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FOR IMMEDIATE RELEASE

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PASCAL PROCESSOR IS CAST IN SILICON BY WESTERN DIGITAL

NEWPORT BEACH, CALIFORNIA. October 4, 1978 ----- Western Digital Corporation said today it has developed a 16-bit computer chip set that directly executes Pascal object programs at least five times faster than is possible with conventional system software and eliminates the previously required host operating system and interpreter.

The company will sell its state-of-the-art development both as a chip set and as a packaged software development computer to both OEM's and personal computing stores.

Designated the Pascal MICROENGINE™ product line, the chip set standardizes the version of Pascal, offered by the University of California at San Diego. UCSD's version is generally regarded by the computer industry as an excellent implementation language for business, industrial and computer aided instruction applications. It was derived from (and is source compatible with) the original Pascal developed in 1971 at the Swiss Institute of Technology.

"The heart of the UCSD system is the 'ideal' pseudo machine called the 'P-machine', Dr. Lotito, Vice President and General Manager, Computer Products Division, explained, "and we have implemented this idealized machine directly in a chip set using LSI technology."

"You might say we have made the first 'sand-casting' of something that previously had been available only as a software product."

The UCSD software system includes a complete Pascal operating system: Pascal compiler, Basic compiler, file manager, screen-oriented editor, debug program and graphics package, all written in the Pascal language.

In addition to the expanded business opportunity for Western Digital, Dr. Lotito sees the MICROENGINE concept as making a number of important contributions to the computer industry.

"First, we have built an engine to drive well-established, field-proven software," he said. "That, in itself, is a major innovation in the computer industry, which has been talked about for many years."

"We have further increased the performance level of microcomputers to a point where they are competitive with larger, more expensive systems for business applications, industrial control, educational systems, and so forth."

(Continued)

"We have significantly lowered the cost of computer power at the system level by utilizing LSI technology in the disk controller, communications controller, DMA controller and other processor support functions, as well as in the processor itself."

The MICROENGINE approach also reduces memory requirements of the UCSD system by a minimum of 25 percent by eliminating the host operating system and interpreter.

"Pascal is becoming one of the world's most popular languages, and we expect that the Western Digital development will contribute toward even more widespread acceptance." Dr. Lotito said.

UCSD Professor Ken Bowles, who has been deeply involved in development of Pascal in the U.S., agreed that the Western Digital announcement should "go a long way toward boosting Pascal's popularity among the user community."

"We are very excited; we've been hoping this would happen," he said. "The original version of Pascal was designed for teaching programming, and there were no provisions, for example, for using it with rotating disk storage files."

"We have attempted to outfit the language with these 'missing links' to make it commercially suitable," he continued.

Bowles noted that there are more users of UCSD's Pascal today than users of all other versions combined. Western Digital and UCSD have agreed to mutually support this LSI implementation as the true UCSD standard.

TECHNICAL INFORMATION

The chip set is comprised of four LSI (MOS) components:

- An arithmetic chip that contains micro-instruction decode, ALU, and the register file.
- A micro-sequencer chip that contains macro-instruction decode, portions of the control circuitry, micro-instruction counters, and I/O control logic.

(continued)

-- Two MICROM chips (each 22 bits x 512) that contain the micro-instruction ROMs and micro-diagnostics.

Additional features of the MICROENGINE chip set include user-defined bus configuration, four levels of interrupts, single- and multi-byte instructions, hardware floating point, stack architecture, 3.0 MHz four-phase clock (75 nanoseconds per phase), and a TTL-compatible three-state interface.

The desktop computer features the 16-bit MICROENGINE processor, 32K words (64K bytes) of RAM memory, full DMA control functions, fully-integrated floppy disk controller, two RS-232 asynchronous ports, and two 8-bit parallel ports -- all on a single 8 x 16 board, and three power supplies (+12V, +5V and -5V) packaged in a low-profile (5¼ inches high x 16¼ x 13½) stylized enclosure.

PRICING INFORMATION

The chip set (CP 9008B-01) is priced at \$195 for a single set and is discounted to \$97.50 each at 10,000 quantity. The development system carries a single unit suggested retail price of \$2995 and an OEM single quantity price of \$2495. Volume discounts are available. Both products will be available for shipment in the first quarter of 1979.

(The company also announced a special introductory offer of \$1995 for the Pascal computer available to the first 500 customers.)

