

# Logical Machine Corporation ADAM

## MANAGEMENT SUMMARY

There are hundreds of small business data processing systems on the market today—but only one ADAM. Charles P. Lecht, President of Advanced Computer Techniques Corporation, in his recently published book, *The Waves of Change*, commented on ADAM as follows: "No one can doubt that Logical Machine Corporation's ADAM, in concept if not in fact, heralds a new day in man-machine involvements which will lay RPG, COBOL, PL/1, FORTRAN and the others to rest—and, with these, many user problems."

What makes ADAM so distinctive is that it requires no trained programmer; nearly anyone can program ADAM. The user simply "teaches" ADAM his way of doing things. Learning to teach ADAM requires a minimal amount of training, primarily because ADAM communicates with the user in the user's own language.

Ease of use is the first consideration in every aspect of the system design, and especially in the operating software. ADAM's operating system is dedicated to discovering what the user wants to do. The user, in turn, communicates with ADAM by responding to prompting from the monitor. These promptings actually guide the user through strictly defined procedures, although he is never fully aware of all the rules.

To gain a closer perception of ADAM, it is very helpful to meet John Peers, ADAM's creator. Peers has been referred to (not undeservedly) as the Monty Python of the computer industry, and anyone who has met this enthusiastic and witty Englishman will agree that the description is apt. John Peers has some notable ideas on computing and on the computer industry—ideas that are contrary to the direction now being taken by the industry. The foremost of these ideas is that "the solution to a problem changes the nature of the problem" (Peers' Law). In other words, Peers believes that many present-day computer-industry solutions of user problems create greater problems.

At present, there are two basic methods used by computer makers to "solve" users' problems. One is the industry-type solution system, the IBM System/32 being the most visible example. In these systems, standard applications

Since its introduction in April 1974, ADAM has become increasingly popular, with over 400 systems installed to date. ADAM is billed as the first truly programmerless business data processing system; hence the company name, Logical Machine Corporation. From impressions gathered during our user interviews and a demonstration, it appears that this claim is substantially true.

## CHARACTERISTICS

**MANUFACTURER:** Logical Machine Corporation, 1294 Hammerwood Avenue, Sunnyvale, CA 94086. Telephone (408) 744-1290.

Logical Machine Corporation (formerly known as John Peers & Company, Inc.) is a privately held company that manufactures the ADAM business computer system. ADAM is marketed through company branches and distributors in 29 U.S. cities, Australia, Malaysia, Europe, Japan, and South America.

At present, company branch offices are located in Los Angeles and Burlingame, California; Arlington, Texas; Atlanta, Georgia; and Amsterdam, The Netherlands.

**DISTRIBUTORS:** ADAM is available from the company branches and authorized distributors on a purchase or lease basis. Maintenance is provided on a contract basis through both the manufacturer and the distributors. The domestic dealers are listed alphabetically by state, followed by the foreign dealers, listed alphabetically by country.

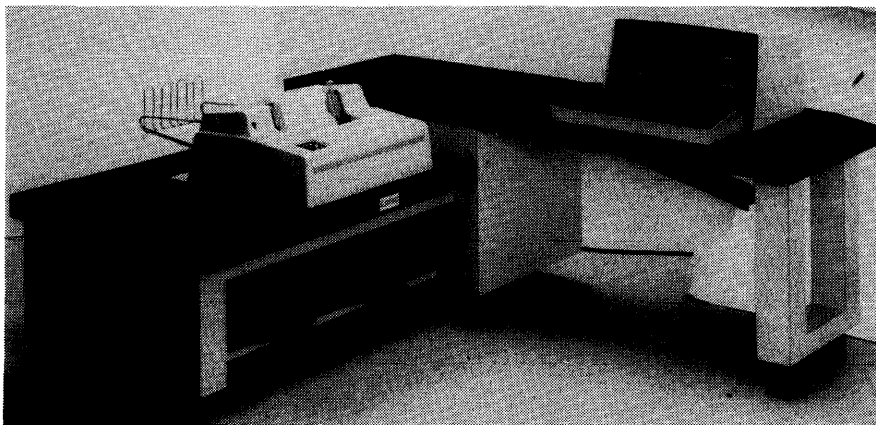
### U.S. Distributors

Minicomputers of Alaska, 4456 Business Park Blvd., Anchorage, Alaska 99503. Telephone (907) 277-9815.

Del Rey Data Corporation, 4314 Marina City Drive, Suite 120, Marina Del Rey, California 90291. Telephone (213) 822-6770.

Rem Office Products, 2120 De La Cruz Blvd., Santa Clara, California 95050. Telephone (408) 244-7200.

Advanced Data Machines Corporation, 11585 Sorrento Valley Road, Suite 102, San Diego, California 92121. Telephone (714) 455-9030.



