The Coleco Adam

This inexpensive home computer has all the necessary peripherals, but using it is no Garden of Eden

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Computer Consultant

In the past few months, you've probably heard a lot about the new Coleco Adam computer. With its built-in word processor, Applesoft-compatible BASIC, letter-quality daisy-wheel printer, 80K bytes of RAM (random-access read/write memory), ability to use all Colecovision game cartridges and accessories, and a price tag of less than $750, it sounded too good to pass up. It is often said that if something sounds too good to be true, it probably is. The Coleco Adam is no exception to this rule.

There are two versions of the Adam computer. The machine used for this review is a stand-alone unit with a Colecovision game system built into it (see photo 1). The other version consists of an expansion module that plugs into an existing Colecovision game system and converts it to a computer. The one feature of the Adam that I have had no problems with is its ability to function as a video game. After producing hundreds of thousands of these game machines, Coleco has that process down pat. Would that it were so for the rest of the system.

The Adam comes in three parts. The main system console includes a Colecovision game unit, main processor and memory, digital data pack (cassette) drive, and expansion interfaces. The daisy-wheel printer includes the only power cord for the system, passing power to the main console using the same cable that sends printer information back. The keyboard is connected to the main console with a coiled telephone-type cord. Two Colecovision joysticks (one of which can be mounted to the keyboard using an adapter that comes with the system) and three digital data packs are also included. One tape contains SmartBASIC, one is a preformatted blank tape to store programs or word-processing files, and the third is a game, Buck Rogers Planet of Zoom (see photo 2).

Plugs and Slots

The Adam has several interfaces for communications and expansion. Power for the system comes from the printer, which uses a single cable to send power to and receive printer signals from the main console, making it difficult to tap into that signal to use a different printer. Next to the printer/power plug on the left side is a standard modular telephone plug marked "Adamnet"; the plug is to be used for an optional modem. Another telephone plug on the front of the console is used to connect the keyboard. On the right side of the system console are two standard nine-pin joystick connectors and a Colecovision expansion interface for attaching Coleco's add-on modules for its advanced games.

Under an easily removable top are three expansion slots, next to the connectors for the installed tape drive and for an optional second drive (see photo 3). Also on top is the Colecovision game-cartridge slot. On either side of that slot are two reset switches: one resets the machine as a computer, the other resets it as a game.

The Adam's peripherals are connected to the main console via a network called Adamnet; each peripheral contains its own 6801 microprocessor. The main system microprocessor is a Zilog Z80A. Four 6801s are used: one as the Adamnet controller and one each in the printer, the keyboard, and the tape drive. Although Coleco has touted the system's resultant multitasking capabilities, systems delivered to date support only the most rudimentary form of multitasking: while a user plays the Buck Rogers game, the tape drive loads the next video screen. The system cannot work on a separate task while the printer is printing, however.

