Epson's HX-20 and Texas Instruments' CC-40

Portable notebook computers hold more promise than performance

by David Ramsey

The microcomputer revolution caught everyone by surprise. When the first Altairs became available, no one had any inkling that personal computing would be more than an expensive hobby for eccentrics. Things didn't work out that way, of course. And now we're on the verge of a submovement: the portable computer revolution.

In this article we'll take a look at two of the many portables available today: the Epson HX-20 and the Texas Instruments Compact Computer 40.

The Epson HX-20

The Epson HX-20 is the Japanese computer that was going to set America on its ear. It didn't, although its brisk early sales were encouraging. After an initial spurt of interest, people began to note that no accessories or software were available for the machine. In an unusual case of Japanese marketing failure, Epson had the lap computer market to itself for almost a year and did nothing with it.

Fortunately, it looks as if a truckload of new software and peripherals for the HX-20 is just around the corner. Epson has recently upgraded the standard $795 machine, which now includes the formerly optional (at $160) microcassette drive and a simple word processor called Skiwriter. Disk drives for the machine are due out before the end of the year, and a telecommunications ROM (read-only memory) should be available by September.

The basic machine contains two 6301 processors, CMOS (complementary metal-oxide semiconductor) implementations of the 6800 architecture that run at 614 kHz. One processor handles computing chores while the other handles I/O (input/output). Included in the standard machine are 16K bytes of RAM that can be expanded to 32K with the addition of the $150 expansion unit. The standard 40K-byte ROM includes BASIC, the routines to drive the printer and microcassette drive, and the small word processor. BASIC and the word processor share the same addresses—the application not in use at the time is bank-switched out. (See the "At a Glance" box.)

Epson's goal with the HX-20 was to provide a complete portable computer system that includes a printer and mass storage. The HX-20 has a 60-key, full typewriter keyboard, a 4-line by 20-character LCD (liquid-crystal display), and a 20-column impact dot-matrix printer (which is, incidentally, the smallest impact dot-matrix printer in the world). It is also equipped with RS-232C (albeit through a DIN connector) and serial ports and a computer-controlled microcassette mechanism for program and data storage.

The display has an important capability not found in competing machines: the ability to act as a window on a "virtual screen" of arbitrary size. Theoretically, a screen of up to 255 rows of 255 columns can be supplied; realistically, however, the 64K bytes of memory that would require don't exist in the machine. Still, allocating an 80 by 24 screen is as simple as typing WIDTH 80,24 in BASIC. You can use the cursor keys to move around the virtual screen with scrolling in all directions, and various control keys provide larger (more than a single character) jumps in any direction. The display is also dot-addressable as a 120 by 32 array, and commands to plot points and draw lines are included in the BASIC.

Along with the standard typewriter keyboard, the HX-20 has three dedicated keys (Break, Pause, and

At a Glance

Name
Epson HX-20 Notebook Computer

Manufacturer
Epson America Inc.
3415 Kashiwa St.
Torrance, CA 90505
(213) 539-9140

Price
$795

Dimensions
11.3 by 8.5 by 1.7 inches

Display
20-character by 4-line liquid-crystal display

Keyboard
Typewriter style

Software
BASIC, Skiwriter (a word processor)

Memory
16K bytes of RAM

Included Interfaces and Peripherals
Microprinter, microcassette, RS-232C interface, bar-code interface, external cassette interface, system bus connector

Documentation
Two-volume BASIC Tutorial and Reference Manual, A Guide to Operations, Skiwriter and microcassette manuals.

Menu) and five user-definable keys that shift to provide 10 functions. System assignments to the function keys allow manual control of the microcassette drive and printer. Interfaces for an external cassette recorder and bar-code reader are also provided, although the former will probably not be used much now that the microcassette drive is standard.