The basic ADAM system sells for \$34,995 and includes the processor with 32K bytes of memory, CRT/keyboard, Centronics 306C printer, 10.6-megabyte cartridge disk drive, and L-shaped desk. The top-loading disk drive is housed in the desk between the printer and CRT/keyboard.

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▷ packages for common business tasks are offered, and users must adapt their way of operating to be compatible with the packages. The second solution is the custom system, which is likely to be substantially more expensive than the standard package solution but is "tailored" by the manufacturer or a systems house to the user's individual needs. When these systems work, they usually work well, but there is probably no reader who cannot relate, either through first-hand experience or that of acquaintances, at least one of the horror stories that these custom systems have sometimes generated.

Logical Machine Corporation (John Peers' company) feels that the computer industry compounds user problems by injecting another variable into an already highly volatile situation—namely, the programmer. The programmer is usually an individual highly skilled in file structures, sub-routine linkages, and run-time packages. But what does he know about lumber, or jewelry, or automobile spare parts—in other words, the nature of the business? On the other side of the coin, what does the small businessman know about data base management, disk drives, and time-sharing? Rarely have the twain met. The programmer receives a rudimentary education in the principles of a specific business and makes a compromise between what the user needs and what the data processing equipment and software can provide.

ADAM provides a third alternative by eliminating programmers, or at least applications programmers, its creator believing instead that the user is best qualified to solve his own problems. Logical Machine Corporation feels that computer manufacturers and systems houses should concentrate their efforts on data processing systems that enable non-computer-trained users to solve their own problems instead of having to accept some programmer's interpretation of the problem. ADAM's approach is to provide computer systems that permit the ultimate user to solve his problems directly, with computer and data processing considerations made as transparent as possible. In fact, John Peers does not care for the term *computer* and refers to ADAM as a *logical machine*; hence the company name.

So, what is ADAM? ADAM is a very basic computing system insofar as hardware is concerned, consisting of a CPU, a cartridge disk drive, a CRT display and keyboard, a printer, and a desk. ADAM's real power is derived from its highly interactive monitor that constantly prompts users, makes programming as simple as possible, and ensures recovery from virtually all user mistakes.

To the user, ADAM looks like a typewriter connected to a huge "memory pit" that can never lose any information placed in it. Further, ADAM can be taught to manipulate the data stored within the pit and to produce output on either the CRT or printer. "Teaching" ADAM (John Peers' term for programming) is done with the aid of the monitor, which asks the right questions at the right time. The user merely supplies names and numbers and expresses what should be done in terms of 42 basic verbs. All communication between the user and ADAM is in the form of English-language sentences, with prompting supplied by ADAM. File names and data labels are all that must be supplied by the user. These, incidentally, are entered in a master index and can be listed on command. ▷

▷ Drew Leasing Corporation, d.b.a. Logical Machine of California, 2473 Port Street, West Sacramento, California 95691. Telephone (916) 371-7901.

K.J. Systems, Stapleton Plaza, 3333 Quebec, Suite 6000, Denver, Colorado 80211. Telephone (303) 399-7102.

Distributors, Inc., 701 South Flagler Drive, West Palm Beach, Florida 33402. Telephone (305) 655-8266.

Logical Business Systems, 2305 South Orange Ave., Orlando, FL 32806. Telephone (305) 422-1213.

Logical Data Systems, Inc., 677 Ala Moana Boulevard, Suite 609, Honolulu, Hawaii 96813. Telephone (808) 521-2117.

Eden Computer Systems, Inc., 2720 Des Plaines River Road, Des Plaines, Illinois 60018. Telephone (312) 298-6035.

Dialecticians of New England, 161 High Street, Box 2117, Boston, Massachusetts 02110. Telephone (617) 423-2900.

Victor Associates, 304 Turnpike Road, Southboro, Massachusetts 01772. Telephone (617) 481-4010.

Datatype, Inc., Mack Plaza, 32290 Five Mile Road, Livonia, Michigan 48150. Telephone (313) 427-2670.

Allied Data Service, Inc., 1266 Gravois, St. Louis, Missouri 63104. Telephone (314) 241-5227.

National Unlimited Business Systems, 271 West Lincoln Avenue, Mt. Vernon, New York 10550. Telephone (914) 664-2828.

Spectrum Leasing, 155 West 29th Street, New York, New York 10001. Telephone (212) 239-6988.

Hammond Industries, 155 Michael Drive, Syosset, New York 11791. Telephone (516) 364-1900.

Southwest Technological Services, 4401 N. Classen, Suite 300, Oklahoma City, Oklahoma 73118. Telephone (405) 528-7242.

F & W Associates, 1980 Foster Road, Hatfield, Pennsylvania 19440. Telephone (215) 368-8719.

Logical Minicomputer Systems, Parkvale Building, Suite 607, Monroeville, Pennsylvania 15146. Telephone (412) 372-7701.