Screen Memory

A personal computer stores its display screen in a sec-

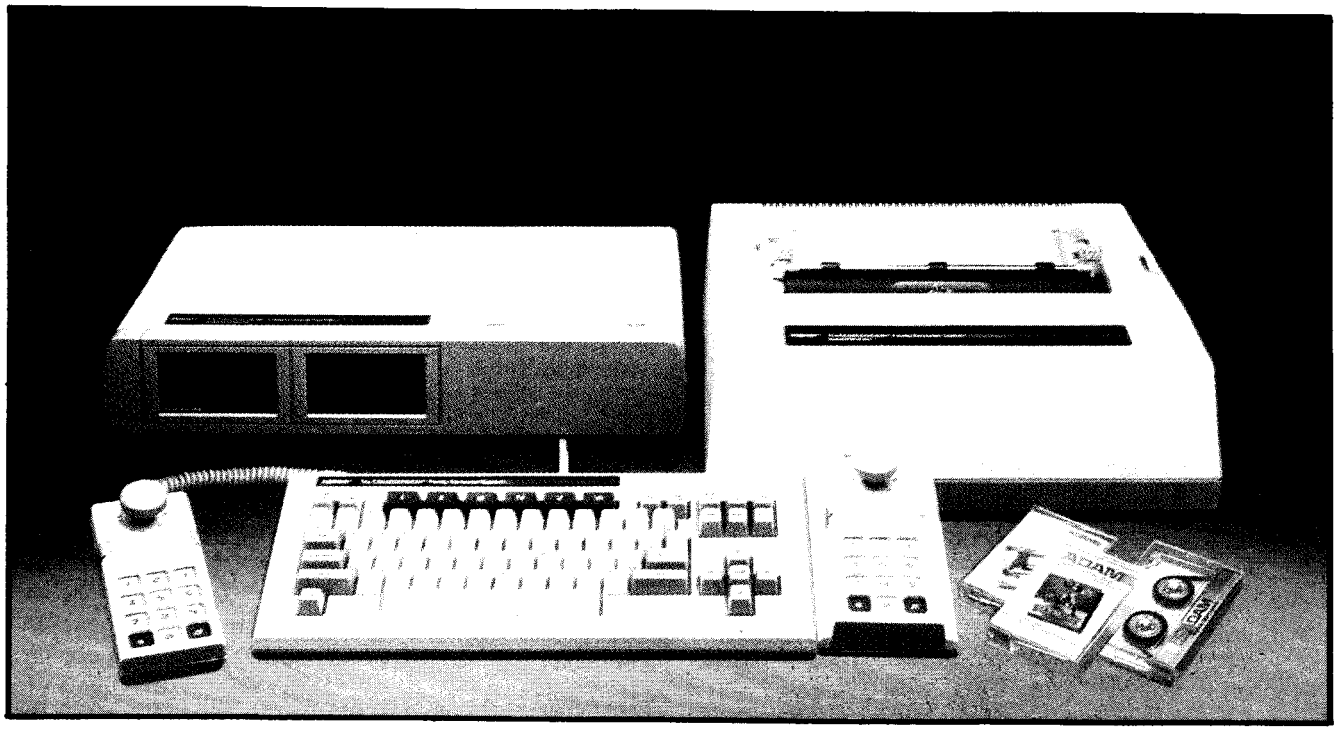

Photo 1: *The Coleco Adam includes a tape drive, a printer, 64K bytes of RAM, a keyboard, a Colecovision game system, and two joysticks.*

tion of memory, which is used by a video processor (in this case, the Texas Instruments 9928) to generate a TV image. In most computers, this memory can be addressed by the main processor, and it can be changed using machine language or POKE statements to put the appropriate values into memory locations. In the Adam, however, the 16K-byte video memory is not addressable from the Z80A microprocessor. The 9928 has its own operating-system software to store video information, which can be used either by the Z80A or the 9928, but Coleco provides technical information on this only to licensed software developers.

Because this memory is not directly accessible by the system's main processor, PEEK or POKE commands cannot be used to locate screen information, and screens cannot be transferred using BLOAD or BSAVE commands. Thus, although Coleco's SmartBASIC is partly compatible with Applesoft, programs that use POKE or BLOAD to insert information directly into either the text or high-resolution screen won't run on the Adam. Because the screen memory in the Adam is not memory mapped as in the Apple, programmers will need more technical information to achieve faster high-resolution graphics action than is possible using BASIC. Coleco said a technical reference manual will be available by early summer.

High-Speed Tape System

One of the technical breakthroughs that can be seen in the Adam is its low-cost, high-speed digital tape system. Although most hobbyists snobbishly turn up their noses at the mere mention of tape storage, Coleco has done an impressive job on the Adam's tape drive. To begin with, everything is automatic and transparent to the user. In fact, the tape commands are virtually identical to the disk commands used in Apple's DOS 3.3, with a few exceptions.

One change I dislike is the elimination of the powerful DOS 3.3 EXEC command, which enables ASCII (American National Standard Code for Information Interchange) files to be read in and appended to program files. Because programs are stored in ASCII format, the differences between the LOAD command and the EXEC command may have seemed to Coleco small enough to abandon the latter. The manual suggests no way to combine two ASCII program files, which is what the EXEC command was used for. Storing programs as ASCII files means they can be easily edited by the word processor, but it also means they require considerably more space on the tape and take longer to load than tokenized programs.

The Adam tape drive operates at two speeds: fast and faster. It reads and writes to the tape at a speed of 19,200 bits per second (bps), or 20 inches per second (ips), according to Coleco. In search mode, it scans the tape at 80 ips.

"Blank" tapes are preformatted with information that tells the tape drive where the head is currently located, much as information on a floppy disk tells the disk drive at which track and sector the head is located. A catalog stored on the tape indicates where each file is kept. The drive switches to its high-speed search mode to properly position the tape and uses its low-speed mode to read data from the tape.

At A Glance

Name
Coleco Adam

Manufacturer
Coleco Industries Inc.
999 Quaker Ln. South
West Hartford, CT 06110
(203) 725-6000 or (800) 842-1225

System Unit

Size:	18¾ by 10⅜ by 4⅛ inches
Processor:	Zilog Z80A
Memory:	80K bytes expandable to 144K bytes; 16K bytes of that memory is dedicated to the video display
Interfaces:	Three expansion slots under a removable cover; one Colecovision expansion slot; one Colecovision game-cartridge slot; four-wire telephone-type jack for Adamnet; nine-pin connector for printer signals and power; two 9-pin joystick plugs; four-pin telephone-type jack for the keyboard
Mass storage:	One 256K-byte digital data pack (cassette) drive; room for optional second drive ($200)

Keyboard

Size:	15⅛ by 6½ by 2¼ inches
Features:	75 full-travel sculptured keys in standard typewriter layout, including six numbered programmable function keys, six word-processing command keys, and five cursor keys; a 12-key numeric keypad, accessible only from the word processor; auto-repeat on all keys

Printer

Size:	15⅜ by 14⅛ by 5¾ inches
Features:	10-cps print speed; standard interchangeable daisy-wheel print element and ribbon

Display
Attaches to a standard color or black-and-white television; 256 by 192 display resolution (maximum); 36 characters by 24 lines in word-processor mode; 31 characters by 16 lines in SmartBASIC

Accessories
Two Colecovision joysticks with keypad; special holder to attach one joystick to the keyboard; all necessary cables and adapters; one blank preformatted digital data pack (cassette)

Software
Internal Smartwriter word processor; SmartBASIC (partly Applesoft compatible); Buck Rogers Planet of Zoom arcade game (tape)

Documentation
Four manuals, all 6 by 9 inches: Set-Up, 64 pages; Smartwriter, 101 pages; SmartBASIC, 225 pages; Buck Rogers, 10 pages. Also includes card for free one-year subscription to **Adam Family Computing** magazine.

