Epson PX-8 lap portable computer

by PETER VERNON

Want a portable computer with the CP/M operating system, built-in WordStar and spreadsheet programs and a host of add-ons and options? The Epson PX-8 may be for you.

Epson actually introduced the first briefcase-sized portable computer, the HX-20, in 1982, but its small 20 column by four line display and non-standard software quickly put it out of the running as more powerful machines appeared. The PX-8, Epson's newest offering, more than compensates, with a more versatile configuration and standard software running under the popular CP/M operating system.

Epson's PX-8 is a complex system, with many features and accessories and a range of options which can be confusing to the inexperienced user. Externally, it is one of the most compact portables available, measuring just 297 x 216 x 48mm when closed for transport, and weighing 2.3kg. A detachable plastic cover clips over the keyboard for protection while traveling and the 80 column by eight line liquid crystal display flips up and can be locked at any angle between 90 and 180 degrees in 15 degree steps. A slide-out carrying handle is fitted to the front of the console

The PX-8 is a true portable, easy to carry and able to be used anywhere thanks to internal rechargeable batteries which provide about 15 hours of operation between charges (less with extensive input/output operations). The batteries are charged by a 6V, 600mA plug-pack adapter which connects to a socket at the rear of the console, and it is possible to charge the batteries while continuing to use the system on mains power. A separate internal battery provides a backup facility which retains the contents of memory for a short time even though the main battery is discharged.

Applications software is provided in Read Only Memory modules, two of which can be installed in sockets on the bottom of the unit. As standard the PX-8 comes with MicroPro's WordStar (modified to use the PX-8 storage and communications facilities under the name "Portable WordStar"), a spreadsheet program called "Portable Calc", and a clock/calendar program for displaying reminder messages, called "Portable Scheduler". Two communications utilities TERM and FILINK, are included in the system software and a version of Microsoft Basic is also supplied.

A microcassette recorder is built-in, and up to 24K of main memory can be configured as a RAM disk emulator with battery back-up. Additional permanent storage is provided by battery powered 60K and 120K RAM modules, which are fastened to the bottom of the machine case, increasing the size and weight of the system.

The Keyboard

The keyboard of the PX-8 is comfortable and convenient to use. Fifty nine keys are provided, colour-coded in brown, tan, red and orange, with an additional nine programmable and special function pushbuttons above the main keyboard. The keys are large, with a firm, positive action and are arranged in a standard typewriter format except for the location of the CAPS LOCK and CTRL keys on either side of the space-bar.

Small folding legs on either side of the console can be used to change the angle of the keyboard to suit the user, but if a



This photograph shows the review model of the Epson PX-8. Note the built-in micro cassette drive and the flip-up display panel.

external RAM pack is fitted, the legs are superfluous. The RAM pack itself is sloped on the bottom to give the same effect, permanently.

On the left of the keyboard is an "inverted T" cluster of orange cursor control keys , a large red RETURN key and the NUM/GRPH key which acts as a second shift key to allow graphics codes to be entered from the keyboard and also (when pressed with SHIFT) re-defines a section of the alphabetic keyboard as a numeric pad for faster data entry. A small LED above the keyboard lights to show that the NUM key is engaged, and two more LEDs indicate CAPS LOCK and the Insert mode of the editor.

Five programmable function keys are available, which when used with SHIFT allow up to 10 pre-defined operations. The PX-8 is programmed with a default set of definitions which allow the most common CP/M commands to be entered with a single keystroke, while BASIC re-defines these keys to allow the entry of common BASIC statements. Other key definitions can be created by the user with the CONFIG system configuration utility program supplied, and optionally displayed on the last line of the LCD screen. Four other function keys are dedicated to particular operations, such as the HELP key, which (used with CTRL) produces a system status display. Other uses of the HELP key depend on applications software written to provide HELP functions.