American Business Machines Corporation, 1001 Waterman Avenue, East Providence, Rhode Island 02914. Telephone (401) 434-6150.

Logical Business Machines, 4111 North Shore Drive, Bldg. 2, Suite 215, Knoxville, Tennessee 37915. Telephone (615) 588-8595.

Central Beverage, Inc., 2601 Perth Street, Dallas, Texas 75220. Telephone (214) 357-6167.

Mann Glass Company, Inc., 7318 Ferguson Road, Dallas, Texas 75228. Telephone (214) 328-3555.

Minicomputer Sales, Inc., 8625 King George St., Suite 170, Dallas, Texas 75235. Telephone (214) 688-0591.

M & W Electronics, 330 South Zangs, Dallas, Texas. Telephone (214) 943-5444.

Logical Computer Systems, Inc., 1353-55 West French Place, San Antonio, Texas 78201. Telephone (512) 732-9984.

Keith Jorgensen Systems, 400 West, 7048 South, Midville, Utah 84047. Telephone (801) 566-1238. ▷

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### PERIPHERALS/TERMINALS

DEVICE	DESCRIPTION & SPEED	MANUFACTURER
306C	Serial printer; 132 positions in standard 80-position (8-inch) space, 96 ASCII characters, 9 × 7 dot matrix; 100 cps at 10 characters per inch or 165 cps at 16.5 characters per inch; speed is selected by switch or under program control.	Centronics
103AL	Serial printer; 132 positions, 96 ASCII characters, 9 × 7 dot matrix, bidirectional; 165 cps	Centronics
Sprint 45	Serial printer; 132 positions, 96 ASCII characters, daisy wheel, bidirectional; 45 cps	Qume
92452	CRT display/keyboard; 24 lines of 80 characters, 12-inch diagonal CRT, 7 × 9 dot matrix, 128 displayable characters; microprocessor-controlled keyboard with 10-key numeric pad; also available as additional slave unit for remote operation	Control Data
MIKE	Voice recognition/response unit; includes microphone, speaker, power supply, and interface	Centigram

▷ The chief function of ADAM's monitor is to keep the operator out of trouble. Most visibly, there is the prompting, but internally there are more sophisticated aids. If a user's program includes any loop, a warning is placed on the screen after the first recursion. Since some programs are designed to loop, the recursion warning can, and often must, be overridden, but it's there to reduce the possibility of unintentional infinite loops.

Another reliability feature built into ADAM is double-copying of *all* disk data. This includes the ADAM system itself as well as all file data.

To illustrate the method by which ADAM is programmed, two examples have been selected: the definition of a new verb and the definition of a new file. Information entered by the USER is printed in UPPER CASE and prompting supplied by ADAM is printed in lower case.

```

VERB   called      NET INVOICE VALUE
1 does MULTIPLY      GROSS INVOICE VALUE by
                INVOICE DISCOUNT RATE
2 and  SUBTRACT      PROD from GROSS INVOICE VALUE
3 and  MOVE          DIF to DISCOUNTED INVOICE
                VALUE
4 and  COMMENT      TAX IS PAYABLE ON DIS-
                COUNTEd VALUE
5 and  MULTIPLY      DIF by SALES TAX RATE
6 and  MOVE          PROD to INVOICE SALES TAX
7 and  ADD           PROD to DISCOUNTED INVOICE
                VALUE
8 and  MOVE          SUM to NET INVOICE VALUE

```

The above routine will calculate a net invoice value from parameters stored in other previously defined data locations (GROSS INVOICE VALUE, INVOICE DISCOUNT RATE, etc.). Once defined in this manner, the new verb NET INVOICE VALUE can be inserted in any line of program text at any time, and it will be acted upon as one of the basic system verbs (ADD, MULTIPLY, DIVIDE, etc.).

To define a file, the user simply inputs FILE from the keyboard and enters each of the elements the file will contain. No field lengths, etc., need to be specified, since ADAM handles that automatically.

### ▶ Overseas Distributors

Data 100, Headquarters Western Pacific Operations, 1st Floor, 464 St. Kilda Road, Melbourne, Australia. Telephone 267-3544.

France Promotion Informatique F.P.I. S.A., Immeuble Pericentre, Rue van Gogh, 59650 Villeneuve d'Ascq, France. Telephone 020-913049.

Societe Phocenne d'Informatique ETS. Jeandet S.A., 3, Rue de la Guadeloupe, 13006 Marseille, France. Telephone 091-534678.

T E I Toulouse, 76, Ailes Jean Jaures, 31000 Toulouse, France. Telephone (61). 48.67.61.

Takachiho Koheki Company, Ltd. 2, 1-Chome, Yotsuya Shinjuku-Ku, Tokyo 160 Japan. Telephone 03-355-1111.

Roneo Vickers Holland N.V., Kerkdreef 1, P.O. Box 111, Krimpen aan de IJssel, The Netherlands. Telephone 01807-19022.