Price
$750

Peripherals
Scheduled for release this year: Adamlink 300/1200-bps modem, less than $250; 5¼-inch disk drive, less than $400; 64K-byte memory expansion, less than $200; accessory kit, including three print wheels, a blank digital data pack, a multistrike carbon ribbon, and a tape-head cleaner, all for about $40; printer tractor-feed option, $125

Audience
First-time computer buyers wanting a complete home computer system for less than $1000

Although the Adam's tape drive is uncomfortably slow compared with floppy-disk drives, it operates much faster than any standard cassette-tape drive. The 20-ips speed is far faster than a normal cassette speed of about 1⅞ ips and even faster than the 15-ips speed used for professional recordings.

The tape used in the Adam system, although similar in appearance to ordinary cassette tape, differs significantly from it. Several modifications have been made to the plastic cassette shell so that it is not possible to use a standard audiocassette in the Adam computer or place an Adam digital data pack into an ordinary cassette recorder. Changes were also made to the tape media, according to Coleco.

When using the Adam data packs, you must take care to be sure they are properly seated in the drive. There is no built-in guiding mechanism to help do this.

Backups Are a Problem

The standard Adam comes with one tape drive and room for a second one. But even if you have two drives, it isn't any easier to make backups, because the operating system does not have a COPY or a BACKUP command. This can be a serious problem, particularly because SmartBASIC resides on tape and Coleco provides only one copy of it. If humans and computers were perfect, one copy would be sufficient. Because neither is, the inevitable is bound to happen: an important program, or even SmartBASIC, could be lost.

Twice, the SmartBASIC file on my tape was somehow damaged. Coleco suggested that it may have been my fault and that the tape may have been damaged by the machine's magnetic field (see "Two Tales of Adam" on page 212). I think not, but in any case it took several phone calls and a week and a half to get a replacement. It's apparently a new version. The BASIC filename no longer appears in the catalog, but it loads properly.

When benchmark programs were run to see how long it would take to write and read a 64K-byte file to tape, three different data packs caused the Write program to terminate with an I/O (input/output) error (see "Benchmarking SmartBASIC," page 214). A fourth data pack permitted the 64K-byte file to be written to tape, but the file could not be read due to more I/O errors; this problem is most disturbing because there is no warning that the data written out to tape is unreadable.

[**Editor's note:** *Coleco has said that a large number of tape problems have occurred because consumers leave tapes on an Adam peripheral or in the drive while turning the machine on or off. However, even tapes handled exactly as Coleco suggests rapidly lose capacity due to problems in allocating file space; deleting a file does not necessarily free up the tape space it used. Coleco has recommended using the BASIC INIT command to reformat a blank tape. The INIT command should not be used on the BASIC tape because it erases all the information on a tape, including the SmartBASIC software and all the program and text files. . . .* **M.W.**]

Coleco has indicated that it plans to come out with a utility data pack containing both a Copy program and a program for initializing (or formatting) blank data packs. Blank data packs weren't available at the time of this review; Coleco said they should be on the market (at a price of less than $8) by the time this article is published. The tapes are roughly the length of a C-60 cassette and store 255K bytes of data. Coleco said the Adam tape system can handle longer tapes to store a half-megabyte of data, but those tapes are not yet available.

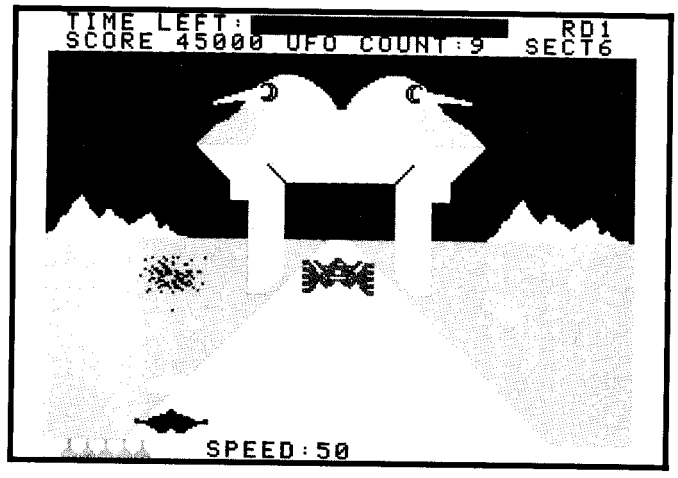

Photo 2: *The Adam's 64K bytes of user memory and 16K bytes of video memory, plus the 255K-byte tape drive, enable use of more advanced entertainment software than Coleco's game system. Shown here is a scene from the Buck Rogers game that's included with the machine.*

A Complete System

Perhaps the Adam's strongest selling point is the fact that it is a complete system. The price even includes a letter-quality daisy-wheel printer. Computer snobs quickly will point out that the printer is slow, capable of printing only about 10 characters per second (cps), and they're correct: it is slow. But I don't consider speed an important issue with the Adam.

I'm not against fast printers—frankly, I prefer them—but for the newcomer to computing who's going to use the machine for programming and word-processing applications, a 10-cps daisy-wheel printer is a darn good compromise. It would have been nice if Coleco had used a standard printer interface on the computer so that those who want to could use higher-speed printers. The company has indicated that a serial printer interface may be available later.