Built-in Software

The HX-20 comes with BASIC in ROM and a small word-processing editor called Skiwriter. Also in ROM are a small machine-language monitor and routines to drive the microcassette, printer, external cassette (including motor control), and serial and RS-232C interfaces. The BASIC, which is supplied by Microsoft, is a fairly standard implementation that supports both single- and double-precision real numbers as well as integers. Epson adaptations include specifying the position of the cursor anywhere on the virtual screen, commands to control the microcassette, and commands to set and read the time-of-day clock/calendar incorporated into the machine. A TONE statement allows precise control of the duration and pitch of notes through the HX-20's piezoelectric speaker.

A notable extension to the BASIC is its ability to load, save, and merge programs to and from the microcassette, external cassette, RS-232C port, or serial port. If you have a larger computer with a serial port, you can edit BASIC

code for the HX-20 on it, connect the two machines, and easily download the text of the program.

The BASIC editor is impressive. Just move the cursor anywhere on the virtual screen, type your changes (using INSERT and DELETE if necessary), and press RETURN to resubmit the line. Why don't we have editors like this on our Apple and Radio Shack machines?

When the HX-20 is turned on, the screen displays a menu of up to 10 options. The standard machine displays three choices: Monitor, BASIC, and Skiwriter. At this point you also have the option of pressing Control-@ to initialize the machine (i.e., clear memory and reset the clock). BASIC programs may be given titles, which will appear as part of the menu until the title is removed or the program is erased. Pressing a menu number immediately executes the desired application.

The HX-20 has an in-memory program and data file system. Five program partitions—P1 through P5—exist, and you can switch between them by entering LOGIN (partition). The memory allocation among the partitions is completely dynamic: any program can expand to fill available memory. In addition, a user-controllable area known as the RAM File, an area of memory whose size is chosen by the user, serves as a random-access data file. The command DEFFIL (record size), (offset) defines the behavior of the special GET and PUT statements. The first parameter defines the size of the record, while the second defines how many bytes into the RAM file record 0 begins. Several files of differing record lengths can be kept in memory at one time.

Built-in Peripherals

The HX-20 is alone in the lap computer market in providing both a printer and mass storage as parts of a standard unit. The little printer is nothing short of amazing: it prints 20 columns on plain paper and consists of four print wires spaced equidistantly across the 20-character width of the platen. As the printer prints, the head wobbles back and forth until one horizontal line of dots is printed. The paper then advances one dot, and the process is repeated. The procedure sounds slow, but the printer finishes a little more than one line per second. The printer is controlled by BASIC LPRINT and LLIST commands. For those cases in which you need more than a microprinter, any printer with a standard serial port can be connected to the HX-20 and used for listings and printouts.

The HX-20 supports the microcassette drive with a minimal set of commands. LOAD and SAVE take care of program storage; WIND winds the tape until the (software) tape counter reaches a specified value, and serial data files can be written by opening the cassette as a file and using the INPUT# and PRINT# statements. A random-access file could theoretically be implemented by determining the amount of tape each record took and using the WIND statement to position the tape before reading and writing, but the procedure would probably be too slow to be useful.

I admit to ambivalence about the microcassette drive. On one hand, it's very handy to have integrated mass storage. On the other hand, it's a pretty minimal implementation. My principal objection to the microcassette implementation, however, is that it's basically just the standard audio recorder moved onto the machine. Convenient, yes . . . but how about keeping directories on the tape? How about a real operating system so I can catalog the tape?

In Epson's defense, the company does provide a set of BASIC programs for manipulating a simple directory on the tape. The program builds a directory by scanning an entire tape at the normal read speed (which takes 15 or 30 minutes, depending on the tape length) and then placing a directory at the start of the tape. The same program then lets you select a directory entry for loading

and winds directly to it. But the slow scanning process must be repeated every time you want to update the directory, and there's no protection against a program growing to overwrite its immediate neighbor. In my opinion, what the HX-20 needs most is an enhanced operating system for its tape drive. Hewlett-Packard does far better with the HP-75, and it doesn't even have the advantage of working with a capstan drive.