Lomac S.A. Doctor Roux, 74, Barcelona—17, Spain. Telephone 03.3018450.

Lomac Svenska AB, Karlsbodavagen 14, 161 70 Bromma/Stockholm, Sweden. Telephone 08/98 07 55.

Max Bodenhoff A/S, Landgreven 7, DK 1301 Copenhagen K., Denmark. Telephone 01.146304.

Lauth und Scheihing GMBH, Buro-Elektronik, Leinenweberstrasse 42, 7000 Stuttgart 80, Mohringen, Germany. Telephone (0711) 714014.

R. Bantle, Freibuhlstrasse 16 Strasse 19, 7700 Singen (Hohentwiel), West Germany. Telephone (07731) 66131.

Melewar Holdings Sdn. Bhd., Suite 6.08 Wisma Central, Jalan Ampang Kuala Lumpur 04-07, Malaysia. Telephone 03-81376/7.

C.O.M., CA., Avenida Principal de Bello Monte, Centro Cristobal, Piso 6, Caracas, Venezuela. Telephone 76-6557.

MODEL: ADAM.

DATE ANNOUNCED: April 1975.

FIRST DELIVERY: April 1975.

NUMBER INSTALLED: Over 400.

### DATA FORMATS

BASIC UNIT: The basic data unit used by ADAM is a 16-bit word. The data units available to users are nouns and

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➤ FILE called INVENTORY INFORMATION

1 uses	PART NO.
2 and	PART DESCRIPTION
3 and	PART COST
4 and	PART PRICE
5 and	INVENTORY LEVEL
6 and	PART ON ORDER QUANTITY
7 and	PART REORDER LEVEL
8 and	SUPPLIER NAME
9 and	YEAR TO DATE USAGE

ADAM also has security provisions. On the keyboard are four keys, S1 through S4, that do not display characters on the screen. These can be used in any combination as non-display passwords or merely interspersed with displayed characters in passwords.

Another noteworthy feature of ADAM is a built-in self-formatting response generator that provides the means to redefine the names of all verbs, files, and dialogue (prompting) responses. With this ability, foreign or international users can convert the English language system into any other alphabet-based language at will. A complete translation can be accomplished in about a day. It is assumed, however, in the case of special alphabets, that the appropriate character generator and keyboard keys have been substituted for the normal set. At the time of this writing, this feature has been employed to generate a Swedish-, French-, Katakana (Japanese)-, Danish-, German-, Dutch-, and Spanish-speaking ADAM. In addition, ADAM can be made bilingual by allocating either upper or lower case to one language and the remaining case to a different language. Also, by defining new verbs through normal programming procedures, ADAM can be made multilingual, although this method is not as efficient as the hardware-generated method.

When disk data is written, both copies are compared. If the comparison fails, the write is reperformed. On disk reads, a comparison failure results in a reread. If multiple repetitions of the read or write operation fail to provide a data match, an error message is placed on the screen, and ADAM cannot be used until the problem is corrected.

Each time ADAM is started, a total disk comparison is made. If one cartridge contains an updated version of the monitor, the older version is automatically updated to reflect the changes. This feature is used to provide regular updates, since Logical Machine Corporation customer engineers perform regular preventive maintenance checks and their service disk cartridges always contain the most recent version.

If the files on the two disks do not match, the user can specify either "copy up" or "copy down" to make both cartridges the same. In addition, selective copying can be specified, in which only selected verbs or files are transferred to the other disk.

ADAM's disk usage might be described as wasteful by today's computer specialists, whose job it is to wring every last bit of performance out of a system. The amount of time lost by the interaction between user and monitor and the halving of the available disk space by redundant copying does produce an unfavorable effect on the price/performance characteristics of the system. But this judgment is made in terms of systems with trained specialists running them—*high-priced* trained specialists. ADAM ➤

➤ verbs made up of ASCII characters. Alphanumeric character strings can be treated as data fields if preceded by quotation marks.

**FIXED-POINT OPERANDS:** May have up to 14 digits plus a sign. Commas, on input, must be correctly placed or the system will reject the entry.

**FLOATING-POINT OPERANDS:** Can be either monetary representations or scientific numbers. The decimal point can be placed anywhere as long as the 14-digit limitation is observed. Internally, all arithmetic operations occur in floating-point format, using 64-bit operands. Normally, only 14-digit results can be extracted; however, a special verb (command) can separate the integer and fractional parts of numbers and output both separately. Using this technique, 28-digit precision is obtainable.

**INSTRUCTIONS:** Resemble English-language verbs. There are currently 42 basic verbs defined in the ADAM system, consisting of such functions as ADD, SUBTRACT, ALTER, OUTPUT, PRINT, LIST REF, GET, and DELETE. Verbs and associated nouns are stored in compacted format on the disk. A more complete summary of the basic verbs is presented in the Instruction Repertoire entry.