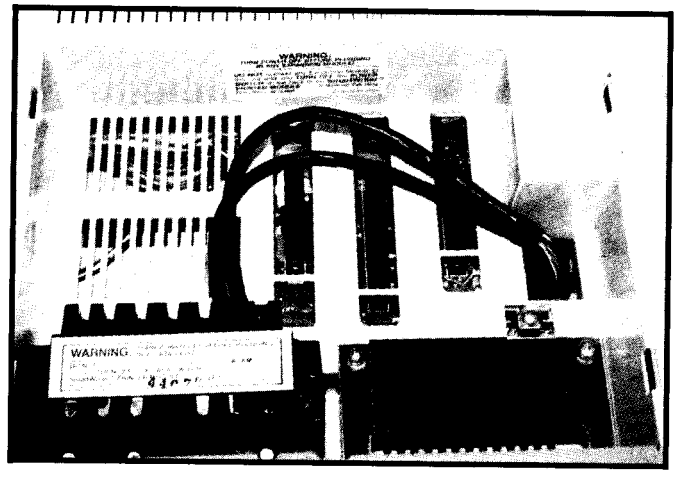

Photo 3: *Three expansion slots reside under a removable top panel. Also visible is the digital data pack (cassette tape) drive and room for an optional second tape drive.*

The daisy wheel used in the Adam printer is a standard 96-character plastic wheel, and the ribbon is a standard Diablo Hytype I or Xerox 800. The printer is capable of both superscripting and subscripting (from the word-processor mode) but cannot print in boldface. I had a number of problems with three different printers; despite Coleco's best efforts, I still don't have one that works.

Coleco's literature indicates that the printer is bidirectional, but this is true only in the word-processor mode. In BASIC, the printer prints in one direction only.

Three cheers for Coleco's keyboard! The company's engineers, when designing this low-cost home computer, were smart enough to realize that the keyboard was not the place to save money. The keyboard on the Adam has 75 full-travel keys arranged in a standard typewriter configuration, including six special word-processing keys, six programmable function keys, and five cursor-control keys (see photo 4). The keyboard is attached to the main console via a coiled cable that has standard modular tele-

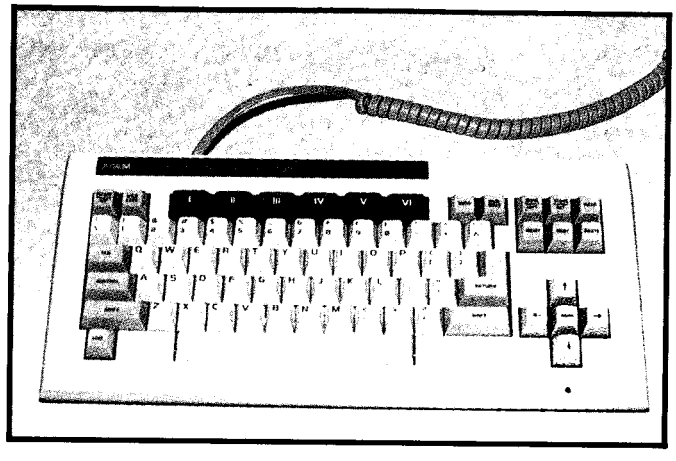

Photo 4: *The Adam's detachable keyboard, perhaps the best-designed part of the system, has 75 full-travel keys.*

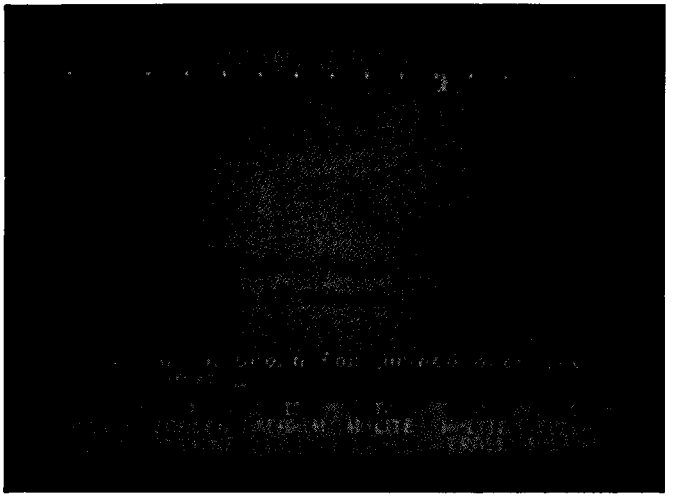

Photo 5: *The Adam's word processor is built into the system's ROM chips. Although limited, the Smartwriter word processor should be adequate for home use.*

phone connectors on each end.

An additional 12 keys on the joystick controller can be used as a numeric entry pad while in word-processor mode. However, information on accessing the joystick and its keypad from BASIC was not included in the manual.

Built-In Word Processor

The Adam is more than just a personal computer. A full-fledged word processor is built into the machine (see photo 5). Unlike BASIC, which is stored on tape, the word-processing program is built into the system's ROM (read-only memory). The Adam's word processor is certainly suitable for home use, but it doesn't have all the capabilities demanded by a professional word-processing system.

The word processor is slow. It can keep up with even the speediest typist, but access to text entered in different sections of a document is slow. If you want to move from one part of a long document to another, the cursor-control keys permit movement either one line at a time or several lines at a time by pressing the arrow keys and the Home key together. Even this "fast" movement through text is agonizingly slow for someone used to professional word processors.

Although the word processor has some advanced features, such as subscript and superscript characters, it lacks others, such as boldface print or form-letter processing. It does not have a "what you see is what you get" type of display, so you never really know what your text is going to look like until you print it out. The display uses 36 characters per line. On the bottom of the screen is a graphic representation of a typewriter roller; across the top and the left side are horizontal and vertical margin markers, which are helpful because they give you an idea of where you're typing on a printed page.

