Kaypro 4 Plus 88

The Kaypro 4 gets an 8088 and MS-DOS

By C. P. Rubenstein

Two of the hot tickets in microcomputing today are transportable machines and IBM PC compatibles. The Kaypro Corporation (formerly Non-Linear Systems, Inc.) has been cashing in on the demand for transportables with its Kaypro II, 4, and 10 line. Now, it is aiming at both markets with an IBM PC compatible transportable called the Kaypro 4 Plus 88.

To backtrack a bit, the Kaypro 4 is an updated, and upgraded, version of the single-board, Z80-based Kaypro II (reviewed in C&E in June 1983). The Kaypro 4 Plus 88, which is reviewed here, is a Kaypro 4 with factory-installed 16-bit Intel 8088 co-processor and an additional 256K bytes of dynamic RAM. Suggested retail price of the 4 Plus 88 with bundled software is $2195. (An 8088 upgrade kit is also available for the Kaypro II and 4 from SWP Microcomputer Products, Dallas, TX.)

Inside the 4 Plus 88

The main board of the 4 Plus 88 contains a Z80 microprocessor, 64K RAM, 2K video RAM, a 2K ROM for the "boot" software, and a 4K character generator. Actually, the Z80 is on a separate small board that plugs into the socket that houses the Z80 on other Kaypro models.

Two Zilog Z80 PIO chips and a Z80 SIO chip are used to implement the 36-pin Centronics-type parallel port and the DB25 serial RS-232C port. The PIOs have a spare 8-bit parallel port as yet unused. Thus, future expansion busses, add-ons, or even an IEEE-488 port could be added with a connector and a few lines of system software.

The 4 Plus 88 has upgraded its disk drive capabilities by using a Western Digital FD1793 floppy-disk controller chip (the II had an FD1791) and including the "UniForm" formatting program, which reconfigures the disk parameters for Xerox 820, Osborne I, and TRS-80 Model I disks. (This controller chip can handle single/double density as well as 5¼" and 8" drives, so watch for 8" add-ons).

The main computing board is well designed with one-third of the 70 ICs socketed for later repairability and ROM upgrades. However, there are no specific sockets available for add-on boards, modems, etc.

The new feature of the Kaypro 4 Plus 88 system is an Intel 8088 co-processor (5.33 MHz) and 256K bytes of RAM. A 16-pin ribbon cable connects the Z80 board to a 6" × 7" board that has the 8088 co-processor and 65 other ICs supplying 256K RAM and 4K ROM. This board is attached to the rear of the disk drive cage and to the 5-V power bus. On this board, only the RAM, the ROM, and the 8088 have sockets, with the other 30 ICs soldered in place.

The board does double-duty as an 8088 co-processor MS-DOS or CP/M-86 system, and as a 256K-byte RAM disk under the CP/M-80 operating system. This RAM disk feature allows programs to have rapid I/O without the expense of a hard disk. It is only implemented when requested, and, since it is dynamic RAM, it is reset when warm/cold booted.

The only drawbacks to this upgrade are those related to IBM PC compatibles in general (see below), the unavailability in the original Kaypro 4 design to support an "open" bus with spare card slots, and the 8088 board's current lack of any place to put additional RAM or the Intel 8087 floating-point mathematics chip that gives the 8088 so much more power.

Physical Characteristics. The Kaypro 4 Plus 88 is in a rugged, grey metal case measuring 8½" × 18¾" × 14⅜" and weighing 28 lb. The carrying handle is on the back of the case.

Also on the back panel are a removable line cord that wraps around the case, a reset button, a brightness control, *exposed* vent slots, and keyboard, serial, and parallel connector sockets. In spite of its rugged appearance the entire unit would require environmental seals and covers to avoid the "raindrops keep falling on my RAM" syndrome. Of course, you can always get a separate carrying case.

The Kaypro 4 Plus 88 features an Intel 8088 and an added 256K.

No doubt listening to its customers' complaints, the 4 Plus 88 now has a foldup wire support brace on the bottom that permits angling the display and drives at a comfortable 15° viewing angle. This allows complete freedom of movement for the keyboard without the II's need for a book, ledge, or shelf add-on to reduce neck strain.

The Keyboard

The keyboard is attached to the console through a standard (unshielded) 4-pin

modular telephone plug. The 12″ coil cord can extend to about 4′, but unhappily half of that extension is lost going *under* the console to plug into the rear panel.