New verbs can be defined using the VERB verb. This is the equivalent of defining subroutines.

**INTERNAL CODE:** ASCII.

### MAIN STORAGE

**TYPE:** Dynamic MOS RAM, refreshed every 2 milliseconds on command from the CPU.

**CAPACITY:** ADAM contains 32K bytes of main memory. An additional 32K bytes can be added.

**STORAGE PROTECTION:** Several system comparison checks are built into the operating software.

**CYCLE TIME:** The ADAM main memory, although capable of operating at a 500-nanosecond cycle time, is operated at 800 nanoseconds for increased reliability.

**RESERVED STORAGE:** All internal aspects of ADAM's operating system are transparent to the user. All main memory is used or controlled by the operating system, and all user storage is effectively on disk.

### CENTRAL PROCESSOR

ADAM's central processor is manufactured by Logical Machine Corp. from Intel 3002 2-bit-slice microprocessor chips to form a 16-bit microcomputer with a 170-nanosecond cycle time. This microcomputer performs all data processing functions for the system, and also performs all I/O control functions; no I/O controllers are used in ADAM. When not engaged in data processing activities, the CPU changes roles and executes programs that emulate I/O controllers—specifically, a disk controller, a line printer controller, and a CRT/keyboard controller.

**CONTROL MEMORY:** Consists of 512 32-bit words of 200-nanosecond bipolar memory.

**REGISTERS:** The ADAM CPU contains 10 16-bit control registers plus a file of 16 16-bit general-purpose registers.

**ADDRESSING:** Performed by the operating firmware and not visible to the user.

**INSTRUCTION REPERTOIRE:** ADAM's basic verb set includes five arithmetic operations—ADD, SUBTRACT, MULTIPLY, DIVIDE and SPLIT; nine definition verbs—VERB, ALTER, FORGET, FIX, COMMENT, FILE, RENAME, EXCHANGE, and EXCHANGE ALL; five structure verbs—CONTINUE, REPEAT, START, GO TO, and LABEL; two test verbs—IF and IF REFERENCE; ➤

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▷ is slower than most small business computers—but it doesn't require the trained specialists or specially written software that can easily double the total cost of a system. ADAM costs \$34,995 *once*. Competitive systems typically cost about the same to purchase, but are likely to also require the services of a specialist earning a yearly salary of \$15,000 to \$18,000. Remember, ADAM is intended only for small business applications, for first-time users. It is a manual system aimed at applications requiring entry of no more than 1000 records per day.

ADAM's hardware is also unique. While ADAM was conceived in Great Britain by John Peers, his associate, Gerard Horgan, now Technical Director of the company, is largely responsible for the system design and implementation. ADAM's CPU, originally a heavily modified GRI unit, is now built entirely by Logical Machine Corporation from Intel 3000-Series bipolar 2-bit slices and has a 170-nanosecond cycle time. Since the CPU is so fast, and since ADAM is a single-user interactive system, the CPU has lots of extra processing time available. So ADAM doesn't use I/O controllers. When not calculating or processing data, the CPU "emulates" the functions of conventional I/O controllers and is connected directly to the I/O devices. Users who frequently pay almost as much for I/O controllers as they do for the devices they control should appreciate this arrangement.

Another innovation found in ADAM is the use of proprietary disk operating routines partially implemented in firmware. With this firmware system and the fast micro-processor-based CPU, a disk data transfer rate of 1.25 million characters per second is achieved.

Logical Machine Corporation is also proud of the power supplies used in ADAM. Both the CPU and the disk subsystem continue to work properly even when the line voltage dips to 91 volts, an important feature considering that the system is intended for small business usage where special filtered lines may not be available or affordable. Datapro's reporter witnessed an ADAM system operating, with no ill effects, directly adjacent to a systems test area where several units were being powered up and down.

ADAMS uses variable-length fields to make up its records, resulting in a nominal disk capacity of 30,000 to 40,000 records. The company is also working on a smaller version and a multi-screen version, both expected to appear later this year.

In 1977, Logical Machine Corporation introduced EVE (Entry and Validation Equipment), a key-to-diskette data entry unit, and DISK/45, a floppy disk unit that attaches to and directly interfaces with ADAM. These optionally available units can provide additional flexibility and a means to communicate with other ADAM systems as well as other manufacturers' equipment. Also introduced was Sprint 45, a serial printer designed for word processing operations. And, just about the time this report is going to press, the company plans to introduce a voice recognition/response unit called MIKE as an additional optional I/O device for use with ADAM.

Logical Machine Corporation currently has more than 400 systems installed and is shipping at the rate of about 40 systems per month. Plans are currently under way to increase the production capability to between 80 and 90 systems per month. ADAM has been a great success thus far, and indications are that it will continue to be. ▷

▶ seven library functions—RECAP, RECAL ALL, LIST NOUNS, LIST VERBS, LIST FILES, LIST UNDEFINED, and TRACE; eight data handling operations—DISPLAY, PRINT, OUTPUT, INPUT, SINPUT, MOVE, CUT, and JOIN; and six file operations—SAVE, GET, DELETE, BEGIN, FIRST-THIS-NEXT, and LIST REFERENCES.