The word processor was still not fully debugged when the first machines were shipped. When I decided to change the margins for text already entered, the computer reformatted the text and all seemed well. However, when I continued to enter text, the computer would sometimes refuse to recognize carriage returns and would continue entering text on the same line. Coleco said this bug was fixed, as were others, in the current version of the machine.

[**Editor's note:** *The word processor occasionally repositions the cursor to the beginning of text after some text insertions, requiring movement to the inserted line using cursor keys or the SEARCH command before continuing. Coleco called this a "nondestructive" bug because it does not damage text, and said it plans to fix it at a later date. . . .* **M.W.**]

Another annoying feature of the word processor is that in order to implement many of the functions, several keystrokes must first be executed. For example, to delete text

Two Tales of Adam

The first time I used the Adam, the SmartBASIC cassette wouldn't even load. Supposing the tape was defective, I took it to the dealer for replacement, only to learn that Coleco wouldn't provide such spares. After quite a few phone calls and two trips, I managed to return my computer and buy another from another dealer.

This time, SmartBASIC loaded quickly; after several days, however, the SmartBASIC file vanished from the tape. A call to Coleco's consumer hotline resulted in a technical honcho suggesting that I probably left the tape on top of the printer or a television, thus erasing it. He then complained that people have less respect for tapes than for floppy disks. However, I don't think I did subject the tape to harm. An added curiosity: when SmartBASIC was erased—and it happened again another time—no other files were affected.

In any case, I was without BASIC; it was several phone calls and a week and a half later before I received a new tape.

The printer worked fine for the first two weeks, and then the daisy wheel started spinning like crazy. After I reset the machine, the printer no longer operated properly, printing different characters than the ones I typed. Coleco experts had no explanation but agreed to replace the printer.

Another phone call and two weeks later, a replacement arrived. It didn't work. Another call led to another printer. This time, the printer came with a piece of paper in it that had obviously been used to test the printer before it was shipped. The test showed plainly that the tops of some of the letters were missing—yet they shipped it anyway. Maybe someday I'll get a complete, working system. **—Jules Gilder**

I spent two days running the Adam computer through simple tests and benchmarks without experiencing a single problem. It was only when I tried to do useful work that the Adam showed problems.

I typed a long BASIC program into the machine and tried to save it to tape. After whirring for a few minutes, the Adam reported a "No More Room" error—although I was trying to save a file about 6000 characters long when the directory said I had 220 blocks (about 220,000 characters) free.

I learned that I could save shorter files, however, and thus saved half of my program. Later, the length of files I could save grew shorter and shorter until I could no longer tolerate it. I decided to write a letter to Coleco explaining the problems, planning to send the tapes for replacement as the company suggested on its consumer hotline (after putting me on hold for 45 minutes).

The word processor, for some reason, dropped a line of my letter while it was being printed. I corrected the letter; the word processor dropped a different line of text. The third time I tried, the printer locked up and wouldn't print. I couldn't save the letter to tape since the tape drive was the problem.

My dealer agreed to replace the main console and tapes, taking parts from a machine that had been returned because of a defective printer. Everything was fine for another week, and then the "No More Room" error reappeared. I knew I only had about 40K bytes saved to tape, so I checked the directory. This time, the directory said there were only 16 blocks free (I was trying to save a 22K-byte file). The tape had lost almost all of its 255K-byte capacity!

The word processor in my second machine also exhibited problems, this time replacing characters in my text at random during printing. After waiting three weeks for a replacement, I received a refund from my dealer. **—Mark Welch**

[**Editor's note:** *Coleco said that most of the aforementioned problems have been corrected in later versions of the Adam. However, "nondestructive" problems, such as repositioning the cursor after an insertion in the word processor, have not yet been corrected, Coleco noted. At press time, we were unable to test a newer machine. . . .* **M.W.**]

you must press the Delete key, move the cursor to the first character to be deleted, press the Hi-Lite function key, highlight the text to be deleted using the cursor keys, and finally press Final Delete.

SmartBASIC

SmartBASIC is not located in ROM but must be loaded from a digital data pack as described previously. Early purchasers of the Adam computer got one of several versions of SmartBASIC with bugs. BASIC wouldn't even load properly in the first machine I bought.

Other changes were made to SmartBASIC. To mimic Apple's DOS 3.3, one section of the tape is reserved for directory information. In early versions of the SmartBASIC tape, this information is stored at the beginning of the tape. Later versions have the data stored in the middle of the tape to cut down on the access time to any particular program. In early versions of SmartBASIC, the CHAIN command does not work.

If you're wondering which version of BASIC came with your computer, you've got a problem: despite the many changes to the language, all versions are labeled 1.0.

Although Coleco boasts that its SmartBASIC is compatible with Applesoft, there are a number of differences in the languages. SmartBASIC was not written by Microsoft, as was Applesoft, and does not have the same internal construction as Microsoft BASIC. A positive result of this difference is that new ideas in interpreter design were included. For example, SmartBASIC checks syntax on entry. SmartBASIC is also more highly table-driven than Microsoft BASIC, increasing the operating speed. SmartBASIC may be the fastest 8-bit BASIC around.

Another advantage of SmartBASIC not being written by Microsoft is that it doesn't have the bugs associated with Microsoft BASIC. The author of this language made sure that all floating-point numbers are properly represented, with no round-off errors occurring as with IBM's Microsoft BASIC.