The keyboard chirps through its built-in piezoelectric speaker when you press the keys down. Although this can be annoying, it is under software control and thus can be turned off either from within the various BASICs supplied, or as a machine language command by outputting "8" to port 5. I do like the feel of the keys with this feature, and must admit that the chirp simulation of tactile feedback is more pleasing as you get used to the keyboard. The keys are a bit light, though, and have a plastic-tinny feel.

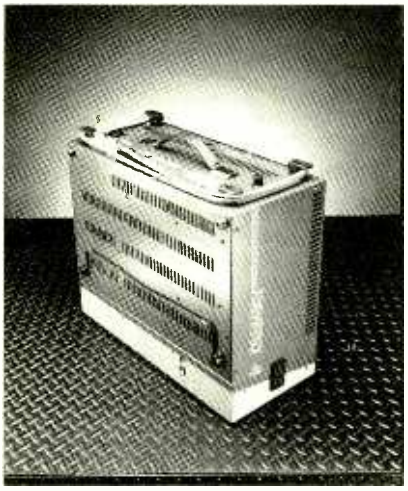
The full-featured QWERTY keyboard with 14-key numeric keypad, standard-control keys, and up-down-left-right cursor-control keys is manufactured by Maxi-Switch Co., and uses an 8049 dedicated microcomputer chip (with 2K of on-chip ROM) for key encoding and 8-bit serial communication with the main processing board.

Using the menu-driven CP/M-80 "Config" program, you can redefine the 18 cursor and numerical keypad keys to any hexadecimal value. The program accomplishes its task by rewriting the key code tables in CP/M's BIOS. Located just after the CP/M jump table (which begins at $FA00), the cursor keys are defined at $FA35H-FA38H, and the numerical keypad at $FA39H-FA46H. Your customized definitions are written onto the disk's CP/M and remain in the memory's CP/M image until a *cold start* (reboot or reset) is done. Each disk can therefore have its own specific keyset to enable rapid use of Perfect Writer or WordStar control-key codes. The keyboard's circuit board has 15 currently unused locations where Kaypro could place user-definable or special-function keys in future upgrades. (See white squares in photo.)

I loaded the CP/M to MS-DOS program on a disk whose cursor key codes were redefined and found that they had been reset to their original values in the booting process. The current MS-DOS disk does not have a "Config" program and thus more information about the MSDOS.SYS and IO.SYS files must be made available. (Their directory attribute of "2" makes them invisible to the directory, and thus cannot be examined by "Debug," etc. unless an MS-DOS equivalent of the IBM PC Norton's Utilities, or a disk editor, becomes available.) It's not clear if Kaypro intends to support key definition tables in CP/M-86 or MS-DOS.

The Display Monitor

I prepared a few WordStar documents with the system and found little problem reading the 9″-diagonal (about 5″ × 7″) green-phosphor screen (even from a distance of over 5′). Also I had no trouble interpreting the rather well-proportioned, 5-dot wide and 7-dot high (8 dots are used to create lower-case descenders) characters on the Elston Electronics, Corp. display that the Kaypro 4 Plus 88 uses for its CRT. The screen displays 25 lines of 80-character blocks



A luggable 28-lb package.

(6×9 dots) or about 480 × 225 pixels if full graphics could be implemented.

The characters are generated, along with an auxiliary Greek alphabet (ESC-G toggles lower case to Greek translation, ESC-A turns off the toggle), using a socketed, 4-kilobyte ROM, thus allowing for future upgrades.

I did notice that there still is some power-surge "screen-pulling" on the left margin whenever the disk drives are accessed.

The Disk Drives

The dual drives on the 4 Plus 88 are double-sided and double-density, thus allowing for twice the Kaypro II's storage capacity (800K). Something that is troublesome, but no great problem, is the constantly "on" LED indicating the last active drive. In many other systems, the drive LEDs are only on during the times that the disks are actually spinning. (When in MS-DOS, the LEDs *are* off when the disks are not running.) Instead of looking at the drive LED, you have to *listen* for the drives to stop if you want to remove the disks. Another interesting thing is that *both* drives spin at any drive request.

The Software Bundle and Documentation

The Kaypro 4 Plus 88 is bundled up nice and warm with a plastic library case containing about a dozen 5¼″ diskettes of enough software to get the new owner off to a good start (see Table I). Also added for your evening's readings are an equal number of manuals weighing in at close to 10 lb, and containing over 2400 pages of excellent user information. (Gee, buy the computer and they throw in a library at "no-extra-cost.") Most of the manuals are high-quality photocopies of the original manufacturer's manuals, some of which are noted for their lack of comprehensibility.