An interesting feature of the PX-8 is that the keyboard layout can be changed by software, or by selecting a pre-defined format using DIP switches located beneath a cover on the bottom of the console. English, French, German and Scandanavian layouts can be selected. Most users will be content with the standard ASCII format supplied, so this feature is of limited value, but it does indicate Epson's determination to be all things to all people.

The Display

The PX-8 has a built-in 80 column by 8 line liquid crystal display which produces upper and lowercase text and 480 x 64 resolution dot graphics. The display quality is good, with an adequate range of contrast adjustment provided by a sliding control under the display, although the absence of lowercase descenders is a peculiarity. Lowercase letters with descenders (the tails of characters such as "j" and "p") are displayed as smaller capital letters in the middle of otherwise normal text.

Flexibility of the system is increased by a "virtual screen" arrangement which allows the text display format to be changed. The eight line display of the PX-8 can be set up as a "window" on a virtual screen of up to 48 lines. Normally the screen scrolls as the cursor is moved up or down, but a combination of keys (SHIFTS and INS) "freezes" the window over a particular portion of the display screen, regardless of movements of the cursor.

Other display options are also available, including formats of 16 lines of 40 characters each, displayed side by side in two groups of eight which scroll together, and two independently scrolling columns with widths defined by the user (to a total of 79 characters). Graphics are also possible, with a horizontal by vertical resolution of 640 x 64 dots and pre-defined symbols available from the keyboard.

The Hardware

The specifications of the PX-8 are impressive. No less than three microprocessors are used in the system, with a Z80 type main processor and two separate slave processors to control the display, I/O and keyboard.

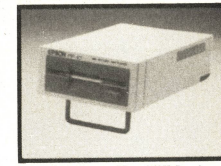
The standard system provides 64K of RAM and 32K of ROM, although the size of the programmable memory is reduced by the optional RAM disk feature and can be restricted further if the user chooses to set a size for the "User BIOS" area. This option is intended for programmers who wish to add their own functions to the system software, and create a protected area of memory to store custom operating system programs.

A battery-powered clock and calendar is provided, together with a wide variety of interface connectors and expansion options. A loudspeaker is built-in for sound effects, and there are two serial ports, a barcode reader port and a 6-bit analog to digital converter, plus a 50-pin expansion connector which brings out the full Z80 bus at the rear of the console.

Mass Storage

Storage on the PX-8 is a "belt and braces" approach. There are a number of ways of permanently storing programs and data in the system, some of which overlap.

The built-in microcassette drive is designated drive H by the operating system and stores files in the sequence they are written. Commands to handle the slower, sequential file access have been added to CP/M to cover the mounting and initialisation of a tape.



The disk drive uses 75cm 360K floppies.

Because files are stored sequentially along the tape and the file directory is stored at the beginning of the cassette, it is not feasible to update the directory on the tape each time a file is saved. Instead, the directory is updated in RAM, and only transferred to the tape during the "dismount" procedure used to change tapes. The CP/M commands for mounting and removing a tape cassette are intended to prevent problems which will occur if the tape is changed over at the wrong time. Because of the limitation on the size of the directory, a maximum of only 12 files can be stored on each microcassette tape.

Programs for the PX-8 can also be stored on "ROM capsules" which also appear on the PX-8 as if they were (write-protected) disk drives. Two 32K ROM modules can be plugged into the base of the PX-8, although only one is provided in the standard system, with BASIC and some CP/M utilities. ROM socket 1 appears as drive B and ROM socket 2 and drive C under the CP/M operating system. Portable WordStar, Calc and Scheduler are available in ROM modules as part of a separate "Software Library".