The SmartBASIC interpreter's unusual way of storing

Text continued on page 216

Benchmarking SmartBASIC

At the time the Adam was introduced, Coleco claimed that its SmartBASIC was faster than Applesoft BASIC, with which it was to be compatible, and also that its digital data pack (cassette) drive would operate at "transfer rates comparable to floppy disks." As can be seen from BYTE's standard benchmark programs (see table 1), SmartBASIC is indeed faster than Applesoft at some operations, but a comparison of the mass-storage speeds shows that the Adam is much slower. A lack of compatibility is also apparent in running the benchmark programs.

The prime-number algorithm normally uses a 7000-element array (see listing 3), an acceptable value for the Apple and most computers with 64K bytes of RAM (random-access read/write memory). But the Adam, for reasons unknown, cannot dimension an array larger than 5112 elements. As a result, no direct comparison can be made for the prime-number benchmark. A version with 5000 elements shows the Adam to be much faster than the Apple, but the incompatibility should alert users to the possibility of other limitations in the Adam.

The Adam was also unable to run the standard Applesoft BASIC benchmarks to write and read a 64K-byte file (listing 2) because that program writes text data to a file as five hundred 128-character blocks. The Adam's SmartBASIC cannot accept a 128-character string as input (listing 2b, line 180), and thus it could not run the program using the file written by listing 2a. A new program, writing a 64K-byte file as one thousand 64-character lines, was used (listing 1). As the table shows, it takes the Adam about nine minutes to access the 64K-byte file, compared to Applesoft's three minutes. (Note that Applesoft is already slow compared to the 32-second run-time for the IBM Personal Computer.)

—Mark Welch

Listing 1: *The 64K-byte file disk/tape Write and Read programs used to compare SmartBASIC and Applesoft (see table 1).*

(1a)

```
 5 nr = 1000
 6 a$ = "1234567812345678"
 7 b$ = a$+a$+a$+a$
10 d$ = CHR$(4): REM Control-D
15 PRINT "opening file"
20 PRINT d$; "OPEN TEST"
30 PRINT d$; "WRITE TEST"
40 FOR i = 1 TO nr
42 PRINT b$
44 NEXT i
50 PRINT d$; "CLOSE HELLO"
55 PRINT " done"
59 END
```

(1b)

```
 5 nr = 1000
10 d$ = CHR$(4): REM Control-D
15 PRINT "opening file"
20 PRINT d$; "OPEN TEST"
30 PRINT d$; "READ TEST"
40 FOR i = 1 TO nr
42 INPUT c$
44 NEXT i
50 PRINT d$; "CLOSE HELLO"
55 PRINT " done"
59 END
```

Listing 2: *The 64K-byte file disk Write (2a) and Read (2b) programs normally used as benchmarks for the Apple II Plus. The Adam cannot accept the 128-character string during line 180 in listing 2b.*

(2a)

```
  5 D$ = " ": REM CONTROL-D
 40 A$ = "12345678123456781234567812345678"
 60 B$ = A$ + A$ + A$ + A$
 80 NR = 500
100 PRINT D$"OPEN TEST"
120 PRINT D$"WRITE TEST"
140 FOR I = 1 TO NR
180 PRINT B$
200 NEXT I
220 PRINT D$"CLOSE"
240 PRINT "DONE"
```

(2b)

```
  5 D$ = " ": REM CONTROL-D
 80 NR = 500
100 PRINT D$"OPEN TEST"
120 PRINT D$"READ TEST"
140 FOR I = 1 TO NR
180 INPUT B$
200 NEXT I
220 PRINT D$"CLOSE"
240 PRINT "DONE"
```

Listing 3: *The standard prime-number program used as a benchmark. To run on the Adam, lines 1 and 2 had to be changed to reflect a limit of 5112 elements to an array. For the benchmark listing, the values of 7000 and 7001 were replaced with 5000 and 5001.*

```
 1 SIZE = 7000
 2 DIM FLAGS(7001)
 3 PRINT "only 1 iteration"
 5 COUNT = 0
 6 FOR I = 1 TO SIZE
 7 FLAGS(I) = 1
 8 NEXT I
 9 FOR I = 0 TO SIZE
10 IF FLAGS(I)=0 THEN 18
11 PRIME = I+I+3
12 K=I+PRIME
13 IF K>SIZE THEN 17
14 FLAGS(K)=0
15 K=K+PRIME
16 GOTO 13
17 COUNT = COUNT + 1
18 NEXT I
19 PRINT COUNT, " primes"
```

Benchmark	Adam SmartBASIC	Applesoft BASIC
Empty FOR . . . NEXT loop	5.5	6.66
Division	50.0	29.0
Subroutine jump	11.1	13.9
MID$(substring)	20.7	32.3
Prime number (7000 elements)	(error)	190.0
Prime number (5000 elements)	78.0	170.0
64K-byte tape/disk write (listing 1a)	564.0	200.0
64K-byte tape/disk read (listing 1b)	527.0	214.0
64K-byte disk write (listing 2a)	(error)	175.0
64K-byte disk read (listing 2b)	(error)	217.0

Table 1: *The timings of Adam SmartBASIC and Apple II Plus Applesoft BASIC using seven BASIC benchmark programs. The listings for the first five programs appear on page 54 of "A Closer Look at the IBM Personal Computer" (January 1982 BYTE, page 36). The disk/tape read and write programs are reproduced in listings 1 and 2. Adam was unable to dimension a 7000-element array and so a smaller (5000-element) array was tested on both the Adam and the Apple II Plus.*

Coleco's Third-Party Software License

Software developers seeking technical information are required to sign Coleco's Technology Licensing Agreement before Coleco will reveal the information needed to write anything more complex than a simple SmartBASIC program. But the agreement represents an exacting toll to software developers.