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Thank you for your interest in Western Digital's innovative new Pascal MICROENGINE™ product line. We are pleased to enclose our initial literature which will soon be followed by more conclusive and detailed data sheets.

Our first product offerings for the Pascal MICROENGINE are at both the system and chip level. The desktop system (CP 9007B-01) configured in a stylized enclosure retails for \$2995, although a special introductory offer of \$1995 is in effect for the first 500 customers to reserve a system. A 20% down payment must accompany orders for this special offer. The chip set (CP 9008B-01) retails for \$195. All prices are subject to applicable tax. Both products are offered to the OEM and retail market segments with corresponding price schedules targeted to those markets. Deliveries will begin in the first quarter of 1979.

Additionally, Western Digital offers a wide range of chip-level products which have been successfully used in a variety of applications including the following:

- Data Communications
- Telecommunications Systems
- Peripheral Controllers
- Terminals and Printers
- Minicomputers
- Microcomputers
- Small Business Systems
- Custom Microprocessor Environments

Please call our regional offices or this author here at Newport Beach for additional information.

- Western - Mr. Ed Raether, Los Gatos, California (408) 354-2813
- Central - Mr. Dave Renwick, Troy, Michigan (313) 643-4482
- Eastern - Mr. Bob Green, Marblehead, Massachusetts (617) 631-6466

We believe these new Pascal MICROENGINE products will provide you the most cost effective solutions for processing requirements across a wide spectrum of applications where a high level language is required.

Sincerely,



J.T. Boren
Marketing Manager
Computer Products Division

JB/lv

Enclosure

*Roger Anderson
from Ron W*

Electronic Engineering Times - Monday, October 16, 1978

PASCAL Implemented in Code Of WD's First Computer Offering

NEWPORT BEACH, CA — PASCAL has been implemented in the microcode of a new computer from Western Digital Corp., the first in a line of system products to be announced soon, according to the company.

Says J.T. Bowen, marketing manager, "This is the first time that a high-level language has been placed in the internal code of a microprocessor."

Western Digital has trademarked the name "PASCAL microengine" for the 4-chip computer, which lists at \$2995. Computer Interface Technology (CIT) of Santa Ana, CA, is the unit's first OEM customer and will supply complete systems by adding floppy discs, a CRT terminal and printer to the CPU supplied by Western Digital. CIT is pricing systems from \$4655 to \$5965.

Five Times Faster

A major benefit of this innovation is the execution of PASCAL object programs at least five times faster than with conventional system software, according to Bowen, accomplished through elimination of the host operating system and interpreter.

"This is not a technology jump, but a conceptual innovation," says Bowen. "The circuitry is well proven."

Ken Bowles of the University of California at San Diego says this development by Western Digital "should go a long way toward boosting PASCAL's popularity among users."

In the original language, "there were no provisions for rotating disc-storage files or for other important functions," adds Bowles. "We have attempted to outfit the language with these 'missing links' to make it commercially suitable," he continues. "Western Digital and UCSD have agreed to mutually support this LSI implementation as the true UCSD standard."

"The heart of the UCSD system is the 'ideal pseudo-machine', called the

'P-machine'," explains Dr. Larry Lotito, vice president and general manager, Computer Products Div. of Western Digital. "We have implemented this idealized machine directly in the chip set."

This new system includes a complete PASCAL operating system—PASCAL compiler, BASIC compiler, file manager, screen-oriented editor, debug program and graphics package—all written in PASCAL.

Lotito foresees the "microengine" concept making several important contributions to the industry. The engine drives well-established, field-proven software, according to Lotito, who feels system performance is therefore increased to be competitive with larger, expensive systems for business, control and education.

"We lowered costs of computing power," he continues, "by utilizing LSI technology in the disc controller, communications controller, CMA controller and other processor-support functions. Also the new 'microengine' reduces memory requirements at least 25 percent by eliminating the host operating system and interpreter."

The basic system contains 32k words of 16 bits each, two RS-232 asynchronous ports, two 8-bit parallel ports and floppy controller with DMA. In addition, it is expandable to 64k words and has an autodiagnos-tics cycle initiated on reset. The reset can also be done remotely.

Currently, "all system orders will be referred to CIT," says Bowen, who indicates his company has received inquiries about this product from minicomputer firms and other large corporations.

The chip set, model CP 9008B-01, costs \$195 in single sets, \$97.50 in 10,000s. The single-quantity OEM price of the PASCAL computer system is \$2495, with further quantity discounts available. —Stan Baker