The third form of storage available for the PX-8 is a battery powered RAM disk. The standard system allows the user to allocate up to 24K of the internal 64K memory for use as a disk emulator, although the default value is 9K. This memory appears to the CP/M operating system as drive A. Use of internal memory as a disk emulator obviously reduces the size of memory available for data and program operation under CP/M, but does not provide enough space in the RAM disk for extensive file storage. Even the maximum 24K represents only six pages of text with one working file and one backup

Epson overcomes the problem by making available two external "intelligent RAM disks", one of 60K and the other of 120K. One of these optional modules can be connected to the bottom rear of the PX-8 console and fastened into place with four screws to form a self-

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contained unit. An external RAM disk module adds about 800g to the weight of the system and increases the height at the rear to 70mm.

When an external RAM disk is connected it appears as drive A and the internal RAM disk is disabled, making the full 64K of internal RAM available for use as programmable memory. The intelligent RAM disk unit has its own battery to maintain the contents of the memory when the PX-8 is not in use. Backup power is controlled by a switch on the rear of the RAM unit, which should remain ON unless the unit is disconnected from the PX-8 for a long time and the stored data is no longer required. A separate switch allows the RAM disk to be write-protected so that important data is not lost accidentally.

RAM disks are not a reliable way of transferring data between two PX-8s however. According to the manual "The battery does not allow the Intelligent RAM Disk unit to be disconnected and then used on a different PX-8 while still keeping the contents of the memory intact".

Additional external floppy disks drives can also be added to the PX-8. One drive was supplied with the review system. Known as the PF-10, this unit uses 75mm Sony "microfloppy"disks and provides 360K bytes of storage on each double-sided disk. A maximum of two external disk drives can be connected to the PX-8 and configured as drives D and E under CP/M.

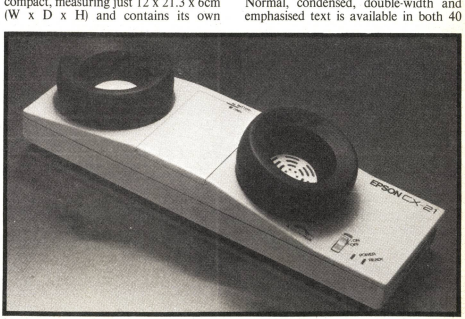
The PF-10 disk drive unit is very compact, measuring just 12 x 21.3 x 6cm (W x D x H) and contains its own batteries so that it can be used anywhere the PX-8 can be used. The batteries provide 90 minutes of continuous operation, and like those of the PX-8, can be recharged through a plug-pack adapter.

Connection of the disk drives is by way of a serial port, with a second drive connected to the serial output of the first disk drive unit. Because the serial link operates at 38,400 bps, data transfer from the disk drives is considerably slower than for normal, parallel connected disk drives.

There is a reference in the manual to applications programs which use data in ROM form. Such programs, according to the manual, "will have a command or specifically prompt you to change the ROM". The instructions require you to load BASIC and then switch the computer off, holding down the CONTROL key. The ROM is then changed, and on switching the power back on the system will automatically return to BASIC because the CONTROL/power off sequence restores the previous status of the machine. We were not supplied with any programs which required this procedure, but it is worth mentioning because of the potential for disaster for careless or inexperienced users.

The P-40 Thermal Printer

The Epson P-40 is a compact battery-powered portable printer that produces text on 112mm wide thermal paper. Normal, condensed, double-width and emphasised text is available in both 40



The CX-21 portable modem has been designed to team with the PX-8.

computer

and 80 column modes, with dot matrix characters formed on a 5 x 7 grid. Graphics can also be produced in two modes, with a resolution of 256 dots per line or 480 dots per line with a maximum line length of 89.6mm. Print modes and other operational parameters are selected by control codes sent to the printer by software.

Like the disk drive units, the printer is connected to the PX-8 by a serial line, although with a data transfer rate of 4,800 bps. The printing speed is a respectable 45 characters per second (normal print mode), and the P-40 is almost silent in operation.

Communications

In addition to the serial port used for connecting optional external disk drives or a printer, the PX-8 is provided with an RS-232C communications port which is well supported by the system software.