First, Coleco demands the right to inspect samples of any program before the developer distributes it. If Coleco isn't satisfied with the program's quality, the developer must change it as Coleco requests or lose the software license. If Coleco does terminate the license, the software developer must cease manufacturing all programs licensed under the agreement.

If a problem in quality control was the reason for terminating the agreement, the developer must send Coleco the remaining inventory. Otherwise, the developer must provide a list of the complete inventory and dispose of excess stock within 90 days. Coleco also demands the right to perform a physical inventory to verify the developer's claims. If the developer doesn't permit the inventory, Coleco claims the right to remove all remaining inventory by entering the storage location, without any liability for damage.

Coleco licensees must also mention the Adam in advertising and provide booth space for Adam products at trade shows.

Perhaps the most restrictive clause in the agreement is this one: "Licensee agrees that it will not, during the term hereof, make or cause to be made disparaging or critical references to the quality of Coleco's products and/or Coleco's business methods." In essence, developers cannot talk critically about Coleco's products or practices.

Text continued from page 212:

program lines in memory was less understandable to me. Program lines don't have the familiar Microsoft line structure (2 bytes point to the next line, 2 bytes for the line number, a tokenized line, and a 0 as a line terminator). In SmartBASIC, the line numbers and next-line pointers are stored in separate tables elsewhere in memory.

The SmartBASIC manual is a classic example of how not to produce a manual. Coleco has indicated it is painfully aware of the deficiencies and said a new manual is being prepared.

Microsoft BASIC stores lines in memory in numerical order, moving segments of the program up and down as lines are added and deleted. SmartBASIC stores lines as they are entered: if line 100 is entered first and line 10 second, they are stored in memory in that order. This doesn't cause problems when the program is listed because the next-line pointer table is properly maintained.

Incompatibilities extend beyond the internal structure of the language. Some tape-based commands are lacking, and other commands (such as FLASH, by which characters are made to flash between inverse and normal) are not provided on early versions of the machine. Most of the other Applesoft commands have been implemented, but early buyers of the Adam are not going to be able to use them because the proper documentation is not included. For example, shape tables and DRAW and XDRAW commands are mentioned several times in the current manual under definitions of other commands but are not themselves explained. Coleco said they are covered in the new manual.

Another annoying feature of SmartBASIC is that it requires spaces between keywords, as do later versions of Microsoft BASIC. Applesoft is very tolerant of this sort of thing and is smart enough to recognize most keywords without spaces.

Although most of the Applesoft commands are available in SmartBASIC, many Applesoft programs may not run as is because of hardware differences. For example, Applesoft uses four memory locations to control the borders of the active screen window so that only certain portions of it are scrolled or modified. SmartBASIC does not have this windowing capability. Also, some Applesoft programs read the keyboard directly by looking at a particular memory location to see what key has been pressed. Coleco's manuals do not include this information for the Adam, which uses different locations. And, as previously mentioned, Applesoft programs that directly access the Apple's memory-mapped display will not run on the Adam without major changes.

Another difference between the Apple II and the Adam relates to their display size. The Apple displays 40 characters per line. The Adam, however, has a 36-character display in the word-processing mode and a 31-character display in BASIC. The difference causes some display problems.

SmartBASIC's HGR routine has a bug in it: if you try to draw a box along the outer borders of the HGR screen (0,0 to 0,255 to 159,255 to 159,0 to 0,0), a triangle is drawn instead. If you switch to HGR2, the program works fine.

Coleco said it is planning to come out with an improved version of the language, fully integrated with the word processor to provide sophisticated editing capabilities (BASIC programs can now be edited with the word processor only by resetting the machine). Although it is also working on implementing other languages, including Logo, Coleco said it will always support BASIC.

How Not to Produce a Manual

The SmartBASIC manual is a classic example of how not to produce a manual. It appears as if it were rushed out the door with little thought given to its composition, completeness, or accuracy. I've been involved with personal computers ever since the KIM-1, so I've seen a lot of manuals, good and bad. The BASIC manual that comes with the Adam, however, is the worst I have ever seen. The book is full of typographical errors, programming errors, and misleading statements. In addition, it is incomplete: there are roughly 30 SmartBASIC commands that are not documented.

The BASIC manual is typewritten, or printed on a computer printer (not the Adam's), which means that one typeface dominates throughout the book; boldface is used for emphasis. No illustrations or color are used; it's a very dull graphic presentation. (The other manuals included with the system do use graphics and photos.)

For now, Coleco's customer-service people suggest Adam owners buy an Applesoft BASIC manual.

The table of contents covers only the first 131 of the book's 222 pages and does this with only four brief entries. No mention is made of the reference section, where each command (except for the 30 undocumented ones) is explained. There is no index.