The most important feature of ADAM is its ability to create new verbs using the basic set. This is done using the VERB verb and permits users to define subroutines and use them in the same manner as the basic verbs. Once defined, a new verb can be referred to in the same manner as the originals.

**INSTRUCTION TIMINGS:** The following timings, in *milliseconds*, are approximate only, since the system is sensitive to data patterns.

Add/Subtract	1
Multiply	3
Divide	4
Compare and branch	1

**INTERRUPTS:** The ADAM CPU has no interrupts. All devices are polled by the CPU under program control.

**PHYSICAL SPECIFICATIONS:** ADAM requires a standard 120-VAC, 20-ampere, 3-wire grounded circuit with standard receptacle. ADAM is mounted in an L-shaped enclosure measuring 74 inches wide and 68 inches deep, and requires at least 144 square feet of floor space including access ways. For protection against power brown-out, the entire ADAM system, including disk drive, can operate reliably with the line voltage fluctuating between 94.5 and 121 volts, and a battery back-up provides protection for up to several hours of power outage.

Operating environment is normal room temperature, 70 degrees F., and ideally should not vary more than five degrees. These requirements are well within normal office conditions. Recommended relative humidity, again ideally, is between 40 and 50 percent.

ADAM's installation area should not be carpeted. If carpeting is required, it should be of the specially woven type intended for computer installations.

### INPUT/OUTPUT CONTROL

ADAM does not employ a conventional I/O scheme with I/O controllers, DMA interfaces, and other hardware designed to unload the CPU's processing burden. Instead, all I/O devices connect directly to the CPU through selector gating, and the CPU executes emulation programs that make it "look like" a controller. All data transfers occur under program control and there are no DMA functions.

**SIMULTANEOUS OPERATIONS:** None.

### CONFIGURATION RULES

ADAM users have a choice of a Centronics 306C or 103 printer, plus an optional Qume Sprint 45 printer, floppy disk unit, key-to-diskette data entry unit, and voice input/output unit. A second, switch-selectable slave CRT can be attached up to 600 feet from ADAM.

### MASS STORAGE

ADAM's standard mass storage capability is provided by one 10.6-megabyte cartridge disk drive manufactured by Control Data. The Model 9427H disk drive stores 5.3 megabytes of data one each of two disks, one fixed and one removable IBM 5440-type cartridge. Average rotational delay is 12.5 milliseconds, and average head-positioning time is 35 milliseconds. Data transfer rate between the CPU and the disk drive is 1.25 million bytes per second.

**DISK/45:** An optional floppy disk unit that attaches to the underside of ADAM's desk, adjacent to the standard ▶

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### ▷ USER REACTION

In February 1978, Datapro interviewed eight ADAM users randomly selected from a list of approximately 50 users supplied by the vendor. The user population was diverse in both geographic distribution and business orientation. Among the eight were a kitchen cabinet manufacturer, a janitorial service company, a cosmetics distributor, a tool manufacturer, a dental supplies distributor, a lighting equipment manufacturer, an import/export company, and an employment agency. Geographically, two users were located in California, one in Illinois, one in New York, four in Texas, and one in Utah. The earliest installation was in April 1975, and the latest in January 1978. None of these users had had any previous data processing experience, although one said he had taken a course in FORTRAN programming a few years ago; yet every person we interviewed had developed one or more new verbs (programs) for the system.

All of these users had evaluated other systems prior to purchasing ADAM, including systems from IBM, Univac, Basic/Four, Qantel, Burroughs, Datapoint, DEC, and Sharp. In each case, the user cited the ability to utilize existing personnel to program the system and develop his own "personalized packages" as the overriding factor that led him to purchase ADAM rather than one of the systems offered by the other vendors.

The table below summarizes the users' responses to Datapro's survey questions.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	8	0	0	0	4.0
Reliability of mainframe	5	1	0	0	3.8
Reliability of peripherals	6	0	0	0	4.0
Maintenance service:					
Responsiveness	7	0	0	0	4.0
Effectiveness	7	0	0	0	4.0
Technical support	8	0	0	0	4.0
Compiler (ADAM)	6	1	0	0	3.8
Ease of programming	7	1	0	0	3.8
Overall satisfaction	7	1	0	0	3.8

\* Weighted Average on a scale of 4.0 for Excellent.

As the figures show, all eight of the ADAM users we interviewed were very well satisfied. Not one user offered an adverse comment, even when we specifically asked them to cite any negative aspects of the system.