The port is normally set up to communicate with a printer, but parameters can be changed with the CONFIG utility prgram to allow data transmission speeds of up to 19,200 bps and various communications formats for different modem services.

TERM, the PX-8's terminal emulation program, allows the system to be used to transmit information from the keyboard and display information on the screen as it is received, and to transmit and receive files, although without any of the error checking and automatic re-transmission protocols of standard CP/M file transfer programs. The operating parameters of TERM cannot be changed once a session has begun — it is necessary to leave TERM and go to the CONFIG program.

A second, more sophisticated file transfer program is also provided, called FILINK, which supports specific communications protocols and is designed solely to transmit and receive files. The communications protocols supported, however, are not standard, and are apparently intended for use with Epson's larger QX-10 desktop system.

Epson's "Portable WordStar" has also been modified to use the RS-232C port to transmit and receive files. Two new commands (T for transmit and C for Receive) have been added to the WordStar opening menu to transfer text files from storage to a remote system, connected either by a serial cable or a modem. WordStar files are sent using the same parameters as the TERM program.

An acoustic coupler modem, the CX-21, is available for use with the PX-8. This battery-powered unit is a 300 baud, answer/originate modem styled to match the PX-8. Other Telecom approved modems could also be used, as the manual goes into great detail on connector pin-outs and exact requirements for the connection of accessory devices. Unfortunately, the communications programs of the PX-8 limit the usefulness of the system as an adjunct to a larger computer. The portable can be used as a "dumb terminal" for accessing dial-up data bases and other modem services, but the lack of support for standard file transfer protocols means that sending information to any computer except the QX-10 requires special software, which you may have to write yourself.

Software

Epson's CP/M has been modified, and at least does not just display the anonymous A> prompt when first loaded. When the PX-8 is switched on the first screen display lists the files available on drive B, a ROM module. These files include various CP/M commands and the applications programs WordStar, Portable Calc and Portable Scheduler. The first file name in the list flashes on and off, and pressing RETURN will select this file. Usually this is PIP, CP/M's file transfer utility. Other programs are selected by moving the flashing highlight with the cursor control keys, or the user may press ESC to enter the CP/M command mode (producing the A> prompt).

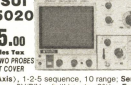
There are also many other options, including automatic start up based on the setting of the internal calendar and clock. With the powerful ARLARM and WAKE functions, the PX-8 can be turned on under software control and can be made to display a message or run a program without further intervention from the operator. Passwords can be added to the operating system so that the PX-8 cannot be used without entering the correct code.

Experienced users of CP/M can really go to town on the PX-8. In addition to a full implementation of CP/M and the usual utilities, Epson have added a User BIOS area, which allows skilled programmers to add their own routines to the CP/M command handler, completely customising the system to their requirements. Other additions include a complete tape operating system for the microcassette drive (called MTOS — Microcassette Tape Operating System) and extensions to support the unit's automatic power on feature, alarm

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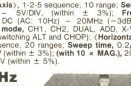
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and clock functions, high resolution graphics, a bar code reader and an analog input device port.

For new users, or those not interested in programming the PX-8, many of these features will be wasted except as they are used in coming applications programs. Inexperienced users may not even realise that the standard ws.com label on the display activates the WordStar word processing program, and the PX-8 provides no assistance other than this rather cryptic listing of available files. There is no self-explanatory start-up menu, as for the HP-110, for example.

We were provided with a copy of the "Software Library" mentioned previously. Apart from Portable WordStar, these two ROM modules also contain Portable Calc, a spreadsheet program, the Portable scheduler, which uses the built-in clock facilities of the PX-8 to allow the user to maintain a diary of appointments and schedule a reminder at the appropriate time and date.