The situation is aggravated even further by the fact that there is no delineation in the manual between operating-system commands and BASIC commands. For example, the manual's authors combine the BASIC DEL command and the operating system's DELETE command into a single misleading definition: "The DEL or DELETE command may be used to erase a single line, a sequence of consecutive lines, an entire program or an entire data file." The manual gives an example of the DEL command by listing a four-line program whose line numbers are 10, 20, 30, and 40. Lines 20 through 40 are deleted, the book says, by entering "DEL 15,40" —in this case, the DEL command is used to delete a range of lines that begins with a nonexistent line number. Although this works, there is no explanation of *how*. Novice users are left to figure out for themselves, if they can, how the DELETE command works and what it is used for.

An example of misinformation occurs on the next page of the manual: you are told that it is only possible to have one- , two- , or three-dimensional arrays; a quick test, however, shows that much larger multidimensional arrays are possible, probably up to 255, as is the case with most BASICs.

The manual includes two blue pages full of corrections to be marked by the buyer onto the appropriate pages, but not all the bugs are corrected. For example, the sample program listed with the HGR and HGR2 commands to draw a rectangle on the high-resolution screen was obviously not tested—a line was missing. (The missing line is: 35 HPLOT 100,10 TO 100,100.) Without this line, the program draws only three sides of a rectangle. The manual also states that the resolution increases from 256 by 160 picture elements (pixels) in HGR to 280 by 192 pixels with HGR2; actually, the resolution for HGR2 is 256 by 192 pixels.

Coleco has indicated that it is painfully aware of the deficiencies of the original BASIC manual and that a new one is being prepared. It should be out by the time this issue is published. In the meantime, Coleco's customer-

service people suggest that Adam owners buy an Applesoft BASIC manual.

Replacements, Peripherals, and Accessories

Early purchasers of the Adam are stuck with what comes in the original package. Dealers have not been provided with spares or backups of any element of the package, and additional game tapes or even blank tapes were not available at the time of this review. But the manufacturer said it is planning on making a variety of accessories available. A 64K-byte RAM expansion kit will reportedly sell for less than $200.

Coleco announced that it will offer a double-sided, double-density 5¼-inch disk drive, Personal CP/M, and an 80-column expansion board for less than $400; the products are scheduled for release by June. Extra tape drives will be available soon for less than $200 each. (Tape duplicators have said that Coleco's high-speed tape is not easy to duplicate, and at least one major software manufacturer has indicated that it's heard that Coleco is switching to disk drives. Time will tell.) Coleco has also announced a 300/1200-bps modem, priced less than $250, that should be available by early summer.

Third-Party Software

With a very large potential customer base for the Adam, it's not surprising that many third-party software firms are interested in producing software for the machine. But unless Coleco changes its attitude toward third-party vendors, it may suffer the same problems that befell Texas Instruments when it tried to control all software produced for the TI 99/4A.

Al Kahn, Coleco's vice president, has indicated in no uncertain terms that the Adam's creator does not intend to make the same mistake that Texas Instruments did and will support all third-party vendors of software, including those that wish to market their products by themselves. But Coleco is not revealing much technical information about the Adam and will not tell software developers anything about the operating system or the locations of subroutine entry points unless the developers are licensed by Coleco. Some of that technical information will be in the technical reference manual, which should be available in June; until then, however, the information will be available only to licensed software developers.

This policy will do little to spur the much-needed software support that will make or break the Adam. It was many small software companies, not a few large firms, that made computers like the Apple successful by providing thousands of applications programs. If Coleco doesn't change its policy soon, small software developers are likely to choose a less reluctant manufacturer's machine. In addition, many larger software companies may choose not to support the Adam because of the license restrictions Coleco imposes before divulging proprietary information. (See the text box on page 216 for a closer look at the third-party license.)

Adam owners may discover that Coleco's reluctance to reveal technical information is resulting in a limited number of software titles for their computers. However, a number of publishers, including Spinnaker, Infocom, Sierra On-Line, Broderbund, Human Engineered Software, and Activision, have announced software support for the Adam.

Reliability

The Adam computer's track record for reliability is terrible, if my experiences are an accurate indication. I have had four different systems in the space of two months and am waiting for my fifth. The printer is still not working. Other problems have centered around the operating system, the BASIC tape, and the tape drive. The only component that seems to be holding up well is the keyboard.

Coleco has claimed that reliability problems are low and within normal rates of occurrence. Considering that I've had four systems in two months and still haven't got one that's working satisfactorily, I find that hard to believe. [**Editor's note:** *At press time, Coleco said most word-processing and tape-drive defects had been corrected, and that a revised, more informative manual would solve most of the other problems that have led to returns....* **M.W.**]

Conclusions

Although the Adam is a machine with a lot of potential, much of it has yet to be realized. The computer was apparently rushed into production before it was completely debugged and, as I've indicated, it has a terrible record of reliability. Many corrections are being made to its documentation, and the BASIC that comes with the computer is being enhanced. These corrections and enhancements, as well as what promises to be a broad range of peripherals and accessories, are scheduled to appear later this year.

Bearing all of this in mind, the best recommendation I can make is don't buy an Adam—yet. Wait until Coleco fixes all of the Adam's bugs and delivers on all of its promises. More than one company has entered the home computer market with great fanfare and plans for the future, only to drop out of the market and leave its early supporters stranded high and dry. Mattel is a good example of this. It promised a wide variety of peripherals and CP/M compatibility for its Aquarius computer, but now it is out of the home computer business; people who bought the Aquarius are stuck with a machine that has no support and no future.

I'm not saying this will happen with Coleco, but it could. Recent articles in the financial press hinted that Coleco is betting the whole company on the Adam and it's not yet clear that it's going to win that bet.■

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