

 $S \cdot Y \cdot S \cdot T \cdot E \cdot M = R \cdot E \cdot V \cdot I \cdot E \cdot W$ 

# The Epson Geneva PX-8

## Epson strikes back

BY RICH MALLOY

he Epson Geneva PX-8 (see photo I) has a low-power CMOS (complementary metal-oxide semiconductor) version of the Z80 processor, 64K bytes of CMOS memory, 32K bytes of permanent ROM (read-only memory), an 8-line by 80-character LCD (liquid-crystal display), a rechargeable battery, a full-size keyboard, and a microcassette drive. In addition, the PX-8 comes with a full complement of software: the CP/M operating system (version 2.2), WordStar, CalcStar, BASIC, a scheduling program, and a communications program. This package (\$995), in combination with a healthy supply of expansion hardware, makes the PX-8 a good second computer, especially for people with CP/M systems.

#### HARDWARE

At five pounds and with physical dimensions just slightly larger than a heavily packed three-ring binder, the PX-8 is quite at home in a briefcase. With its LCD folded tightly and a plastic cover over its keyboard, it is fairly well protected for the ordeals of the road. There is even a large plastic handle that slides out near the keyboard. When you want to use it, the cover quickly slides off and the display unfolds to the desired angle, revealing a speaker and microcassette drive.

On the rear panel of the PX-8 are several ports: an RS-232C DIN (Deutsche Institut für Normung, the German standards organization) connector, a serial DIN connector (for an optional floppy-disk drive), a connector for a bar-code reader, an external speaker connector, and a 50-pin expansion connector covered by a plastic strip. The power switch is conveniently placed on the right side of the unit.

#### DISPLAY

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The size of the Geneva's LCD is acceptable, but it is a little hard to read (see photo 2). You can adjust the display to whatever angle gives you the least glare and the most contrast, and you can adjust the screen contrast further by sliding a switch that's below the screen.

The PX-8 can display 8 lines of 80 characters each. (The characters are composed on a 5- by 7-pixel matrix inside a 6- by 8-pixel matrix.) However, lowercase letters such as g and y do not have descenders, and you can't display in reverse video (i.e., light character on dark background). The characters are much smaller and thinner than those on the TRS-80 Model 100, and the screen is slower, but the Epson does display twice as many characters.

The screen displays all 96 standard ASCII (American Standard Code for Information Interchange) characters plus 32 common graphics symbols (codes 128–159 decimal), which are compatible with *some* Epson printers but not with the IBM-compatible ones. Character sets are available for France, Germany, U.K., Denmark, Sweden, Italy, Spain, and Norway.

The PX-8's keyboard is similar to but better than the HX-20's (see photo 3). It has four cursor keys above the Return key and a Help key plus five function keys in the upper left. And there are indicators for caps-lock and num-lock features.

#### MEMORY

The PX-8 uses a low-power CMOS version of the Z80 microprocessor with a clock rate of 2.45 MHz. In tests with BASIC and Calc-Star, it appeared slower than most other office computers at calculating. The PX-8 also uses two slave processors. A 6303 controls access to the display, the external disk drive, and the application ROM chips, among other things. A 7508 works with the system clock and keyboard and controls the Geneva's alarm features.

The Geneva comes with 64K bytes of CMOS memory that is always *on*: even if the main battery fails, a small backup battery keeps the memory chips powered on for a week or so until you can recharge it. The only event that should clear memory is if you press a special hidden reset button on the bottom of the machine and do a cold reboot. You can set part of the memory up as a RAM disk with a size of 2K to 24K bytes.

The operating system is held in 32K bytes of ROM. When you turn on the system, it replaces (bank-switches) the lower 32K bytes of RAM (random-access read/write memory) with this ROM. When you run an application, the system bank-switches the RAM back into this location. The net result is a virtual 96K-byte machine.

The machine has two sockets for ROM chips hidden under a panel on the bottom of the computer. The software bundled with the PX-8 comes on four 32K-byte ROM chips: one each for CP/M system utilities, WordStar, BASIC, and a combination of CalcStar and a scheduling program. Only two of these chips can be resident in the machine at one time.

Epson has done a good job of implementing a microcassette drive in the Geneva. Even though it looks and acts like a tape drive, the operating system sees it as a disk drive, albeit a slow one. It even has its own directory and drive specification (H:). However, it has some quirks. To save time, the system doesn't write the directory onto the cassette until you tell it that you are going to remove the tape. If you forget to tell the system, some data stored on the cassette will be lost.