The new user might really feel intimidated without a large dose of dealer support after opening these classics. Some, like the CP/M manual, have confused many people for many years, others like the WordStar Training Manual are designed so that the new user doesn't have to read the WordStar Reference Manual (which has been much streamlined from the last time I saw the WordStar 2 manual).

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TABLE I—KAYPRO 4+88 SOFTWARE

Operating System:	Digital Research CP/M-80 2.2 Microsoft MS-DOS 1.25 (version 2.1 also available)
Word Processor with Spelling Checker:	WordStar 3.30 with the WordPlus 1.4 Perfect Writer 1.2 with Perfect Speller 1.1
Spreadsheet:	Microplan 4.04 Perfect Calc 1.1
BASIC:	S-BASIC C-BASIC 2.08 with CRUN 2.08 and 2.38 Microsoft BASIC-80 4.51 and 5.21
Database:	Perfect Filer
Other:	UniForm (disk format changer)

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dows will probably benefit you. More so if the data you work with is required by several of the programs you use, or is generated by one program but required by another.

How do you decide which system is best for you? Obviously you can rule out some for hardware reasons, and others because you don't feel comfortable with the features they offer. That still isn't going to help you make your final decision.

Probably the best thing you can do, after weeding out the ones that are clearly not for you, is to see what software runs under those that are left. In the end, it's the application, and not the operating system, that will be the basis for your decision. ◇

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The "IBM PC-Compatibility" Myth

The recent trend in portable computers is to either produce or retrofit a product so that it is IBM PC-compatible. But this is like a utopia that can never be reached because IBM cleverly merged the Microsoft MS-DOS into its hardware-dependent 40K ROM operating system. In doing so, and copyrighting same, IBM closed the doors (which Digital Research's CP/M had opened for 8-bit machines) for software swapping and compatibility on 16-bit microcomputers. Anyway, we now have to define what PC-compatible is.

By definition, any 16-bit microcomputer operating under MS-DOS that can read and write to a particular (IBM) disk format, and that can run an assembly level or language level program that does not directly access the *forbidden* IBM ROM BIOS, or use a bit-mapped video display, *might* run programs from any other system that claims the same. This means that BASIC, etc. programs that run through a machine-customized interpreter or compiler without using the special bells and whistles of the hardware, *might be compatible!* Thus unless you use "plain vanilla" or generic programs (on single-density IBM disks), that do not make extensive or creative use of the display, you will find that the Kaypro hangs up when you try to run the program.

Unfortunately, right now all of the applications software bundled with the Kaypro is for CP/M-80. Thus, all you can do when you get the machine is fool around with the MS-DOS operating system, and format MS-DOS disks. You will have to purchase MS-DOS software at additional cost. (A list of compatible software is available from Kaypro.)

I couldn't wait to see a 16-bit machine that would blow my mind and have me wondering why I hadn't changed to an IBM derivative until now. The first program I tried to run on the 4 Plus 88 was Supercalc3 (not on Kaypro's list), which was configured for the IBM PC and PC XT, the Compaq, Hyperion, and Columbia Eagle PC and 1600. I could read the disk's directory and any ASCII files. (The MS-DOS TYPE command dumps the entire file into memory and then to the screen rather than buffering the sectors as CP/M-80 does; keep your finger on CTRL-S.) I got anxious. I typed SC3 and pressed RETURN. Noise from the drive told me that the program was loading, chung, chung, chug, hiccup, hiccup, chug-chug, chu-u-u-ggg, ti-pocket-a, ti-pocket-a. Then there was silence. The cursor was in the middle of the last line on the screen. *Hangup time at the ol' corral.* There was no joy in my office, mighty Kaypro had struck out.

As could be predicted, the Kaypro 4 Plus 88 hung up whenever I attempted to run IBM standard software. However, I was later successful running software recommended by Kaypro as compatible with the 4 Plus 88.

Conclusion

The Kaypro 4 Plus 88, although an IBM PC compatible machine is limited in many ways. Much of the software written for the IBM PC cannot run on this machine. It remains to be seen whether software companies will tailor their MS-DOS programs to run on the 4 Plus 88. Besides the software problem, there are difficulties with the hardware. Memory size is limited to 256K and there are no expansion slots. The finer things of computing such as graphics and color won't be available on the 4 Plus 88. However, for those people who want to run the 16-bit software that is available, the machine is an exceptional buy. At a cost of just $400 more than the basic price of the machine, you gain access to the 16-bit world and also get a RAM disk for your CP/M-80 system as a bonus.

The Kaypro 4 Plus 88 is a well-designed and complete (including software) system at a great price. If your particular needs can be satisfied by the add-on 8088 board, I certainly recommend the system. ◇