The RS-232C port implements lines 1 through 8 of the RS-232C standard on a DIN connector. Espon supplies as options two cables with DB-25 connectors; one has pins 2 and 3 reversed for use with a modem. Although Epson offers a fine CX-20 acoustic modem, no terminal program is commercially available for the HX-20 at present. I've written a terminal program that drives a Hayes Smartmodem through the serial port. The serial port supports a variety of data formats—the user can set the bit-per-second (bps) rate (110 to 4800), the number of bits, parity, and type of handshake, although the very standard XON/XOFF software handshake protocol is curiously absent and must be handled in software. Programs using the port with systems that expect this protocol must query the buffer status to determine the number of characters and transmit XON and XOFF where appropriate.

The serial port obeys the signal level standards for RS-232C but implements only pins 1 through 5. The bps rate goes to 38,400. In Japan, this connection is used for the TF-120, a dual 5¼-inch floppy-disk drive. Epson is working on a drive for the American market that is due to appear before the end of the year. It is rumored to contain its own Z80 processor and a fair amount of CMOS memory. The TF-120 requires AC power, but Epson has said that new peripherals for the HX-20 will be battery powered, which almost certainly means sub-5-inch drives. Rumor also has it that a larger LCD will be a plug-in option.

Skiwriter

Skiwriter, a small word-processing program on a 2764 ROM, was written by Kenneth Skier, who also wrote all of the HX-20 manuals and was one of the programmers for Wang's word processor. Now standard on the machine, Skiwriter is also available as a separate product for those who bought earlier versions of the HX-20.

Skiwriter is well designed and easy to use. A simple program, it offers only three output formatting commands: line spacing and left and right margins (defaults are 1, 10, and 70, respectively). The user enters text in free format, and words wrap at the boundary of the 20-column screen. Horizontal scrolling is not used, presumably because it would make reading a document on the screen more difficult.

Skiwriter lets the user mark, copy, and delete blocks of text, find (although not replace) strings, and reset the format (line spacing and margins) at any point in the

document. This last feature is useful for setting off sections of documents. You can also insert formfeeds into the document at any time. Skiwriter has two 16-byte buffers whose contents are sent to the printer before printing (for the preprint buffer) and after printing (the postprint buffer). That way, the user can put control and escape sequences in these buffers (which are normally filled with nulls) to get the printer to a particular state. I think Skiwriter would be much more useful if it let you insert control and escape sequence commands directly in the text.

When you make an error, Skiwriter beeps. You can continue, but pressing the Help key displays a help screen detailing the error. This is a nice touch, especially for people who have little previous computer experience.

You can save and restore documents to either the microcassette or an external cassette, and documents can be printed on the internal microprinter or through the RS-232C port. Documents can be read in from either cassette and appended to the document in memory, a useful feature.

You can't use Skiwriter to edit BASIC text, but the standard HX-20 BASIC editor is so good that you don't really mind.

[Editor's note: *Skiwriter may be available for other microcomputers in January 1984. . . .***R. M.]**

The Monitor

The machine-code monitor comes as a pleasant surprise, especially for those who enjoy digging into the (undocumented) workings of a machine. The monitor uses the physical screen only—you're limited to the 20 by 4 display—and normally displays the contents of the A and B accumulators in the index register, stack pointer, condition code register, and program counter. The following single-keystroke commands are available:

B Return to BASIC
K Set the "keystack sequence," a group of keystrokes that is automatically executed whenever the HX-20 is turned on
D Dump memory (in hexadecimal)
G Execute a routine in memory with optional breakpoints
S Set new memory values—used for entering data in hexadecimal
X Display and (optionally) change register contents
R Read a file from external cassette, microcassette, serial port, or ROM
V Verify file saved on device
W Write file to device
A Return starting and ending addresses of file as well as the entry point

Documentation

Four manuals are supplied with the HX-20: a two-volume *BASIC Tutorial and Reference Manual,* a *Guide to Operations,* and Skiwriter and microcassette manuals. All

are complete and well written. *The Guide to Operations* is a profusely illustrated work that gently guides the neophyte. Topics such as the virtual screen and the concepts of "programs" and "data" are handled very well. Overall, I'd have to rate the documentation high.