A 60-minute cassette (30 minutes per side) stores up to 12 files and up to 60K bytes per side.

You can also use the microcassette drive much like a regular audio-tape drive. Under certain conditions, the programmable function keys can simulate the control keys on a cassette tape player. You can even use it to listen to your audio cassettes, but the volume is very low.

The PX-8 is powered by an internal nicad (nickel-cadmium) battery, which can supply full power for about 15 hours. (Use of the microcassette drive or serial port shortens this time.) You can recharge the battery with a small transformer that plugs into any power outlet. A full recharge takes about 8 hours, longer if you use the machine during the process.

#### INTERFACES

The Geneva has a number of interfaces for external peripherals. The most useful is probably the RS-232C serial port configured as a round eight-pin DIN jack. It has pins for all the most commonly used signals— GND, TD, RD, RTS, CTS, DSR, DTR, DCD, and FG (frame ground)—and a maximum speed of 19,200 bps (bits per second). You can use two protocols: SI/SO (shift in/shift out), which can transmit a full 256 characters over a 7-bit communications link, and XON/XOFF.

To use the RS-232C port you need to purchase a DIN/DB-25 converter cable (approximately \$25). Although we didn't test a large number of serial devices, we found the Geneva worked well with an Epson acoustic modem and with an IBM Personal Computer (PC) using a null modem adapter.

(continued)



Photo I: The Epson Geneva PX-8 computer, shown with optional batterypowered 31/2-inch floppy-disk drive. Note the internal microcassette drive located between the keyboard and the display.

The PX-8 has another similar connector labeled serial, which you can use to connect an external disk drive (at 38,400 bps) or a serial printer (at 4800 bps). It also has three other ports: an external speaker jack (in addition to the internal speaker), an analog input jack (which connects to an internal analog-to-digital (A/D) converter, 0-2 volts, 6 bits of resolution), and a connector for a bar-code reader. One interface noticeably absent is a parallel printer interface. Another desirable connection would be for a full-size 80- by 24-character display.

The PF-10 portable 3½-inch disk drive (see photo 1) is available for \$599. Powered by an internal battery, it is rechargeable by the same transformer that recharges the Geneva. The disk drive can store about 320K bytes on a 3½-inch microfloppy disk and connects to the PX-8 with a short



**Photo 2**: The display of the Epson PX-8. Under certain lighting conditions this 80-character by 8-line display can be difficult to read.



Photo 3: The keyboard of the Epson PX-8. In this picture the display is folded down over the microcassette drive. Note the second Control key to the right of the space bar and the caps-lock, num-lock, and insert-mode indicators above the zero key.

cable through the serial port. You can connect two disk drives in daisy-chain fashion. The data-transmission rate is 38,400 bps, slower than the parallel connections most disk drives use. When you purchase the disk drive, you also get the following familiar CP/M utilities: FORMAT, DISKCOPY, ED, DDT, ASM, LOAD, and DUMP.

#### **EXPANSION**

The Geneva has some other interesting accessories. All are wedge-shaped modules that attach to the bottom of the computer and connect through the 50-pin expansion bus. These modules add little to the size and weight of the unit and elevate the keyboard to a comfortable typing angle.

The first of these are memory-expansion modules (see photo 4), which come in two flavors: 60K bytes (\$329) and 120K bytes (\$460). Since the Z80 microprocessor can address only the basic 64K bytes of memory, the second and third 60K-byte segments are set up as a RAM drive.

A second add-on module is a directconnect, 300-bps modem (\$180). A third module combines that modem with 60K bytes of memory for \$360. We did not test either of these modules.

These expansion units all connect through the 50-pin expansion-bus connector on the back of the computer. This connector was not designed for easy access, but once you attach an accessory you probably won't have to touch it again.

#### SOFTWARE

The Geneva comes equipped with 128K bytes of software on ROM chips—four 32K-byte chips. The first one contains the BASIC interpreter; the second, some CP/M utilities; the third, Portable WordStar; and the fourth, a combination of Portable Calc (CalcStar) and Portable Scheduler. Only two of these chips can be present in the system at one time (see photo 5).