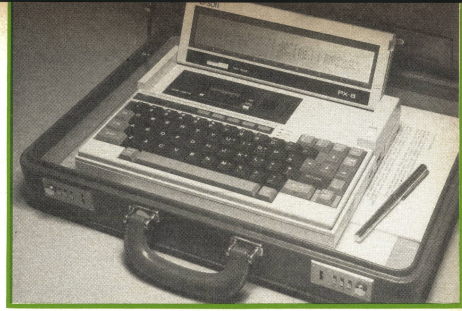
The Basic of the PX-8 is fairly standard Microsoft, with enhancements to support the microcassette drive, RAM disk and RS-232C port. A variety of graphics statements and functions are provided to take advantage of the PX-8's abilities in this area, as well as statements to control the clock and calendar and supply of the computer.

The Basic program area is divided into five sections, allowing up to five different programs to be held in memory simultaneously, and a versatile screen editor makes entry of programs easy.

Expansion

The PX-8 provides a number of expansion possibilities. In addition to the serial ports for printer and modem and the external memory modules and disk drives already mentioned, there is an analog interface and a bar code reader interface. Using the analog interface, voltages from any other attached device can be converted into digital form for use in a machine language program, while the bar code reader interface supports standard reading wands as used in supermarkets, etc. The interface is not supported by BASIC or the PX-8 operating system however, and special software would be required to make use of this feature.

A 50-pin connector on the rear of the PX-8 console gives access to the system bus, including all processor address, data and control signals and battery status signals. The external RAM disk module is connected to this interface, but also mentioned in the manual is a "Universal Unit", which apparently is a printed circuit prototyping board which allows other circuits to be connected to the system bus. If you fancy a portable computer for experiments with hardware, the PX-8 maybe for you.



This photograph gives an idea of just how portable the Epson PX-8 really is.

Conclusion

For CP/M users and experienced programmers the PX-8 is a powerful, versatile portable computer system. If you use WordStar, in particular, then you'll like the PX-8, although you'll need an external RAM disk if you plan on producing documents more than about six pages long.

If you are looking for a portable computer as such, then the availability of CP/M is less of an advantage and you'd be better looking at the presentation and ease of use of the software. Unless you want to learn the intricacies of a disk operating system, many of the features of the PX-8 will be wasted. Even the availability of thousands of programs under CP/M is no advantage unless you can acquire the programs in a format suitable for use with the portable, which means either down-loading over a communications link or transferring copies to a microfloppy disk drive in PX-8 format.

The communications capabilities of the PX-8 also fall short of the ideal. The emphasis on use with the QX-10 is understandable, since this system is Epson's desktop flag-bearer, but not a lot of them are in use. If you want to do more than access established dial-up services and bulletin boards, you'll need an experienced programmer to write file transfer programs to suit your requirements.

Prices

The standard PX-8 costs $1,300 plus sales tax. A 60K RAM disk is $404 and a 120K RAM disk is $570. Add-on disk drives are available for $720 and Epson's acoustic coupler is $209. The P-40 battery-powered thermal printer is $193.

Epson PX-8 Specifications

Processor: T84 (Z80 equivalent), slave 6301 for I/O and 7508 sub-processor controlling the keyboard and A/D interface.
RAM: 64K programmable, or less depending on the size of the internal RAM disk emulator. 60K and 120K external RAM disk available, 6K screen RAM.
ROM: 32K plus 2 x 32K plug-in modules.
Keyboard: 59 typewriter style keys, nine special and programmable function buttons.
Display: 80 x 8 line liquid crystal display screen with various text display formats, 480 x 64 dot graphics.
Interfaces: Two serial ports, A/D port, bar code reader port, expansion connector.
Power Supply: Nicad batteries mounted internally, rechargeable by external AC adapter. 15 hours operation per charge is claimed.
Dimensions: 297 x 216 x 48mm (w x d x h closed); add 30mm for external RAM disk height. 120mm height for display in working position.
Weight: 2.3kg console only, extra for external RAM disk if added.
Software: CP/M 2.2 disk operating system, BASIC, Portable WordStar, Portable Calc, Portable Scheduler and communications utilities in ROM modules.