Summary

The HX-20 has a lot of potential. The introduction of the Radio Shack Model 100 has given the HX-20 very stiff competition, and compared to Radio Shack's 40 by 8 display, the HX-20 looks primitive. But Epson's new wave of peripherals and software, if introduced in a timely manner, will probably save the machine. Currently, its big selling points are the integrated microcassette and printer, features no other portable offers yet.

The Texas Instruments Compact Computer 40

I tried to be unbiased and objective about this machine, I really did. I kept reminding myself what a notebook-sized BASIC computer would have meant to me just a few years ago. And the price of the TI CC 40 is only $250.

But there's no clock. No file system. Only one BASIC program at a time can reside in memory, and the user can work with only about 5200 bytes of that. And the keyboard is vile.

There's also no cassette interface. If you want to store programs or data, you have to buy the TI wafertape drive. The CC 40 offers neither built-in storage nor a standard audiocassette interface. It could be argued, however, that you can buy a CC 40, the optional wafertape for mass storage, and another 16K bytes of memory, and still have an inexpensive computer. Unfortunately, none of these accessories was available at the time this review was written.

The CC 40 has a 31-character display, a sort-of-typewriter keyboard, and a separate numeric/cursor keypad. The keyboard spacing is so small that it's essentially impossible to touch-type on it. The Shift and Control keys lock for one keystroke—to type an uppercase character, you press *and release* the Shift key, then press the character key. There's only one Shift key; the space normally occupied by the right-hand Shift key is taken up by the Return key.

The CC 40 does make a dandy scientific calculator, and perhaps that's the market it should be aimed at. Good scientific programmable calculators cost about as much and are not nearly as powerful as the CC 40. Up to 10 user-definable key sequences can be entered, and the Playback feature recalls the line last entered on the display for editing and resubmission. All BASIC keywords can be entered with a two-keystroke sequence (FUNC followed by another key), which is handy considering how difficult it is to type on this machine. There is a slot for ROM or RAM cartridges in the upper-left corner of the machine. None were available at the time of this writing.

Built-in Software

The TI BASIC included is a good extended BASIC with several interesting features, among them a subprogram capability (with local variables); an ACCEPT statement that combines the functions of the normal INPUT statement with automatic positioning of input and length and type checking; a PRINT USING and IMAGE capability that allows some elaborate output formatting; and some real oddities such as SETLANG, which sets the output language for system messages. The standard computer includes English and German, so you can set your error messages to be displayed in German if you wish. Some ROM cartridges presumably offer the option of other languages.

At a Glance

Name
Texas Instruments Compact Computer 40

Manufacturer
Texas Instruments Inc.
POB 53
Lubbock, TX 79408
(800) 858-4565

Price
$249.95

Dimensions
9.2 by 5.7 by 1 inch

Display
31-character by 1-line liquid-crystal display

Keyboard
Miniature typewriter style

Language
BASIC

Memory
6.2K bytes of RAM

Peripherals
Printer/plotter, RS-232C interface, wafertape digital tape drive, Hex-bus interface, socket for ROM cartridges

Documentation
One 280-page manual

Peripherals

The CC 40 includes an integral Hex-bus interface, which TI describes as "a medium speed (6000 bytes/second) 4-bit interface." The Hex-bus is used to connect peripherals such as the wafertape drive (which old-timers may remember as the Exatron stringy floppy) and printer.

Documentation

The CC 40 is accompanied by a single manual describing the computer and explaining BASIC. About two-thirds of the bulk of the manual is BASIC reference. Several appendixes describe the ASCII code, error messages, the internal structure of the machine (including memory maps), and warranty and service information.

Summary

The redeeming feature of this machine is its low price. Virtually all of its competition vastly outstrips it in power and features. If you don't need portability, TI's own 99/4A home computer will give you much more memory, color graphics, sound, and lots of expansion capability for a mere $99. The CC40's true utility cannot be judged until at least some of the peripherals and software become available.■

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