Four of these users were particularly impressed with the training they had received and the technical support they were getting from the manufacturer and/or the distributor. All eight users commented on how easy it was to learn to use the system, and said that ADAM was able to do everything that they asked of it. One user commented that "you are limited only by your own imagination" and that he felt he had to make "no compromise."

Considering the success of ADAM to date and the enthusiasm and satisfaction of the system's users, we may soon see other companies following John Peers' lead and introducing "logical machines" that can conform to the needs of the user without requiring him to learn the language of the machine and program it under the constraints imposed by that language. □

▶ cartridge disk unit. The DISK/45 uses IBM 3740-compatible diskettes with 26 sectors per track, 128 bytes per sector, and 77 tracks. Each diskette has a capacity of 242K bytes. Average rotational delay is 83 milliseconds, and average access time is 260 milliseconds. The data transfer rate is 31,250 bytes/second. The DISK/45 is manufactured by Shugart.

### INPUT/OUTPUT UNITS

See Peripherals/Terminals table.

### COMMUNICATIONS CONTROL

ADAM has no data communications capability. At present, it is designed solely as a one-operator, stand-alone system.

### SOFTWARE

**OPERATING SYSTEM:** ADAM's operating system is a highly interactive, single-user, disk-based system that is partially implemented in firmware for increased performance characteristics. It is "real-time" inasmuch as the input device (the user) cannot go faster than the CPU. All information, including verbs and files, is stored symbolically, using only slight character compression. Disk space is allocated dynamically by the ADAM operating system.

The most important functions performed by the operating system are validity, reliability, and syntax checking. All data input is range-checked for alphabetic, numeric, or monetary data (dollars and cents). In addition, the disk operating firmware copies all data on both disks (mirror image), and then rereads and compares the results of each disk write. If the compare fails, the process is reinitiated to ensure that all data is written correctly. The comparison also occurs on data retrieval.

Files are defined by naming each file and describing the elements it contains. Record length and sequencing are transparent to the user since ADAM maintains complete indexing for all files. Once a file is defined, ADAM allocates disk space so that the file may extend to any length within the 5-megabyte limit of the disk.

ADAM produces a status report, on command, that informs the user of the number of alternate tracks substituted for normal tracks; a complete dictionary of verb names, file names, nouns, and constants in the system; a count of the total number of records in all files; the version number of the system; and a recap of storage image and storage remaining.

**LANGUAGE:** There is insufficient space for a full description of ADAM's language, but a brief summary of the verb set will aid readers in forming a clearer understanding of the system's operation.

The five arithmetic operations are:

- ADD (noun) to (noun); result is in SUM.
- SUBTRACT (noun) from (noun); result is in DIF.
- MULTIPLY (noun) by (noun); result is in PROD.
- DIVIDE (noun) by (noun); result is in QUOT.
- SPLIT (noun). This operation breaks a numeric value into an integer (INTG) and fraction (FRAC) and stores the two parts in the named locations.

The nine defining operations are:

- VERB—used to create subroutines and programs. Once defined, these new verbs are used in the same way as the basic verb set (see example in Management Summary).
- ALTER—permits users to modify both verb definitions and files. Lines can be changed or deleted and new lines

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added. Changes can be made only to empty files (i.e., files with no data stored in them). Records in files cannot be changed by the ALTER verb.

- **FORGET**—will remove a named item from the vocabulary provided that the item has not been used as part of another definition or has not been FIXED.
- **FIX**—chisels a verb (subroutine or program), noun, or file in stone and protects that item from FORGET or ALTER. FIXing is nonreversible, although the value for a FIXed noun can be altered.
- **COMMENT**—permits inclusion of messages or notations in verbs or files; limited to 50 characters per line.
- **FILE**—permits users to create new files (see example in Management Summary).
- **RENAME**—changes file, verb, or noun names. All references to the old name are resolved by the operating system. The new name cannot be a currently used name, however, and neither the old nor new name can be a number or expression.
- **EXCHANGE**—accomplished more than RENAME. One item, including its definition, is replaced by an alternate item, with both a new name and a new definition. Both items can be files, verbs, nouns, or numbers, but one type of item cannot be exchanged for another type (verb exchange for noun). Both items can still be found in the system after exchanging.
- **EXCHANGE ALL**—similar to EXCHANGE, but more universal in its effects, performing the exchange throughout the entire ADAM storage system instead of in one occurrence.

The structure operation verbs are:

- **CONTINUE**—terminates the present routine (verb) and returns to the previously executed routine.
- **REPEAT**—causes the present routine to start again at the first command.
- **START**—has the same effect as pressing the START key on the keyboard, and reinitializes ADAM prior to beginning a new task.
- **GO TO**—executes a branch to a specific labeled line or command.
- **LABEL**—affixes a designator to any line of program or text. LABEL is used only within a routine, and the name can be used again in other routines.

