineering Institutes



2368-C WALSH AVE., SANTA CLARA, CA 95050 • (408) 247-8940

Published monthly by Microcomputer Associates, Inc.,
M. R. Lemas, President. Subscription \$60.00 per year.
DARRELL D. CROW, Editor; LILLIAN LAU, Associate Editor;

BOB FULLER, 114 Glenmont Dr., Rochester, N.Y. 14617, Eastern
Correspondent; RAY HOLT, Applications Technical Advisor;
MANNY LEMAS, Applications Technical Advisor.

January

- Arr. Microprocessor Architecture: Intel
8080, New York, NY IEEE Computer
Society
- Arr. Microprocessor Programming: National
IMP-16 New York, NY IEEE Computer
Society
- 7 Control Structures Palo Alto, CA
SIGPLAN
- 7- 9 Microprocessors/Microcomputers \$410
Washington, DC Integrated Computer
Systems, Inc.
- 7-10 Minicomputers/Microcomputers \$425
Zurich, Switzerland Integrated Com-
puter Systems, Inc.
- 8-10 Microprocessors and Systems Applica-
tions \$325 Bridgeport, CN Automata
Information Services
- 14-17 Minicomputers/Microcomputers \$425
Orlando, FL Integrated Computer Sys-
tems, Inc.
- 15-17 Microprocessors/Microcomputers \$410
Salt Lake City, UT Integrated Compu-
ter Systems, Inc.
- 20-22 Second Annual Symposium on Computer
Architecture Houston, TX ACM-SIGARCH
- 22-24 Microprocessors/Microcomputers \$410
San Diego, CA Integrated Computer
Systems, Inc.
- 22-24 Microprocessors and Systems Applica-
tions \$325 Syracuse, NY Automata
Information Services
- 28-30 Microprocessors/Microcomputers \$410
Ottawa, Ontario Integrated Computer
Systems, Inc.
- 28-31 Minicomputers/Microcomputers \$425
Washington, DC Integrated Computer
Systems, Inc.

February

- 3- 5 Microprocessors and Systems Applica-
tions \$325 Saddlebrook, NJ Auto-
mata Information Services
- 4- 7 Minicomputers/Microcomputers \$425
Dallas, TX Integrated Computer

Systems, Inc.

- 12-14 International Solid-State Circuits
Conference Philadelphia, PA SSC
Council
- 12-14 Microprocessors and Systems Applica-
tions \$325 Philadelphia, PA Auto-
mata Information Services
- 18-20 Computer Science Conference 1975
Washington, DC ACM Contact William
F. Atchison
- 24-27 Minicomputers and Microprocessors
\$395 Zurich, Switzerland Technology
Service Corp.
- 25-27 COMPCON SPRING San Francisco, CA
Contact Compata, Inc., L.D. Amdahl

March

- 11-12 Microprocessor Applications in In-
dustry Philadelphia, PA IECI

SPONSORING ORGANIZATIONS AND CONTACTS

- ACM SIGARCH, Oscar Garcia, Dept. of EE,
Univ. of South Florida, Tampa, FL 33620
- Andy Hish Assoc., 9710 Cozycroft Ave.,
Chatsworth, CA 91311 (213) 998-0222
- Arthur D. Little, Inc., Acorn Park, Cam-
bridge, MA 02140 (617) 864-5770
- Atchison, William F., Dept. of Comp. Sci.,
Univ. of Maryland, College Park, MD 20742
- AUTOMATA Information Services, 592 Maude
St., South Hempstead, NY 11550 (516) 483-
5185
- Compata, Inc., 1333 Lawrence Expy., Santa
Clara, CA 95051 (408) 246-6575
- Compata, Inc., L. D. Amdahl, 6150 Canoga
Ave., Woodland Hills, CA 91364 (213) 884-
5400
- IECI R. W. Bolz, Automation for Industry
672-D Alpha Dr., Cleveland, OH 44143
- IEEE Computer Society, Daniel R. McGlynn,
NY Chapter Chrm., 86-45 St. James Ave.,
Elmhurst, NY 11373
- Integrated Computer Systems, 12561 Appleton
Way, Los Angeles, CA 90066 (213) 391-1648



2368-C WALSH AVE., SANTA CLARA, CA 95050 • (408) 247-8940

Published monthly by Microcomputer Associates, Inc.,
M. R. Lemas, President. Subscription \$60.00 per year.
DARRELL D. CROW, Editor; LILLIAN LAU, Associate Editor;

BOB FULLER, 114 Glenmont Dr., Rochester, N.Y. 14617, Eastern
Correspondent; RAY HOLT, Applications Technical Advisor;
MANNY LEMAS, Applications Technical Advisor.