The Geneva's operating system has some interesting features. First, it all resides on yet another ROM chip, (continued)

### AT A GLANCE

#### Name

Geneva PX-8

#### Manufacturer

Epson America 2780 Lomita Blvd. Torrance, CA 90505 (213) 539-9140

#### Size

11.7 by 8.5 by 1.9 inches (29.7 by 21.6 by 4.8 cm), 5.1 pounds (2.3 kg)

#### Components

Display: 80-character by 8-line LCD, 480- by 64-pixel graphics Keyboard: 72 keys, 4 cursor keys, 5 programmable function keys Processor: Z80-compatible, low-power CMOS version, 2.45-MHz clock speed Memory: 64K RAM; 6K RAM for display; 32K ROM (system); 64K ROM (applications) Power: Nicad battery rated at 15 hours, small transformer/recharger Options: 320K, 31/2-inch disk drive (\$599); 60K memory expansion (\$329); 120K memory expansion (\$460); 300-bps, direct-connect modem (\$180); combination 60K memory plus modem (\$360)

#### Software

CP/M 2.2, BASIC (Microsoft), Portable WordStar, Portable Calc, Portable Scheduler, TERM (communications)

#### Documentation

Five manuals

**Price** \$995





EPSON PX-8

The Memory Size graph shows the standard and optional memory available for the computers under comparison. The graph of Disk Storage capacity shows the highest capacity of one and two floppy-disk drives for each system. The Bundled Software Packages graph shows the number of software packages included with each system. The Price graph shows the list price of a system with two highcapacity floppy-disk drives; a monochrome monitor; graphics and color-display capability; a printer port and a serial port; 256K bytes of memory (64K for 8-bit systems); and the standard operating system and standard BASIC interpreter for each system. Note that the price of the Epson does not include a disk drive.

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The rear panel reveals (among other things) a speaker jack, an expansion bus, and an RS-232C port.



A look inside the PX-8 shows the processor chips (left) and the ROM chips (lower center).



The graphs for Disk Access in BASIC show how long it takes to write a 64K-byte sequential text file to a blank floppy disk and how long it takes to read this file. (For the program listings see June 1984 BYTE, page 327, and October 1984, page 33.) The Sieve column shows how long it takes to run one iteration of the Sieve of Eratosthenes prime-number benchmark. Note that the Epson could not run the Sieve test because of insufficient available memory. The Calculations column shows how long it takes to do 10,000 multiplication and division operations using single-precision numbers. The System Utilities graph shows how long it takes to format and copy a disk (adjusted time for 40K bytes of disk data). The file-copy test involved copying a file from one part of a floppy disk to another. The Spreadsheet graph shows how long the computers take to load and recalculate a 25- by 25-cell spreadsheet where each cell equals 1.001 times the cell to its left. The spreadsheet programs used were Portable Calc for the Epson and Microsoft Multiplan for the others. The tests for the Apple IIe were done with the ProDOS operating system. The IIe Multiplan test was done with DOS 3.3, the IBM with PC-DOS 2.0. which is permanently installed in the system. Second, when you turn the machine on for the first time, the system asks you how much memory you want in your RAM disk—from 2K to 24K bytes. Thereafter when you turn on the system, you see a menu of all the files on a particular drive. (By *drive* I refer to any device: a disk, a RAM drive, a microcassette tape. The operating system treats them all alike.) You then move the cursor to the program or document you want and press the Enter key. This loads the selected program into RAM and executes it.

If you press Control-Help, you see the System Display, which includes information on various operating-system parameters. The display contains the date and time, the size of the RAM disk, whether or not a password is in effect, which drives are listed on the menu, and which data files are linked to which programs.

The password feature on this machine is pretty secure. If you set a password, the machine won't do anything until you give it the correct one. The only way around it is to do a cold reboot and lose all your data.

You can turn the menu on or off and choose which drives are to be listed on the menu and in which order.

The System Display also lets you control the cassette drive manually. The function keys become like the controls on a tape recorder.

In practice, the menu is quite useful, but sometimes it gets in the way. For example, it is hard to enter a command such as STAT A:\*.\*—how many files are on the A drive and how large are they. To do this you must leave the menu by hitting Escape. Fortunately, you can turn the menu on or off.

The most significant piece of software in the Geneva is the ROM-based version of WordStar. Despite its small size, this version seems to contain most of the features of the larger version. The only features lacking are certain printing capabilities.