Testing (branch) operations include:

- **IF**—a conditional branch statement in which the numeric or alphanumeric value of one operand is compared to the value of another and, depending on the results of the comparison, causes ADAM to go either to the next program line or to another specified program step.
- **IF REF**—compares the numeric or alphanumeric value of one operand to all the references in a specified file.

Library functions include:

- **RECAP**—lists a selected routine on either the printer or CRT.
- **RECAP ALL**—lists all routines.
- **LIST NOUNS**—lists all nouns names found in ADAM's files.
- **LIST VERBS**—lists all verb names.

- **LIST FILES**—lists all file names.
- **LIST UNDEF**—lists all files or verbs that have been referenced by other verbs but have not been defined by the user.
- **TRACE**—searches through both verbs and files and lists all occurrences of a named item (verb, noun, file, expression, etc.) in each defined verb or file. If a noun is specified, the names of all nouns of equal value are listed.

Data operations include:

- **DISPLAY**—causes a specified noun, number, or expression to be displayed on the CRT display.
- **PRINT**—causes a specified noun, number, or expression to be listed on the printer.
- **OUTPUT**—causes a selected noun, number, or expression to be either printed or displayed when selected by the operator through the SCRNL/PAPER key.
- **LAYOUT**—similar to the FORMAT statement in FORTRAN. It is used after any DISPLAY, PRINT, or OUTPUT verb to specify the positioning of either printed or displayed material.
- **INPUT and SINPUT**—cause ADAM to wait for information from the keyboard. SINPUT signifies that the information must be numeric and include properly placed commas and decimal point.
- **MOVE**—transfers data from one location to another.
- **CUT**—breaks apart a data field at a specified point. The resulting two fields are referred to as the HEAD and TAIL.
- **JOIN**—accomplishes the opposite of CUT, combining two data fields into a single field.

File operations include:

- **SAVE**—causes a record to be stored in a specified file.
- **GET**—retrieves a record from a specified file.
- **DELETE**—removes a record from a specified file.
- **BEGIN**—specifies the starting point, within a specified file, where operations on data records will commence.
- **FIRST-THIS-NEXT**—general file references used after the GET, SAVE, or DELETE verbs. FIRST refers to the first record in the file; THIS refers to the most recently used record; and NEXT refers to the next record in sequence. Using these references, users need not specifically identify each record in a file in order to sequentially access the file.
- **LIST REFS**—causes a reference list or index to be output to either the printer or display. The list includes the total number of records in the file and the actual references.

**APPLICATIONS:** The purpose of ADAM is to permit users to generate their own applications programs very simply, without the use of extensive training in programming languages and techniques. Thus, no standard applications programs are offered by the vendor at this time. However, skeleton models of most accounting applications are available to assist first-time users in developing their own personalized business systems.

## Logical Machine Corporation ADAM

### ► PRICING

**POLICY:** ADAM is available for purchase through Logical Machine Corporation branches and distributors at various locations throughout the United States and numerous foreign countries. ADAM systems can also be leased through the distributors for approximately \$1,000 per month, including maintenance, under a 60-month contract. Logical Machine Corporation warrants ADAM for 90 days on-site, parts and labor. Distributors are not required to offer the warranty, but nearly all provide the same terms as the manufacturer. Delivery and installation are not included in the purchase price.

ADAM software is updated free of charge, and all documentation is supplied with each system. Five half-day training sessions are provided for one operator with each system.

Training is held either at the manufacturer's local branch facilities or at the distributor's facilities. On-site application design assistance and training for up to 22 days is included in the base system price.

Contract maintenance is available for \$249 per month. The period of coverage is from 8 a.m. to 5 p.m. on weekdays and includes parts, labor, and preventive maintenance within 50 miles. For systems located between 51 and 75 miles away, contract maintenance costs \$30 per month more, and between 76 and 100 miles away, \$60 per month more. Logical Machine Corporation and its distributors guarantee response to any service call within four hours.

Distributorships are available. Distributors are expected to maintain an adequately trained staff for customer support. The manufacturer trains all distributor personnel free of charge.■

### EQUIPMENT PRICES

	<u>Purchase Price</u>
Basic ADAM System; includes processor, CRT/keyboard, Centronics 306C printer, one disk drive, one cartridge disk pack, one L-shaped desk, training course, and 22 days of on-site training	\$34,995
Expansion memory module; 32K bytes	3,275
Centronics 103 Printer (in lieu of 306C printer)	2,060
Original equipment disk pack (set of 3); includes formatting and operating software (initial order)	400
Additional cartridge disk pack	150
Additional CRT display (slave switch-selectable unit)	4,500
Qume Sprint 45 Printer, in addition to Centronics 306C or 103 printer; includes interface electronics and selector switch	5,567
EVE single-station data entry terminal	5,450
EVE dual-station data entry terminal	6,210
DISK/45 floppy diskette read/write data transfer terminal	3,500
MIKE voice recognition/response unit	*

\*Contact vendor.