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

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

National Electronics Conference, Oak Brook Executive Plaza No. 1, Ste. 103, 1301 W. 22 St., Oak Brook, IL 60521 (312) 325-5700

National Telecommunications Conference, 10435 Roselle St., San Diego, CA 92121

Professional Growth in Engineering Institute, Oak Brook Executive Plaza No. 1, 1301 W. 22 St., Oak Brook, IL 60521 (312) 325-5700

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

SIGPLAN, C/O ACM, P.O. Box 355, Sunnyvale, CA 94088

SSC Council, Philadelphia Section, Univ. of PA

Technology Service Corp., 225 Santa Monica Blvd., Santa Monica, CA 90401 (213) 451-8778

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

FINANCIAL:

EARNINGS

<u>Fairchild</u>	<u>1974</u>	<u>1973</u>	<u>%</u>
Oct. 25			
Share earnings	\$.93	\$2.18	-57.3
Earnings	4,818K	11,334K	-57.5
Sales	96,414K	90,431K	+ 6.6
9 months			
Share earnings	4.36	5.58	-21.9
Earnings	22,903K	29,017K	-21.0
Sales	306,042K	250,115K	+21.8
<u>Intersil</u>	<u>1974</u>	<u>1973</u>	<u>%</u>
Sept. 30			
Share earnings	N/R	N/R	N/A
Earnings	\$-560K	N/R	N/A
Sales	7,257K	\$5,736K	+26.5

<u>Intersil (cont'd)</u>	<u>1974</u>	<u>1973</u>	<u>%</u>
9 months			
Share earnings	\$.18	\$.38	-52.6
Earnings	487K	1,030K	-52.7
Sales	22,841K	15,601K	+46.3

<u>Rockwell Int'l</u>	<u>1974</u>	<u>1973</u>	<u>%</u>
Sept. 30			
Share Earnings	\$.64	\$1.16	-44.8
Earnings	22,145K	34,539K	-35.8
Sales	1,292,645K	846,585K	+52.7
Year			
Share Earnings	4.14	4.07	+ 1.7
Earnings	130,343K	125,839K	+ 3.6
Sales	4,408,523K	3,179,049K	+38.6

<u>TI Corp.</u>	<u>1974</u>	<u>1973</u>	<u>%</u>
Sept. 30			
Share earnings	\$.39	\$.72	-45.8
Earnings	2,505K	4,658K	-46.2
Sales	39,375K	41,970K	- 6.2
9 months			
Share earnings	1.31	2.03	-37.5
Earnings	8,450K	13,071K	-35.4
Sales	116,360K	121,278K	- 4.0

WEMA SEES 1975 TO BEGIN TURNAROUND

Limited growth to negative growth is the consensus of the WEMA forecast for next year's world wide semiconductor industry. MOS was hailed the strongest area, while discrete devices are expected to decline.

The forecast concluded that the market will remain flat until after the middle of 1975 with the third and fourth quarter showing a quickening recovery. Although the forecasts for 1975 were seen as very realistic, the 1976-77 results were viewed as only projections.

In dollar form, 1975 semiconductor consumption is expected to rise from \$4.806 billion to \$4.877, a 1.47% increase. But by adjusting for inflation, the figures drop into the minus, indicating a negative growth for 1975.

The study showed that ICs should grow 7%, MOS should increase 12%, while discretes are expected to decline approximately 3%. Of the MOS business slated for next year, 59% will be logic functions, 24% RAMs, 10% ROMs and PROMs, and 1% shift register memories.

(cont'd next page)



2368-C WALSH AVE., SANTA CLARA, CA 95050 • (408) 247-8940

Published monthly by Microcomputer Associates, Inc., M. R. Lemas, President. Subscription \$60.00 per year. DARRELL D. CROW, Editor; LILLIAN LAU, Associate Editor;

BOB FULLER, 114 Glenmont Dr., Rochester, N.Y. 14617, Eastern Correspondent; RAY HOLT, Applications Technical Advisor; MANNY LEMAS, Applications Technical Advisor.

The meeting, held in Monterey, CA, was the first WEMA has had since 1972. More than 30 participating firms took three months to compile and analyze the forecast. WEMA will issue an industry update every three months.

NEREM FINDS μ C COMPANIES "HOLDING"

Cautious buying, flattening market and over inventory situations were among the observations made at the Northeast Electronics Research and Engineering Meeting (NEREM) held in Boston, MA, last month.

Although the microprocessor seminar itself was heavily attended, it was still 30% lower than expected. Officials felt engineers were less willing to leave their jobs or firms had reduced traveling expenses.

Participants identified the medical electronics, mini and microcomputer segments as the strongest with military products being the weakest.