The spreadsheet supplied with the PX-8 is Portable Calc, a ROM-based version of CalcStar. Portable Calc performed our standard recalculation (continued) **Table 1:** Word-processing benchmarks for Portable WordStar on the Epson Geneva PX-8 (times in seconds). In many tests the Epson with a RAM disk performs as fast or faster than a floppy-disk-based IBM PC. There are two glaring exceptions, however: the scroll test and any test involving the Epson's floppy disk. All tests were done using a standard BYTE 4000-word test file (21K bytes). The RAM disk used was a 128K-byte external memory-expansion module. The data for the IBM PC was obtained using an IBM PC with WordStar version 3.3, DOS 2.0, two floppy-disk drives, and a monochrome monitor and adapter.

	Geneva PX-8		IBM PC
	RAM disk	Floppy disk	
Load text file	8.3	17.3	9.9
Save text file	15.6	80.0	24.2
Search	12.5	37.6	10.5
Scroll	287.0	n.a.	41.2



Photo 4: The optional memory-expansion module for the Epson PX-8, shown ready to attach to the bottom of the computer.



Photo 5: The sockets for the Epson's ROM chips are hidden in a special compartment on the bottom of the machine. A soft metallic sheet minimizes radio-frequency interference in the surrounding environment.



#### **REVIEW: EPSON GENEVA PX-8**

test as fast as Multiplan did on the Apple IIe, and it was much faster than the CalcStar version that comes with the 16-bit Sanyo MBC 550.

Portable Scheduler runs rings around the SCHED program on the Radio Shack Model 100 and approaches the usefulness of the scheduler features on the HP 75 portable. You can set an alarm, and you can have the computer remind you of a series of appointments.

#### BASIC AND CP/M

The BASIC interpreter on the Geneva takes up about 32K bytes of memory, compared to about 16K bytes used by the Model 100's BASIC. The Geneva version lets you do quite a few more things; for example, you can access the alarm features directly from BASIC. It also includes AUTO (automatic line numbering) and WHILE ... WEND. Both BASICs were created by Microsoft, and they are fairly compatible.

In terms of performance, the Geneva's BASIC does not compare well with desktop-machine versions. The results of our single-precision calculation test were significantly slower on the Epson than on the IBM PC and the Apple IIe. Also, we could not get our Sieve of Eratosthenes test to run. Of course, anything that involved disk accesses was significantly slower.

Finally, we come to the utility programs of CP/M version 2.2, such as copy files (PIP), check disk or RAMdrive status (STAT), and perform several different programs in sequence (SUBMIT). To these programs Epson has added a configuration utility and two communications programs.

TERM is a general-purpose program for communicating with other computers via phone or direct connection. It doesn't support automatic dialing or logging on, but it is quite easy to use. FILINK is for file transfer to and from an Epson QX-10. We didn't test this program.

The practicality of these application programs is somewhat limited by the fact that only two ROM chips can be present in the PX-8 at one time. If, however, you have one of the optional memory-expansion modules, you can load some of the more useful utilities into the RAM drive, then remove the CP/M utility chip and use that socket for another ROM chip.

One advantage of owning a CP/M system is that you potentially have a wide selection of available software. The Geneva display and keyboard emulate a Soroc IQ-120 terminal, and, theoretically, the Epson can run any CP/M software that is compatible with the Soroc. In actuality, the Geneva doesn't support features such as highintensity or inverse-video characters, and although it has a virtual screen of 24 lines, its physical screen has only 8. According to Bob Diaz of Epson, most of the simple CP/M utility programs such as DU and CATALOG run on the Geneva. More complex CP/M programs, such as PeachText, will run but with some minor problems. And CP/M programs customized for a particular terminal or computer probably won't run at all.

#### DOCUMENTATION

The documentation for the Geneva and its software is, on the whole, good. The manuals are typeset, well written, accurate, and practically devoid of typographical errors. I was particularly impressed with the easyto-read Portable WordStar manual, which included a reference card and stick-on labels for certain keys.

The main manual lists the entry addresses and functions of all the BIOS (basic input/output system) and BDOS (basic disk operating system) routines of the Geneva's version of CP/M.

#### SUMMARY

After the disappointment of the Epson HX-20, the Geneva PX-8 represents a giant improvement. It is, at this time, the most powerful 8-bit portable available. And its price of \$995 makes it fairly affordable. With the CP/M 2.2 operating system, the Geneva is an ideal second computer for CP/M system owners. It is also a good second computer for people who use Word-Star on a desktop system. ■