Many felt the recession has had little effect on new companies as they have always had a rough time. One new microprocessor company reports their seminars were holding their own, while their microcomputer services showed increasing business

COMPANY INDEX:

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

Andy Hish Assoc., 9710 Cozycroft Ave., Chatsworth, CA 91311 (213) 998-0223

Bendix Corp., 12843 Greenfield Rd., Detroit, MI 48227 (313) 272-3710

Comstar Corp., 7413 Washington Ave. S., Edina, MN 55435 (612) 941-4454

Digital Equipment Corp., One Iron Way, Marborough, MA 01752 (617) 897-5111

Esterline Angus, Box 24000, Indianapolis, IN 46224 (317) 244-7611

Fairchild System Tech. Div., 3500 Deer Cr. Rd., Palo Alto, CA 94304 (415) 493-5011

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

Hewlett-Packard, 11000 Wolfe Rd., Cupertino, CA 95014 (415) 493-1501

Inseleck, 743G Alexander Rd., Princeton, NJ 08540 (609) 452-2222

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

Intersil Inc., 10900 N. Tantau Ave., Cupertino, CA 95014

Microdata Corp., 17481 Red Hill Ave., Irvine, CA 92705 (714) 540-6730

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

Motorola, E. McDowell Rd., Phoenix, AZ 85008 (602) 244-6900

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

National CSS, 433 S. Pastoria Ave., Sunnyvale, CA 94086 (408) 739-6271

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

NCR Corp., 5225 Springboro Pike, Dayton, OH 45439 (513) 449-2000

Process Computer Systems, G-4025 S. Center Rd., Flint, MI 48507 (313) 744-0225

RCA Solid State Div., Box 3200, Somerville, NJ 08876 (201) 722-3200

Rockwell International, 3370 Miraloma Ave., Anaheim, CA 92803 (213) 647-5000

Scientific Micro System, 520 Clyde Ave., Mt. View, CA 94043 (415) 964-5700

Signetics, 811 E. Arques Ave., Sunnyvale, CA 94086 (408) 739-7700

Texas Instruments, P.O. Box 5012, Dallas, TX 75222 (214) 238-2011

Toshiba America, Inc., 200 Park Ave., Suite 1608, New York, NY 10017 (212) 986-9794

Western Digital Corp., P.O. Box 2180, Newport Beach, CA 92663 (714) 557-3550

Xerox Corp., Xerox Square, Rochester, NY 14644 (716) 546-4500

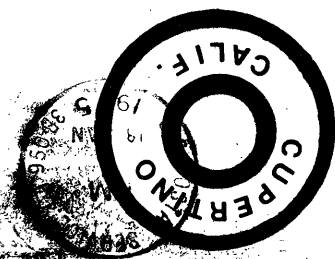
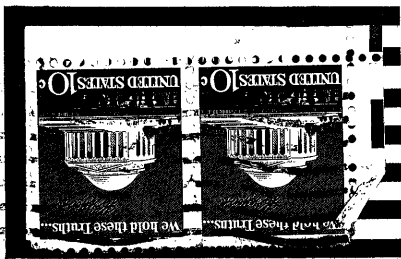
MicroProcessors Unlimited, 7400 Ritchie Highway North, Glen Burnie, MD 21061 (301) 761-5864



2368-C WALSH AVE., SANTA CLARA, CA 95050 • (408) 247-8940

Published monthly by Microcomputer Associates, Inc., M. R. Lemas, President. Subscription \$60.00 per year. DARRELL D. CROW, Editor; LILLIAN LAU, Associate Editor;

BOB FULLER, 114 Glenmont Dr., Rochester, N.Y. 14617, Eastern Correspondent; RAY HOLT, Applications Technical Advisor; MANNY LEMAS, Applications Technical Advisor.



2368-C WALSH AVE., SANTA CLARA, CA 95050 • (408) 247-8940

MICROCOMPUTER DIGEST

CAN YOU AFFORD TO LOSE TIME?

Time is valuable, that's why we're here. To help you "gain" time so you can have lots left to do your own thing.

From one source, you'll have the latest on microcomputer developments, applications, products, companies, industry trends, personalities, and more. We're here to help you stay on top of things in the fast moving microcomputer industry.

Microcomputer Digest is the first and only TOTAL microcomputer news source. So begin saving time today by completing the adjacent form and mailing it to us to insure receiving our January issue. You really can't afford to lose time in today's industry.

Coming Special Features

- Microcomputers and Medical Electronics
- Microcomputers in Electronic Warfare
- Programming--How Hard Is Software
- Designing Your Own Microcomputer

MERRY CHRISTMAS AND HAPPY NEW YEAR!

Yes! Start sending me MICROCOMPUTER DIGEST every month.

- 1 Yr. @ \$60 6 Mos. @ \$36
(for overseas, add \$10)
- Payment Enclosed Bill My Company
- Subscription Renewal 1 Yr. @ \$48

Name _____

Title _____

Company _____

Address _____

City _____ State _____ Zip _____

Business Phone () _____
Area Code

Send to my home:

Address _____

City _____ State _____ Zip _____



2368-C WALSH AVE., SANTA CLARA, CA 95050 • (408) 247-8940

Published monthly by Microcomputer Associates, Inc.,
M. R. Lemas, President. Subscription \$60.00 per year.
DARRELL D. CROW, Editor; LILLIAN LAU, Associate Editor;

BOB FULLER, 114 Glenmont Dr., Rochester, N.Y. 14617, Eastern
Correspondent; RAY HOLT, Applications Technical Advisor;
MANNY LEMAS, Applications Technical Advisor.